Exploring risk-awareness as a cultural approach to safety: An ethnographic study of a contract maintenance environment

DAVID M. BORYS

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School of Science and Engineering

University of Ballarat
PO Box 663
University Drive, Mount Helen
Ballarat, Victoria 3353
Australia

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Preamble

Management fads come and go but the hazards stay the same

Abattoirs are inherently risky places to work. The work is repetitive and unpleasant. The sights and smells of an abattoir challenge the senses and for those who work in them, the stench and the sight of death and blood becomes a normal part of a day's work. Labour turnover is high yet the work is skilled. It is not unusual for meat workers to carry the scars of their job – missing fingers and lacerations to their forearms are common due to constantly working with and around razor-sharp knives. The less obvious scars include muscle strains from the repetitive and physically demanding nature of the work. Workers are also exposed to other hazards such as moving machinery, cold environments, noise and biological hazards.

When I first saw the abattoir, or meat processing plant as it now prefers to be called, it was new and had been in operation for only four years. By industry standards it probably would be considered best practice. So much so that one manual task had been replaced by a robot. This particular organisation was also attempting to break the culture of the industry by changing work practices and the language used to refer to those work practices. Innovations included a partnership with a training institution and an onsite training facility used to move workers through differing levels of competence in various tasks. Even so, in a staff of 250, labour turnover remained high. This represented a challenge to retain skilled staff. The number of workplace injuries was also deemed unacceptable.

As part of its approach to reducing injuries and improving safety culture, the abattoir decided to introduce a behaviour-based safety initiative backed by the government body responsible for safety and the industry association. The abattoir put forward the behaviour-based initiative under this program. As an external consultant, I proposed a shift in focus away from individual behaviour to that of collective mindfulness and risk-

awareness. This shift was accepted by management and their application for funding was successful.

The program was to be delivered to all workers on site. Managers were to receive a two hour training program whilst workers would receive a one hour training program. The focus of the program was a conceptual framework that was designed to share and improve understanding across the site about how to prevent injuries and, in particular, the role of collective mindfulness and risk-awareness. Photographs were taken of people working and these were to be used as case studies during the training. I put forward two options for delivering the training. The first was a train-the-trainer option; the second was for the trainer to deliver all the training. The abattoir elected to go with the second option as they believed an external person would be more credible in the eyes of the workforce. This assumption was later shown to not always be the case.

The training program was to be evaluated pre and post training. Before the training commenced, data was collected on a range of organisational indicators of safety including injury rates and the number of incidents reported. Data was collected at the start of each training session to determine individual perceptions of safety at the abattoir and if workers believed injuries were preventable. The same data was collected six months after the start of the program. Further data was also collected at this point to determine if the program had been successfully implemented and sustained.

The training itself spanned eight weeks and involved all 250 workers. Workers in their white work gear would trudge the long and winding concrete path to the training centre, some with blood still dripping off their trouser legs. In the training room emotions sometimes ran high as the workers expressed cynicism about the program. Many were just pleased to have time off work and a number could not be bothered taking the supporting material away with them. It was when the trainer shut up and the workers had a chance to tell their stories that the real insights into life in an abattoir emerged. Unfortunately I, as trainer, being external to the organisation, was not the most

appropriate person to hear the stories and potentially valuable organisational learning was lost.

It was while the workers returned back along the path to work, and to no doubt talk among themselves about what they had just been subjected to, that it started to become evident that the training that was taking place in that classroom was far removed from the reality of the day-to-day working lives of the workers. Sadly the implementation of the program was not sustained in the workplace. This outcome could serve to reinforce the belief among workers that in organisations, management fads come and go but the hazards stay the same. Could it be that this belief, handed down in the form of stories, will be what prevails in the minds of the workers? On reflection, maybe it is not only what you do to improve safety that is important, but how you do it.

This experience left me with questions about how occupational health and safety ideas can be successfully embedded in a workplace. The abattoir experience is not unique; many workplaces are dangerous places to work and fatalities, injuries and diseases continue to occur at unacceptable levels. This is despite a significant growth of interest in and knowledge about how they occur. It would seem that the best efforts to date have not delivered the desired result.

This intervention focused on promoting a culture of risk-awareness by establishing organisational processes for supporting individual risk-awareness. Even though the risk-awareness program was not sustainable in this workplace, it would still be of interest to the wider occupational health and safety community to better understand what impact similar programs in other industries have upon the culture of safety and risk.

What impact do risk-awareness programs have upon the culture of safety and the resulting impact upon risk?

Abstract

Safety culture has risen to prominence over the past two decades as a means by which organisations may enhance their safety performance. Safety culture may be conceptualised as an interpretive device that mediates between organisational safety rhetoric and safety programs on the one hand, and local workplace cultures on the other. More recently, risk-awareness has emerged as a cultural approach to safety. Front line workers are encouraged to become risk-aware through programs designed to prompt them to undertake mental or informal risk assessments before commencing work. The problem is that risk-awareness programs have not been the subject of systematic research and the impact of these programs on the culture of safety and the resultant level of risk is unknown. Therefore, this ethnographic study of two sites within a large contract maintenance organisation in Australia explored what impact risk-awareness programs have upon the culture of safety and the resultant level of risk. The researcher spent two months in the field and data was collected through participant observation, semi-structured interviews and through a review of organisational documents. This study found that managers focused upon collecting the paperwork associated with the program as proof that workers had a safer workplace, whereas workers preferred to rely upon their common sense rather than the paperwork to keep them safe. As a consequence, the risk-awareness program resulted in a culture of paperwork and varying levels of risk reduction because the paperwork associated with the program created an illusion of safety for managers as much as common sense did for workers. The results of this study have implications for safety culture, risk-awareness programs and for organisational learning. They also have implications for organisations wishing to improve their safety culture by encouraging risk-awareness in front-line workers.

Statement of Authorship

Except where explicit reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma. No other person's work has been relied upon or used without due acknowledgement in the main text and bibliography of the thesis.

_____ _____

David Borys Date

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Professor Dennis Else Date

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Associate Professor James Sillitoe Date

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But most importantly I would like to acknowledge and thank my principal supervisor Professor Dennis Else and my associate supervisor Associate Professor Jim Sillitoe for their encouragement, enthusiasm and above all, their wisdom.

Dedication

I would like to dedicate this thesis to my family: Cynthia, Angie, Brittnee and Sebastian for tolerating my preoccupation with this study.

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Chapter 1 Introduction

1.1 Global Efforts to Improve OHS

Communities around the world are faced with the ongoing challenge of preventing work-related fatalities, injuries and disease (FID). This challenge is reflected in International Labour Organization estimates that globally there are about 2.2 million work-related deaths, 270 million injuries and 160 million cases of ill health per annum (Takala, 2005). Governments and other peak organisations are responding to this challenge through the development of long-term improvement strategies that aim to reduce the incidence of FID in their respective countries (ASCC, 2005; HSC, 2004; NIOSH, 2004; The Swedish Work Environment Authority, 2004). These strategies generally outline a range of occupational health and safety (OHS) initiatives designed to reduce the incidence of FID and include initiatives to build capacity within individual workplaces to better control risk.

1.1.1 Australia's national improvement framework

Australia, like many countries around the world, is tackling the problem of work-related FID at a national level. Australian workers' compensation statistics for the year 2004-2005 reveal that there were 140, 655 new claims reported and 214 compensable fatalities (Australian Safety and Compensation Council, 2007). The cost of work-related injury and diseases in Australia is estimated to be $34.3 billion or 5 percent of Gross Domestic Product for the 2000-2001 financial year (National Occupational Health and Safety Commission, 2004). The Australian Safety and Compensation Council (ASCC), formerly known as the National Occupational Health and Safety Commission (NOHSC), is the peak body representing all Australian States and Territories, the Commonwealth as well as peak employer and employee bodies (ASCC, 2005; NOHSC, 1999). Its role is to lead and coordinate activities to prevent death, injury and disease in Australian workplaces (ASCC, 2005; NOHSC, 2003).

The ASCC has recognised that although there have been improvements in Australia's OHS performance, the number of fatalities, injuries and disease experienced in Australian

workplaces represents a significant challenge (NOHSC, 2002). To combat this challenge, the ASCC has developed the National OHS Strategy 2002–2012. This 10 year strategy has a vision of achieving "Australian workplaces free from death, injury and disease". The National Strategy establishes national targets, principles and priorities. Of the five national priorities, priority two: "Develop the capacity of business operators and workers to manage OHS effectively" (ASCC, 2005; NOHSC, 2002) is particularly relevant to this study. Priority two focuses upon building capacity within individual workplaces to control OHS risks through the implementation of effective OHS management strategies (NOHSC, 2002).

To help achieve this priority, a range of strategies are already available to organisations looking to improve OHS. These strategies are summarised in the next section.

1.2 Current Approaches to Improving OHS

Current approaches to improving OHS can be categorised by *activity*, for example individual screening and monitoring (Bohle & Quinlan, 1999), by *responsibility*, for example, victim-blaming (Hopkins, 1995), by *time period*, for example the three ages of safety proposed by Hale and Hovden (1998) or by *model*, for example the engineering model (Reason, 1997). Reason's categorisation of approaches to managing OHS will be used here, partly due to the current popularity and widespread use of Reason's work, partly because it is inclusive of other categories mentioned above and partly because Reason argues that the approaches can co-exist as long as the strengths and weaknesses of each approach is appreciated (Reason, 1997).

Reason argues that there are three models for managing safety: the person model, the engineering model and the organisational model (Reason, 1997). Table 1 summarises some of the main assumptions that are made about the causes of FID within each of the three models, together with the corresponding prevention approaches to managing safety. It is likely that in practice, the approaches to managing safety are more interrelated than is illustrated here. For example, a behaviour-based safety strategy to prevent unsafe acts

under the person model could also be thought of as originating from the organisation model. Similarly, efforts to reduce human error span the engineering and organisational models.

Table 1

Assumptions about the causes of fatalities, injuries and diseases and examples of corresponding approaches to prevention

The Person Model		**The Engineering Model**		**The Organisational Model**	
Assumptions about cause	*Prevention strategies*	*Assumptions about cause*	*Prevention strategies*	*Assumptions about cause*	*Prevention strategies*
Accident proneness	Screening of workers using psychometric testing	Equipment failure	Systems safety Risk assessment Safe design Purchasing Maintenance and inspection programs Environmental monitoring Biological monitoring	Management system failures	OHS management systems Auditing OHS management systems
Unsafe acts	Motivation and incentive programs Behaviour-based safety programs Safety rules Training			Failure of safety culture	Informed safety culture Collective mindfulness Risk-awareness Climate surveys
Human error	Safe design Safety rules Drug testing Training Job safety analysis Risk-awareness programs			Leadership oversights	Mindful leadership

Source: adapted from Reason (1997)

1.2.1 The person model

The person model focuses upon the behaviour of individuals within a workplace and the role that behaviour plays in causing FID. Traditionally, this model has concentrated upon the behaviour of workers but has evolved to include all decision makers including

managers in an organisation. The person model can be viewed from at least three perspectives that can be traced back to early last century:

Accident Proneness

The concept that some workers could be ‘accident prone’ emerged in the 1920’s. It was theorised by psychologists at the time that some people exhibited particular traits that made them more susceptible to having accidents than others (Shaw & Sichel, 1971). Consequently, being able to identify ‘accident prone’ workers and exclude these workers from risky tasks would prevent FID.

Unsafe Acts

The view that 88% of all FID are caused by the unsafe acts of workers (Heinrich, 1959) emerged in the 1930’s as a result of the research conducted by H. W. Heinrich. Heinrich’s ‘domino model’, the main tenet of which is that ‘accidents’ can be prevented by removing the ‘unsafe act’ domino has been and still is the most widely used ‘accident’ prevention model. Reducing ‘unsafe acts’ by encouraging workers to work more safely through the use of incentive programs and safety slogans would prevent FID (Pardy, 1999). More recently, behaviour based safety programs which are based upon the theory of operant conditioning have emerged as popular approach to promoting safe behaviour (Krause, 1997).

Human Error

Human error research recognises the role humans play in contributing to FID and has spawned an array of models that attempt to identify and classify error types (Reason, 1990). This approach suggests that understanding and compensating for different types of human error would prevent FID. Techniques for reducing human error range from controlling behaviour through rules and procedures, designing error-tolerant equipment, working environments and systems of work through to programs designed to increase the risk-awareness of workers (Hopkins, 2005a).

1.2.2 The engineering model

The engineering model focuses upon the physical aspects of the workplace that are external to any person and the role that the physical working environment and equipment can play in causing FID. Rather than trying to influence the behaviour of workers, this model looks for opportunities to engineer safety into the system within which workers work. This 'safe place' approach rather than 'safe person' approach to the control of risk is a well established and accepted principle of contemporary risk control practices (Atherley, 1978). This philosophy is also a feature of contemporary OHS legislation which now requires risks to be controlled in accord with a hierarchy of control. At the top of the hierarchy of control is the need to either eliminate the hazard, or if that is not possible, control the hazard through the use of engineering controls. This model also employs the principle of defence-in-depth meaning that multiple defences must be breached before a FID can occur (Reason, 1997). The engineering model can incorporate a range of disciplines including engineering, risk engineering, systems safety and ergonomics. A range of techniques are available to support the use of this model, particularly qualitative and quantitative risk assessment techniques. Quantitative risk assessment techniques include fault tree analysis, event analysis and hazard and operability studies (for examples see Harms-Ringdahl, 2001).

1.2.3 The organisational model

The organisational model focuses upon the role of senior decision makers in complex socio-technical systems and the role decision making and action plays in causing FID. This model emphasises culture; how leadership and management decisions shape culture and the relationship between culture and error-producing conditions in the workplace (Reason, 1997).

The organisational model can be viewed from three broad perspectives: management systems failures, failures of safety culture and leadership oversights.

Management System Failures

The contribution of management system failures to FID has been well recognised, particularly following investigations into major disasters that occurred during the latter part of the last century (for examples see Hopkins, 2001; Kletz, 2001). As a result, OHS has followed in the footsteps of quality management resulting in the development, documentation and auditing of OHS policies and procedures designed to systematically manage OHS and, presumably, reduce FID (Bluff, 2003). However, management system failures may reflect more general organisational failures as management systems must operate within an organisation context and may be influenced by the culture of the organisation.

Failures of Safety Culture

The contribution of a poor safety culture to FID has emerged as a recurring theme from investigations into major disasters that have occurred around the world over the past two decades (see for example Hopkins, 2005a; McInerney, 2005). As a result, much has been written on this topic and what steps organisations need to take to develop a good safety culture. Although it is acknowledged that there is a relationship between safety culture and safer work places, the nature of this relationship remains the subject of debate. For example, there is debate over whether safety culture is an individual or group phenomenon (Hopkins, 2005a) and following from this, whether culture change should focus on changing individual values and beliefs or collective practices (Hopkins, 2005a; Reason, 1997). There is also debate over whether or not organisations have one culture or multiple cultures (Richter & Koch, 2004).

Leadership Oversights

Leaders shape culture (Schein, 2004) and have a vial role to play in determining whether an organisation exhibits practices that would be consistent with a culture focused on safety (Hopkins, 2005a; Reason, 1997), because leadership oversights are often at the heart of failures in safety culture (Hopkins, 2005a). Mindful leadership requires leaders to have the necessary information on, and to exhibit ‘chronic unease’ about, the state of

safety (Hopkins, 2007). A mindful and informed safety culture knows where the 'edge' of safety is without having to fall over it (Reason & Hobbs, 2003).

1.2.4 Summary of current approaches to improving OHS

There are a range of approaches available for managing OHS which can be classified according to either the person, engineering or organisational model based upon the assumptions the different approaches make about the cause and prevention of fatalities, injuries and disease. Contemporary OHS management recognises that workplaces are complex socio-technical systems (Reason, 1995) and that it will be a combination of approaches that will result in a reduction in these FID.

Of the three models, there is wide support in the literature for the organisational model and in particular the role and importance of safety culture (Gherardi & Nicolini, 2000a; Hopkins, 2002; Hopkins, 2005a; Reason, 1997). For example, Gherardi and Nicolini (2000a) assert that although the role of what they call the traditional approach (the engineering model) and the normative route (the person model) should not be underestimated, safety is an emergent property of cultural systems.

1.2.5 The organisational model and the emergence of safety culture

Safety culture has been the subject of theory, research and practice for at least two decades and yet remains a poorly understood construct (Guldenmund, 2000). It is generally agreed that the term 'safety culture' rose to prominence following the investigations into the 1986 Chernobyl nuclear reactor disaster in the Ukraine which was attributed to a failure of safety culture (Gherardi et al., 1998; Glendon & Stanton, 2000; Pidgeon, 1997; Weick & Sutcliffe, 2001). Safety culture has gone on to be implicated in a range of disasters world-wide including both the Challenger (Presidential Commission on the Space Shuttle Challenger Accident, 1986) and Columbia (NASA, 2003) space shuttle disasters in the United States and more recently, the BP Texas City fire and explosion which killed 15 and injured 180 (CSB, 2007), also in the United States.

In Australia, the inquiry into the Waterfall rail disaster in New South Wales also identified the importance of a good safety culture (McInerney, 2005). Similarly, Hopkins' (2005a) analysis of the Glenbrook rail disaster, also in New South Wales – Australia, identifies the importance of a good safety culture. However, what constitutes a 'good' safety culture is contentious. In Australia at least, the notion of risk-awareness has recently emerged as a cultural approach to safety that is interchangeable with the notions of an informed safety culture and collective mindfulness (Hopkins, 2005a).

1.2.6 Risk-awareness as a cultural approach to safety

Hopkins (2005a) argues that risk-awareness is an approach to culture and safety that is largely interchangeable with two other cultural approaches to safety: collective or organisational mindfulness and an informed safety culture. In practical terms, risk-awareness is developed in organisations through programs that encourage workers to undertake a risk assessment in their minds before commencing work (Hopkins, 2005a). One rationale for promoting these programs is the realisation that it is impossible to write a safety rule to cover every circumstance, and that circumstances and risk change (Hopkins, 2005a). Risk-aware workers are also more likely to see more and to report more hazards, errors, near-misses and incidents (Hopkins, 2005a). Risk-awareness programs, as a cultural approach to safety, rely not only on individual risk-awareness but on organisational systems that encourage risk-awareness (Hopkins, 2005a, 2007).

1.3 Problem Synthesis

Globally, the number of work-related FID remains unacceptably high. In response, many countries, including Australia, have put in place national strategies designed to combat the toll and to build the capacity of organisations to manage OHS. A range of approaches are already available to organisations to manage safety, however, investigations into major disasters have highlighted the importance of a good safety culture. In Australia, promoting risk-awareness is viewed as one strategy for promoting a good safety culture, that is, an organisational culture that is focused on safety (Hopkins, 2005a). However,

for these programs to be successful they must be supported by organisational systems that encourage individual risk-awareness (Hopkins, 2007).

1.3.1 Statement of the problem

Hopkins (2005a, p. ix) argues that "every organisation has a culture and that culture can be expected to impact on safety". Risk-awareness, Hopkins (2005a, p. ix) goes on to argue, is a cultural phenomenon that today is advocated as a way of "enhancing safety".

The problem is; programs that are designed to promote risk-awareness have not been the subject of systematic research and the impact that these programs have on safety, culture and risk is unknown. To state the problem succinctly: there is no evidence, apart from anecdotal evidence, that risk-awareness programs enhance safety.

1.3.2 Significance of the study

This study is significant because it will build upon and extend Hopkins ideas in relation to safety culture and risk-awareness and provide, for the first time, an insight into the relationship between risk-awareness, safety culture and safer work places.

The knowledge gained from this study will add refinement to the debate (Geertz, 1975) not only about what risk-awareness is, but about the relationship between risk-awareness, safety culture and enhanced safety. Such knowledge may unveil learnings that organisations hoping to change safety culture, either in general or through risk-awareness programs in particular, can apply.

1.3.3 Aim of the study

The aim of this study, therefore, is to explore what impact, from the perspectives of the on-site workers and managers, an organisation's risk-awareness program has upon the culture of safety and the resultant level of risk.

1.3.4 Outline of the thesis

To fulfill this aim, Chapter 2, the Literature Review, will locate risk-awareness within the wider context of safety culture. Risk-awareness will be distinguished from behaviour-based safety programs before being located within the context of a range of approaches to risk assessment. Concepts that are similar to risk-awareness, for example, situation awareness, will be discussed to enhance understanding of risk-awareness as a concept. The literature review will conclude by drawing out key theoretical and/or conceptual themes that will be used to construct the research questions.

Chapter 3, the Theoretical Framework, will introduce a conceptual framework for thinking about risk-awareness and a research framework for studying risk-awareness as a cultural approach to safety. The conceptual framework will build upon theories and concepts that emerged in the literature review. The research framework will assume that you do not study organisations to understand culture, you study in organisations to understand them (Geertz, 1975). Therefore, ethnography will be introduced as a methodology for interpreting culture from the perspective of the workers and managers on the basis of the meaning that workers and managers attach to the risk-awareness program in practice.

Chapter 4, the Methodology, will expand upon what it means to do ethnography and how participant observation and in-depth interviews will be used to uncover the meaning that workers and managers attach to the impact of the risk-awareness program on the culture of safety and risk. The process of data analysis, the iterative process of close reading, coding and memoing, will be used to reduce the data into themes.

Chapter 5, Results and Discussion, will be presented as a thematic narrative derived from the process of data analysis to provide a 'thick description' (Geertz, 1975) of life and the practice of risk-awareness in the organisation under study. The narrative will be field-note centered but will also fold practical concerns back into the relevant literature through analytical commentary on the field notes.

Chapter 6, Conclusions, will, on the basis of the thematic narrative, provide contributions to the research questions introduced in chapter two and in so doing, fulfill the aim of this study.

Chapter 2 Literature Review

The concept of risk-awareness is a relatively new one in the field of safety culture. Therefore, the purpose of this literature review will be to locate risk-awareness within the broader landscape of safety culture. To achieve this purpose, this literature review will be broken down into four sections. Section one will provide an overview of perspectives on safety culture including the functionalist and interpretivist perspectives. Section two will discuss how the notions of an informed safety culture and collective mindfulness have risen to prominence from the field of perspectives as precursors to the concept of risk-awareness. Section three will discuss the emergence of risk-awareness and how risk-awareness resembles situation awareness at the level of individual cognition. This section will also distinguish the concept of risk-awareness from that of behaviour-based safety whilst locating risk-awareness within a schema of risk assessment. The fourth and final section will draw together the strands of this review, reveal the gaps in the literature and identify a new opportunity for interpreting safety culture through what might be termed the technology of risk-awareness.

2.1 Perspectives on Safety Culture

Over the past decade there have been at least three theoretical landmarks that have framed and influenced the safety culture debate. The first landmark was the 1998 special issue on safety culture of the journal of *Work & Stress*. This special issue was prompted by the recognition that "the notion of safety culture is now gaining importance … and has been highlighted as a contributory factor in a number of major disasters" (Cox & Flin, 1998a). In their editorial on safety culture, Cox and Flin (1998a) argue that there is a need for more research, clearer theoretical frameworks and a rationalisation of the existing literature on culture and climate with the aim of translating theory into practice resulting in safer workplaces.

The second landmark was the 2000 special issue on safety culture of the journal of *Safety Science*. This special issue presented selected papers originally presented in workshops at

the International Injury Prevention Conference in Amsterdam, and the International Association of Applied Psychology Conference in California (Hale, 2000). In his editorial, Hale (2000, p. 4), in reflecting on the papers laments the lack of consensus and states that "one of the few things on which all the papers agree is the call to do more research to clarify the field and try to reach that consensus". In his editorial, Hale raises a number of issues, particularly in relation to the language of safety culture. For example, he argues that the term 'safety culture' can only be talked about in a positive sense when an organisation "really places safety centrally enough in its basic values and assumptions" (Hale, 2000, p. 5). Adopting this line of reasoning then, Hale suggests that it is more appropriate to refer to "*cultural influences on safety* and not *safety culture*" (Hale, 2000, p. 5). Furthermore, Hale argues that there is confusion over which term to use to refer to organisational influences on safety: 'safety culture' or 'safety climate' and that these terms have competed for prominence in both the safety culture and organisational culture literature.

The third landmark was the literature review on safety culture and safety climate conducted by Guldenmund (2000). He found a lack of consensus on safety culture and the absence of an "explicit, theoretical model outlining the manner in which safety culture is thought to be embedded in the whole of an organisation's practices and system structure" (Guldenmund, 2000, p. 238). Therefore, Guldenmund uses Schein's three levels of organisational culture model (artifacts, espoused values, basic assumptions) as a framework to differentiate and study safety culture and safety climate. Within Schein's model of organisational culture the term 'levels of culture' refers to the degree to which cultural phenomenon are visible to the observer (Schein, 2004). At the first level, artifacts are things that are easy to observe but difficult to understand. At this level, although it is possible to describe what is seen and felt, it is not possible to construct what it means to a given group. Artifacts are things that an outsider sees, hears and feels when they enter a new group with an unfamiliar culture. Artifacts include language, myths and stories, published values, observable rituals and the visible behaviour of the group. It is what groups visibly do. At the second level, espoused beliefs and values, what groups do may be "out of line" with what groups say (Schein, 2004, p. 30). These conscious (espoused)

beliefs and values can used to predict behaviour that is observable at the artifacts level. At the third level, basic underlying assumptions, if the espoused beliefs and values are not built on prior learning of what works, then they become merely just that, espoused beliefs and values, and as such although they may predict what people will say, they may not predict what people will do. If however, beliefs and values have been learnt and found to be valid in solving problems, then they become unconscious and taken for granted basic underlying assumptions that become the "rules of behaviour" that members of the group use to "depict culture to themselves" (Schein, 2004, p. 29). Basic underlying assumptions therefore, are the essence of a group's culture and should be the focus of any attempts to change culture by leaders. Change at this level, however, is difficult because it requires group members to learn something new which increases anxiety. To sum up then, artifacts are easy to see but are difficult to understand and have a low impact on culture. In contrast, underlying assumptions are difficult to see and are difficult to change but have a high impact upon culture. Finally, people might say one thing and do another. According to Guldenmund (2000) then, safety culture, like organisational culture, may also have three levels, and each level can be studied separately. For example, the safety climate of an organisation may be studied at the level of espoused beliefs and values whereas the safety culture of an organisation may be studied at the deeper level of basic assumptions.

Each of these landmarks identifies the lack of consensus in the safety culture literature. Two perspectives on safety culture also emerge from these landmarks in the literature. First, there is the perspective that safety is subject to the influence of organisational culture. Second, is that culture can be measured and studied, although whether the focus of measurement and study should be 'safety climate' or 'safety culture' is vigorously contested.

The lack of consensus in the safety culture literature extends to how safety culture is to be defined. Guldenmund (2000, p. 227) argues that to define a construct, such as safety culture, is to set "the boundaries of the concept" and focus the research. Guldenmund reviewed 18 definitions of safety culture and safety climate in his review. Although the

18 definitions may be worded differently, they contain the six characteristics of what is known about organisational culture (Guldenmund, 2000, p. 224):

1. It is a construct;
2. That is relatively stable;
3. With multiple dimensions;
4. That is shared by groups of people;
5. Consists of various aspects;
6. And constitutes practices that are learned.

Nevertheless, Guldenmund concludes that the terms ‘safety culture’ and ‘safety climate’ are ill-defined. Because he believes that defining safety culture focuses research Guldenmund (2000, p. 251) defines safety culture as “those aspects of the organisational culture which will impact on attitudes and behaviour related to increasing or decreasing risk”. Of interest is that Guldenmund’s definition does not contain all six characteristics of organisational culture that Guldenmund himself applied to other definitions. For example, the notion that culture is shared and constitutes practices that are learned is not immediately evident in Guldenmund’s definition, although aspects of these characteristics may be assumed to be implicit within the term ‘behaviour’. Compare Guldenmund’s definition of safety culture with that proposed by Hale (2000, p. 7): “the attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risks and risk control systems”. If the practical purpose of a definition of safety culture is to focus research efforts, then Hale’s focus on the shared practices of natural groups in relation to risk and risk control systems would seem to provide a shaper focus for research than that of Guldenmund. It is not possible to say which definition is ‘right’, and this highlights again the lack of consensus in the area. Indeed, the most popular definitions of safety culture, based upon how frequently they are cited, have not emerged from academia.

The first is the definition is that proposed by the International Atomic Energy Agency (IAEA) through the International Nuclear Safety Advisory Group (INSAG) (1991) which defines safety culture as:

> Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance. (p. 1)

According to the IAEA, the term 'safety culture' was first introduced in response to the investigation and report into the Chernobyl accident. This definition, developed post-accident, has often be used as a reference point in the literature on safety culture (Choudhry et al., In press; Cooper, 2000; Hopkins, 2005a; Reason, 1997). This definition is open to interpretation in that safety culture will be an overriding priority relative to risk. This leaves the door of interpretation open in terms of whom in the organisation is to decide what constitutes 'significance'. Reason (1997) refers to this definition as a 'motherhood' statement.

The second definition is that proposed the Human Factors Working Group of the Advisory Committee on Safety in Nuclear Installations (Health and Safety Commission, 1993) in the United Kingdom:

> The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management. Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures. (p. 23)

This definition is also used as a reference point in the literature for discussions on safety culture (Cox & Flin, 1998b; Health and Safety Executive, 2005; Reason, 1997). Reason (1997) argues that this is a more useful definition but goes on to emphasise the importance of a safety information system as part of an informed culture. By comparison to a 'motherhood' statement or a statement open to interpretation, this statement is more focused yet so wide-ranging to make its use as a focus for research difficult.

Both these definitions are prominent in the literature and offer subtly different definitions and focus. If nothing else, they confirm the lack of consensus in this area. The greatest influence on thinking about safety culture seems to be the work of Edgar Schein and his work on organisational culture. Many safety researchers (Choudhry et al., In press; Cooper, 2000; Glendon & Stanton, 2000; Guldenmund, 2000; Hopkins, 2005a; Hopkins, 2006a) have drawn on Schein's definition of organisational culture and his three levels of culture model (Schein, 2004). Schein (2004) defines organisational culture as:

> …a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 17)

Notably absent from this definition, however, is any explicit reference to practices or behaviour. This point is made by Hopkins (2005a) who notes that Schein has omitted reference to behaviour because behaviour is influenced by more than values. However, Hopkins (2005a, p. 7) argues that the notion of shared values is implicit in "shared basic assumptions", as such "shared values undoubtedly give rise to patterns of behaviour, and it is the job of the cultural analyst to identify the connections between values and behaviour".

Guldenmund (2000) has already applied Schein's three levels of organisational culture to safety. Hale (2000) suggests that safety culture is better understood as the organisational influences on safety, therefore, there may be merit in also applying Schein's definition of organisational culture to safety. Take for example 'shared basic assumptions'. This can be extended to 'shared basic assumptions about safety that a group learns and considers valid such that they be taught to new members'. This extended definition provides a focus not only for research, but for organisations wishing to introduce safety interventions. In relation to the latter, take for example interventions designed to change safety culture such as a program designed to make workers more risk aware. If the work group does not value the intervention because they do not believe that it works, then it is likely to be rejected by the group and the impact of the intervention upon culture is at best minimal and at worst negative. In this example, the rejection by the group of the

intervention is consistent with the point that Hopkins (2005a) makes that shared values can be reflected in shared practices.

There have, however, been some criticisms of Schein's approach to culture. These criticisms have come from both organisational culture and safety culture researchers alike. But the criticisms from the two fields come from different directions.

In the field of organisational culture Hatch (1993, p. 659) has reviewed Schein's model and contends that "the usefulness of his model depends upon identifying the links among a culture's artifacts, values and assumptions – links that Schein has not explained". Hatch builds upon Schein's model to develop what she refers to as the "cultural dynamics perspective" in which culture is presented as a wheel rather than a hierarchy. Hatch has also extended Schein's model by adding a new element; symbols and making the relationships between the elements in the model more central. In the model, symbols are distinguished from artifacts on the basis that not all artifacts are symbols. In Hatch's version of the model, an artifact only becomes a symbol on the basis of the surplus meaning that members of the organisation attach to the artifact. In this way, culture research is about interpreting the processes of symbolisation. For example, an organisation may introduce a glossy pocket card designed to prompt workers to stop and think about risk before starting work. As an artifact, the pocket card is little more than a piece of thick paper. If workers do not respond to the opportunity of the pocket card, the piece of card remains in the "literal realm" (Hatch, 1993) perhaps as a handy book mark, something to jot things down on or relegated to the sun visor of their truck with other similar paraphernalia. When workers enter the "symbolic realm" (Hatch, 1993) they engage in the surplus meaning of the card. This can be observed in the responses workers give to the card in relation to safety - be they positive or negative. For example, the card may come to symbolise the importance of safety and thinking about risk. Alternatively it may come to symbolise yet more safety propaganda from management.

In the field of safety culture Richter and Koch (2004, p. 720), based upon their ethnographic work in Danish manufacturing, found "the perspectives of integration,

differentiation and ambiguity … are useful tools, when pursuing [sic] to understand the complex social reality, which shapes safety cultures …" Their work draws on the organisational culture field which they argue is dominated by two perspectives: functionalism and interpretivism (Richter & Koch, 2004). Glendon and Stanton (2000) also use these contrasting perspectives on culture to frame their discussion of safety culture. A functionalist perspective is considered a "top down" approach that assumes that there is an ideal culture to which the organisation aspires (Glendon & Stanton, 2000). Richter and Koch (2000, p. 704) argue that safety research tends to be located within the functionalist perspective and that "many safety scholars maintain a unitary, integrative and monolithic approach to culture". By comparison, an interpretive perspective is considered "bottom up" and recognises the existence of sub-cultures and the differentiation and ambiguity of safety culture (Glendon & Stanton, 2000; Richter & Koch, 2004). An interpretive perspective assumes that culture is an emergent property of social groups and as such is created by all the organisation's members as opposed to culture being at the mercy of management manipulation and coercion (Glendon & Stanton, 2000).

One of the implied criticisms of Schein's work on organisational culture is that his work is located in the functionalist or integration perspective and therefore assumes a unitary view of culture at the expense of an interpretivist perspective (Hatch, 1993; Richter & Koch, 2004), although Glendon and Stanton disagree (2000). Schein too, in a letter to the editor of *Safety Science* in 2004 makes the point that it is at the level of definition that culture is integrated and it is at the level of organisational units that differentiation occurs. In fact Hatch (1993) has been able to take Schein's model and apply its ideas from a symbolic-interpretive perspective. Therefore, an acknowledgement of the presence of both perspectives may be more advantageous than an out-right fight for supremacy. Aspects of both perspectives may be useful for understanding the dynamics of safety culture as Richter and Koch (2004) found in their Danish study of manufacturing. A similar viewpoint is offered by Pidgeon (1997, p. 6) who, although he supports a view of culture that is more in keeping with "a system of symbols or meanings" (for example, a shared cognitive model) as opposed to "the way we do things

around here" (for example, observable behaviours) acknowledges that to an extent, both views are interdependent.

By adopting the position that aspects of both the functionalist perspective and interpretive perspective may be useful for understanding the dynamics of safety culture, it is now possible to use these contrasting perspectives to frame the remainder of this section.

2.1.1 Safety culture from the functionalist perspective

Two ideas are prominent within the functionalist perspective of safety culture. The first idea is that safety culture can be measured by safety climate surveys. This idea is of interest to researchers attempting to understand safety culture and organisations wishing to improve their safety culture. The second idea is that a safety culture can be engineered through collective practices. For organisations this gives leaders and managers the power to change culture and, for researchers, practices may be a practical and useful starting point for interpreting culture.

Whilst the term safety culture first came to prominence following an investigation into the 1986 nuclear accident at Chernobyl (Cox & Flin, 1998b), the term safety climate is said to have first appeared in the literature in 1951 and related to a study in an automotive plant (Guldenmund, 2000). Another early study of safety climate was that conducted by Zohar in 1980 (Cox & Flin, 1998b). Zohar (1980) used a 40-item questionnaire to study the organisational climate for safety across 20 industrial organisations in Israel. Zohar (1980, p. 101) found that management commitment to safety was "a major factor affecting the success of safety programs in industry". The term climate is considered to mean the "overt manifestation of culture within an organisation" (Guldenmund, 2000, p. 221). Glendon and Stanton (2000, p. 198) argue that climate is a more superficial concept than culture and go on to argue that "there is no agreement on the key dimensions to be measured". Nevertheless much effort has gone into testing various measurement instruments, for example, the Organisational and Safety Climate Inventory (OSCI) which contains 78 items. This instrument was tested in 15 Portugese organisations representing

different industry sectors, and the results suggest that OSCI "has some capacity to predict and distinguish organisations with different accident levels" (Silva et al., 2004, p. 217). According to Silvia et al. the results support the reliability and predicative validity of the instrument. This is but one of a number of instruments for measuring safety climate and the measurement of safety climate is prominent within particular industries. Take for example, the survey undertaken in the mining industry in Australia in 1999 (Minerals Council of Australia, 1999). Safety climate surveys are also administered post-accident as part of public inquiries as was the case with the Texas City explosion in the United States in 2005 (CSB, 2007) and the Waterfall train crash in Australia in 2003 (McInerney, 2005).

The second prominent idea under the functionalist perspective focuses less on measuring culture, or climate, and more on what organisations can do to change culture in an intended direction. According to Reason (1997; 1998) a safety culture can be socially engineered and that a safe culture is an informed culture. An informed culture is one where managers and workers know how the human, technical and organisational factors combine and contribute to the safety of the system (Reason, 1997). In other words, knowing where the "edge" of safety is before having to fall over it first (Reason & Hobbs, 2003). The content of an informed culture will be discussed in the next section. In forming this view, that culture can be engineered, Reason (1997; 1998; 2003) draws upon the work of the organisational anthropologist Geert Hofstede. Hofstede researched both national and organisational cultures. He found that at the national level, values, learnt early in life distinguished different cultures. By contrast, at the organisational level, practices, learnt in the workplace, distinguished different cultures, and that practices could be influenced by organisational structures and systems (Hofstede, 1991). According to Hofstede this resolves the controversy about whether culture is something an organisation 'is' or 'has':

> … controversy about whether an organization *is* or *has* a culture … we propose that practices are features an organization *has*. Because of the important role of practices in organizational cultures, the latter can be considered *somewhat* manageable. Changing collective values of adult people in an intended direction is extremely difficult, if not impossible. Values do change, but not according to someone's master plan. Collective

> practices, however depend on organizational characteristics like structures and systems, and can be influenced in more or less predicable ways by changing these. (p.199)

Hopkins (2005a) argues that according to social scientists, culture is a characteristic of groups not individuals. Hopkins (2005a, p. 7) also supports Reason's focus on practices but extends Reason's view by stating that, in keeping with culture as a characteristic of groups, it is the "collective practices" of workers and managers that should be the focus of culture change. In contrast to Hofstede, however, Hopkins (2005a, p. 8) argues that changing practices will also change values and assumptions through creating "cognitive dissonance" which is the desire by humans to align behaviour with values (Baron, 1986). Hopkins (2005a) used the idea that culture is a set of practices to examine the railway culture that led up to the Glenbrook train crash in Australia in 1999 which killed seven people. Hopkins (2005a, p. x) concluded that "four main constellations of practices and hence four cultural themes … contributed to the accident: a culture of rules, a culture of 'silos', a culture of on time running, and a risk-blind, even risk-denying culture".

2.1.2 Safety culture from the interpretive perspective

The prominent ideas within the interpretive perspective of safety culture are that safety is an emergent property of a cultural system and that the practice of safety is learnt through participation in communities of practice. The interpretive perspective is more problematic for organisations because practical remedies for cultural ills are not as readily apparent under this perspective as they are under the functionalist perspective. For the researcher too, more effort is required in the field to uncover how members of an organisation socially construct meanings about safety.

The interpretive perspective is complex. This perspective assumes culture to be an emergent property of social groups (Gherardi & Nicolini, 2000a; Glendon & Stanton, 2000). Social groups make local interpretations of what it means to work safely and transmit and share this knowledge about safe work practices to new members of the group (Glendon & Stanton, 2000; Pidgeon, 1997; Pidgeon & O'Leary, 2000; Richter & Koch, 2004). Therefore, on the basis that social groups within an organisation construct

their own interpretations of safety, organisations may be comprised of many sub-cultures of safety (Glendon & Stanton, 2000). According to Gherardi and Nicolini (2000a, p. 9), the acceptance of many rather than one culture of safety is in keeping with "the common experience that everyday activity in organizations is constituted by plurality and conflict, rather than consensus". As a consequence of this view, culture is deemed to be dynamic, unstable and ambiguous (Gherardi et al., 1998; Pidgeon, 1997; Richter & Koch, 2004). On this basis, the notion of a unitary culture is relegated to being little more than organisational rhetoric resulting in an illusion of safety (Gherardi & Nicolini, 2000a; Gherardi et al., 1998; Hopfl, 1994; Pidgeon, 1997). According to Hopfl (1994, p. 55) then, the notion of safety culture becomes "an interpretive device which mediates between espoused values of the corporate culture, that is it's declared and desired common values, and the taken-for-granted assumptions of the workplace culture".

In accord with an interpretive perspective then, culture is the "exploration of meaning, and the symbols and systems of meaning through which a given group understands the world" (Pidgeon & O'Leary, 2000, p. 18). On this basis, safety culture is seen as a "set of assumptions, and their associated practices, which permit beliefs about danger and safety to be constructed" (Pidgeon & O'Leary, 2000, p. 18). This view is shared by Gherardi and Nicolini (2000a, p. 9) who agree that safety culture is constructed and who argue that "learning safety means knowing how to behave as a competent member in a culture of safety practices".

At this point it is interesting to reflect on how the functionalist and interpretive perspectives have come together around the notion of 'practices'. However, the ways in which practices are influenced is approached differently by the two perspectives and supports the argument that safety culture is an 'interpretive device' that mediates between the two perspectives. The functionalist perspective assumes that practices are able to be influenced by organisational structures and processes which can be engineered by leaders and managers. In contrast, the interpretive perspective argues that safe working practices are learned within communities of practice (Gherardi & Nicolini, 2000a, 2002; Gherardi et al., 1998). According to Gherardi et al. (1998, p. 202) "there are as many safety

cultures as there are communities of practice inside an organization contributing to the social construction of safety". The notion of 'communities of practice' draws on social learning theory; in particular situated learning. The term 'communities of practice' emerged to explain how learning occurs and resulted from ethnographic studies of apprentices entering different occupations (Lave & Wenger, 1991). Situated learning is characterised as a process of 'legitimate peripheral participation' in a community of practice (Lave & Wenger, 1991). Lave and Wenger (1991) describe a community of practice as:

> … a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice. A community of practice is an intrinsic condition for the existence of knowledge … Thus, participation in the cultural practice in which any knowledge exists is an epistemological principle of learning. (p. 98)

Gherardi et al. (1998) examined safety culture based upon explanations of accidents given by two communities of practice - engineers and site managers located on a building site in Modena, Italy. They found that for the same site, the communities of practice held different views of both the causes and prevention of accidents. They contend that there are "a plurality of fragmented and antagonistic safety cultures" (Gherardi et al., 1998, p. 211). As a result, safety culture is seen as an emergent property of a socio-technical system that may either impede or enable the learning of safety (Gherardi et al., 1998).

In another study, Gherardi and Nicolini (2002) conducted an ethnographic study of how safety is learned by novices on a building site in Italy. The aim of the study was to "understand the processes whereby learning in practice occurs and people acquire, transmit and revise their knowledge about the prevention of workplace accidents" (Gherardi & Nicolini, 2002, p. 198). The researchers shadowed a trainee from the classroom onto the site and, using participant observation as a method of data collection, took part in the daily life of the building site. They found that mastering a practice was the result of participation in the ongoing practices of a community (Gherardi & Nicolini, 2002).

Somerville and Abrahamsson (2003) conducted an ethnographic study of mine rescue training in New South Wales in Australia. They found that although trainers did not work in the same geographical location as trainees, but had worked underground in the past, there was a strong community of practice that perpetuated masculine storylines even though both groups belonged to separate communities of practices that espoused conflicting values (Somerville & Abrahamsson, 2003). Somerville and Abrahamsson (2003, p. 19) conclude that "understanding how mine workers learn safety in the workplace, that is, within communities of practice, is critical to attempts to improve safety training and safety records".

These studies illustrate the critical relationship between learning and culture within the interpretive perspective. In particular, these studies point to the importance of communities of practice as the focus for learning and for constructing and transmitting safety knowledge and safety practice. This view of learning and how learning impacts upon culture is likely to be at odds with the rhetoric of learning under a functionalist perspective that learning is "out there" and simply needs to be located and transferred to the head of the learner (Gherardi & Nicolini, 2002, p. 192).

2.1.3 An alternative perspective: Safety culture as an interpretive device

This review of perspectives on safety culture has revealed that there is lack of consensus amongst practitioners in the field. In particular there is a divide between the functionalist and interpretive perspectives that results in different strategies for safety culture research and change. However, an opportunity exists to re-frame how safety culture is researched by building on Schein's 'levels of culture model' and the argument that safety culture is an interpretive device which mediates between both perspectives (Hopfl, 1994).

According to Guldenmund (2000, p. 252) the of appeal of Schein's model is "that it fuses safety climate and safety culture and that it does justice to the integrative, holistic concept of culture as advocated by, for instance, cultural anthropologists". An extended version of

Guldenmund's fusion model that incorporates the perspective on safety culture and corresponding research methods for each level of culture is shown in Table 2.

Table 2

Using Schein's model to fuse safety culture concepts

Levels of safety culture using Schein's three levels of culture model	**Visibility of safety culture at each level**	**Examples of safety culture at each level**	**Perspective on safety culture and corresponding research methods for each level**
1. Outer layer – artifacts and symbols related to safety and risk control.	Visible, but hard to comprehend in terms of underlying culture	Statements, meetings, inspection reports, dress codes, personal protective equipment, posters, bulletins, breaking safety rules, non-compliance with safety policies.	Perspective: Interpretive perspective Methods: Participant observation
2. Middle layer – espoused beliefs and values regarding safety and risk control.	Relatively explicit and conscious	Attitudes, safety policies, safety values, job descriptions.	Perspective: Functionalist/interpretive perspective Methods: Safety climate surveys Interviews
3. Core – underlying assumptions regarding safety and risk control.	Mainly implicit: obvious for the members, invisible, pre-conscious	Have to be deduced from artifacts and espoused values as well as through observations of theories in use within groups	Perspective: Interpretive perspective Methods: Participant observation Interviews

Source: Adapted from Guldenmund (2000), Schein (2004) and Hatch (1993)

However, safety culture has not been studied from the perspective that it is an 'interpretive device' (Hopfl, 1994) that mediates between the functionalist and interpretive perspectives. Hopfl (1994, p. 52) argues that "the organic culture of the workplace produces its own taken-for-granted assumptions about the world and systems for ordering experience". Hopfl's "organic culture of the workplace" is consistent with an

interpretive perspective of culture and Schein's third level of culture of basic underlying assumptions. In contrast, the mechanisms of corporate culture change "reinforce a common rhetoric by ensuring the coherence of systems, structures, skills and rewards as a basis for regulating and standardizing patterns of behaviour" (Hopfl, 1994, p. 52). Such rhetoric and systems is consistent with a functionalist perspective of culture and Schein's second level of culture of espoused beliefs and values. Organisational rhetoric about safety culture may provide managers with the illusion that they have safety under control (Gherardi et al., 1998), however, what managers say may not predict what workers will do. The reason for this is that the rhetoric of the corporate culture may be at odds with the basic underlying assumptions produced organically by the workplace culture. Therefore, Hopfl (1994, p. 55) puts forward the notion of "safety culture as an interpretive device which mediates between the espoused values of the corporate culture, that is its declared and desired common values, and the taken for granted assumptions of the workplace culture". Studying safety culture from this different perspective may yield new insights into how culture can be researched and changed.

Therefore, given that organisations are striving to improve their safety performance, there will always be safety rhetoric and associated safety strategies and programs leaving corporate offices and travelling down and across organisations. Some of these strategies and programs will be aimed at improving safety culture. Risk-awareness programs are exactly that. Therefore, the point at which these safety culture strategies and programs and their associated rhetoric meet, and are interpreted by the workplace culture, could become the focus of research for the purposes of better understanding how these corporate programs are mediated by the local workplace culture as shown in Figure 1.

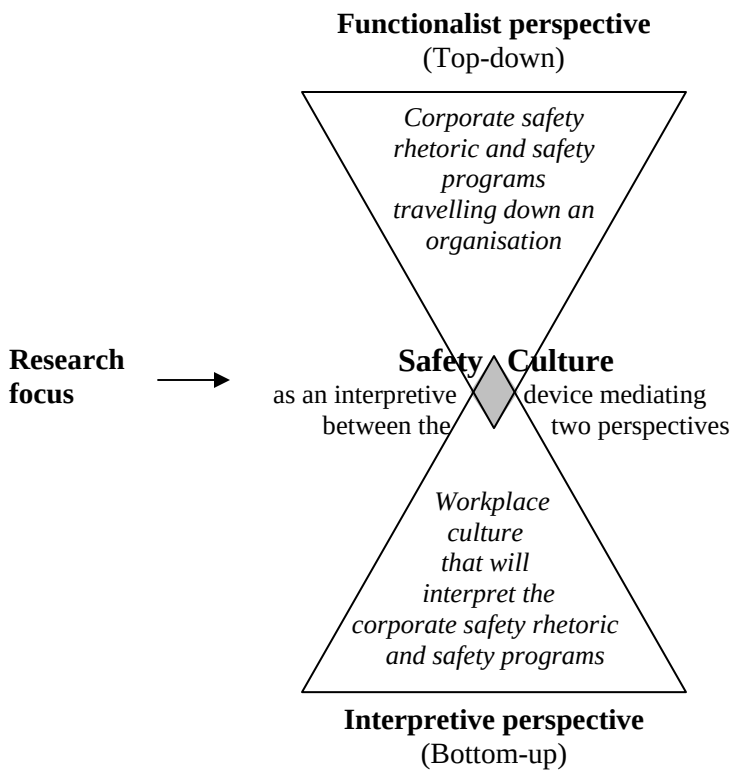


Figure 1 Safety culture as an interpretive device

This section has provided an overview of perspectives on safety culture and in the process has identified not only gaps in the literature, but opportunities. The next section will review the rise to prominence from that literature of two approaches to improving safety culture: an informed safety culture and collective mindfulness.

2.2 The Rise to Prominence of an Informed Safety Culture and Collective Mindfulness

Despite the lack of consensus in the field of safety culture, two ideas have risen to prominence over the past decade. The first idea is that a safe culture is an informed culture (Reason, 1997, 1998). The second idea is that reliable performance is achieved through collective mindfulness (Weick & Sutcliffe, 2001; Weick et al., 1999).

2.2.1 An informed safety culture

Reason (1997) argues that organisations exist in a notional "safety space" between increasing resistance and increasing vulnerability to risk. The "ingredients" required to move organisations toward increased resistance are management commitment, competence and cognisance (Reason, 1997). To be competent, managers need to collect the right information from their safety management system. To collect the right information, organisations must develop what Reason calls an "informed culture". According to Reason an informed culture is a safety culture. An informed safety culture is "the 'engine' that drives the system towards the goal of sustaining the maximum resistance towards its operational hazards, regardless of the leadership's personality or current commercial concerns" (Reason, 1998, p. 294). An informed safety culture allows managers and workers to know how the human, technical and organisational factors combine in an organisation to contribute to the safety of the system (Reason, 1998; Reason & Hobbs, 2003). Expressed another way, this means knowing where the "edge" of safety is before having to fall over it first (Reason & Hobbs, 2003).

According to Reason (1997) an informed safety culture is comprised of four interlocking sub-cultures, or structures and systems designed to impact upon collective practices: a reporting culture, a just culture, a learning culture and a flexible culture. To foster an informed culture, managers must create an atmosphere of trust that encourages workers to report errors, near-misses and hazards. Workers must feel "safe" to report which means being free from fear of punishment or retribution. To achieve this, managers must

promote a no-blame culture that recognises that to err is human and that many errors are symptoms of failures in management systems rooted deep within the organisation. Therefore, a no-blame culture must reward the reporting of errors as these errors could point to something wrong with the system. However, it is argued that a just culture must distinguish between acceptable and unacceptable behaviour or blame-free (unintentional) and culpable (intentional) acts (Reason & Hobbs, 2003). To do this organisations must clearly articulate the behaviours that are important for achieving safety and deal consistently and firmly with intentional violations (Reason, 1997). The information gained through the reporting sub-culture can be used for organisational learning and systemic reform. According to Reason and Hobbs (2003) the type of learning that is required is 'double-loop learning'. Double loop learning challenges underlying assumptions about safety or what are termed 'mental models'. Mental models are internal pictures in peoples' minds that guide their action in the real world. Therefore, organisational learning of this type is said to lead to "global reforms rather than local repairs, and to the adoption of a 'system model' of human error" (Reason & Hobbs, 2003, p. 154). Finally, a flexible culture requires managers to allow decision making to be moved down and around an organisation based upon the need or the problem to be solved in the moment (Reason, 1997). This culture of adaptability is drawn from studies into high reliability organisations where adapting to changing demands was found to be a defining characteristic.

Reason's notion of an informed safety culture has a lot in keeping with Westrum's (1992, p. 402) view that "for the safety of large scale systems, one must have a culture of conscious inquiry" that requires individuals and groups to have "requisite imagination" about the ways things could go wrong and bringing this information to the attention of management. How well an organisation responds to this information distinguishes the top performers from the rest and Westrum (2003; 2004) identifies three classes of organisation, or three cultures, based upon how safety-related information is treated:

1. A *pathological* organisation does not want to know about safety, responsibility for safety is shirked and failure is covered up or punished;

2. A *bureaucratic* organisation may not want to actively find out about safety and responsibility for safety is compartmentalised;
3. A *generative* organisation actively seeks safety information, and responsibility for safety is shared and new ideas are welcomed.

The point that is made here is that establishing an informed safety culture is not enough. Information that is surfaced through reporting systems must be acted upon otherwise organisations run the risk developing a culture that is simultaneously informed yet pathological.

The notion of an informed safety culture is more in keeping with a functionalist perspective of safety culture. An informed safety culture is taken to be a unitary culture, that is, there is one culture and it is informed. Reason's view also presupposes that such a culture can be socially engineered by managers. Therefore, an informed safety culture is a feature an organisation 'has' and there is no room for mediation and interpretation between the informed safety culture as espoused by the organisation and the basic assumptions that may exist in local workplace cultures.

2.2.2 Collective mindfulness

The term 'collective mindfulness' first emerged in 1999 as an 'umbrella term' that brought together and articulated earlier research conducted into what came to be known as High Reliability Organisations (HROs) (Weick et al., 1999). HROs are organisations whose activities are interactively complex and tightly coupled, such as aircraft carriers, nuclear power plants and air traffic control centres, but who have had less than their fair share of failures (Weick & Sutcliffe, 2001; Weick et al., 1999). This line of research emerged in response to Perrow's (1982) analysis of the incident at Three Mile Island that occurred in 1978 and which resulted in Perrow coining the term Normal Accident Theory (NAT) (La Porte, 1982; La Porte & Consolini, 1991; Roberts, 1990a, 1990b; Roberts & Rousseau, 1989). Normal accident theory posits that accidents are inevitable in an interactively complex and tightly coupled system such as nuclear power generation.

According to Perrow (1982; 1984; 1999) such systems are incomprehensible to operators and hence accidents will be a normal outcome of these systems. As a consequence, Perrow argued for the abolition of high risk technologies such as nuclear power (Perrow, 1984). However, and as a counterpoint to Perrow's view, the HRO studies, unique in that the research drew lessons from success rather than failure, highlighted that such systems could in fact operate reliably (Hopkins, 1999a; La Porte, 1982, 1996; La Porte & Consolini, 1991; Mannarelli et al., 1996; Roberts, 1990a, 1990b; Roberts & Bea, 2001; Roberts & Libuser, 1993; Roberts & Rousseau, 1989). The competing views have been subject to rigorous debate in the academic literature (Bain, 1999; La Porte, 1994; La Porte & Rochlin, 1994; Perrow, 1994; Rijpma, 1997, 2003; Sagan, 1993) but it was Weick and his colleagues who drew the literature on HROs together in its current popular form around the concept of collective mindfulness. In so doing, they have drawn on and built upon work by Langer (2000, p. 220) into individual mindfulness. Langer defines mindfulness as "a flexible state of mind in which we are actively engaged in the present, noticing new things and are sensitive to context". According to Langer (1989a) mindfulness may be better understood by considering its opposite; mindlessness. The characteristics of mindlessness include entrapment to category, automatic behaviour and acting from a single perspective (Langer, 1989a, 1989b; Langer & Moldoveanu, 2000a, 2000b). Weick et al. (1999) have taken the concept of individual mindfulness and extended it to organisations to describe what it means to be a high reliability organisation. For organisations, collective mindfulness is the ability to "preserve the capability to see the significant meaning of weak signals and to give strong responses to weak signals" (Weick & Sutcliffe, 2001, p. 4). Weick and Sutcliffe (2001) define collective mindfulness as:

> … the combination of ongoing scrutiny of existing expectations, continuous refinement and differentiation of expectations based on newer experiences, willingness and capability to invent new expectations that make sense of unprecedented events, a more nuanced appreciation of context and ways to deal with it, and identification of new dimensions of context that improve foresight and current functioning. (p. 42)

Collective mindfulness is characterised by five processes. The first, preoccupation with failure, treats any lapse as an indicator that something is wrong with the system (Weick &

Sutcliffe, 2001). The second, reluctance to simplify interpretations, requires organisations to create more complete pictures by trying to see more and simplify less (Weick & Sutcliffe, 2001). The third, sensitivity to operations, requires an ongoing concern for the unexpected through situation awareness that allows errors to be identified and contained (Weick & Sutcliffe, 2001). The fourth, commitment to resilience, requires organisations to develop an ability to 'bounce back' once things start to go wrong. Commitment to resilience also requires improvisation in the moment and knowledge of the system and is linked to the fifth process, deference to expertise, where decision making moves down and around the organisation based upon the need in the moment (Weick & Sutcliffe, 2001).

Taken together the five processes of collective mindfulness create a "rich awareness" of how small errors could escalate into a major disaster (Weick et al., 1999). As such the processes of collective mindfulness are conceptualised as cognitive processes or what Weick et al. (1999, p. 82) refer to as "cognitive learning that enables simultaneous adaptive learning and reliable performance". According to Weick et al. (1999, pp. 86-87) reliability in this sense is not "a lack of variance in performance", rather in HROs "there is variation in activity, but there is stability in the cognitive processes that makes sense of this activity." Put simply, "unvarying procedures cannot handle what they didn't anticipate" (Weick et al., 1999, p. 86). Therefore, mindful awareness through the five processes of collective mindfulness is a way of organising to discover and manage unexpected events (Weick et al., 1999). According to Weick et al. (1999, p. 90) collective mindfulness is also as much about "what people do with what they notice as it is about the activity of noticing itself". Weick et al (1999) make two other important points. First that mindfulness need not be generated by novelty alone, rather that "familiar" events are also capable of surprise because even the familiar can not be known perfectly (Weick et al., 1999). The implication of this view is that although research into HROs was carried out in complex, high risk organisations with a track-record of novelty and surprise, the processes of mindfulness may apply to a broader range of less exotic organisations. This leads to the second point which is that the processes of collective mindfulness are applicable to "mainstream" organisations and can be viewed as "an investment in both

learning and safety" (Weick et al., 1999, p. 113). More recently Weick and Sutcliffe (2001, p. 23) have argued that the "processes by which HROs pursue mindfulness are processes that can be adopted by anyone". Research efforts to date are limited to retrospective studies of organisations already operating reliably (La Porte, 1982; Roberts & Libuser, 1993) and post-hoc analyses of disasters (Hopkins, 2001, 2005a, 2007). Less is known about how "mainstream" or how other exotic (complex and high-risk but not reliable) organisations become more mindful, that is, how they develop the requisite cognitive processes for reliability, and with what results.

Although collective mindfulness is conceptualised as a set of stable cognitive process, the very fact that the process of collective mindfulness is about making meaning about what is going on so that decisions can be made makes collective mindfulness and reliability an "issue of culture" (Weick, 1987). The processes of collective mindfulness are recognised as adding another perspective to the safety culture debate (Cox & Flin, 1998b; Pidgeon, 1997, 1998; Reason, 2000). According to Weick and Sutcliffe (2001, p. 127) "the concept of safety culture illuminates what it means to create a culture of mindfulness". Weick and Sutcliffe (2001, p. 147) argue that mindfulness as a set of cognitive processes can also be treated as a culture because mindfulness is built on an "integrated set of values, expectations, and norms that encourage appropriate attitudes and behaviours and discourage inappropriate ones". Drawing on the work of Reason (1997), Weick and Sutcliffe (2001, p. 147) claim that "a mindful culture resembles an informed culture". To demonstrate the resemblance between mindfulness and an informed culture, Weick and Sutcliffe (2001) draw on Hopkins' (1999b) analysis of the 1994 Moura mine disaster in Queensland, Australia, in which 11 workers died in an underground coal mine explosion. They demonstrate how the four sub-cultures of an informed safety culture overlap with the five processes of collective mindfulness.

To sum up then, the cognitive processes of collective mindfulness could be said to inform the collective practices of an informed safety culture. Therefore, the notion of collective mindfulness is more in keeping with a functionalist perspective of culture too. By definition a 'mindful' culture is a unitary culture. But as Weick and Sutcliffe (2001) point

out, what makes collective mindfulness a cultural issue is that the processes of mindfulness must be supported by the appropriate beliefs and behaviours, or what Schein (2004) would describe as 'basic underlying assumptions'. Therefore, espousing the benefits of an informed safety culture or collective mindfulness may not be enough, because if, as Hopfl (1994) suggests, safety culture is an interpretive device that mediates between the functionalist and interpretive perspectives, then to be effective, both approaches to culture must be interpreted meaningfully by the workplace culture. To date no studies have examined this mediation point in relation to these approaches to safety culture.

The next section introduces risk-awareness as a cultural approach to safety; an approach that is largely interchangeable with an informed safety culture and collective mindfulness (Hopkins, 2005a).

2.3 The Emergence of Risk-awareness

Andrew Hopkins (2002, p. 13), in a working paper that considered if safety, culture, mindfulness and safe behaviour are converging ideas, argues that risk-awareness is "one variant of the safe behaviour strategy". According to Hopkins (2002, p. 14), however, the strategy of promoting risk-awareness among workers is "unlikely to succeed unless it is part of a broader strategy of promoting organisational mindfulness or a culture of safety as described by Reason". In his later book *Safety, culture and risk*, Hopkins (2005a, p. ix) argues that risk-awareness and organisational mindfulness are "both essentially cultural phenomena and both are nowadays advocated as ways of enhancing safety". According to Hopkins (2005a, p. 22) "the concepts of safety culture, mindfulness and risk-awareness are largely interchangeable". All three concepts must operate at the individual and organisational level and to focus on the individual level at "the expense" of the organisational level will be "self-defeating" (Hopkins, 2005a, p. 22).

To date, the strategy of promoting risk-awareness among workers as a cultural approach to safety has not been the subject of published research. Therefore, little is known about the relationship between risk-awareness, culture and safety in practice.

In this section the concept of 'risk-awareness' will be explored from six perspectives. First, the rationale for promoting Hopkins' conception of risk-awareness will be discussed. Second, the literature is reviewed to determine if the concept of risk-awareness appears in the broader occupational health and safety and safety culture literature. Third, organisational strategies or what will be referred to as 'technologies' for promoting risk-awareness within organisations will be discussed. Fourth, the concept of risk-awareness will be distinguished from the concept of behaviour-based safety. Fifth, the relationship between risk-awareness and risk assessment will be discussed and made explicit. Sixth, the similarities between risk-awareness and the related concepts of situation awareness and safety imagination will be discussed. Finally a tentative definition of 'risk-awareness' is offered for consideration.

2.3.1 The rationale for risk-awareness

Hopkins (2005a, p. 16) argues that "risk-awareness is synonymous with mindfulness". Hopkins' argument is in turn complemented by Weick and Sutcliffe's (2001) argument that mindfulness overlaps with Reason's (1997) notion of an informed safety culture. Therefore, it can be inferred that the rationale for risk-awareness is based upon the view that there will always be information, warning signs and signals that if left undetected or disregarded could combine in unexpected ways resulting in fatalities, injuries and disease. Weick et al. (1999, p. 88) refer to this ability to detect warning signs as the "capability to induce a rich awareness of discriminatory detail and a capacity for action". Reason (1997, p. 195) refers to this ability as "not forgetting to be afraid".

Hopkins (2002; 2005a; 2005b) identifies at least three reasons for promoting risk-awareness. The first reason is that it is impossible to write a safety rule to cover every situation (Hopkins, 2005a). Even when a safety rule exists the rule may be incomplete

and therefore is not a guarantee of safety (Hopkins, 2005a). Workers who are risk-aware will appreciate the limitation of safety rules and will focus more on risk rather than mindlessly following the rules (Hopkins, 2005a). The second reason is that workers who are risk-aware will report more safety issues and make more suggestions for improving safety (Hopkins, 2005a). The third reason is that individual workers who are more risk-aware will be able to identify ways in which things might go wrong and take action to prevent things from going wrong (Hopkins, 2005a). Hopkins calls this a "mini risk assessment" which takes place prior to starting a job (Hopkins, 2006b). However, for risk-awareness to effective, it must be embedded in practices at both the individual and organisational level (Hopkins, 2005a).

The concept of risk-awareness in this context is said to be interchangeable with the concepts of collective mindfulness and an informed safety culture (Hopkins, 2005a). According to Hopkins (2005a, p. 22) "all three concepts refer to the aspects of organisational culture which are conducive to safety". The next section will review the extent to which the concept of risk-awareness appears in other contexts in the occupational health and safety literature.

2.3.2 The concept of risk-awareness

The concept of risk-awareness appears in three other forms in the literature. The first form relates to the usefulness of risk-awareness as a moderator of worker safe-behaviour. The second form relates to the extent to which risk-awareness is a component of safety culture based on the premise that safety culture may impact upon behaviour. The third form relates to the role of risk-awareness within a system for managing risk.

A cross-sectional study of 92 Swedish fishermen that explored fishermen's attitudes towards risks and risk controls found that, although strategies to increase safe behaviour through risk awareness in fishery are common, the results did not support using risk-awareness as the sole strategy for risk control (Eklof & Torner, 2002). Instead, the study found evidence in support of strategies that develop fishermen's understanding of how

risk can be prevented or managed (Eklof & Torner, 2002). According to Eklof and Torner (2002, p. 59) risk-awareness will not alter behaviour so "long as present behaviour is more or less imperative".

A questionnaire-based study of 1550 employees working in two nuclear power plants in the United Kingdom explored a range of components of safety culture, including risk-awareness, to determine the extent to which the components varied in such a highly-regulated environment (Harvey et al., 2002). They found that risk-awareness was one of six factors "conceptually common to shop floor and management (supervisor/manager/professional) groups for both plants" (Harvey et al., 2002, p. 18). In this context, risk-awareness is considered to be one of a group of attitudes that constitutes safety culture. Attitudes are said to be related to safe behaviour, therefore, according to Harvey et al. (2002, p. 20) "attitudes are probably the most important single index of the effectiveness of a safety culture".

The use of the term 'risk-awareness' in the two studies described above is conceptually different to the way in which it is used by Hopkins (2005a, p. 22) to refer to an aspect of organisational culture that is "conducive to safety". The main difference is that in the two studies, risk-awareness is conceptualised as a personal attribute related to risk-taking and safe behaviour, whereas Hopkins' conceptualisation relates risk-awareness first and foremost to a set of collective or organisational practices and processes that enable organisations to proactively manage risk.

In its third form, a connection between risk-awareness and culture was made following the investigation of a criticality accident in 1999 at a Japanese uranium-processing plant operated by JCO Co. Ltd (Furuta et al., 2000; Takahashi & Kitamura, 2000; The Nuclear Safety Commission., 1999; Westrum, 2000). This accident, referred to in the literature as the JCO criticality accident, highlighted that a lack of risk-awareness "was the underlying cause of the criticality accident" (The Nuclear Safety Commission, 1999). It is contended that this lack of risk-awareness reflected a general degradation of safety culture, not only within the plant, but within the "nuclear community" more generally (Furuta et al., 2000).

According to Westrum (2000), there was an absence of requisite imagination about what might go wrong. The report by The Nuclear Safety Commission into this accident recommended that "all organizations and individuals concerned with nuclear power must maintain risk awareness while playing their respective roles" (The Nuclear Safety Commission, 1999). Furuta et al. (2000) undertook a causal analysis of the JCO criticality incident and state that risk-awareness means "that one has a correct understanding of an event … foresees the effects of his/her actions, and recognizes the potential risks behind those actions". They argue that risk-awareness is needed not only by workers at the worker-work interface, but also those who are distant from the worker-work interface including executives and the regulator, or what Hollnagel (2004) would respectively call the 'sharp end' and the 'blunt end'. According to Furuta et al. (2000, p. 199) "all organisations and individuals concerned with nuclear power must maintain risk awareness; that is safety culture". In commenting on the report by Furuta et al. (2000), Takahashi and Kitamura (2000) argue that recommendations in relation to risk-awareness should be given the highest priority because the JCO criticality accident was ultimately attributable to a lack of risk-awareness on the part of workers, designers, managers, and the public alike. In further exploring risk-awareness, Takahashi and Kitamura (2000) point out that JCO empahsised procedure following over education and suggest that it is human nature for workers to modify the rules. According to Takahashi and Kitamura (2000, p. 235) "unless the workers have a keen risk awareness on the basis of sound knowledge, it is natural for them to deviate from the prescribed procedure in search for higher efficiency and/or less workload". This propensity on behalf of humans to modify procedures may be explained by Hollnagel's (2004) 'ETTO principle', or efficiency thoroughness trade-off principle, that asserts that people will try to optimise their performance by finding a balance between thoroughness and efficiency. But trade-offs in terms of modifying procedures to gain efficiency may be less likely, in Takahashi and Kitamura's (2000) view, if people receive sufficient education in risk-awareness. According to Takahashi and Kitamura (2000, p. 236), people may be less likely to make trade-offs if they have knowledge, or what they call 'what-if' knowledge, that supplements 'know-how' and 'know-why' knowledge. 'What-if' knowledge extends the operational awareness of risk and must take into account how a procedure could fail

(Takahashi & Kitamura, 2000). It is argued that this knowledge can be gained through the use of simulators which provide workers with the opportunity to violate procedures in order to see what happens and learn from the experience (Takahashi & Kitamura, 2000).

There are similarities between Hopkins' concept of risk-awareness and the concept of risk-awareness as discussed in the investigation of the JCO criticality accident. Perhaps the most striking similarities are in relation to the fact that risk-awareness is viewed under both concpetualisations as an individual as well as an organisational practice. Furthermore, both conceptualisations recognise the limitations of safety rules. The main difference between the two conceptions rests in the methods for encouraging risk-awareness. Hopkins' (2005a) view is that individual risk-awareness is encouraged in industry through programs such as 'Step back five by five' which are designed to prompt workers to think about what could go wrong before starting a job. By comparison, in the case of the JCO criticality accident, education and the development of 'what-if' knowledge is given prominence (Takahashi & Kitamura, 2000). This knowledge is developed through simulator training where workers are encouraged to violate safety rules to gain a deep appreciation for the strengths and weaknesses of the role of rules in controlling risk (Takahashi & Kitamura, 2000).

This review of the concept of risk-awareness highlights that although Hopkins' concpetualisation is similar to that which emerged following the JCO analysis, the point of departure is the manner in which risk-awareness is encouraged in workers. The 'technology' (DeJoy, 2005) of encouraging risk-awareness under Hopkins' conception are programs designed to encourage workers to stop and think about what could go wrong before starting work. This 'technology' is discussed in the next section.

2.3.3 The technology of risk-awareness

The term 'technology' is used here to describe the strategies that organisations use to promote risk-awareness. The term has been borrowed from DeJoy (2005) who uses the term to compare behaviour-based and culture-change approaches to safety management.

According to DeJoy (2005) a strength of the behaviour-based approach to safety is that it has a specific technology derived from psychology. By comparison, the technology of culture-change is diffuse and underspecified (DeJoy, 2005). As a result, organisations are more likely to embrace behaviour-based approaches to safety management because there is a specific 'technology' (program) that they can purchase and implement. This principle of a specific 'technology' will be applied to risk-awareness for two reasons. Firstly to gain a better appreciation for how risk-awareness is encouraged in industry and to determine if the technology of risk-awareness has been the subject of research.

Hopkins cites several examples of risk-awareness programs operating in industry including Esso Norway's 'Step-back five by five' (Hopkins, 2002; Hopkins, 2005a) and Xstrata Coal's 'Stop, Look, Assess, Manage' (Hopkins, 2005b). The common feature of these programs is that they encourage individual workers to stop before starting a job, to think about the hazards and risks on the job and to ensure that adequate risk controls are in place before starting work. These types of programs are examples of the specific technology that organisations can implement to encourage risk-awareness. However, although there is a specific technology available at the level of implementation, where that technology is derived from is less clear. For example, in Australia, the National Minerals Industry Safety and Health Risk Assessment Guide views risk-awareness programs as an informal approach to risk assessment with the aim of creating "a state of risk awareness in the minds of individuals about to undertake a task or during a task where an unexpected change has occurred" (Joy & Griffiths, 2005, p. 38). The Guide lists a number of risk-awareness 'tools' including "Take 5", "Hudson's Rule of Three" and "Positive Attitude Safety System (PASS)", as well as the 'tools' mentioned by Hopkins (2005a; 2005b) of "SLAM Stop, Look, Assess and Manage" and "Stepback 5 X 5" (Joy & Griffiths, 2005). However, where these 'tools' or technologies for risk-awareness were derived from is less clear. For example, Hopkins (2005a, p. 18) is critical of risk-awareness programs being reduced to the "mindset of individuals" because such programs are dependent upon the "organisational context" for success. According to Hopkins (2005a, p. 18), reducing risk-awareness to individual mindsets may undermine the effectiveness of the programs as they may come to "be viewed as an attempt to

transfer responsibility for safety from the employer to the employee and to blame workers for being insufficiently risk-aware when things go wrong". In this sense then, Hopkins' conception of risk-awareness is derived from a collective practices view of culture; a culture that exhibits qualities of collective mindfulness and an informed safety culture. However, other technologies in the Minerals Industry guide appear to be derived from elsewhere. For example, "Hudson's Rule of Three" appears to be derived from cognitive psychology and is based upon the concept of situation awareness. This program has been designed for the oil company Shell as a decision making tool (Hudson et al., n.d.). The "Positive Attitude Safety System (PASS)" is, according to the web site for this technology, derived from "Learned Helplessness, Positive Reinforcement (shaping of behaviours) and Intervention Theory" (http://passinc.net). With its focus on safe behaviour observations and positive reinforcement of behaviour, this program could be classified as a behaviour-based safety program.

Therefore, the technology of risk-awareness becomes more diffuse and underspecified the deeper one digs in an attempt to unearth from where the individual technologies are derived. The different risk-awareness technologies make the meaning of the term 'risk-awareness' unclear. In practice, therefore, the one term, 'risk-awareness', could equally be interpreted to mean a cultural approach to safety (Hopkins, 2005a), an approach to risk assessment (Australian Coal Association Research Program, 2007), a behaviour-based safety strategy (Hopkins, 2002; Hopkins, 2005b) and or a strategy to promote situation awareness (Australian Coal Association Research Program, 2007; Hopkins, 2005a). This diffusion leads to confusion over what risk-awareness is and is not. This situation is compounded by the fact that there are few published studies of the effectiveness of risk-awareness programs. This literature review found only two published studies.

The first study related to the "ThinkSafe SAM" campaign in Western Australia where "SAM" stands for **S**pot the hazard, **A**ssess the risk and **M**ake the changes (Bartholomaeus, 1998; Hopkins, 2005a). The "ThinkSafe" campaign targeted industry and the community in an attempt to bring about behavioural and cultural change in a bid to reduce injuries among young workers (Bartholomaeus, 1998). Market research found

53% of respondents were applying “ThinkSafe” in their every day activities and 51% were applying “ThinkSafe” to their work (Bartholomaeus, 1998).

The second study, conducted in the coal mining industry in Australia focused on communication strategies that maximise the effectiveness of informal/mental risk assessment programs (Australian Coal Association Research Program, 2007). This study found short-comings in the mechanisms used to communicate with front-line workers in relation to how they should apply the informal risk assessment process.

The next sections will attempt to clarify and consolidate the concept of risk-awareness by distinguishing it from behaviour-based safety programs, by illustrating the relationship between risk-awareness and risk assessment and by drawing parallels with the related concept of situation awareness. Finally, a working definition of risk-awareness is put forward for consideration.

2.3.4 Risk-awareness and behaviour-based safety

According to Hopkins (2005a), risk-awareness is an aspect of an organisational culture conducive to safety that operates at both the individual and organisational level and is interchangeable with the ideas of collective mindfulness and an informed safety culture. By comparison, behaviour-based safety is derived from the principles of operant conditioning and behaviour modification and is directed toward the safety-related behaviours of workers (DeJoy, 2005). According to DeJoy (2005, p. 107) behaviour is “under the control of environmental contingencies”. In practical terms, this means workers observe the safety behaviours of other workers and feed back the results (Hopkins, 2005b). The central concepts of behaviour-based safety are antecedents, or what triggers the behaviour, behaviours themselves as observable acts, and consequences that follow the behaviour (Krause, 2005). According to Krause (2005), consequences have a powerful influence on behaviour. To be effective, however, consequences should be positive be applied consistently and follow close in time to the behaviour (Krause, 2005). Hopkins (2005b) has been critical of safe behaviour observation programs on a

number of grounds. For example, not all behaviours are observable and the focus of these programs is usually worker behaviours and not the behaviours of managers (Hopkins, 2005b).

Hopkins (2005b, p. 590) distinguishes risk-awareness programs from behaviour-based safety programs by saying that risk-awareness programs "invite workers to consider all potential risk factors, not just their own behaviour or that of their workmates". According to Hopkins (2005a) although the risk-awareness of workers is the aim of the program, it is the behaviour of managers and supervisors that will determine if the risk-awareness program is successful.

The key difference between behaviour-based safety programs and risk-awareness programs is that behaviour-based safety programs use safe behaviour observations to gather information on safety and to control behaviour (Krause, 2001, 2005). By contrast risk-awareness programs gather information on safety through workers who are empowered to always be on the look-out for how things could go wrong and to take action to control risk where they can and to report matters of concern when they cannot (Hopkins, 2005a).

This section had distinguished risk-awareness programs from behaviour-based safety programs. The next section will address the relationship between risk-awareness and risk assessment.

2.3.5 Risk-awareness and risk assessment

Risk-awareness is a cultural approach to safety but it is also a form of risk assessment and has been variously referred to as 'informal risk assessments on day-to-day tasks' (Joy & Griffiths, 2005), 'informal/mental risk assessment' (Australian Coal Association Research Program, 2007), 'last minute risk assessments' (Gillette et al., 2004) and 'mini risk assessments' (Hopkins, 2005b). What makes risk-awareness a form of risk assessment is that risk-awareness programs require workers to stop and think before

starting work so that they may identify hazards and risks and take action to control those risks.

Risk-awareness as a risk assessment process has two characteristics that distinguish it from other forms of risk assessment. The first is that risk-awareness is practiced by workers close in time and space to the risks, that is, at the start of, and ideally during, a particular job. Managers support this process by allowing workers the time to stop and think about risk and by empowering workers to make decisions about risk control action. The second is that risk-awareness is typically informal in that what is thought about is not necessarily written down. As a result, the risk assessment remains in the workers' heads and in group situations is verbally communicated within the group. Managers support this process by providing workers with the knowledge and skills that will increase workers' understanding and awareness of risk.

But risk-awareness does not operate in isolation and must be supported by other approaches to risk assessment as illustrated in Figure 2.

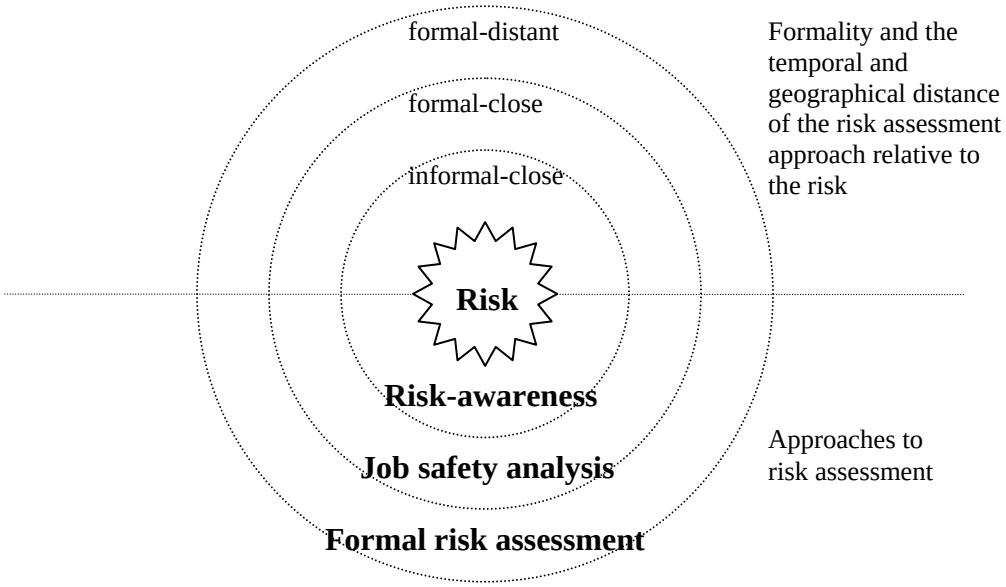


Figure 2 A schema of risk assessment

The outer circle of Figure 2 refers to formal risk assessments. These types of risk assessments are undertaken at a time and place that is distant to both the task and risks and are formal in the sense that they are documented. Examples of these types of risk assessment include manual handling risk assessments, noise risk assessments and safety cases for major hazard facilities. Job safety analysis (JSA) is an approach to risk assessment that is widely used in industry and is undertaken at a time and place that is closer to the task and risks. JSAs are also formal in the sense that they are documented. JSAs complement rather than compete with formal risk assessments and are undertaken on a project by project or task by task basis. The inner circle of Figure 2 locates where risk-awareness programs might appear in the scheme of risk assessment. Risk-awareness is an important process as it is an approach to culture and risk that could combat the "incompleteness" (Pidgeon, 1988) of more formal risk assessments. Formal risk assessment that is undertaken distant in time and place to the job may not always be up to date because of the constantly changing nature of work and risk. Risk-awareness, therefore, is for individual workers and organisations alike, a last line of defence against risk. Risk-aware workers are also in the best position to be able to detect warning signs and to report "matters of concern" to managers (Hopkins, 2005a). This relationship between risk-awareness and the risk management process of hazard identification, risk assessment and risk control, and the opportunities this process affords in relation to reporting "matters of concern" and learning from those reports, is shown at Figure 3. Although the risk management process as shown in Figure 3 applies equally to all levels in the schema of risk assessment, it is the ability of workers to report matters of concern, supported by an organisational culture that empowers workers to take risk control action, that distinguishes risk-awareness from the formal and close and formal and distant approaches to risk assessment.

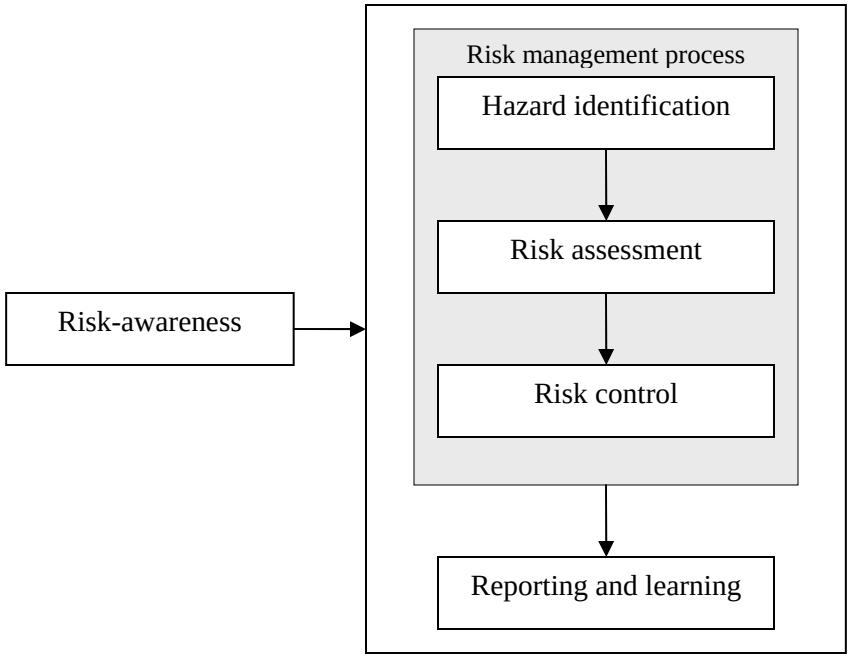


Figure 3 The relationship between risk-awareness, risk management and reporting

Although the importance of risk-awareness operating as a set of practices at both the organisational and individual level has been recognised (Hopkins, 2005a), the associated cognitive processes involved in achieving individual risk-awareness remain underspecified. There are, however, parallels between risk-awareness and the concept of situation awareness, and to an extent safety imagination, and these are discussed in the next section.

2.3.6 Risk-awareness, situation awareness and imagination

Risk-awareness, at the level of the individual worker, is essentially giving workers what Westrum (1992, p. 404) calls a “licence to think”. In a similar way, Hopkins (2005a, p. 17) suggests that workers “need to act with a heightened awareness of the risks involved” but does not specify the individual cognitive processes or organisational processes that enable or restrict workers ability to act with “heightened awareness”. The concepts of situation awareness and safety imagination may help fill this gap.

2.3.6.1 Situation awareness

According to Weick and Sutcliffe (2001), situation awareness is a component of being 'sensitive to operations'; one of the five processes of collective mindfulness. Therefore, given that risk-awareness is said to be interchangeable with collective mindfulness (Hopkins, 2005a), situation awareness is a legitimate concept for exploring the cognitive processes involved in workers achieving a heightened awareness of risk.

Situation awareness (SA) is an approach to understanding the cognitive processes involved in decision making in complex and dynamic environments (Endsley, 1995a). Although situation awareness has its origins in aviation (Endsley, 1995b, 2000; Stanton et al., 2001) it is said to be applicable to a range of working environments and according to Endsley (1995b, p. 33) "many other everyday activities call for a dynamic update of the situation to function effectively. Walking, driving in heavy traffic, or operating heavy machinery surely call for SA".

Endsley (1995b, p. 36) proposes that situation awareness is about "knowing what is going on" and defines situation awareness as "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future".

Endsley (1995b) has proposed a model of situation awareness in dynamic decision making that includes a three-level hierarchy, or three steps toward achieving situation awareness from which follows decision making and action. The first level, perception of elements in the environment, is influenced by the ability of the individual to pay attention to the relevant elements. This ability is influenced by experience, training and the availability of cues in the environment. The second level, comprehension of the current situation, goes beyond perception to how people interpret and integrate information relative to their goals. According to Endsley, experience plays a role as do existing mental models against which the picture of the situation will be compared. The third level, projection of future status, is influenced by how effectively meaning is comprehended so that future status can be predicted for decision making and action.

Situation awareness is affected by a combination of human as well as task and system factors (Endsley, 1995b). A person's limited attention and working memory capacity both restrict situation awareness, but these limitations can be compensated for by mental models developed through training and experience and stored in long term memory (Endsley, 1995b). Situation awareness is also affected by a range of other factors including workload, stress, system complexity and interface design (Endsley, 1995a).

Situation awareness has parallels with risk-awareness because it elaborates the cognitive processes associated with achieving 'awareness'. The three levels of situation awareness can be applied successfully to better understand how individuals can act with heightened awareness of risk. For example, first the elements in the environment that could be of interest need to be perceived and these could include the hazards associated with a particular task, the adequacy of existing safety rules, time pressures, changes in the physical environment, availability of equipment, and the availability of other people to assist with the task. Second the elements need to be integrated and comprehended such that a picture emerges of how things could go wrong.

This section has put forward the view that situation awareness is a useful concept for understanding the cognitive aspects of what it means to be risk-aware. The concept of safety imagination may also assist with clarifying what it means to act with a heightened awareness of risk.

2.3.6.2 Safety imagination

The concept of 'safety imagination', unlike situation awareness, is not restricted to describing individual cognitive processes. Rather safety imagination is an organisational construct in the same way as collective mindfulness, but still has lessons for what it means for workers to act with a heightened awareness of risk.

Safety imagination is an approach to safety culture borne out of Turner's 'Man-made disasters' (MMD). This model attempts to explain accidents in socio-technical systems as a six stage process in which pre-existing cultural beliefs about what is common sense safe

practice collapse in the face of a disaster leading to cultural readjustment and the forming of new beliefs about what constitutes safe practice (Turner & Pidgeon, 1996). Therefore, the MMD model hypothesises that there are many pre-conditions to any system failure that accumulate, unnoticed, sometimes for years, because the critical information may be at odds with the existing cultural norms and beliefs about safety (Turner & Pidgeon, 1996). These authors refer to this period as the disaster incubation period.

The development of "safety imagination" is proposed as a means for overcoming this information barrier to organisational learning (Turner & Pidgeon, 1996, p. 188). Safety imagination allows for organisational intelligence to be developed and for information about hazards to be surfaced (Pidgeon, 1997; Pidgeon & O'Leary, 2000; Turner & Pidgeon, 1996). In this way safety imagination is a concept similar to the concepts of collective mindfulness and an informed safety culture because it operates, both at the individual and organisational levels.

Organisational learning about safety as "reflection on practice" is viewed as one facet of a 'good' safety culture (Pidgeon & O'Leary, 2000). The impact of safety culture on safety performance is summed up well by Weick (1998, p. 18) who argues that organisations are defined as much by what they ignore as what they pay attention to, a view not dissimilar to Clarke's (1993) earlier observation that:

> Organisational cultures may be organized to enhance imaginations about risk and safety. But they can also insulate organisational members from dissenting points of view. And organisational cultures can perpetuate myths of control and maintain fictions that systems are safe. (p. 687)

Safety imagination, it is argued, is an aspect of risk-awareness in that it promotes the idea of 'reflection on practice'. Safety imagination is based on the principle that "our understanding and analysis of events should not become overly fixed within prescribed patterns of thinking" (Pidgeon & O'Leary, 2000, p. 22). Safety imagination is a way of thinking outside of the known and taken-for-granted ways of managing safety so as to consider the possibility of risks arising from hazards that have not been identified in advance or if they have, remembering that "foresight will continue to fail" and "what

looks acceptable today may not look so tomorrow" (Pidgeon, 1988, p. 365). This process of "stepping outside" of what is taken to be known, is "a critical and self-reflective process, in that one seeks to challenge the default assumptions about the world and its hazards, and then to use this interrogation to interpret the significance of external warning signs and events" (Pidgeon & O'Leary, 2000, p. 22).

To promote the processes of reflection and imagination, Pigeon and O'Leary (2000) have adapted a list of guidelines for fostering safety imagination drawn from a training program for fire-fighters in the United States, these guidelines are reproduced in Table 3.

Table 3

Guidelines for fostering 'safety imagination'

1. Attempt to fear the worst
2. Use good meeting management techniques to elicit varied viewpoints
3. Play the 'what if' game with potential hazards
4. Allow no worst case situation to go unmentioned
5. Suspend assumptions about how the safety task was completed in the past
6. Approach the edge of a safety issue with a tolerance of ambiguity as newly emerging safety issues will never be clear
7. Visualise 'near-miss' situations developing into accidents

Source: Adapted from Pidgeon and O'Leary (2002, p. 23)

According to Pidgeon and O'Leary (2000, p. 23) the guidelines presented in Table 3 are a useful cognitive checklist for workers confronted with "ill-structured risk situations". Therefore, fostering safety imagination may complement the development of situation awareness and ultimately risk-awareness.

However, Pigeon and O'Leary (2000) caution that safety imagination alone will not ensure that learning occurs unless a second barrier involving the interplay of organisational power, politics and blame, is addressed first. They go on to ask "what political, cultural, symbolic and institutional arrangements support the generation of organizational intelligence and safety imagination over corporate myopia?" (Pidgeon & O'Leary, 2000, p. 24) Their answer is a monitoring and reporting system built on trust (Pidgeon & O'Leary, 2000).

The importance of imagination in relation to risk and culture has also been identified by Westrum (1992) who coined the term "requisite imagination". Requisite imagination is the "the ability to imagine key aspects of the future we are planning … and anticipating what might go wrong" (Adamaski & Westrum, 2003, p. 195). Westrum refers to this type of imagination as a "license to think" which is cultivated by a culture that values requisite imagination (Westrum, 1992). Although Westrum has developed his ideas in the context of high-risk socio-technical systems, and with system designers in mind in particular, the notion of requisite imagination, in principle at least, has a lot in common with safety imagination. Both concepts deal with forecasting what might go wrong. Extending upon this theme, Hollnagel (2004) argues that imagination is an "important ingredient" for understanding risk. Hollnagel argues that imagination can be harnessed by using a systematic method and cites Hazard and Operability Analysis (HAZOP) and its use of guidewords as an example. He acknowledges, however, that although guidewords are useful, they are no substitute for "human reasoning and imagination". Industry risk-awareness programs are typically supported by pocket cards that provide prompt statements as a means to jog workers' thinking and to assist workers to imagine what might go wrong. So perhaps pocket cards can act in the same way as HAZOP guidewords in harnessing imagination; albeit for more mundane activities and risks.

At the organisational level, safety imagination is similar in concept to both collective mindfulness and an informed safety culture. At the individual level safety imagination complements or may even enhance situation awareness. The strength, however, of safety imagination is that it builds on the man-made disaster model of the accident process and

the incubation of disasters as cultural collapse leading to cultural readjustment. Against this context then, collective mindfulness makes explicit the cognitive processes that may unearth the incubation of accidents. An informed safety culture makes explicit the organisational practices that complement the cognitive processes of collective mindfulness. Situation awareness and safety imagination sharpen those cognitive processes, particularly for front-line workers. A culture that is risk-aware could be said to exhibit an understanding of this complex web of processes and practices and apply them at both the individual and organisational levels.

2.3.7 Defining risk-awareness

The term risk-awareness is a relative newcomer to the lexicon of OHS and this discussion has built upon Hopkins' (2005a) view that organisational mindfulness, safety culture and risk-awareness are interchangeable ideas. The aim here has been to extend the risk-awareness concept by considering its relationship to risk assessment and as well as considering its relationship to two similar concepts: situation awareness and safety imagination. Therefore, for the purpose of this research, the following definition of risk-awareness will be used:

Risk-awareness is the mindful and dynamic process of perceiving, imagining, making sense of and taking action to control risk and of reporting matters of concern that relies upon individual empowerment, collective knowledge and collective practices that are embedded within and influenced by the organisational, social and technical setting.

This definition recognises that organisations strive to develop a culture of risk-awareness through programs that encourage risk-awareness in front-line workers (Hopkins, 2005a). These programs are variously referred to as informal or mental risk assessments (Australian Coal Association Research Program, 2007) and have been referred to in this research as the technology of risk-awareness. Therefore, risk-awareness is a feature of organisational culture as much as it is a feature of individual mindsets, with the former

supporting the latter. This research will use the term ‘risk-awareness program’ to refer to both the organisational and individual features of risk-awareness.

2.4 Exploring Risk-awareness as a Cultural Approach to Safety

The purpose of this literature review was to locate the relatively new concept of risk-awareness within the broader landscape of safety culture. Section one of this review provided an overview of perspectives on safety culture and in particular, the functionalist and interpretive perspectives of safety culture. Section two discussed the rise to prominence of collective mindfulness and an informed safety culture as precursors to risk-awareness. Section three discussed the emergence of risk-awareness and in the process distinguished risk-awareness programs from behaviour-based safety programs and characterised risk-awareness as an ‘informal and close’ approach to risk assessment. This section also showed that the individual cognitive process of achieving heightened risk awareness may be better explained by the three levels of situation awareness. Finally the relationship between risk-awareness and safety imagination was explored.

The next sections will identify the gaps found in the literature on safety culture, present how this study will address some of those gaps and conclude with a revised set of research questions.

2.4.1 Identifying gaps in the literature

This literature review has identified a number of gaps in the literature in relation to studying and changing safety culture. The most prominent gap is that between the functionalist ‘top down’ and interpretive ‘bottom up’ perspectives of safety culture. Risk-awareness fits within the functionalist perspective because it is based upon the assumption that, within organisations, it is easier to change practices than values. Leaders can influence practices by the structures and processes they put in place. Therefore a strategy to promote risk-awareness will work so long as the collective practices are in place to support the program. However, there may be a gap between risk-awareness and the technology of risk-awareness as espoused by an organisation and the interpretation of

the risk-awareness technology by local workplace cultures. There is no published research evidence on the effectiveness of risk-awareness programs, or what is referred to here as the 'technology' of risk-awareness. Therefore, it is not known if the technology of risk-awareness actually heightens workers' awareness of risk, if the technology of risk awareness results in increased reporting of hazards, errors, near-misses and other matters of concern and in what ways the technology of risk-awareness impacts upon the culture of safety and a reduction in risk.

In section 2.1.3, Figure 1, safety culture was viewed from the perspective that it is an interpretive device mediating between corporate safety rhetoric and safety programs travelling down an organisation on the one hand, and the workplace culture that will interpret the corporate safety rhetoric and safety programs on the other. This perspective on safety culture provides a different focus for research and it is this perspective that will be used to frame this research. Therefore, in the context of this perspective of safety culture, risk-awareness programs are understood to be an example of a corporate safety program travelling down an organisation. However, this review of the literature reveals that little is known about how workplace cultures interpret risk-awareness programs and what impact risk-awareness programs have on the culture of safety and risk reduction. The nature of the gaps between the corporate risk-awareness program and the workplace culture are shown in Figure 4.

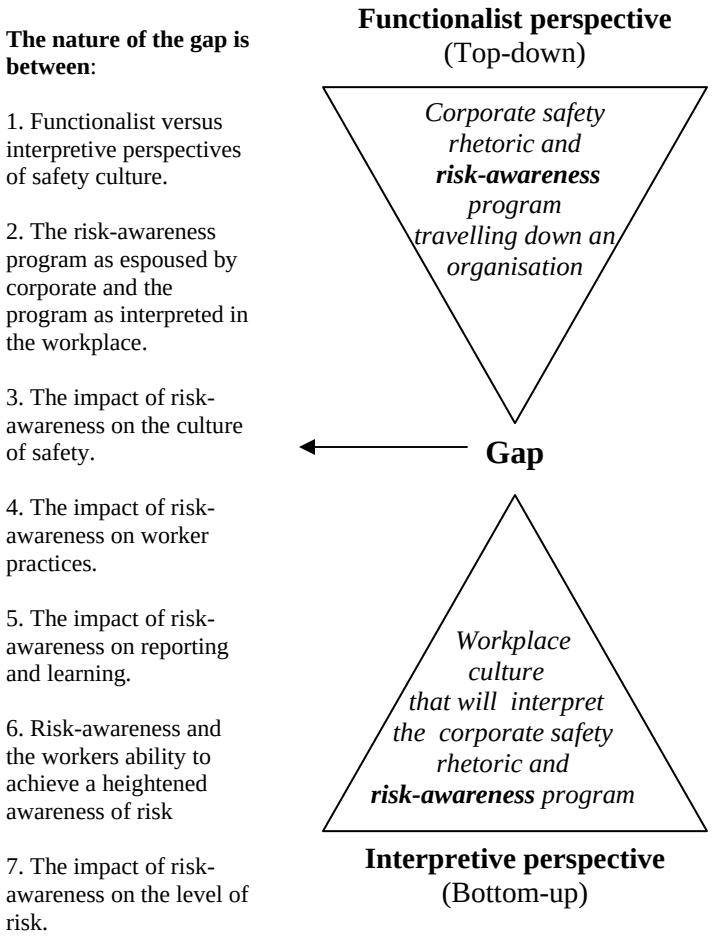


Figure 4 Gaps in the literature in relation to risk-awareness

The next section will propose the areas of research focus and an alternative perspective on safety culture as a step toward closing the gaps.

2.4.2 Towards closing the gaps

The previous section, section 2.4.1, established that risk-awareness programs are an example of a corporate safety program and that the success of the program will depend not on the espoused safety rhetoric related to the program, but upon how the program is interpreted by workplace cultures. Figure 4 identified gaps in the literature between risk-awareness programs on the one hand, and how they are interpreted by the workplace culture on the other. Figure 5, below, illustrates that to close the gaps, the research focus should be directed towards exploring how workplace cultures interpret the risk-awareness program, and in doing so, may provide insights into safety culture.

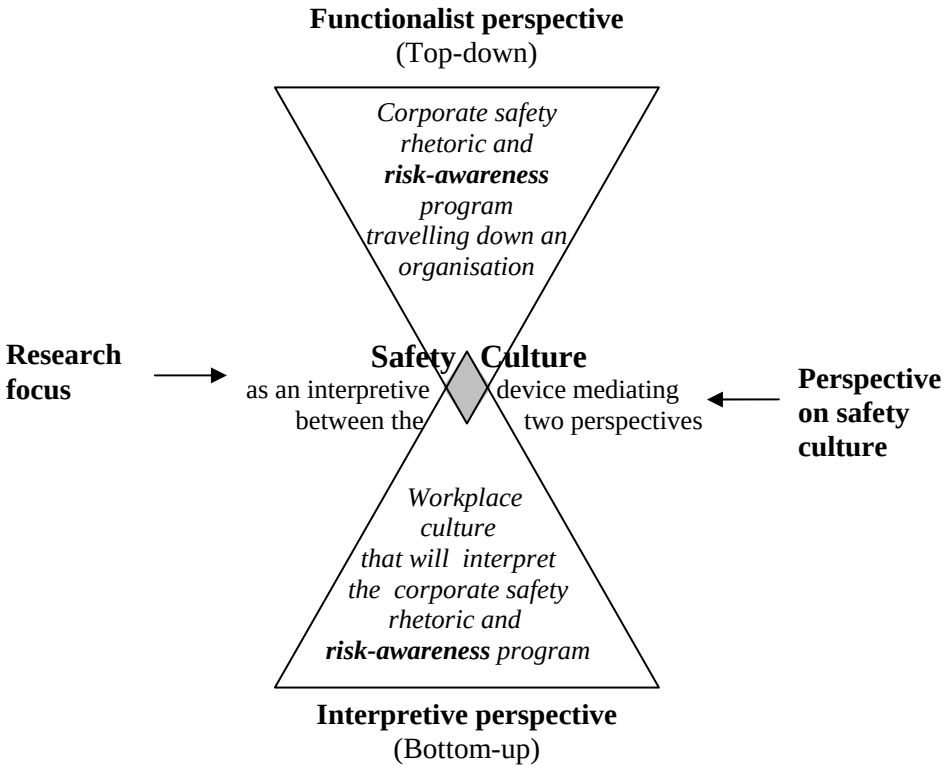


Figure 5 Using safety culture as an interpretive device to study risk-awareness

This alternative perspective, of treating safety culture as an interpretive device that mediates between the functionalist and interpretive perspective (Hopfl, 1994), may overcome the limitations of using either method in isolation. The research focus may then move to tracking a particular intervention designed to impact upon safety in the

workplace (the functionalist perspective), in the case of this research, a risk-awareness program, and exploring how workers interpret the program and the meaning they attach to it (the interpretive perspective).

2.4.3 Refining the research question

The aim of this study is to explore what impact, from the perspective of workers and managers, risk-awareness programs have upon the culture of safety and risk. Based upon the review of the literature, the aim has been expanded into a main research question supported by six sub-questions.

2.4.3.1 The main research question

What impact, from the perspectives of the on-site workers and managers, does an organisation's risk-awareness program have upon the culture of safety and the resultant level of risk?

The main research question acknowledges that some organisations strive to develop a culture of safety that is risk-aware through programs that encourage risk-awareness in front-line workers (Hopkins, 2005a). These risk-awareness programs are also referred to as informal or mental risk assessments and are practiced by front-line workers prior to commencing work (Australian Coal Association Research Program, 2007). These worker practices are supported by management practices that encourage risk-awareness. Therefore, risk-awareness programs impact upon the culture of safety to the extent that they influence the collective practices of managers and workers (Hopkins, 2005a). Furthermore, by improving the risk-awareness of frontline workers, and by empowering workers to take risk control action and report matters of concern, risk-awareness programs may also impact upon the level of risk in the workplace. However, this relationship between safety culture, collective practices, risk-awareness and the level of risk has not been the subject of research. Therefore, the main research question is designed to explore these relationships and contribute toward filling this gap in the occupational health and safety literature.

2.4.3.2 Research sub-questions

1. What impact does on-site leadership have upon the risk-awareness program?

Leaders and managers are said to shape culture (Hopkins, 2005a; Schein, 2004) and this question is designed to explore the role of leadership in shaping a culture that is risk-aware.

2. What role do organisational structures and processes play in supporting risk-awareness?

Leaders are said to shape culture through the structures and processes they attend to that impact upon practices (Hopkins, 2005a; Reason, 1997). This question explores the role of structures and processes in supporting the practice of risk-awareness.

3. How do workers and managers, individually and collectively, learn of the risk-awareness program?

The effectiveness of the risk-awareness program may be influenced by how the workers and managers learn about the program. This question explores how the organisation introduced the program into the workplace.

4. What impact does the risk-awareness program have on the individual and collective practices of workers and managers and their awareness of risk? In particular:

a. *What impact does the risk-awareness program have upon workers' and managers' ability to perceive and comprehend hazards?*
b. *What impact does the risk-awareness program have upon workers' and managers' ability to project future states of risk?*
c. *What impact does the risk-awareness program have upon workers' and managers' risk control practices?*

d. *What impact does the risk-awareness program have on hazard, error and near-miss reporting?*

The practice of stopping to assess risk prior to commencing work is a necessary part of the process, but should be complemented by a cognitive process for thinking about risk. This cognitive process of being aware of risks is congruent with achieving situation awareness (Endsley, 1995b). Furthermore, the more aware workers are of risk, the more likely they are to report matters of concern to supervisors and managers (Hopkins, 2005a). This series of questions explores the extent to which workers and managers apply the practice of risk-awareness or stopping to think about risk before commencing work. The questions also explore the extent to which the risk-awareness program enables workers to achieve situation awareness as well as the resulting impact upon decision making and the resultant action in relation to risk control. Finally, the question explores the link between increased awareness of risks and reporting.

5. What impact does the risk-awareness program have on the texture of workplace learning and knowing as expressed through the practices of workers and managers?

Although leaders may shape a culture of safety that is risk-aware, it may not be safety that is learnt within that culture but safe work practices (Gherardi et al., 1998). These safe work practices may be learnt within communities of practice (Gherardi & Nicolini, 2000a, 2002). This question explores how learning about safety occurs in the workplace and what impact that the risk-awareness program has on workplace learning about safety.

6. What is the perceived impact, from the perspectives of the workers and managers, of the risk-awareness program on the culture of safety?

Risk-awareness is said to be a cultural approach to safety (Hopkins, 2005a). This question explores the ways in which risk-awareness impacts upon the culture of safety.

7. Is the risk-awareness program perceived by workers and managers to be making the workplace safer?

The idea of risk-awareness, as a cultural approach to safety, is advocated as a way of enhancing safety (Hopkins, 2005a). The intent of this question is to explore if the risk-awareness program is perceived to be enhancing safety by reducing the level of risk.

This literature review has explored perspectives on safety culture, the rise to prominence of the concepts of an informed safety culture and collective mindfulness and the subsequent emergence of risk-awareness as a cultural approach to safety. This literature review revealed that there are few published studies of risk-awareness, resulting in knowledge gaps between the concept of risk-awareness and its application in practice. A range of research questions have been developed to explore and help address these gaps, and the next chapter will outline the theoretical, conceptual and research frameworks that will underpin how the research questions will be addressed.

Chapter 3 Theoretical Framework

This chapter will outline the theoretical framework and the research framework for this study. The theoretical framework locates risk-awareness in the context of safety culture and organisational culture and presents a conceptual framework for studying risk-awareness. The research framework introduces the epistemology, theoretical perspective, methodology and methods that form the approach to this study of risk-awareness. The next chapter will expand on the research framework by presenting the methodology in more detail.

3.1 Theoretical Framework

The literature review has revealed that there is a lack of consensus in the field of safety culture resulting in no agreed definition of terms and no agreed model or framework for studying safety culture (Guldenmund, 2000; Hale, 2000). There does seem to be agreement, however, that safety culture is an aspect of organisational culture (Guldenmund, 2000; Hopkins, 2005a). The three levels of organisational culture model (Schein, 2004) is referred to consistently in the safety culture literature (Guldenmund, 2000; Hopkins, 2005a) and it has been suggested that the model also applies to safety culture as a means for reconciling the debate between the functionalist and interpretive perspectives of safety culture (Guldenmund, 2000). The three levels of organisational culture model incorporates the view that organisational culture is under the influence of leadership (Schein, 2004). This view has also been applied to safety culture (Hopkins, 2005a; Reason, 1997).

An alternative to the functionalist and interpretive perspectives is the view that safety culture is an interpretive device mediating between the two perspectives (Hopfl, 1994). The functionalist perspective assumes that culture is unitary and can be socially engineered by leaders through organisational structures and process designed to impact upon collective practices (Hopkins, 2005a). The interpretive view assumes that culture is an emergent property of a socio-technical system and is dependent upon the significance

and meaning that workers attach to their work (Gherardi & Nicolini, 2000a, 2002; Glendon & Stanton, 2000). As a result workplaces are comprised of multiple and ambiguous cultures (Richter & Koch, 2004).

The functionalist versus interpretive divide is also a divide between organisational leaders and managers on the one hand and local workers, supervisors and managers on the other. The former group instigates safety strategies. The latter group is the recipient of those strategies. Leaders and managers instigate safety strategies and establish organisational structures and processes in support of them. Workers, together with local supervisors and managers, will interpret the significance and meaning of the organisational strategy in the context of the local workplace cultures. The point where the organisational strategy meets local interpretation is an alternate focus for understanding safety culture by understanding what happens when the two perspectives meet. Conceptualising the functionalist perspective as being consistent with the organisational domain and the interpretive perspective as being consistent with the local workplace domain, allows for the three levels of culture model to be located within both domains. That is, the organisation will have artifacts, espoused beliefs and values and underlying assumptions as will the local workplace. Strategies released by an organisation will reflect someone's underlying assumptions which become explicit through espoused beliefs and values and artifacts. Studying safety culture as a mediating device will provide insight into what happens when attempts are made to transfer these espoused beliefs and values into the workplace. One method for studying this mediating point is by focusing on a particular organisational strategy designed to improve safety to see how it is mediated by the local workplace culture. This is, to study a functionalist intervention though an interpretivist lens. Therefore, how a strategy to increase risk-awareness is mediated by the local workplace becomes the focus of this study. These ideas are shown in Figure 6.

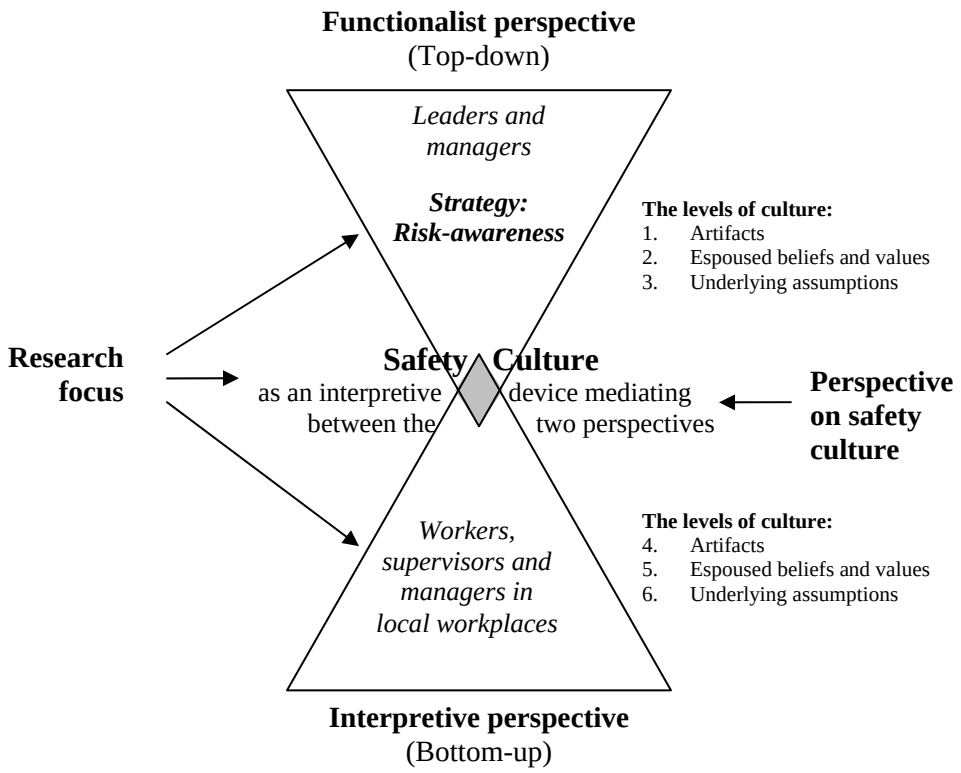


Figure 6 An integrated model for studying safety culture

3.1.1 A conceptual framework for risk-awareness

Risk-awareness, as the research focus, is related to a number of other theoretical ideas on organisational culture and safety culture. The intent here is to provide a conceptual framework that speculates on the relationship between those ideas and how, from a functionalist perspective, they relate to a safer workplace through reduced levels of risk. Of course the aim of this study is to explore the impact of the 'top down' approach from the 'bottom up'.

There are two key theoretical ideas drawn from organisational culture that inform risk-awareness. The first is the theory that culture is a group phenomenon (Hopkins, 2005a). Second is the theory that in the first instance it is easier to change practices than it is to change values (Hofstede, 1984, 2001; Hofstede & Hofstede, 2005; Hofstede et al., 1990;

Hopkins, 2005a; Reason, 1997). Over time, work groups' basic underlying assumptions about safety will shift to align with practice (Hopkins, 2005a).

There are also a number of theoretical ideas in the safety culture literature that are related to risk-awareness. First and foremost is that risk-awareness is a concept that is interchangeable (Hopkins, 2005a) with collective mindfulness, a construct drawn from high reliability theory (Weick et al., 1999) and an informed safety culture (Reason, 1997). In keeping with these views is the theory that workers who are more risk-aware will report more matters of concern to supervisors and managers and in so doing, provide the organisation with an opportunity to learn (Hopkins, 2005a). In theory, workers who are more risk-aware will be able to see more risks, will understand the limitations of safety rules and make better decisions about risk control (Hopkins, 2005a). Therefore, risk-awareness is also a process of risk assessment. The cognitive aspects of individual risk-awareness are similar in nature to the theory of situation awareness (Endsley, 1995b). The concept of safety imagination, drawn from the theory of man-made disasters (Pidgeon & O'Leary, 2000; Turner & Pidgeon, 1996) is also similar to a culture of risk-awareness at both the individual and organisational level.

These different theoretical perspectives on risk-awareness are reconciled in the conceptual framework shown in Figure 7. According to Miles and Huberman (1994, p. 18) "a conceptual framework explains, either graphically or in narrative, the main things to be studied – the key factors, constructs or variables – and the relationships among them". In the context of this study then, the conceptual framework aims to explain the relationship, from a functionalist perspective, among the concepts of leadership, culture, risk-awareness, collective practices and safety. The conceptual framework is cross-referenced to the research questions (refer to the lower case numbers within the framework). Within the framework the term risk-awareness carries two meanings. First that risk-awareness as a strategy for improving safety that is synonymous with collective mindfulness, an informed safety culture and safety imagination. The second meaning refers to the technology of risk-awareness, that is, a particular program designed to promote risk-awareness among workers. It is the technology of risk-awareness that

becomes the focal and starting point for the study because it is tangible. It is assumed that the technology of risk-awareness will result in a culture of safety that is risk-aware.

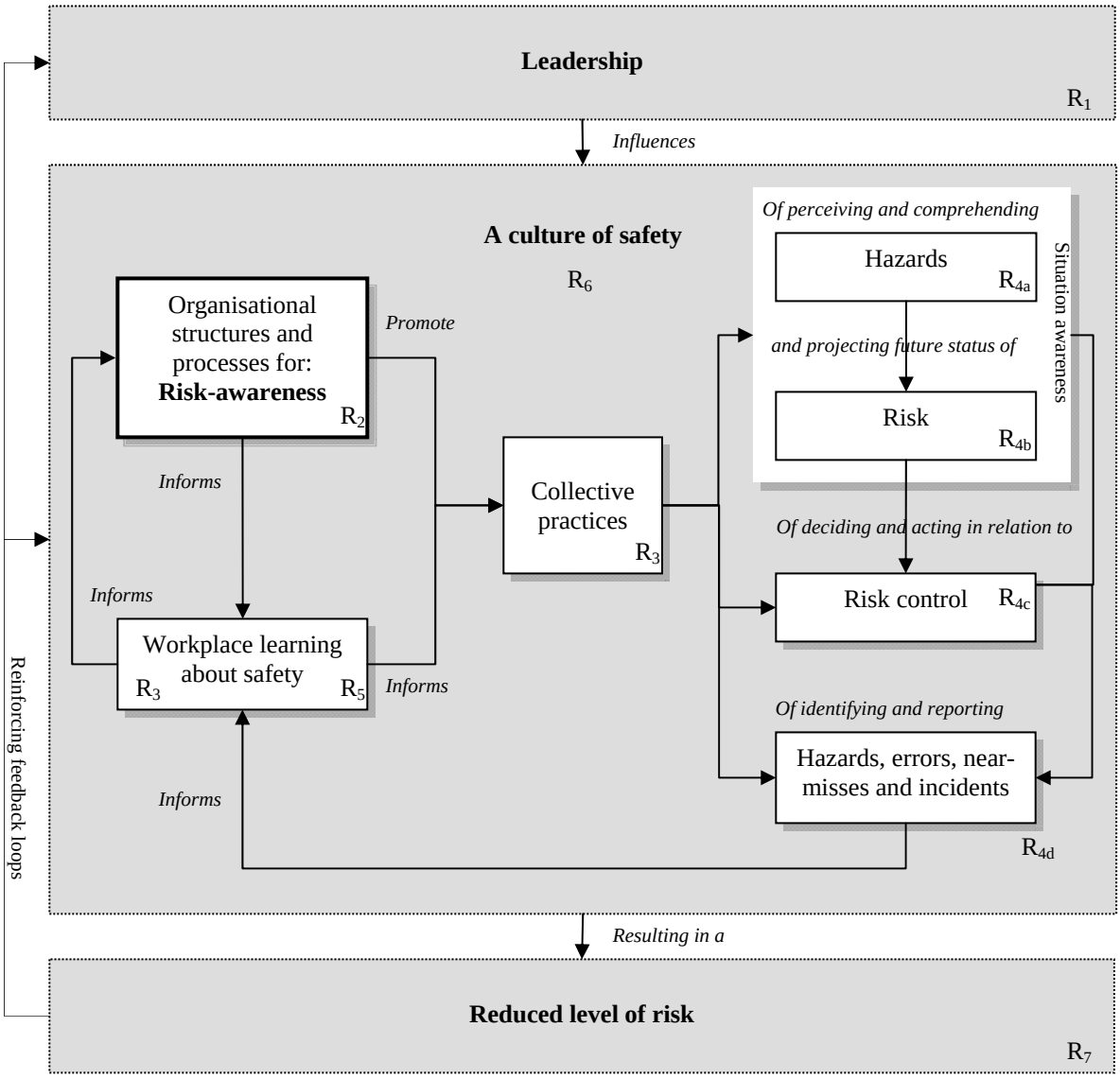


Figure 7 A conceptual framework for studying risk-awareness

Although the entry point for studying risk-awareness are the organisational structures and processes for risk awareness, the conceptual framework can also be read from top to bottom in two ways.

First, that **leadership** influences an organisation's **culture of safety** resulting in a safer workplace through **reduced levels of risk** which creates a reinforcing feedback loop through the culture of safety and leadership.

Second, within **a culture of safety** there are a range of **organisational structures and processes** that promote **collective practices.** Collective practices are taken to mean the practices of workers and managers. The organisational structures and processes that are of interest here are those associated with the technology of **risk-awareness** and a culture of safety that is risk-aware and empowered to be risk-aware. The technology of risk-awareness empowers workers to think about risk before and during a job. Organisational structures and processes also inform **workplace learning about safety** which in turn informs the collective practices of risk-awareness. The **collective practices** associated with the technology of risk-awareness require workers and managers, individually and collectively, to perceive and comprehend **hazards** and to project the future status of **risk**, in other words, achieve **situation awareness**. On the basis of that awareness decisions can be made and action taken in relation to **risk control**. The practice of becoming risk-aware will result in more **hazards, errors, near-misses and incidents** being identified and reported. Situation awareness, risk control and reporting result in opportunities for **workplace learning about safety** that feed into organisational learning and collective practices.

Having established two frameworks, one for thinking about how to study safety culture and the other for thinking about the process of safety culture change, the next section will outline the framework within which this research will be conducted.

3.2 Research Framework

The purpose of the research framework is to clearly set out the research methodology and methods to be used in this study and to justify the choice of methodology and methods (Crotty, 1998). According to Crotty, the methodology and methods, or research process, must be capable of answering the research questions and fulfilling the purpose of the

study. He goes on to argue that the justification for the research process must also surface the assumptions that are made about reality and about human knowledge. Crotty (1998) claims that there are four related elements in any research process. The first element, epistemology, deals with the nature of human knowledge and how humans create meaning about the world. Epistemology informs the second element, the theoretical perspective. The theoretical perspective deals with the philosophical assumptions that are made about the methodology and provides a context for the research process. The third element, methodology, is the strategy that will be used to achieve the purpose of the study and to guide the choice of methods, the fourth element. Research methods are the techniques that will be used to gather and analyse data relevant to the research questions.

The theoretical framework for this study has adopted the view that safety culture is an interpretive device that mediates between organisational rhetoric and safety programs and the interpretation of the rhetoric and programs by various actors in the workplace. Therefore, this study proposes to take a particular organisational safety program, in this case a program designed to increase risk-awareness, and explore how the program is interpreted by workers and managers in the local workplace to determine the impact of the program on the culture of safety and resultant level of risk. Crotty's four elements will be used to frame how this study intends to explore risk-awareness as an aspect of safety culture. A summary of the research framework is shown in Table 4.

Table 4

A research framework for studying risk-awareness and safety culture

Epistemology	**Theoretical perspective**	**Methodology**	**Methods**
Constructionsism Reality for workers and managers in relation to risk in general and the risk-awareness program in particular is socially constructed. Therefore, their response to the program will be based upon the shared significance and meaning that the program has for them. It is their shared response, not the program, that creates a culture of safety or not.	*Symbolic interactionism* Culture results from groups with shared understandings of ways to behave. Such understandings and behaviours in relation to risk-awareness will be constructed through the meaning that groups attach to the risk-awareness program; meaning that is interpreted through the use of symbols including language.	*Ethnography* To gain an appreciation for the shared understandings workers hold about risk and the meaning they attach to the risk-awareness program, it is necessary to understand first-hand how workers experience the risk-awareness program in the context of their work.	Participant observation Semi-structured interviews Collection and review of organisational documents

Source: Adapted from Crotty (1998)

3.2.1 Epistemology

This study has adopted the perspective that safety culture is an interpretive device that mediates between organisational rhetoric and safety programs and local workplace cultures. This perspective refutes the view that meaning and therefore meaningful reality exists apart from consciousness (Crotty, 1998), or that the objective truth about risk is waiting to be discovered in a risk-awareness program. Rather, this study takes the view that meaning about risk and therefore meaningful reality about risk-awareness is socially constructed (Berger & Luckman, 1966) through engagement with the real world that human beings are interpreting (Crotty, 1998). Therefore constructionsism is an appropriate epistemology because, according to Crotty (1998), constructionism takes the view that:

> … all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context. (p. 42)

Applying this definition to this study, knowledge about risk and what it means to be safe at work is contingent upon the practices of workers, being constructed in and out of interaction with fellow workers and managers and their world of work. One aspect of which might be a program designed to increase risk-awareness, and developed and transmitted within a workplace or work group. This view, that safety and safety culture is socially constructed around practices, and in particular within communities of practice, is supported by Gherardi and Nicolini (2000a; 2000b).

3.2.2 Theoretical perspective

Interpretivism is the over-arching theoretical perspective that will be used to inform this study. Interpretivism is concerned with understanding, or what Max Weber referred to as *Verstehen* (Crotty, 1998). According to Crotty (1998, p. 67) interpretivisim, or understanding, "looks for culturally derived and historically situated interpretations of the social life-world". The anthropologist Clifford Geertz (Geertz, 1975, p. 5) draws on Weber's view that "man is an animal suspended in webs of significance he himself has spun". According to Geertz (1975, p. 5) "culture is those webs", therefore the study of culture is semiotic (the study of signs and symbols) involving an interpretive search for meaning.

Interpretivisim is consistent with a constructionist epistemology as well as the perspective adopted by this study that safety culture is an interpretive device. According to Glendon and Stanton (2000, p. 195), "an interpretive perspective on culture is more appropriate than a functional approach as a way of modeling attempts to understand behaviours and cognitions in respect of safety and other aspects of organisational life".

In the context of risk-awareness, workers and managers will make their own local and culturally derived interpretations of the risk-awareness program as it travels down and across the organisation from corporate headquarters.

The interpretive tradition that will inform this study is symbolic interactionism, in particular, the "Chicago School" (Shibutani, 1970) of symbolic interactionism because of its ethnography-grounded approach that is sensitive to the individual and the context within which the individuals exist (Benzies & Allen, 2001; de Laine, 1997). This school of symbolic interactionism assumes that "individuals act on the basis of the meaning that things have for them" (Benzies & Allen, 2001, p. 541). In the context of this study, workers will act in relation to the risk-awareness program on the basis of what the program means to them as a device to keep them safe. Furthermore, humans modify their actions as part of an iterative process and in response to the actions of others. Put more simply, meaning is constructed through the "process of interaction" (Becker & McCall, 1990, p. 6). In relation to risk-awareness, it is not so much the program itself from which individual workers will construct meanings about risk and safety, rather that individual workers will construct meaning through an iterative process of interaction with other workers and managers based upon how they act and what they say in relation to the program and safety. This process of interaction is what is available to the researcher to interpret and, to interpret culture, what researchers do is ethnography (Geertz, 1975).

3.2.3 Methodology

The assumption that knowledge is socially constructed through interactions in a given context creates a strong justification for using ethnography as a methodology for exploring the nature of those interactions. According to Hatch (1993, p. 672) the study of symbolic processes "calls for direct involvement" and ethnography provides a methodology for achieving direct involvement in a culture.

Ethnography has variously been defined or described as the "art and science of describing a group or culture" (Fetterman, 1989, p. 11), "participating … in people's daily lives for an extended period of time, watching what happens, listening to what is said" (Hammersley & Atkinson, 1995, p. 1) and "is the study of people in naturally occurring settings or 'fields'" (Brewer, 2000, p. 10). In the context of this study then, it means spending time with workers as they go about their work, watching how they use the risk-

awareness program, watching how they practice safety and listening to what is said about the risk-awareness program and safety more generally.

Ethnography is already an established approach to the study of safety, and in particular safety culture. Ethnography has been used to: study how novices learn the trade on an Italian construction site (Gherardi & Nicolini, 2002); how mine workers in Australia learn safe work practices (Somerville & Abrahamsson, 2003); to explore perceptions of safety culture in a Danish manufacturing organisation (Richter & Koch, 2004); to explore safety management in the Australian fishing industry (Brooks, 2005); to analyse the space shuttle *Challenger* disaster (Vaughan, 1997) and to study high reliability organisations in the United States of America (La Porte & Consolini, 1991).

Hopkins (2006a, p. 879), however, in discussing how to study organisational cultures and their effects on safety, questions the usefulness of the ethnographic approach based on the "time it requires from the researcher". Instead Hopkins (2006a) argues in favour of using the results of major accident inquiries to explore culture and safety. However, this approach is not helpful for researching the more "commonplace" organisations who may never experience a disaster compared with the "heroic" organisations, for example nuclear power stations, (Gherardi, 2006) that are normally the source of much of the literature on safety culture. This study is about an organisation that is "commonplace" and within the confines of a PhD, ethnography, it is argued, is still more than relevant because the time is available but a disaster is not.

Ethnography is both a methodology and a set of methods for collecting data (Brewer, 2000) but it is also a product which is a "written representation of a culture" (Van Maanen, 1988, p. 1). Geertz (1975, p. 26) refers to this written account as a "thick description". A "thick description" does not aim to "generalize across cases but to generalize within them" (Geertz, 1975, p. 26). Therefore, according to Geertz (1975, p. 26), the aim of ethnographic interpretation is the analysis of "social discourse" which is drawn from "symbolic acts or clusters of symbolic acts". The writing down of social discourse occurs through a thematic narrative that tells a story about life and events in a

particular culture (Emerson et al., 1995). In the context of this study then, the impact of the risk-awareness program on the culture of safety and risk will be written in the form of a thematic narrative.

3.2.4 Methods

The research methods are the methods that will be used to collect data and these methods follow naturally from ethnography as the methodology. Three methods will be used for collecting data: participant observation, semi-structured interviews and a review of organisational documents related to risk-awareness.

Participant observation aims to understand how local workers and managers, as the recipients of the organisation's risk-awareness program, interpret the program from their point of view. This according to Spradley (1980, p. 3) is the central aim of ethnography, that is, "to understand another way of life from the native point of view". Participant observation means then that researcher must go and study "in" (Geertz, 1975, p. 22) the workplace in order to observe the everyday activities and record casual conversations in order to describe the culture (Spradley & McCurdy, 1972).

Semi-structured interviews (Minichiello et al., 1995) or ethnographic interviews (Spradley, 1979) use a flexible interview guide to explore people's "perception of reality" as it relates to the research questions. Semi-structured interviews will help clarify events observed in the field and will allow for the exploration of the deeper meaning of those events to the workers and in the process, uncover matters of interest that are relevant to the research questions that may not have been possible to uncover through observations.

Organisational documents related to risk-awareness will be reviewed to provide the organisational context against which the culture of safety will be described based upon participant observation and semi-structured interviews.

Chapter 4 Methodology

The previous chapter argued that ethnography is an appropriate methodology for studying safety culture and consequently was the methodology used for this study. The purpose of this chapter is to outline in detail the ethnographic methods that were used to collect and analyse data. This chapter is broken into five sub-sections. Section 4.1 acknowledges that ethics approval was granted to undertake this research. In section 4.2, the sampling strategy and site selection process is discussed. A description of the participating sites and their risk-awareness program is provided in section 4.3. The methods used to collect data collection in relation to the risk-awareness program are described in section 4.4. Finally, the data analysis process is described in section 4.5.

4.1 Ethics Approval

Approval to conduct this research was granted by the University of Ballarat Human Ethics Research Committee. The Statement of Ethics Approval is shown at Appendix A.

4.2 Sampling

Ethnography is also referred to as field research because the researcher literally goes to the field to study "ordinary events in natural settings" (Neuman, 2003, p. 368), it is not concerned with selecting a site that is representative of the population, but rather site selection is guided by the extent to which the site is relevant to the research topic (Neuman, 2003). This form of sampling is referred to as nonprobability sampling (DePoy & Gitlin, 2005; Neuman, 2003). The nonprobability sampling technique that was used to select a field site for this study was purposive sampling (Neuman, 2003). A purposive sample is selected by the researcher based on predefined criteria (DePoy & Gitlin, 2005). According to Neuman (2003) there are three factors to consider when choosing a site: richness of data, unfamiliarity and suitability.

A field site in the context of this study is an organisation and specific sites within that organisation. The criteria that were used to select a purposive sample (organisation) were:

1. Richness of data

The organisation must be a source of rich data in relation to risk-awareness. Therefore, the organisation, or parts of it, must have implemented a program to encourage risk-awareness among frontline workers. The program must have been in place for at least one year prior to the commencement of the study.

A risk-awareness program consists of organisational structures and processes that encourage workers to stop and think about risk and to take action to control risk before starting work.

2. Unfamiliarity

The organisation, or parts of it, must be unfamiliar to the researcher because cultural events and social relationships are easier to see on unfamiliar sites (Neuman, 2003).

3. Suitability

The organisation must agree to participate in the study as must individual sites.

On the basis of these criteria, two sites within a multinational contract maintenance organisation that had implemented a risk-awareness program were selected and agreed to participate in this study. A description of the sites and of the risk-awareness program is discussed in the next section.

4.3 Site Description

This ethnography took place on two very different sites within the one multi-national organisation. The organisation provides a range of services in many countries around the world and in Australia provides contract maintenance services within a range of industry sectors.

Site A

Site A is in the water industry sector and is located in a rural city. For many years the company has held the contract to maintain water treatment plants and their associated infrastructure as well as waste water treatment plants and their associated infrastructure on behalf of the local water authority. Workers operate out of a 'depot' but are required to provide maintenance services over a large geographical area which means that workers spend a good proportion of their time driving their trucks between the depot and jobs in the field. At times workers may work alone in remote and isolated areas whilst at other times, and depending on the job, they may work in groups. The company employs around 30 workers, most of them male. The majority of workers have a trade background either as electricians or fitters. Work is coordinated by two 'working' supervisors. That is, as well as being responsible for planning work, the supervisors are also required to undertake work in the field.

Site B

Site B is in the facilities management industry sector and is located in a town on the fringe of a major metropolitan city. The company has held the contract to maintain public parks and open spaces for many years on behalf of the local shire council. Again, workers operate out of a 'depot' but are required to provide maintenance services over a large geographical area once again requiring workers to spend a good proportion of their time driving their trucks between the depot and jobs in the field. Unlike Site A, workers work in teams most of the time. The contract employs around 90 workers, most of them male although there are some female workers in the field. Some workers have a trade background, for example arborists and landscape gardeners, whilst other workers have a non-trade background. Work ranges from removing large trees on the side of busy roads to grass cutting and weed spraying. Work is broken down into three sections and there is a non-working supervisor for each section.

4.3.1 Description of the risk-awareness program

The risk-awareness program had been in operation at both sites for over a year and was comprised of a formal risk assessment component and an informal risk assessment component. The formal component required workers to fill-out a form to demonstrate that they had thought about and controlled risk before starting a job. The informal component did not require any paperwork to be completed but still required workers to think about and control risk before starting a job. This informal or mental risk assessment was supported by an *aide-memoir* in the form of a pocket card. The pocket card contained prompts for workers to help them think about risk.

4.4 Methods of Data Collection

Three methods were used to gather data: a review of organisational data relevant to risk-awareness, participant observation and semi-structured interviews. Each will be discussed in more detail in sections 4.4.1, 4.4.2 and 4.4.3.

Gaining access to the organisation and the two sites was achieved through a series of gatekeepers. A gatekeeper "is someone with the formal or informal authority to control access to a site" (Neuman, 2003, p. 372). At the organisational level, the gatekeeper was the corporate health and safety manager. At the site level, in the first instance it was through the industry sector health and safety manager. In the second instance at the site level the gatekeeper was the contract manager. On a day to day basis in the field at a site, the gatekeeper was the relevant supervisor. More than a gatekeeper however, the supervisor was the key informant or the person who took the researcher "under their wing" by showing the researcher around, introducing the researcher to others and teaching them how to act (Taylor & Bogdan, 1998, p. 54).

The strategy (Neuman, 2003) for entering the field occurred at two levels. The first level was through a process of 'getting to know' the key gatekeepers. The industry sector health and safety manager arranged introductory meetings on-site with the contract manager. The contract manager then arranged for the researcher to be introduced to the

workers at site toolbox meetings. The second level occurred on a day-to-day basis where entry was negotiated (Taylor & Bogdan, 1998) with the relevant supervisor who, through negotiation with the researcher, arranged field observations and interviews.

4.4.1 Review of organisational data

Data related to the risk-awareness program was collected to provide the background and context for data collected through participant observation and semi-structured interviews. The following types of data were collected:

1. Organisational policy and procedure related to the risk-awareness program that details how the program is expected to operate in practice.
2. Risk-awareness forms and pocket-cards that support the policy and procedure.
3. Examples of completed risk-awareness forms.
4. Annual reports that outline the intent of the risk-awareness program.
5. Any other organisational documents related to promoting the risk-awareness program.

4.4.2 Participant observation

The researcher spent two months in the field with one month spent undertaking participant observation at each of the two sites. The researcher had a high degree of involvement with workers but had only a moderate to low level of participation in the actual activities performed by the workers (Spradley, 1980). This style of participation allowed the researcher to maintain a balance between being an insider and an outsider (Spradley, 1980). In practice this meant that the researcher spent a full day with individual workers or work crews, interacting with them as they went about their day's work for the purpose of understanding, from the workers perspective, what the risk-awareness program meant to them in the context of their normal work practices.

A purposive sampling strategy in combination with consultation and negotiation with the relevant supervisor was used to select activities for observation. The following criteria were used to select activities to be observed:

1. The activity involves the use of either the formal or informal risk-awareness program.
2. That a range of activities are observed across different locations, spanning different work groups, different workers and varying degrees of risk.

The researchers participation was overt and was fully disclosed to the workers (Patton, 2002). The workers were required to give their informed consent (Hammersley & Atkinson, 1995). To achieve this, workers were given a Plain Language Statement (see Appendix B) explaining the purpose of the study and inviting them to participate in the research with full disclosure of what participating in the study means for them. If workers agreed to participate they were asked to sign an Informed Consent Form (see Appendix C).

The researcher recorded field notes (Patton, 2002) which comprised of observations of scenes, events, interactions, key words and phrases in a pocket size note pad. Emerson et al. (1995) claim that a researcher participates in the field in order to write, however, it may not be appropriate to take down jottings in the field and some observations may need to be retained as "headnotes" for retrieval later on (Emerson et al., 1995, p. 19). As soon as possible at the end of each day the researcher elaborated on "headnotes" and jottings by dictating observations into a digital voice recorder. The field notes were then downloaded onto a notebook computer using transcription software.

Sensitising concepts were used to assist with the process of observing the complexities of social life in the field (de Laine, 1997). The idea of "sensitising concepts" was originally put forward by American sociologist Herbert Blumer, one of the foremost exponents of the Chicago School of symbolic interactionism (Shibutani, 1970). The benefit of using sensitising concepts is that they "suggest directions along which to look" (Shibutani, 1970). The sensitising concepts for this study are shown in Appendix D and were informed in part by the conceptual framework introduced in the previous chapter (refer to Figure 7) and in part by Schein's (2004) three levels of culture model.

4.4.3 Semi-structured interviews

Data was also collected using semi-structured in-depth interviews. Semi-structured interviews revolve around an "interview guide" but the wording and ordering of interview questions remains flexible (Minichiello et al., 1995, p. 65). The idea of "funneling" information was used to inform the design of the interview questions meaning that questions moved progressively from the broad and general to the specific and narrow (Minichiello et al., 1995, p. 84). Questions were also designed to be open-ended to minimise pre-determined responses (Patton, 2002).

A purposive sampling strategy in combination with consultation and negotiation with the relevant supervisor and contract manager was used to select workers and managers for interview. The following criteria were used for selecting workers for interview:

1. That the worker is familiar with and uses or should be using the risk-awareness program.
2. That a range of workers are interviewed representing different work groups, different trades or occupations within those work groups, who are exposed to a range of risk and who have different opinions on the usefulness of the risk-awareness program.

Furthermore, the process of participant observation helped to identify workers for interview. Wherever possible, interviews followed periods of observation so that there was an opportunity during interview to elaborate on matters observed and jointly experienced in the field. A break down of the 26 interviews conducted is shown in Table 5. The difference in the number of interviews between the two sites reflects the difference in the number of workers employed at each site.

Table 5

Break down of interviews by site

	Site A	**Site B**	**Total**
Workers	7	12	19
Managers	3	4	7
Total	10	16	26

Workers were defined as those employees who, by virtue of their trade or non-trade skills, work under supervision and apply their trade and skills to specific tasks in the field in order to assist the business achieve its objectives. Managers were defined as those employees, who, over and above any trade or other skills, have responsibility for planning; organising and supervising work in order to assist the business achieve its objectives. Managers included the contract manager for the site and the supervisors for each area of work.

The interview questions for workers and managers (see Appendix E and Appendix F respectively) were developed to address the research questions. In particular, specific questions in relation to risk-awareness were informed by the language and process inherent in the organisations risk-awareness program. The reason for doing this was to make the questions as meaningful as possible for participants.

Participants were given a Plain Language Statement (see Appendix G for workers and Appendix H for managers) which explained the purpose of the study and invited them to participate in the research with full disclosure of what participating in the study meant for them. If workers and managers agreed to be interviewed they were asked to sign an Informed Consent Form (see Appendix C).

Interviews were conducted in locations and at times that were suitable to the participants. Each interview was recorded using a digital voice recorder. The recorded interviews were then downloaded onto a notebook computer for transcription.

4.4.4 Relating the methods of data collection to the research questions

To demonstrate and communicate the coherence that underpins various aspects of this research, the relationship between the methods of data collection and the research questions is shown in tabular form at Appendix I. In Appendix I, the seven sub-research questions are presented in columns one and two and the words highlighted in bold allow each sub-question to be related back to the conceptual framework. Column three links each worker interview question to a research sub-question and column four does the same for manager questions. Column five links the sensitising concepts that guided the participant observation aspect of the field work back to the research sub-questions. The next section will describe how the data was analysed.

4.5 Data Analysis

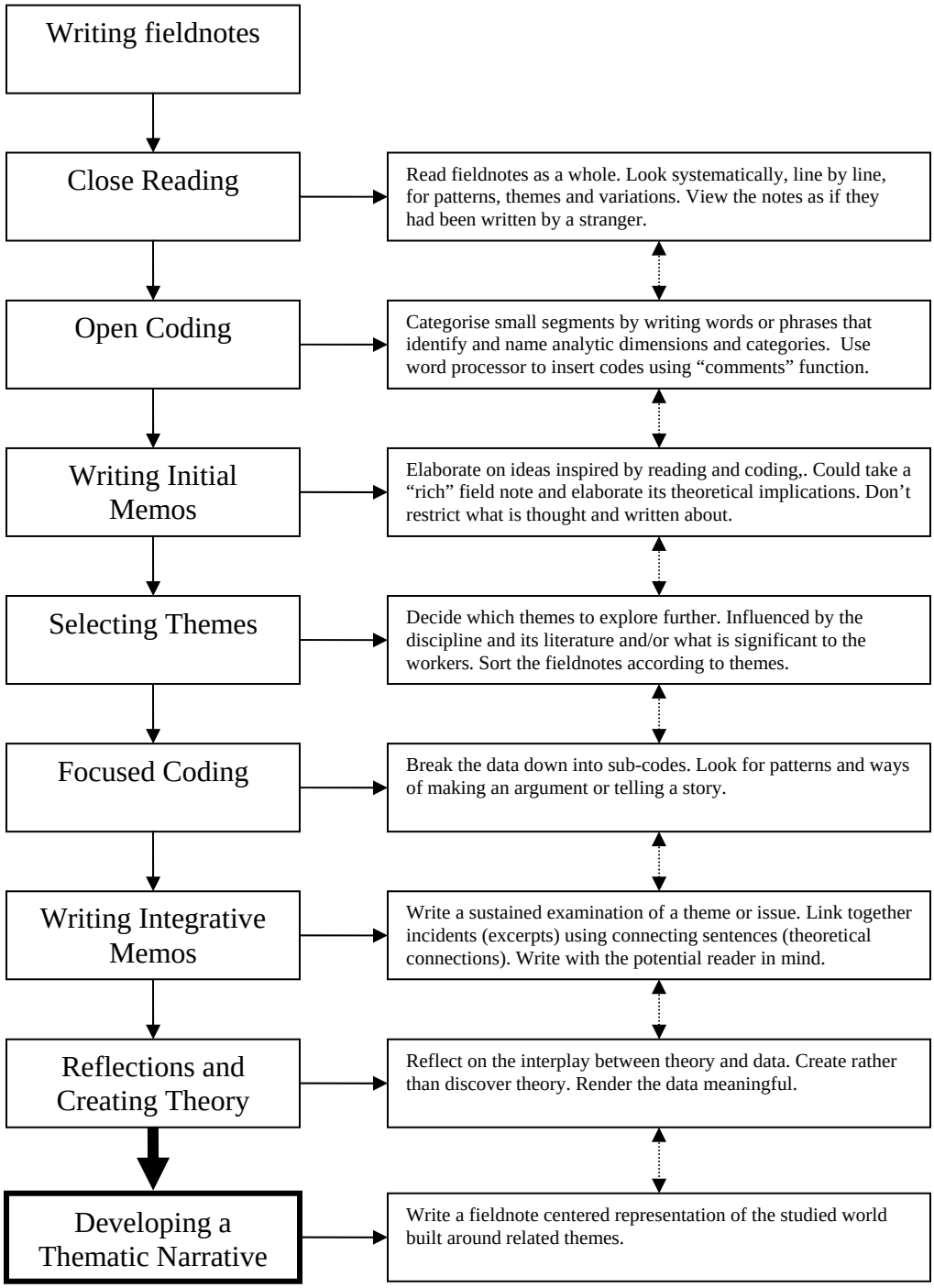
Data was collected through participant observation and semi-structured interviews and was analysed using an approach to qualitative data analysis inspired by Emerson et al. (1995) as shown in Figure 8, and culminated in the writing of a thematic narrative as a means for presenting and discussing the results.

Although Emerson et al. base their approach to data analysis on the method of "grounded theory" which posits that original theories will be "discovered" in the data, they argue instead in favour of an approach to analysis that is "at once inductive and deductive" (Emerson et al., 1995, p. 144). They suggest this position on the basis that analysis "pervades" all phases of the research and therefore is not free of analytical thoughts and theoretical musings (Emerson et al., 1995, p. 144). This study is already informed by a conceptual framework; therefore a purely inductive or grounded theory approach to analysis is inappropriate. Therefore, this study used both an inductive and deductive approach as recommended by Emerson et al. (1995) which allowed the data to speak for itself and reveal its own revelations whilst simultaneously being cognisant of the conceptual framework and research questions.

The general principle that informed the data analysis was “data reduction” (Miles & Huberman, 1994, p. 10). According to Miles and Huberman (1994), data reduction is a process of continual focusing, simplifying and abstracting of the data. In the context of this study then, field data was subject to an iterative process of data reduction culminating in a thematic narrative.

The process of data reduction proposed by Emerson el al. (1995) and shown in Figure 8 was based on an iterative process of reading, analytical coding and memoing. Codes were used to identify ideas, themes and issues in the data (Emerson et al., 1995). Codes were attached to meaningful “chunks” of data including words, sentences or even whole paragraphs (Miles & Huberman, 1994). According to Miles and Huberman (1994), there are three types of codes that can be used: descriptive codes that entail little interpretation, interpretive codes, and pattern codes that identify an emerging theme. The process of analytical coding moved from open coding to more focused coding as the analysis progressed (Emerson et al., 1995). Memos, or more particularly theoretical memos were used to elaborate on the insight associated with the code (Emerson et al., 1995). Initial memos elaborated on open codes whereas as the analysis progresses, integrative memos elaborated on focused codes in an effort to “seek to clarify and link analytic themes and categories” (Emerson et al., 1995, p. 143).

Fieldnote and interview data was stored on a notebook computer, from there; the researcher transcribed the data which involved the researcher listening to the original voice recordings and typing them into a word processor. The transcription process was also used as an opportunity to highlight sections of data that were of initial interest for later analysis. Although computer software was used to store and manage the data, it is worth acknowledging de Laine’s (1997, p. 267) point that “one should not equate organising and storing the data with “analysis proper”. Therefore, “analysis proper” will always be the province of the researcher in the context of the data, or as Hammersley and Atkinson (1995, p. 203) so eloquently put it “understanding and interpretation are the outcome of interactions between the ethnographer and the data … there is no mechanistic substitute for those complex processes of reading and interpretation”.



Source: Emerson et al. (1995)

Figure 8 A process for analysing qualitative data

4.5.1 The data analysis process

This section describes the process of data analysis that was used in this study. The process presented here is in keeping with the process proposed by Emerson et al. (1995) that was introduced in the previous section.

Stage 1

The field data, which had been stored on a notebook computer, was transcribed using a word processor and sections of interest were highlighted during transcription.

Stage 2

The transcribed data was broken down into six data sets. The data sets were comprised of two types of data: field notes from the participant observation phase of the field work and interview data for workers and managers from the semi-structured interviews. Consequently each of the two sites was comprised of three data sets: a field observations data set, a worker interviews data set and a manager interviews data set. The break down of the data sets for each of the two sites is shown in Figure 9.

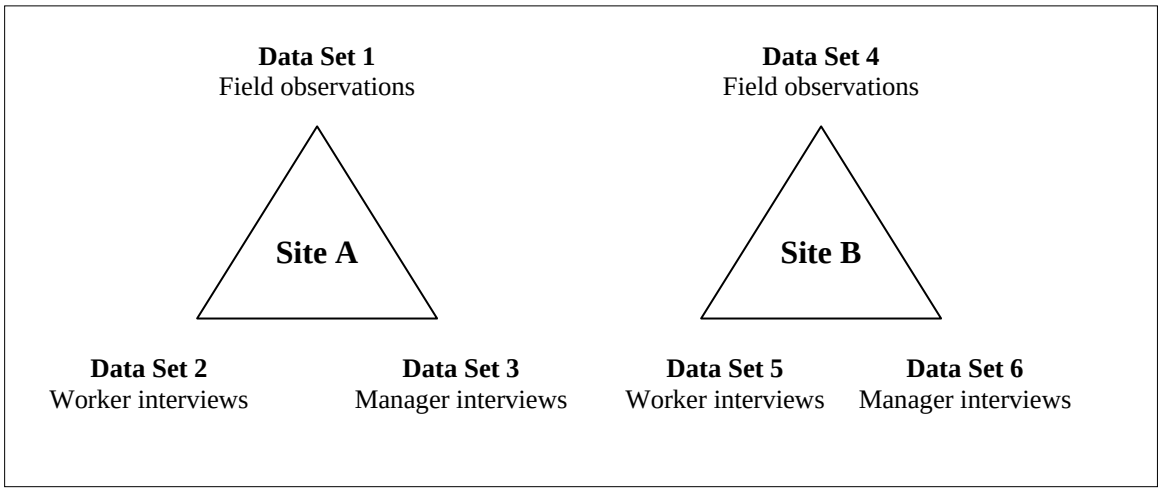


Figure 9 A break down of the data sets for each site

Stage 3

The interview data sets were broken down further with individual responses being collated for each interview question. An example of this process is shown at Appendix J.

Unlike the interview data sets, the participant observation data sets were not broken down further.

Stage 4

The collated responses for each interview question were subject to a process of close reading resulting in open codes being attached to sections of the text to identify and name analytic dimensions and categories. Initial memos were written to elaborate on the ideas inspired by the close reading and open coding.

The same process of coding and memoing was also applied to the participant observation field notes.

An example of the coding and memoing process, as applied to an interview question, is shown at Appendix J.

Stage 5

For each interview question, the sections of coded text and the corresponding initial memos were collated by code. An example of this process is shown at Appendix K. The resulting master list of codes is shown at Appendix L.

Stage 6

The coded text for both interview and field observation data sets was reviewed and emerging patterns and themes were identified. Some themes and patterns emerged naturally from the data sets whilst the identification of other themes was informed by the research questions and conceptual framework. The open codes for each data set were collated by theme and an example of this process for an interview data set is shown at Appendix M.

Stage 7

For each theme, patterns were identified within the open codes. This process resulted in the identification of focused codes; codes that would help to make an argument or tell a story. Open codes were then collated by focused codes and integrative memos were written to provide a sustained examination of themes and issues. An example of an integrative memo and focused coding for a theme is shown at Appendix N.

Stage 8

The integrative memos for each theme were reviewed and through a process of reflection on the data, research questions and conceptual framework, themes were identified to form the basis of a thematic narrative.

The integrative memos were collated by the themes for the thematic narrative and portions of the data were selected for inclusion in the narrative. A combination of integrative and excerpt strategies was used for writing the narrative (Emerson et al., 1995).

To create a link between the excerpt and theory, commentary units were written around an identified analytic point. The excerpt itself was then presented and commentary on the excerpt was provided as part of articulating the interplay between the data and theory (Emerson et al., 1995).

This process of data analysis culminates with the writing of a thematic narrative. The purpose of writing a thematic narrative is two-fold. Firstly, to reflect the meaning that workers and managers attach to the risk-awareness program and their subsequent perceptions of the impact of the risk-awareness program on the culture of safety and the resultant level of risk. Secondly, to consider the interplay between the workers and managers perceptions and the theoretical concerns informing this study. The thematic narrative is presented in the following results and discussion chapter.

Chapter 5 Results and Discussion

5.1 Introduction

The results of the field work, and the discussion of those results, will be presented in the form of a thematic narrative. This introduction to the narrative is broken into four sections. The first section will explore the role of narrative in ethnography, and in particular, the role of telling tales of the field. The second section will introduce the eight themes and outline the structure of the narrative. The third section provides a personal account of what it felt like to enter the field. The fourth and final section also provides a personal account, this time of life in the field, as a lead-in to the narrative.

5.1.1 Telling tales of the field

The aim of this research is to explore the question: 'what impact, from the perspectives of the on-site workers and managers, does a multi-national organisation's risk-awareness program have upon the culture of safety and the resultant level of risk?' The purpose of an ethnography is to answer such research questions by reporting what was learned about the culture under study (Van Maanen, 1988). In the case of this research, to report what was learned about the impact of the risk-awareness program on the culture of safety at the two sites that participated in this study. Writing a narrative is one means for reporting what was learned about the culture, and it has been suggested that narrative is "the primary form by which human experience is made meaningful" (Polkinghorne, 1988, p. 1). Furthermore, narrative 'tales' or storytelling (Richardson, 1990b; Van Maanen, 1988) is one means for reconstructing (Atkinson, 1990; Hammersley & Atkinson, 1995) as well as representing and reasoning about the world (Richardson, 1990a, 1990b). The following tale is an example of how culture can be represented through storytelling.

> *Timber!*
>
> This tale unfolded early one morning as I embarked upon another day of observations, this time with a 'tree crew'. I was standing approximately five metres away from the young apprentice arborist who was cutting the tree branch and I was

as shocked as he was when the branch suddenly and unexpectedly fell. Here is my brief account of what happened:

A young apprentice arborist was cutting a tree limb from a tall gum tree. The tree was situated adjacent to a wooden picket fence in front of someone's home. A limb had broken off during a storm the night before and was left hanging dangerously in the tree. The young apprentice used a pole saw to cut the limb down, but made one cut too many and the large limb broke without warning and fell onto the fence below significantly damaging the fence. This incident occurred despite the fact that the worker and his supervisor had stopped and thought about the risks before starting work and had documented their findings, as required, on the risk-awareness program form. At the time of the incident, the supervisor had been making a private telephone call from the cabin of the work truck.

In this case, the risk-awareness program did not identify the risk of the tree limb falling onto the fence, nor did it increase the workers risk awareness sufficiently to prevent this incident from occurring. Common sense also failed to prevent this incident. Consequently, the young apprentice was most distressed by what had occurred and reported it immediately to his supervisor.

This thematic narrative draws on this, and similar tales, in reconstructing, representing and reasoning about what was learned about the impact of the risk-awareness program on the culture of safety and the resultant level of risk. In doing so, I have made a conscious effort to weave the authentic voice of the workplace with underpinning theoretical concerns, while at all times being conscious of the fact that inevitably the narrative reflects my own position in and learning from the field as well as my own theoretical concerns. As such, the resulting 'tale' will reflect what I see in the data. In acknowledging this limitation, it is also apparent that it has implications for *how* I choose to tell the story which is equally as important as *what* story is told (Van Maanen, 1988). Van Maanen (1988) has surveyed the narrative conventions that are associated with the writing of an ethnography and has classified them as 'realist', 'confessional' or

‘impressionistic’ tales. Realist tales are dispassionate and are typically narrated in the third person voice (Van Maanen, 1988). Confessional tales, by comparison, are more personalised and locate the researcher more centrally in the culture under study and have concern for the impact that the culture had on the researcher (Van Maanen, 1988). Impressionist tales tell ‘striking stories’ and employ metaphor and imagery and are typically told in the first person (Van Maanen, 1988). In writing this narrative, I wanted to be able to locate my own voice in the field, perhaps confess how the field work also affected me as well as telling striking stories. In other words, I wish to employ an eclectic mix of the three conventions. To do this, in principle I have adopted Richardson’s (2005) notion of ‘writing as a method of inquiry’ in which the meaning of qualitative research is to be found in the reading (Richardson & St. Pierre, 2005). Writing as inquiry is set against a freer postmodern context that will allow the tale to be told at times as a realist tale, whilst at other times as a confessional and impressionistic tale. My voice will at times be in the foreground and at others, retreat to the background.

The structure for telling tales of the field is presented in the next section.

5.1.2 Structure of the thematic narrative

This narrative is structured according to eight themes that were identified during the process of data analysis. The eight themes are:

1. The role of leadership
2. Risk-awareness and the culture of safety
3. Common sense and the practice of safety
4. The practice of safety on the job
5. Decision-making and rule-breaking on the job
6. Reporting practices and risk-awareness
7. The texture of workplace learning about safety
8. Risk-awareness and a safer workplace

The sequencing of the themes loosely reflects the conceptual framework presented in Chapter 3, but deviates and introduces new themes where necessary to allow for the voice of the workplace to be heard. Each theme will be broken down into Site A and Site B. Breaking down the data according to site allows for both within; and between-site comparisons to be made as shown in Figure 10. Comparing sites is one way to find out about cultures as comparison allows for any differences between sites to emerge (MacDonald & Seguin, 2006). Culture is a group phenomenon and within-site comparisons will allow for the identification of what groups of people at each site have in common (Hofstede & Hofstede, 2005; Schein, 2004). To allow for common patterns to emerge within each site, and to identify differences between sites, the narrative (for each theme and for each site) will firstly be built around the answers given by the workers and managers to the semi-structured interview questions; and secondly, anecdotes from the field that were gathered during the participant observation phase of the research.

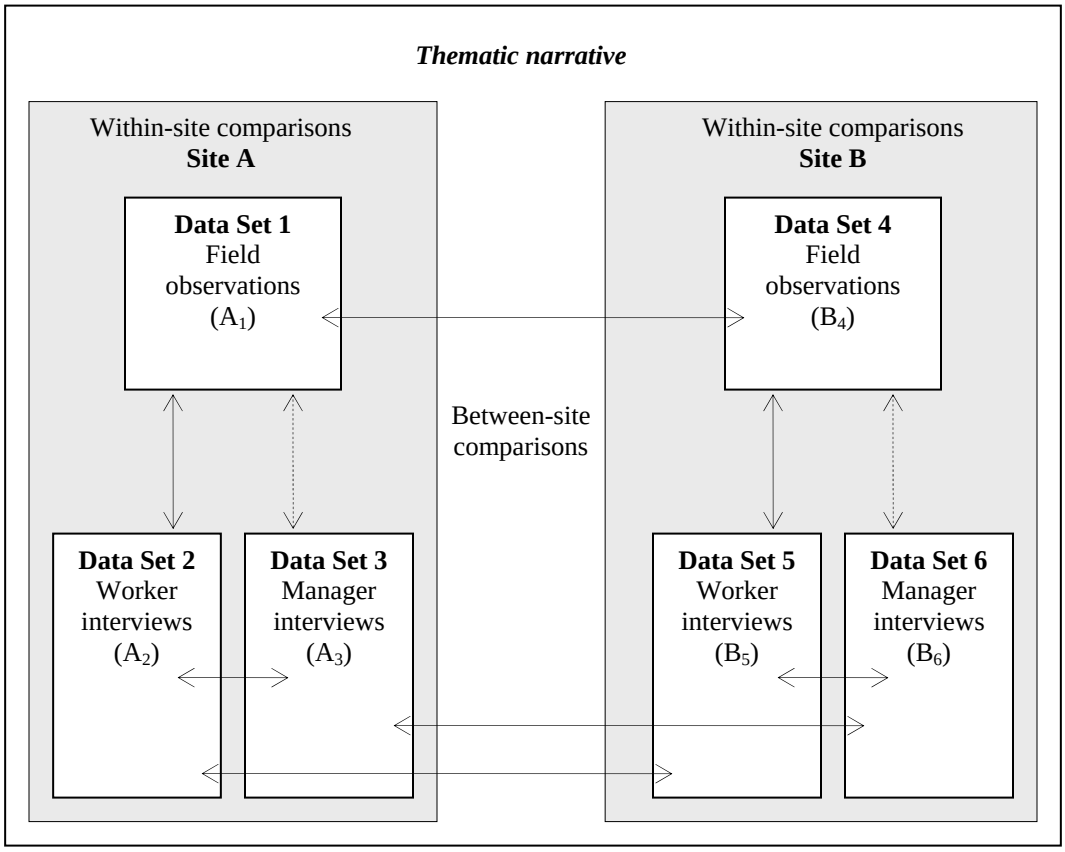


Figure 10 Structure of the thematic narrative

As a precursor to presenting each of the eight themes that comprise the thematic narrative, the next section presents my reflections on what it felt like to enter the field, in particular, what it felt like to enter a new culture.

5.1.3 Entering the field

Entering a new culture is not easy, but being accepted by the culture is a necessary pre-condition for ethnographic research. In practical terms, this means being accepted as part of the social fabric of the workplace. With such acceptance comes trust, and with trust comes data. What follows is how I felt as I entered the cultures of the two sites that participated in this study.

Site A

My entry into this culture was a nervous one. The depot was a long grey building with a large bull-nose verandah running the length of the building in front of which the workers parked their trucks on the concrete apron. Visitor car parking was provided opposite the depot on the other side of the wide bitumen driveway that provided access to the depot. Work started at 7:30 am but it was customary for workers to start arriving around at 7:00 am. Workers would 'get a brew' (coffee or tea) from the small kitchen at one end of the depot and congregate in a group, brew in hand, in front of the main entrance to the depot. It was this ritual that made culture palpable to me. As I parked my car in the car park I could feel my anxiety levels rise as I walked across the bitumen towards the group. It became apparent to me that to be accepted into the culture was to first join in the ritual of 'the brew'. This insight provided a stark insight into how culture feels and the difficulty of moving from the position of an outsider to an insider within a culture. Making this transition was not always easy because the workers talked in colourful language, a practice that also seemed to be part of the ritual of 'the brew'. Once 'inside' the trust of individual workers had also to be gained. For me, it was important to treat the workers as people first, workers second and as research subjects a distant third. In practical terms this meant showing interest in what was of interest to the workers as people, even though those interests may have been far removed from my research interests.

Site B

My entry into this culture was a nervous one too; however, the vector of entry was somewhat different to Site A. My initial introduction to 'the crews' was by the contract manager at a toolbox meeting. The contract manager, in conjunction with the supervisors became my first port of call each morning at 6:45 am as I waited to be allocated to a crew. Rather than turning up at the depot, I turned up at the office. The same anxiety was present as I felt like an outsider to the morning routine of the office workers. Again the morning 'cuppa' was a practiced ritual and the contract manager had purchased an expensive coffee making machine for the benefit of the office. I never did master the coffee machine and each morning felt very obvious and out of place as I waited for the contract manager to organise my day. As the research progressed, I started to turn up at the workshop at the back of the office and received the greetings of the crews as they packed their trucks in readiness for the days work.

Have gained entry to the field and acceptance by the culture, the next section is a general reflection on life in the field.

5.1.4 Life in the field

Much of my time in the field was spent riding in trucks with workers listening to their stories and hearing their views on life and work as we traveled from job to job. Most workers were receptive to my presence although some thought that I might be a 'management spy'. Interestingly, my presence had an impact on their work practices, particularly in relation to filling-in the paperwork associated with the risk-awareness program. Once comfortable with my presence, however, practices quickly reverted to normal and the workers freely admitted to filling in the paperwork for my benefit. At each job I also observed the work practices of workers who were more than willing to share their views on what they were doing and why. On occasions the workers drew me into assisting them with the job. To complement the observations I undertook semi-structured interviews – more often than not after I had spent time in the field with the worker. This approach gave great focus to the interviews often resulting in extended

conversations over experiences shared in the field. I was aware, however, that workers gave more openly of their thoughts in the field than they did during interview.

It is against this introductory background that the thematic narrative can now unfold.

5.2 The Role of Leadership

The role of leadership is central to both safety and culture because leaders have the power to change culture through the introduction of various organisational structures and processes designed to improve safety (Reason, 1997). This view of the leadership is drawn from the work of anthropologist Geert Hofstede who argues that values are learnt early-on in life in the family and are difficult to change, whereas collective practices can be changed by organisational characteristics such as structures and processes (Hofstede, 1984; Hofstede & Hofstede, 2005; Hofstede et al., 1990). (2005a, p. 8). Hopkins (2005a, p. 8) also believes that the responsibility for culture rests with leaders and states that "it is the leaders of an organisation who determine how it functions, and it is their decision making which determines in particular, whether an organisation exhibits practices which go to make up a culture of safety". Hopkins goes on to argue that changing collective practices will ultimately "change values and assumptions as well" (Hopkins, 2005a, p. 8).

The risk-awareness program is an example of an organisational structure and process designed to influence collective practices (culture) and improve safety by making workers more risk-aware. Therefore, the role of leadership is central to the success of the program. However, in a large organisation there are many levels of leadership meaning that the risk-awareness program must travel a significant organisational distance before it reaches its target audience: workers in geographically distributed workplaces. The risk-awareness program began its journey in 2004 as a corporate health, safety and environment initiative. The program then traversed the different levels of the organisational hierarchy before entering individual work sites through the contract manager, site health, safety and environment coordinators and on down to the workers via supervisors and team leaders. The point is that there are many leaders who play a role in shaping culture, some closer to the workplace than others, but all with an ability to influence the meaning, trajectory and content of the risk-awareness program. In turn, workers may influence the program as it travels across and down the organisation. This view may limit the cause and effect ability of leaders to influence culture as power plays a central role. Gherardi (2006, p. 59), in discussing workplace learning, argues that "it is

power that holds connections together, and power is the resource that enables establishment of the associations that interweave and materialize the texture of a field of practices". Gherardi, drawing on the work of Latour (1986) goes on to contrast the diffusion model of power with the translation model of power. In the diffusion model an 'artifact', for example the risk-awareness program, requires an initial force after which the artifact will travel smoothly so long as it does not encounter resistance. By comparison, in the translation model, the diffusion of the artifact is not mediated by an initial force, but rather the diffusion is "brought about by people, each of whom may act in a different way: they may let it drop, modify it, deflect it, betray it, add to it, or appropriate it" (Gherardi, 2006, p. 60). This notion of power has implications for leaders because according to Latour (1986), power under the diffusion model looks different to power under the translation model. Latour says:

> The obedience to an order given by someone would require the alignment of all the people concerned by it, who would all assent to it faithfully. Such a situation is highly improbable. The chances are that the order has been modified and composed by many different people who slowly turn it into something completely different as they sought to achieve their own goals. (p. 268)

This introduction to the relationship between leadership and culture sets the scene for exploring the role of leadership in relation to the risk-awareness program. Most of the findings that are presented in the next section are drawn from the semi-structured interviews where I asked workers and managers what role supervisors and managers play in relation to the risk-awareness program.

5.2.1 Site A workers' perceptions of leadership

Data from the semi-structured interviews indicates that workers believe that the role of supervisors and managers is to drive the program and to communicate with them about the program at toolbox meetings. In particular, workers thought that managers were driving the program to satisfy client needs.

5.2.1.1 Driving the process

Workers believe that the key role of leadership is to drive the process and that in turn, workers will comply with leaders' requests to use the risk-awareness program as captured in the following comments:

> *I guess that it will be driven from the top. It will definitely have to be driven from the top rather than from the shop floor that it is done right …*
>
> *If I am asked to do it then I'll do it.*
>
> *… but if that's what they want done, that's what they want done.*
>
> *If they are saying this is what you gotta do, that's what you've got to do.*

These comments highlight that workers will respond favourably to requests made of them by supervisors and leaders and lend support to the argument that leaders play a key role in changing culture by changing practices (Hopkins, 2005a). The extent to which leaders can influence worker practices is also evident in the following comment: *you're not doing a *** *****, you should be, I'll do one every day from now on but as it is, I am getting away without having to do one every day so I don't.* This comment demonstrates that in the absence of leaders driving the process, workers may chose not to comply. This comment also illustrates that what leaders are changing are practices more so than values. This worker does not appear to see value in the process and will not comply unless told to comply by leaders. Hopkins (2005) argues that a change in values follows from a change in practices, even though Hofstede (2005) argues that it is difficult to change the values of adults. It may not matter if values are changed or not, so long as workers' practices

change. This line of thinking makes that assumption that a change of practices leads to a safer workplace. This assumption, however, might not hold true. Although leaders may be bringing about a change in practices as measured by the completion of paperwork, they may not be bringing about an increase in risk-awareness or better risk control practices. This view is reflected in the comment: *I can't see anybody who's doing it other than to do the paperwork*. This points to a gap between the practice of paperwork and the practice of safety, or "work as imagined" versus "work as actually performed" (Dekker, 2006, p. 86).

Furthermore, leaders are perceived by workers to say one thing and do another when it comes to complying with the risk-awareness program, in particular, completing the paperwork. A worker said:

> *… my supervisor, he's probably one of our worst for paperwork, he doesn't like filling it in but all the same even though he doesn't fill it out himself, he reinforces it and encourages us. He's got a duty of care to encourage us to fill out all this paperwork.*

This comment illustrates that corporate programs, like the risk-awareness program, may meet resistance, even from leaders, as the program travels through the organisation.

Sometimes circumstance and risk, rather than supervisors and managers, will influence workers decision making and practice. One worker, during interview, gave a graphic account of when circumstance and risk would take precedence:

> *… just say for argument's sake you get called out at two o'clock in the morning and you have got sewer running down the road well do they expect you to sit there for 10 minutes while you are doing a risk-awareness program and then you might need a job analysis so you have to fill out a job analysis and then you have still got sewer flowing down the street and then do the job? It's not going to happen …you do the job and the risk-awareness program gets put to the side because you have*

got to try to eliminate that hazard to the public the sewer flowing down the road you have got to stop that

This excerpt brings to the fore the notion of decision-making, power and influence. Although workers will generally comply with the program because they have been told to use the program by supervisors and managers, workers will, under specific circumstances, take decisions that may be in conflict with their leaders' wishes. This means that on the job, workers as well as leaders have power and influence over work practices. Ironically, in this case, the workers might be exercising true risk-awareness and not mere compliance with a corporate process. This may be an example of the translation model of power (Gherardi, 2006) where the risk-awareness program, as an artifact, is mediated as much by local workers as it is by leaders meaning that culture may be influenced by more than leadership.

5.2.1.2 Communicating about the process

Workers perceive that supervisors and managers use toolbox meetings to communicate with them, information about the risk-awareness process and in particular, they use toolbox meetings to drive the process. Workers said:

*… at the toolboxes at the meetings they are always pushing us to do these *** ******: 'do the *** ******' …*

It gets brought up at the toolboxes that people aren't filling them in: 'you have got to start doing it' …

… when they go back to the workshop they check … they see how many people … they don't name names, they just say a percentage of people that aren't doing them and then they bring them up the tool boxes.

These quotes raise two issues. The first is the importance of toolbox meetings as an organisational structure for facilitating communication between workers and managers, and the second issue highlights the degree of ownership that workers feel in relation to

the program. This latter point is evident in comments such as *they are always pushing us* and *you have got to start doing it*. Both these comments are indicative that the program is being met with some resistance at the worker level and that managers are attempting to use their power to coerce workers to use the program. The result, as discussed already, might be little more than compliance with the paperwork. Workers believe that managers 'push' the program to satisfy the client.

5.2.1.3 Satisfying the client

The site provides contract maintenance services to a water authority in what is presumably a very competitive environment. Meeting client needs is seen by the workers as a key reason why managers push the risk-awareness program at toolbox meetings:

> *… at the toolboxes at the meetings they are always pushing us to do these *** ******: 'do the *** ******' because their contract says they have to.*

> *It gets brought up at the tool boxes that people aren't filling them in, you have got to start doing it because it is a client obligation to do it, the client wants us to do it.*

What is significant about these comments is that workers perceive that satisfying the client, rather than improving safety, is what is driving the risk-awareness program at the site level, or in the words of one worker: *it is a client obligation to do it, the client wants us to do it*. This could be one reason why the program is met by some resistance at the worker level, that is, that the workers feel that it is the interests of the client, rather than the workers, that are paramount.

5.2.2 Site A managers' perceptions of leadership

It appears that managers perceive that the role of supervisors and managers is to drive the program, in part to satisfy client needs, to reduce the paperwork and to monitor the use of the process.

5.2.2.1 Driving the process

Managers perceive that the key role of leadership is to drive the process, or in the words of this manager: *support it, drive it and ensure that it is happening*. Leaders are acutely aware that their actions will impact upon the culture of safety. In one interview a manager suggested that:

> *I have got to be a leader in that culture…*
>
> [What does that mean in practical terms?]
>
> *I have got to be the driver of our corporate processes. I have got to ensure that our corporate processes are in place and I see my role is to push that on to our senior people. To see that they then drive it down to their own people … I mean, if I have got a shit safety culture, how can I expect anyone else to have a good safety culture on this site?*

Two point important points emerge from this comment. The first is that *corporate processes* must travel a substantial organisational distance and traverse different levels of the organisational hierarchy before impacting upon worker practices. In this case, it is the role of this senior manager to *push* the program down to managers who on turn will push it *down* to workers. The word *down* is the key here as it implies something that is being forced on the site. As such, the program may encounter resistance as it moves down the organisation. Such a view is consistent with the translation rather than the diffusion view of power (Gherardi, 2006).

The second point to emerge is that culture seems to be viewed as an individual phenomenon as captured by the comment: *I mean if I have got a shit safety culture, how*

can I expect anyone else to have a good safety culture? This view of culture is at odds with the view that culture is a group phenomenon (Hofstede & Hofstede, 2005; Hopkins, 2005a; Schein, 2004).

As much as managers are aware that they must drive the process, they also realise that they have not driven the process as much as they should have:

> *… the whole process hasn't been backed up and we probably haven't run with the process as much as we should … it's changed fairly recently and now there's a lot more emphasis on getting this *** ***** stuff right …*

This comment is an illustration of how the program may be influenced by different groups as it makes its way down the organisation. Given that leaders are particularly influential in changing culture, then the program, in theory, will only be as successful as leaders' commitment to driving the program. Leaders' commitment is being influenced by a number of factors, including the need to satisfy the client.

5.2.2.2 Satisfying the client

Leaders sometimes feel under pressure to change the culture of safety, and some of that pressure is coming from the client as much as it is from the corporate office. One manager said:

> *Most recently, the last four years, the drive is coming from three places. From our client, from ********* corporate … and also from local management. We need to have something in place that suggests there is a process involved and that we can prove that there is a process being carried out and at the moment … especially for this site, this site because we haven't been put under the microscope in previous years, we've been getting away with a lot of things. Sooner or later that sort of practice is going to catch up with you. I think we need to maintain some form of process that we can prove is working.*

The comment that: *we've been getting away with a lot of things* may be an indicator of culture and that the risk-awareness program may be one factor influencing cultural change. For this manager, there is now a need to *prove* that there is a process for risk-awareness in place and that it is working. This proof is often measured through the completion of the paperwork associated with the process.

5.2.2.3 Reducing the paperwork

Ironically, while managers acknowledge the need for *proof* of a risk-awareness process, they are also aware that paperwork can act as a barrier to the acceptance of the program by the workers. This manager said:

> *… if we can take as much of the unnecessary, and that's what they see it as, some of this paperwork is unnecessary, it takes up a lot of their time. When they see these processes as unnecessary they're not going to do them, simple as that. So if we can identify those unnecessary parts of the process and remove them, and then come up with a much better and more efficient way, and if the efficient way is to use the ***** cards then that's the way they'll do it, and if the guys in the field can see that were trying to clear up the bureaucracy, trying to make their day a little bit lighter in terms of the amount of time they spend sitting down at the desk and filling out paperwork, then they will support whatever we roll out to them…*

This comment suggests that the paperwork associated with the risk-awareness program may be acting as a barrier to the successful translation of the program into work practices. Managers, on the one hand, are concerned with proving that a process is in place to satisfy the client - presumably a key motivator in a competitive environment, whilst at the same time recognising that workers may resist completing the paperwork. This may mean that the paperwork may become the focus of attention rather than increased risk-awareness or better risk control practices. The problem is compounded by the fact that there is no resource allocation for safety processes like the risk-awareness program within the contract of work with the client. As this manager said:

*We do routine maintenance work here and the routine maintenance work consists of 640 hours per month that we must complete. So we have already got an allocation of time placed against us as part of our workload here. It needs to be done and that work allocation is only for the work involved and not for the paperwork that we need to chase up in terms of filling our *** ******. Now one *** ***** per job is unacceptable and it could be a menial task, it could be a task of going round and greasing bearings on an item which only takes five minutes. Now a guy's not go to fill out a piece of paper and sit down for 10 minutes making sure that that he is going to be safe, he knows damn well that he is just going to pull-out a grease gun, get out of his vehicle and go and squirt a couple squirts into a bearing somewhere. So he knows in his mind that this whole process of filling out paperwork is boring, it's unnecessary, he's not going to do it. So if we all understand that that is the situation, and that we need to remove those tasks, we need to remove unnecessary paper filling tasks …*

This comment illustrates the practical difficulties of operating safely in a contract maintenance environment. But the comment also raises the issues of which version of the risk-awareness program to use and under what circumstances. There are two versions of the risk-awareness program. One version is an informal or mental risk assessment that is conducted at the start of a job and is supported by a pocket card. The informal or mental risk assessment does not require any paperwork or documentation. That is, there is nothing tangible to 'prove' that workers have used this process. The second version is an extension of the informal or mental risk assessment but requires the process to be documented. The resultant paperwork is submitted to supervisors or managers. The paperwork is 'proof' that the workers have thought about the safety risks before commencing work. At the time of the study, clear guidance was lacking on which process to use under what circumstances, but at the very least, completing the paperwork associated with a risk-awareness program for routine, short duration and low risk jobs is seen as unnecessary. This lack of clarity is likely to have a mediating and deflecting influence on the entry of the program into the workplace, limiting the ability of the

program to influence collective practices (culture). Ultimately, however, managers are seeking a *level of comfort*. As this manager said:

> *…I like the idea of reducing the amount of paperwork our guys have to fill in in the field, while at the same time still maintaining a level of comfort that they are still doing the right thing from a safety perspective out there…*

To provide this level of comfort, one role of leadership is to monitor the process.

5.2.2.4 Monitoring the process

To provide proof and comfort, the role of leadership is also to monitor compliance with the paperwork and to ensure that the practice of completing the paperwork is translated into safety practices on the job. This is the view given by the health, safety and environment coordinator during interview in response to the following question:

> [On this contract do you think there's a gap between what they are saying they will do on the form and what they are actually doing on the job?]
>
> *On a *** *****, not necessarily … because on a *** **** it's easier to see the transparency of … because with the *** ***** they look at a hazard they tick a box. Now, I try and nail them on what that means. Sometimes it's ticked for the right reasons, it is there, it's controlled, they have got all the processes in place, it's not an issue. In other cases they tick a box, it's a tick, so unless you go and actually dig into each one you never know that real true part…*

Monitoring of the process has a direct influence on the workers compliance with the paperwork. When asked in interview about the percentage of jobs for which the paperwork is completed, this manager said:

> *Yes I do and the gut feel is its very low, lower than it should be which is really why the focus is on getting these *** ****** right, now. I would say that 25% have a*

**** ***** completed correctly now. Recently, with the focus that is on these *** ****** that 25% has improved probably to 85-90% but it is something that the pressure has to be kept up on, its got to be maintained, because I can guarantee you, if we miss a month and we are not making some comment, and it could be positive comment, the positive comment is probably what I prefer, we are up around the 85% of our jobs coming in with the *** ***** completed and checked, and those comments need to be placed back out in the field somehow, look, great job guys we are doing what we should be, then you can guarantee that the next month we are going to have the same, if not a better percentage. But this is all recent, it's a management philosophy that we have to get in place to make sure that feedback is getting out to the guys and they know that their *** ****** are important, that they are getting checked…*

This comment highlights the importance of monitoring and feedback in influencing practices. In fact feedback increases the compliance rate from around 25% of jobs having the risk-awareness paperwork completed to 85% of jobs having the risk-awareness paperwork completed. The comment implies, however, that if managers stop giving feedback, then compliance with the process will decline. This comment also underscores the role that leaders can play in shaping practices. But it remains a moot point at this stage of the narrative if the change in practices reflects a culture of safety that is more risk-aware or is simply creating a culture of paperwork and the illusion of safety.

5.2.3 Site A anecdotes from the field

5.2.3.1 Do as I say, not as I do

This anecdote is a compilation of observations that I made in the field and is included here to provide extra illumination on the comments made during interviews about the role of leadership.

I found that the time riding in the cabin of the truck with the workers and allowing the workers to talk openly was the time when the most revealing stories were told. Time

spent in genuine conversation with the workers meant that verbatim recording of what they said was not easy, in fact not possible. I found that it was better to listen than to interrupt the flow of the conversation by endlessly scribbling in my note pad. Although over time, and once the workers became more comfortable with my presence, they would sometimes ask me *aren't you going to write that down?*

On at least two occasions the in-cabin conversations turned to the role of leadership. In both cases, the workers felt that there was a culture of *getting the job done* and in practice; this meant that although the supervisor would push workers to complete a risk-awareness program, the supervisor, who is a working supervisor, would not do them. In other words, do as I say, not as I do.

I also spent considerable time with the supervisor and observed that the workers perceptions of the role of leadership this was not entirely accurate. The supervisor did complete risk-awareness programs. The extent to which the supervisor's practices were in response to my presence is difficult to say.

5.2.4 Within-site comparison of findings

Workers and managers have similar perceptions of the role of leadership in the risk-awareness program and both agree that it is the role of leadership to drive the process. If the process is not driven by leaders, then workers are less likely to use the process. Both parties acknowledge that the 'paperwork' associated with the risk-awareness program creates resentment among workers but is required as proof of a process for the client.

There were differences, however, within the managers' perceptions. Generally, the higher up the hierarchy the leader (manager) the more likely that they perceived the program positively and gave the program their full support. Lower level leaders are more likely to perceive the program less positively and question the usefulness of the program, although they will fulfill their leadership role and push the program down to workers, irrespective of their beliefs.

Overall, the risk-awareness program appears to travel down the organisation more in keeping with a translation model of power (Gherardi, 2006; Latour, 1986). Power is a consequence that results from a “chain of agents” (Latour, 1986, p. 264) who translate the risk-awareness program into practice. In other words, leaders can only exert power and must then rely on its translation by a chain of agents rather than having power and believing that all the agents will comply. The latter is the illusion of power and fails to acknowledge power as consequence of collective practice. The translation model of power may stand in conflict with contemporary theories of the role of leadership in influencing culture and safety through collective practices (Hopkins, 2005a; Reason, 1997).

5.2.5 Site B Workers' perceptions of leadership

At site B there was also a belief among the workers that the key role of supervisors and managers is to drive the process.

5.2.5.1 Making sure we fill it out

The general view among the workers was that the key role of leadership is to drive the process. In practical terms, this meant making sure that workers fill out the paperwork associated with the risk-awareness program. This is what three of the workers said:

> *… his role is to make sure that we fill it out …*

> *… he really has to see that people who are working for him fill it out …*

> *… making sure we hand them in or making sure they are filled out ..*

One worker, when asked during an interview what would motivate workers to use the program, also made the point that supervisors and managers are the key motivator because they drive the process which includes communicating and clarifying expectations. This worker said:

> *So what would make me use it or not? Um … nothing motivates me to use it really … what motivates me to use it is that I have to use it. **** and **** have made it very clear that we have to fill these sheets out and I have to abide by what **** and **** are saying to me.*

Workers tended to believe that if they do not *fill it out* that they would get into trouble with their supervisor. This belief was expressed in the following terms:

> *… an arse-kicking … just do the paperwork …*

> *… we would get our arses kicked …*

There are two aspects to these excerpts that are important and both revolve around the comment *fill it out*. First is the ability leaders have to influence workers to comply with the process or *fill it out*. The comment *fill it out* refers to completing the paperwork associated with the risk-awareness program. The workers compliance is motivated by a desire to avoid an *arse-kicking*. Second, and arguably more importantly, the use of the language *fill it out* is a recurring theme and suggests that leaders may be preoccupied with workers completing paperwork. These perceptions of the role of leadership again appear to support the notion that leaders can influence practices ('fill it out') and in turn influence culture and safety (Hopkins, 2005a; Reason, 1997). But although leaders may be capable of bringing about a change in practices as measured by the completion of the paperwork, they may not be bringing about an increase in risk-awareness or better risk control practices. This point may be explained by the translation model of power (Latour, 1986) which argues that a "chain of agents", in this case managers, supervisors, team leaders and workers will translate the risk-awareness into practice in accord with their own needs. Therefore, compliance with the paperwork may be no more than an illusion of safety. This illusion is reflected in the following comment from a team leader (a team leader is also a worker):

> *… I wouldn't tell somebody new that I think it is a waste of time because they would be well like, what am I doing it for? So you have got to set the right example.*

This comment illustrates that leaders take their responsibilities seriously and will lead by example, irrespective of their personal beliefs ('it is waste of time') but in the process, the illusion of safety is kept intact.

5.2.6 Site B Managers' perceptions of leadership

The managers at site B generally believed that the role of supervisors and managers is to use the risk-awareness program to entrench a safety culture.

5.2.6.1 Entrenching a safety culture

Managers perceive that the key role of leadership is to use the risk-awareness program to entrench a safety culture among workers. This perception is reflected in the following comments from two of the managers:

> *… to ensure that everybody embraces it and encouraging the culture of using it and using it effectively …*

> *… making sure, I guess, that the safety culture that is supposed to be entrenched is there in practice …*

There are two aspects to these excerpts which are important. The first is the perceived relationship between leadership and culture. The leaders believe that it is their role to *ensure* and *making sure* that a culture of using the risk-awareness program is *entrenched* among the workers. The second important aspect is the leaders' understanding of culture. The comments *using it* and there *in practice* suggests that leaders view culture as something tangible, something that is enacted in practice. This view is consistent with the view that culture is something that an organisation 'has' rather than an organisation 'is' and "emphasizes management's power to change culture through the introduction of new measures and practices" (Reason, 1997, p. 193). However, this view of power needs to be treated with caution as this narrative has already revealed that artifacts like the risk-awareness program may travel in a manner that is more consistent with a translation rather than a diffusion model of power (Latour, 1986).

The supervisors and manager believe that education is one of their key roles for *making sure* that workers are *using it*, or in the words of the contract manager:

Basically I don't want to say that we are the policeman for the process. We are involved because ultimately we have a responsibility for workplace safety in the workplace and we need to be providing our staff with every opportunity to control their safety properly. Now, every opportunity isn't just giving a piece of paper and pen, its giving them the education. It's giving them backup support. It is giving them a sounding board so that they can do it in the best manner possible. So our role and responsibility in it is to make sure that we are out there and discussing it, keeping it in their minds, making sure they are remembering why it is important, what it is protecting them against, and ultimately, the fact that they want to go home and see their family and friends at the end of the day and processes like this are going to help them.

This view is also supported by the supervisors who said:

… my role is to educate the guys in how to use these risk-awareness programs …

… my role is to educate the guys in … how I expect them to be filled out …

Both levels of leadership acknowledge the role they play in educating workers. Part of this education is to communicate expectations. This supervisor acknowledges that if supervisors do not make their expectations clear, then workers would not use the process: *If I didn't tell them I can guarantee you that they wouldn't come in.* This comment again points to the idea that it is not leaders alone who have power, and that workers also may exercise considerable power in relation to the implementation of the risk-awareness program. This insight is another example of the translation model of power in action (Latour, 1986).

5.2.7 Site B anecdotes from the field

5.2.7.1 Wearing gloves to sharpen a saw blade

This anecdote came about during a day of observations with a crew of workers who were cutting-back branches that were overhanging the road along a residential street. I was talking with the team leader when this anecdote arose naturally in conversation. I have included the anecdote here because it highlights that leaders at all levels take their responsibilities seriously and lead by example. Here is my field note that captures the setting and my conversation with the team leader:

> *It was a grey wet day and I was accompanying a crew responsible for cutting-back branches that were overhanging the road along a residential street. The crews were all dressed in orange safety equipment from their hard hats to their chain-saw-proof trousers. The crew of five went about their task of cutting back the native trees in a systematic manner. The pleasant smell of eucalyptus hung in the moist cool air. The workers wore hearing protection, as did I, to protect against the racket made by the pole saws (a small chain saw on a pole that allows workers to cut higher branches), chain saws and the chipper. It is easier to cut the braches if the saw blades are kept sharp. This requires workers to periodically sharpen the saw teeth with a file. After lunch I was watching the team leader sharpen his pole saw on the back of his truck. He said to me that this was an 'example of him leading by example' because he was wearing gloves to sharpen the saw. He said many guys don't wear gloves and inevitably their hand will slip across the saw blade resulting in bad lacerations.*

5.2.8 Within-site comparison of findings

Workers talked differently about the role of leadership in the risk-awareness program to managers. Workers perceived that the role of leadership was to make sure that they filled-out the paperwork associated with the risk-awareness program; whereas supervisors and managers perceived their role to be entrenching a safety culture through education in the risk-awareness process. Workers perceived that they comply with the process for fear of an *arse-kicking*, and supervisors and managers acknowledged that workers would not use the program if leaders did not keep enforcing their expectations. Although the two groups use different language to talk about the role of leadership, what is central to both groups is completing the 'paperwork'.

5.2.9 Between-site comparison of findings

What emerges from the comparison of the two sites is that the perceived key role of leadership, albeit expressed in different language at each site, is to drive the risk-awareness process. If leaders do not drive the process, then workers are more likely to not use the process. A focus on completing the paperwork is also similar for both sites. A central issue that emerges in relation to the role of leadership is power. The risk-awareness program travels throughout the organisation more in keeping with a translation model of power. This means that although leaders can exert power, they do not have power and the success of the program will be dependant on a "chain of agents"', all of whom will translate the risk-awareness program into practice according to their own needs (Gherardi, 2006; Latour, 1986). The central role of power in the process may limit the proposed ability of leaders to influence collective practices (Hopkins, 2005a; Reason, 1997).

The main difference between the two sites is the perceived influence of the role of the client. At site A, both workers and managers perceived the need to satisfy the client as a key driver of the risk-awareness program. No mention of the client was made at site B. The reasons for this difference are not clear. But it maybe that within different industry sectors, the client is able to exert more pressure upon the contractor.

5.3 Risk-awareness and the Culture of Safety

Developing a culture of risk-awareness is one aspect of an organisational culture that is "conducive to safety" (Hopkins, 2005a, p. 22). Risk-awareness programs encourage workers to think about and control risks before starting a job (Hopkins, 2005a). The concept of risk-awareness also recognises that it is not possible to write a safety rule to cover every situation; therefore workers are encouraged to be aware of and respond to the risks in a given situation rather than mindlessly following safety rules (Hopkins, 2005a). Hopkins (2005a, p. 18) argues that a more risk-aware workforce is also more likely to report "matters of concern" and to "make suggestions for safety improvements". Therefore, a culture of risk-awareness requires both an organisational context that supports risk-awareness and individual workers who are more risk-aware. According to Hopkins (2005a, p. 8), if risk-awareness is reduced to the "mindset of individuals" then risk-awareness runs the danger of being viewed "as an attempt to transfer responsibility for safety from the employer to the employee and to blame workers for being insufficiently risk-aware when things go wrong". Finally, risk-awareness must be supported by practices which are "embedded within the organisation" (Hopkins, 2005a, p. 19).

Culture then, is viewed as collective practices that can be 'engineered' by leaders. The previous theme explored how the role of leadership is central to both safety and culture. Leaders, notionally at least, have the power to shape a culture that is more risk-aware. Hopkins (2006a, p. 876) argues that "every organisation has a culture (or perhaps a series of subcultures) and that culture can be expected to impact on safety". The culture of an organisation, and the extent to which that culture is focused upon safety, will have an impact upon safety performance (Hopkins, 2005a; Reason, 1997). However, a safety culture "emerges gradually" and requires the combination and application of persistence and practical measures designed to improve safety practices through "collective learning" (Reason, 1997, p. 192). This approach to safety as a sub-set of organisational culture takes the view that leaders have the power to influence culture by implementing practical measures, like risk-awareness programs that encourage workers to perform mental or

informal risk assessments, and embedding those programs in the organisation and supporting their enactment through workers practices, resulting in reduced risk. This views culture as something that an organisation 'has' rather than something and organisation 'is'.

The alternative view to the power of leaders and managers to 'engineer' a culture of safety is that safety is an emergent property of a cultural system (Gherardi & Nicolini, 2000a). They argue that it is not "safety as a topic that is learned, but safe work practices" (Gherardi & Nicolini, 2000a, p. 8). Although this view of culture also revolves around the concept of practice, it is communities of practice, not only leaders, that socially construct and transmit what constitutes safety practices (Gherardi & Nicolini, 2000a; Gherardi et al., 1998). This view is in keeping with culture being something that an organisation 'is'.

It is against this theoretical backdrop to risk-awareness and the culture of safety that I will present the findings from the field. The findings that I will present here relate to the general manner in which the risk-awareness program is perceived to be building a culture of safety. I will deal with the extent to which the risk-awareness program generates increased awareness of risk on the job, creates a more mindful appreciation for the safety rules and increases reporting in later themes.

The findings are drawn from both the semi-structured interviews and observations from the field. During interviews I asked workers and managers a series of questions about what safety culture meant to them and how the risk-awareness programs were contributing to both safety and organisational culture.

5.3.1 Site A workers' perceptions of risk-awareness and culture

Of the seven workers interviewed four (57%) had not heard the term 'culture' or 'safety culture'. The following comment is a typical response:

> *I haven't really heard the term before. You usually hear health and safety, occupational health and safety, health safety and environment but not the term safety culture itself …*

For workers who had heard the term 'safety culture' it was perceived to be, as one worker said, *another buzz word*.

The workers perceive that safety is a personal responsibility and that the risk-awareness program has placed more responsibility back onto the worker for safety. They also perceive that the organisation values 'getting the job done'. Workers perceive that the risk-awareness program has created a culture focused on the completion of paperwork.

5.3.1.1 Safety culture means a personal responsibility to work safely

Workers understand the term 'safety culture' to mean taking personal responsibility for working safely. This team leader, during interview, and in response to the question 'what does safety culture mean to you?' said:

> *Safety culture … it's probably just another word to me … it's safety culture … should be natural habits if you like, is that what you mean by culture? If someone said what's the culture of safety here at this workplace, to me that would be how closely the fellas work to systems that promote safety, how their safety performance in general is, how easily they embrace it, how much they'd look out for each other how much common sense do they display on the job and it varies from place to place*

The aspect of this excerpt that is important is that safety culture is described as a characteristic of individuals, that is, in terms of an individual responsibility for working

safely, for example: *how closely the fellas work to systems that promote safety* and *how their safety performance in general is*. Not only is safety culture viewed as an individual responsibility, in particular it is a worker responsibility. This view of culture is at odds with the view that culture is a characteristic of groups, not individuals (Hofstede & Hofstede, 2005; Hopkins, 2005a; Schein, 2004). However, the comment *how much they look out for each other* introduces a community view of safety and culture and may speak more of communities of practices (Gherardi & Nicolini, 2000a; Gherardi et al., 1998). The comment *how much common sense do they display on the job* may illustrate what is culturally valued within the communities of practice, that is, common sense. It is possible that common sense may be valued more highly within the local work culture than programs traveling down the organisation from corporate headquarters. The notion of common sense will be explored further in the next theme, but suffice to say that common sense may act as a modifier at the local worker level of the risk-awareness program and this may yet again be an example of the translation model of power (Latour, 1986) in action.

Another worker also expresses the view that safety culture is a characteristic of individuals, this time safety culture is expressed as a way of thinking about risk:

> *It's a way of thinking … for every particular job that you do that you take into account that there … that there are risks, what the risks are and what sort of rating you would give them … personally if you think, oh geez, something could seriously go wrong here but that you do take that into account and plan if you need to … could be something as simple as every time I use a drill wear safety glasses*

This expression of what safety culture means could be interpreted in two ways. First, it could be an example of a culture of risk-awareness and how it is being enacted by this worker, for example: *you take into account that there are … that there are risks*. Furthermore, the comment: *every time I use a drill wear safety glasses* points to the type of risk control practices that might be expected as part of a culture of risk-awareness. Describing culture as *a way of thinking* would be consistent with that part of Schein's

(2004, p. 17) definition of organisational culture that refers to teaching new members of the group the correct way to “perceive, think and feel”. But for this interpretation to hold true, the whole group would have to share a belief that the risk-awareness program helped them think about and control risk such that it would be taught to new workers entering the group.

The second way of interpreting this comment is that it is not an example of a culture of risk-awareness, but rather the value one worker places on working safely. For this comment to be indicative of a culture of risk-awareness, the practices of thinking about and controlling risk would need to be shared by the group. In support of this latter interpretation that this is not the case is this comment from another worker: *here it is probably a change in the work culture, it is very individualistic here and there is that feeling from a safety point of view that it is much less safe*.

Workers are also motivated by a desire not to get hurt, a sentiment captured in the following comment:

> *Safety culture? Well it's just work safe, go home at the end of the day the same as you came in and make sure you don't hurt anyone else while you're doing it. Pretty much that's the nuts and bolts of it. Make sure you don't get hurt, make sure someone else doesn't get hurt or what you do doesn't impact on someone else*

This comment may partially explain why workers interpret safety culture to mean a personal responsibility for working safely. Workers value their own as well as the safety of others and by couching safety culture in terms of a personal responsibility, they are giving themselves some control over their own destiny. But another explanation for how workers think about safety culture could be the perception that through the risk-awareness program, the organisation is putting more responsibility back onto the workers.

5.3.1.2 Risk-awareness means putting more responsibility back onto the worker

Workers tended to perceive that supervisors and managers are using the risk-awareness program to push more responsibility back onto the worker, a view captured in the following worker responses:

> *They're putting more responsibility obviously back onto the worker rather than having supervisors and whatever come out onto the job site saying, making sure you're working safe, you should be doing this and should be doing that, making the worker responsible for their own safety which is the way it should be.*

> *… putting the onus back on to the worker rather than supervision and management to look after your own health and safety…*

> *… management's attitude is more to pass the responsibility down to the worker …*

Some workers believe that the reason for pushing responsibility down to the workers is business related. That is, the flat organisational structure that allows the organisation to compete for and win contracts. For example:

> *… you don't have the support services above you helping you implement your processes too much because we are a fairly flat organisation here, we don't have a lot of supervision and again, the logistics of it, the fellas might be out on their own.*

> *…there is a fair bit of responsibility on the individual technicians. I suppose to win a service contract like this you can't be too top-heavy an organisation and the logistics of this organisation see a lot of fellas out on their own, so every fella takes a little bit more responsibility than the average workplace, we all do things that a supervisor would normally do for you at other work sites and you tend to be doing a lot of the supervisory things yourself …*

Therefore, an emphasis on workers taking personal responsibility for safety is perceived as being good for business:

… but it is stressed to us, 'do the job safe', and at the end of the day it reflects on their contracts, future contracts. If they have got a bad safety record, they won't get work anywhere.

The proceeding series of comments demonstrates a complex relationship between culture, risk-awareness, individual responsibility, business performance and values (both personal and organisational). This complex relationship may explain why workers interpret safety culture to mean a personal responsibility for working safely. The workers' personal value system, not getting hurt, having a job and common sense, are strong motivators for workers to accept responsibility for their own safety as it provides them with a sense of control and an ability to live and work in accord with their personal values. The workers' personal values may be compromised by a site culture that values 'getting the job done' and an organisational culture that values the completion of paperwork.

5.3.1.3 A culture of 'getting the job done'

It was the view of some workers that the risk-awareness program conflicted with a site culture of 'getting the job done'. For example, two workers said:

I get annoyed personally with the bureaucracy that it brings on board and a lot of the systems we have to work to don't help us get our job done they hinder us …

For the way we work here that would seem so over-blown and so time-consuming.

[What do you mean by that comment "for the way we work here"?]

Well you are expected to get out and just bore in and get stuff done I think that's the way I see things here, but I couldn't imagine anybody really going through all that.

These comments are important because they highlight that workers perceive the risk-awareness program as being at odds with the site culture that values workers who *just*

bore in and get stuff done. Furthermore, the workers do not value the *bureaucracy* that is associated with the program as again, it doesn't help workers to *get our job done*.

As much as some workers may have safety as a personal value, one worker believes that other workers may value taking risks on the job. This worker said:

> *… and that's another thing about personalities. To come in to work you know there are guys here who are natural risk-takers, and you can only find that out through experience and working with them. So if you're working with so and so, he will fly off the handle if something goes wrong or if something doesn't work he hits it with a bigger hammer type thing. But you can only find that out through experience; not thinking before they act*

This worker believes that risk taking is also valued by some levels of leadership:

> *I see myself as being conservative and I think that by filling out a sheet I'm being even more conservative and being even slower on the job, so I'm not applauding, but I know that my particular work coordinator is a little bit gung ho and I sense that he, that one thing he might look down on me upon for is not being gung ho like that and being a risk taker, because he said it to me on some occasions just get in and have a go find out about it … no, I'd rather talk to someone who has worked on a piece of plant before or worked with them … have a chat to someone who has been through it, that makes it just so much easier, makes it more efficient, makes it safer.*
>
> *… and the attitude of the coordinator too you've got to be seen to just bore in have a crack don't stand around thinking about it that's not viewed positively by our coordinator.*

These series of quotes suggest that values play an important part in forming culture. Some workers value their own safety and having a job, other workers may value risk

taking. Some workers perceive that some leaders may value getting the job done. The larger organisation may value having evidence to prove that a risk-awareness process is in place, possibly to satisfy the client and legal requirements. Still other workers contradict these findings in relation to the site culture and perceive that leaders value workers doing what ever is necessary to get the job done safely, a value that is expressed in the worker comments that follow:

> *… if you cut a corner, you are doing it at your risk, because we have been told if you do the job you do it safe and do it properly; costs extra it costs extra…*

> *… it's part of the mentality not just that hey, we're here to do a job and we have to do it, it doesn't matter how you get it done just do it safely has got to be part of it …*

Worker, site and organisational values may at times be in conflict. In particular, the organisational value of having evidence of a risk-awareness process may conflict with the values of some of the workers who perceive the risk-awareness program as extra paperwork.

5.3.1.4 Risk-awareness means extra paperwork

The impact of the risk-awareness program is best summed by the collective view that the risk-awareness program means extra paperwork:

> *Extra paperwork, extra paperwork for no reason …*

> *Nothing, it's just paperwork …*

> *No, no, it's just paperwork to me …*

> *It makes you fill in more paperwork …*

There was a wide-spread perception among the workers that the paperwork slows them down and if they can get away with it, they will not complete the paperwork as the following comments illustrate:

> *It probably slows us down a little bit. At the end of the day, depending on what form you are filling out and how you go about it, it can vary from five minutes to half an hour an hour depending on if it's a *** ***** or job analysis…*

> *… our issue was we are filling out paperwork that takes us longer to do than it is to do a simple task where there is very minimal risk … so he has brought this card in.*

> *… if you can get away without doing paperwork you are going to, so you are going to rely on your ***** ***** more than your *** *****, the less paperwork the better.*

> *… a lot more paperwork to prove that we are going about things the right way I guess. Before we didn't have the paperwork or an official format to follow to prove that we were actually thinking about what we were doing and making it safe …*

These series of quotes are important for three reasons. First it is the paperwork associated with the Risk-awareness program, not the principle of risk-awareness that is causing resentment among the workers. Workers may be prepared to use a risk-awareness program if it does not require paperwork: *if you can get away without doing paperwork you are going to, so you are going to rely on your***** ***** more than your *** *****, the less paperwork the better*. Second, the comment *to prove that we were actually thinking* suggests that the paperwork is proof of a link between risk-awareness and safety. However, even if the workers do complete the paperwork, it does not necessarily follow that the paperwork actually increases risk-awareness or influences risk control practices. This point can be illustrated with reference to Schein‘s (2004) three levels of culture model. The paperwork associated with the risk-awareness program is an artifact (level 1) that reflects the espoused beliefs and values of the organisation about ‘safety’ and provides evidence of compliance through the ‘paperwork’ (level 2).

However, the underling assumptions (level 3) may not have changed and the overwhelming belief by workers is that the paperwork at least is an unnecessary waste of time. Therefore, the risk-awareness program has failed to influence the underlying assumptions of workers who not only resent the paperwork, but view the process as an exercise in 'arse-covering'. Two workers said:

> *Well, it's all arse-covering at the end of the day. It is documentation to say that you have done checks before you start the job which you do anyway. I mean a lot of this is just commonsense, but the way the legal system is these days and all that they want is paperwork because if it goes to court, something happens it goes to court, paperwork is there - well people's arses are covered, the company's arse is covered. If you did something outside the guidelines of what's on that paper, well then you're in the shit. At the end of the day it's all legal. You could probably say it's a legal document, if there's a problem that thing becomes a legal document …*

> *To cover arse because if you have nothing, well, then there is nothing to say that they're trying to help your health and safety. If they have no documentation, well they can't say that Joe Blow, he's actually thinking about what job he is doing next, he just going there and he's just going about it gung ho and just getting stuck into it and not worrying about what he is trying to do or the health and safety of other people - which is fair enough, they have got proof that they are … the blokes are actually thinking about the job by the *** ***** that's all there is sort of thing and I can see their point where they probably want some documentation to say that they we are actually doing something for their employees health and safety …*

Finally, the third reason why the initial comments in relation to the paperwork are important is because the risk-awareness program does not appear to have influenced the culture of safety. Workers do not value the paperwork and an over-emphasis on the paperwork by the organisation is more than likely perpetuating an illusion of safety. The risk-awareness program is not viewed by this group of workers as helping solve their

safety problems and therefore has not been adopted by the group as a shared basic assumption.

5.3.2 Site A managers' perceptions of risk-awareness and culture

The three managers interviewed were all familiar with the terms 'culture' and 'safety culture'. The managers perceived that safety culture meant creating a safe working environment and that a safe working environment was good for business. It was acknowledged, however, that historically, the site had valued a culture of 'getting the job done'. Managers perceived that to build a culture of risk-awareness required conditioning workers minds. Conditioning workers' minds was made more difficult because managers perceive that workers may not see value in the paperwork associated with the risk-awareness program.

5.3.2.1 Creating a safe work environment

Managers perceive that a good safety culture means creating a safer working environment for workers and that a safe working environment would be good for business. When asked what safety culture means to you, the following responses were given by the most senior manager on site:

> *I think that safety culture is something that someone in my position is conditioned with every single day, it's everywhere from everything we do. We go to meet new clients and we push the safety line every chance we get. Our chief operating officer got up at our latest managers conference and he pushed how important his employees are to him, our employees is our business and we have got to create a safe working environment for our employees, we have got to become the employer of choice for good employees and they're not going to do it if you haven't got good safety systems and a good safety culture…*
>
> *...it's extremely important to our business plan, its extremely important to our ability to win new clients and our ability to keep existing clients, it is also important*

from a financial perspective when it comes to WorkCover claims when we go to self insurance …

These two excerpts point to safety as being a value that can enhance the organisation's business performance and growth. Safety, as a value, is being driven by the Chief Operating Officer and is carried forward and into the local worksite by the contract manager. This relationship between leadership and culture is consistent with Schein's (2004, p. 1) view that leadership and culture are "two sides of the same coin". However, there may be gap between these espoused beliefs and values about safety and underlying assumptions. For example, not all managers agree that corporate processes like the risk-awareness program are good for business. This manager said:

*No, look sometimes the processes that we do get from ********** corporate even … I guess at ********** and my level we do tend to shake our heads it's just … I guess they are there for a reason whether they are right or wrong they are rolled out and we just have to run with them which is certainly the way we are approaching a lot of the procedures that are coming from downtown these days. But to be honest with you, some of the processes we just can't see a use for here and need for, and if we can see that it's going to be an advantage to the way we do our business here, yes, you will certainly get a lot more support, we will get behind it and push it, but some of the processes that we do see…they are a bit doubtful…*

This manager is questioning the value of some corporate programs. This may mean that some managers may be put in a position of espousing corporate beliefs and values to workers that are inconsistent with their own underlying assumptions. This may create a tension which becomes observable to workers where a manager says one thing and perhaps does another.

Values appear to also differ at different levels of the organisation. This is not to say that safety is not a value, it is and at all levels. What is in question is how safety as a value is enacted in practice. Workers value returning home safely at the end of a day's work, but

achieve that through the enactment of common sense that draws on knowledge and experience. Managers value safety because it is good for workers and for business but enact that value through documented processes. Both groups value safety, but workers do not value paperwork and managers quite possibly do not value common sense. To complicate matters further, safety is only one value. Individual sites may find that there is a tension or possibly even a conflict between safety as a value and a value such as 'getting the job done' to satisfy client needs.

5.3.2.2 A culture of 'getting the job done'

This manager perceives that as a group, they have historically valued 'getting the job done':

> *… we have always been a contract, a group of people that have tried to work our way around the unnecessary bureaucracy that we see coming out of these processes … we have a culture here that is probably not the right culture in terms of safety in the workplace, we have always tried to get the job done … the focus is to make sure that the job is done and completed and we move on to the next one, we need to get that changed somewhat and make sure that the guys are thinking before they roll and rush into a job, this is where we get ourselves in trouble …*

This comment reflects Schein's (2004) view that a defining characteristic of a culture is a group's shared history. This site has operated successfully in a competitive contract maintenance environment for many years. All on site have learned that to be successful, over time, meaning to retain the contract, means doing whatever it takes to get the job done to satisfy the client. This culture is powerful and is taught to new workers. To be successful has meant that strain is placed upon the role of supervisors: This supervisor said:

> *The way this contract is manned is very difficult because most people have got two jobs …all the supervisors are working supervisors, they all have a role where they work and they do some administration as well. If someone is away something has*

got to give way, so it's either work or administration, administration doesn't pay …it is one of the products of tendering or going into the service industry like this that the clients want you to do it the right way but they don't want to pay for it …

This comment highlights a further tension which is the need to contain costs and a further tension is created by simultaneously doing safety the right way to satisfy the client, yet the contract is not resourced adequately and as a result, doing it the right way places strain on the role of supervisors. Programs such as those that encourage risk-awareness are initiated from a different organisational vantage point and may add to the strain because managers are required to on-sell a program to workers that probably is at odds with the existing culture.

Schein (2004) argues, however, that the role of managers is to identify when a culture needs to change and change it. This could be the case here. A manager's role is to act within that culture. Managers do see their role as changing culture and perceive that the best way to do this is to condition workers' minds.

5.3.2.3 Conditioning workers' minds

Some managers perceive that culture is about conditioning workers' minds so that workers use the risk-awareness program. For example, two managers said:

…trying to condition the guys to use the process in their mind…

…if we can get that culture change and get it driven home …if we can get those key elements of the risk-awareness program placed quite firmly in these guys' heads that unconsciously they are going to be going through this…

These comments are important because it reflects a view of culture as something that resides in the heads of individual workers. Workers may refuse such conditioning because they do not see value in the risk-awareness program and its paperwork. Therefore, compliance with the program is at odds with the culture that they have learned

which is to get the job done. The paperwork simply slows workers down. Managers understand this tension and realise that they have to reduce the paperwork.

5.3.2.4 Reducing paperwork

Managers perceive that to develop a culture of risk-awareness, which means the program being accepted by the group of workers, will require workers to see value in the program. Managers perceive that to influence how workers perceive the program, they, managers, must reduce the paperwork:

> *…I like the idea of reducing the amount of paperwork our guys have to fill in in the field while at the same time still maintaining a level of comfort that they are still doing the right thing from a safety perspective…*

Not only do managers perceive that there is a need to reduce the paperwork, they also recognise the need to demonstrate the value of the process to workers:

> *I think you have got to show the guys the value, the reason why you are doing a risk-awareness program you are doing it for these reasons…*

This comment is significant because if the organisation cannot *show the guys the value* in the process then the risk-awareness program is less likely to build the culture of risk-awareness hoped for by the organisation. This is supported by Schein's (2004, p. 17) definition of culture that states that culture is "a shared pattern of basic assumptions … that has worked well enough to be considered valid".

5.3.3 Site A anecdotes from the field

Here I include two very different anecdotes from the field. The first, 'getting the job done' is drawn from one of my observations in the field whilst the second 'the ditch witch accident' was recounted to me during an interview.

The first anecdote sheds light on what this worker values. The second anecdote sheds light on how this worker believes that a culture of risk-awareness could have prevented this accident.

5.3.3.1 A culture of 'getting the job done'

This anecdote came about during a day of observations with this worker who I will call 'Bill'. I spent the day with Bill and one of our jobs for the day was to undertake routine inspection of a water pipeline. This anecdote is an attempt to capture Bill's thoughts about life on the job and safety.

> *Today I observed Bill doing 'routines'. This required Bill and I to follow a water pipe line and to look for any obvious maintenance issues. The pipe line traversed paddocks and creeks and sometimes ran parallel to the road. At times we had to drive 'off-road' to access the pipe line and its series of valves and pumps. Some valves and pumps were located below ground level in concrete sided pits covered by metal grates. Some of these pits were designated confined spaces. I knew that they were designated confined spaces because they were signposted as such! At one pit, which was located in the middle of an open paddock, the fact that the pit was a confined space sparked a conversation between us about safety. As we both stood there in the paddock contemplating the concrete pit, Bill said that he would 'just get in without a permit'. Bill also said that there was 'too much paperwork and too many rules' and that all the paperwork was mainly about 'arse covering'. Bill went on to share his view that 'safety was Aussie common sense' and that it was part of the 'Aussie culture'. Bill also said to me that he 'doesn't trust managers with his safety, he only trusts himself'. I said to Bill that I had noticed a mental risk assessment card under the visor of his truck, but he said 'I never use the card, I use*

common sense, it is the Aussie way, just lift it up, just get in the hole, do whatever it takes to get the job done'.

This anecdote reinforces the importance of existing values and the difficulty of introducing programs that workers perceive as being at odds with those values. 'Bill' values common sense and getting the job done. Common sense is viewed by 'Bill' as a characteristic of the national culture. To 'Bill' safety processes, rules and paperwork is the antithesis of common sense. Finally, 'Bill' does not trust managers with his safety, he only trusts himself.

5.3.3.2 The ditch-witch accident

This story of the ditch-witch accident emerged during interview and in response to a series of questions: what do *** ***** and ***** ***** mean to you and what do they mean to the organisation? These questions were designed to try to uncover basic underlying assumptions about culture.

The story as told by the worker is reproduced in full; however, the key parts to the story are highlighted in bold.

*That was ****** accident. He actually was working with ****** and* ***they were using a ditch witch to dig a trench.*** *I wasn't there so I probably really can't make comment I suppose, it's probably my own opinion but from what I can gather from history, as I say I wasn't there so I can't say for sure, but the ditch witch was coming up near a piece of reo that anyone that has ever used a ditch witch knows they're bloody dangerous machines the ditch witch … I suppose this is where your card comes in to account.* ***If you sat down and read your card and you thought through all those questions what happened to him wouldn't have happened*** *knowing how dangerous the ditch witch is and he has been in the industry for long enough to know … but what happened is that the ditch witch jumped up out of the hole which they commonly do if they grab hold of something because of the chain and the action the way they operate it grabbed the reo he was standing on, he was*

checking the depth of the trench in front of the machine which is the way the machine would go if it got loose, which is not very clever at all you should always stand at the side of a machine or any machine you know you never stand in front of it where it is about to go and obviously from what I can gather he was and the machine grabbed the reo pulled the reo into it and he was standing on the reo so ***he got dragged into the chain and it cut him up the inside of your thigh area between the legs it cut a lot of tendons and blood vessels*** *and all these other things and* ***consequently this mental risk assessment card wasn't used back then risk-awareness program wasn't used back then may be these things if they had of been in place would have prevented that he would have thought about it a bit more*** *… obviously … I dunno if they were in a hurry or what they were doing he wasn't thinking clearly but* ***if you think about your ***** ***** cards or ***** ***** there is no way known you would stand in front of a machine*** *like that surely not so that's where our three years or so lost time injury free went down the toilet …*

This is a powerful anecdote and highlights the power of story-telling as means for transferring learning about safety and influencing culture. In fact I had been told this story by a number of workers and the story seemed to have become part of the folk-lore of the organisation. As a newcomer I was left in no doubt about what the risks of a ditch-witch were and how I would position myself if I found myself in the presence of such a machine in the field. If culture is learned as Schein (2004) proposes, then story-telling may be one way of bringing about learning.

But this anecdote also reveals that this worker believes that a culture of risk-awareness may have prevented this accident.

5.3.4 Within-site comparison of findings

Workers and managers have similar perceptions of how the risk-awareness program is impacting upon the culture of safety. The risk-awareness program is seen by both parties to be at odds with a culture of 'getting the job done', a culture that has worked for the site for many years. The risk-awareness program is seen as an impost, particularly the paperwork because it is perceived to take too long and is at odds with getting the job done.

In effect, the risk-awareness program, as it travels down from the corporate level of the organisation, is deflected by the existing site culture and causes little more than a glancing blow to that culture. The reasons for this are twofold. Firstly, the strength of the existing culture and the basic underlying assumptions that inform that culture. These underlying assumptions are built on a value set of getting the job done. Secondly, the values of individual workers also play a role. Workers value their own safety and wish to return home at the end of day's work uninjured. Hence they prefer to take personal responsibility for their own safety and to exercise 'common sense' as it affords them a degree of control over their own destiny. The corporate program, or in particular the paperwork associated with the program is not valued as it is perceived to be 'arse-covering'.

It may be that different value sets exist for different groups of workers. For example, at the corporate level paperwork is valued because it provides evidence of a system for both legal and client purposes. At the site level, getting the job done is valued because it has been a proven method for retaining the contract. At the individual worker level, personal safety is valued. The corporate value that is placed upon paperwork is perceived to make it more difficult for the site and individual workers to fulfill their own values, hence the resistance to the risk-awareness program.

5.3.5 Site B workers' perceptions of risk-awareness and culture

Of the 12 workers interviewed half had not heard the terms 'culture' or 'safety culture'. Given time to think about what culture meant to them, workers perceived culture to be a *learned way of living*, *knowledge of something* and *how people live*. The workers perceive safety culture to be a shared way of dealing with safety and that the risk-awareness program was influencing safety culture by training workers to look after themselves. However, the paperwork associated with the program was perceived as a barrier by a number of workers.

5.3.5.1 Safety culture means the way we deal with things around here

Some workers understand the term 'safety culture' to mean *it's the way we deal with things around here and we have got to be safe*. This worker uses the word *we* which would suggest that culture is something tangible that is shared among the group. This notion of culture being shared is also reflected in the following comments:

> *Safety culture? What does it mean to me? I don't know. I think it is more about sharing your thoughts; it's more about input from everyone else. It's not just my safety it's everyone else's as well …*
>
> *Safety culture? … Um … making sure that everybody understands what has to be done to make a safe workplace, so everyone's on the same level um … yeah, so everybody has a common understanding of a level of safety that we want to work at …*

These workers talk of safety culture as meaning *sharing your thoughts* and that *everybody has a common understanding*. Using this language to talk about what safety culture means to them suggests that some workers understand safety culture to be a characteristic of groups, a view consistent with organisation and safety culture theorists (Hofstede & Hofstede, 2005; Hopkins, 2005a; Schein, 2004).

Workers also use other language to describe what safety culture means to them, for example, for this worker safety culture means people's attitudes towards safety:

> *People's attitudes to … something like that … what works in the workplace sort of … like if your team leader is always doing something it sort of rubs off …*

Although this worker perceives safety culture to be related to people's attitudes, there are two other important aspects within this comment. The first is the idea that safety culture is *what works in the workplace*. Expressing culture as something that works is consistent with that part of Schein's (2004) definition of organisational culture that states that culture is something that "has worked well enough to be considered valid". For the risk-awareness program, the challenge is for the group of workers to believe that the program works. Only then will it be taught to new workers as part of the repertoire of shared basic assumptions that the group holds to to solve safety problems. Second is the idea, for this worker at least, that leaders who model the desired behaviour can impact upon culture. This view suggests that leaders influence culture by attending not only to what they say, but what they do, or as this worker says *it rubs off*. Workers can learn from leaders who model the appropriate behaviour. This would require leaders to not only tell workers to use Risk-awareness program but to use it themselves.

For this worker, safety culture is understood to be a tool for not getting hurt:

> *Well safety culture is probably the tool that I would use to ensure that if you go to work in the morning you come home safe, and that the culture and the way of ensuring that is to have people have it in their minds that safety is the highest priority for the company, for the ****** and for individual workers …*

Where the previous workers have referred to safety culture as either the shared characteristic of groups or individual attitudes, this comment reveals safety as a value and to enact that value requires a culture where *people have it in their minds that safety is the highest priority*. This comments reflects a more personalised view of safety culture, one

where safety culture is an individual responsibility to work safely, motivated by a desire to *come home safe*.

Another worker also perceives that safety has to exist in workers' minds with the comment that safety culture is about *trying to drum into everyone's head that safety should become a second nature type thing*. Hopkins (2005a, p. 18) cautions however, that risk-awareness programs in particular should not be "reduced to the mindset of individuals". The challenge, it would seem, is to obtain and maintain a balance between the individual and organisational characteristics that together constitute a culture of safety this is risk-aware. This challenge is very real and some workers may have a different attitude to work and safety:

> *Get away with what you can pretty much I reckon … for people working here they are getting away with doing as little as they can … it's not a very good attitude.*
>
> [Would you have an example?]
>
> *Large logs may be thrown in the bushes rather than put into chippers … or rather than having to carry it they will chop it in the bushes, things like that …*

It is difficult to know if this worker is referring to a 'safety culture' or a 'culture of safety'. Hopkins (2005a) argues that all organisations may have a safety culture, but this does not mean that the culture is favourable to safety. Whereas to talk of a culture of safety does place the focus on just that, a culture that is favourable to safety. Applied to this worker's perspective the 'safety culture' may be interpreted as negative toward safety: *people working here they are getting away with doing as little as they can … Large logs may be thrown in the bushes rather than put into chippers* because workers have a lazy attitude. Alternatively the comment could be construed to mean a 'culture of safety' within which workers are improvising based upon their awareness of risk, that is, logs are too heavy to be manually handled or too large to be put through the chipper safely, and in the absence of any other organisationally sanctioned means for dealing with the logs, the workers find a 'workaround' that suits them and protects their safety. This

discussion highlights the difficulty of understanding culture, particularly at the deepest level of culture of basic underlying assumptions. Perhaps this worker is even unclear.

Despite the challenges of understanding what safety culture means, workers did perceive that for the organisation a good safety culture was good for business. For example, workers said:

> *… but obviously being a contractor … it would be a feather in the cap if they had.*

> *… if they were known maybe industry wide for their safety culture …*

5.3.5.2 Risk-awareness makes you think about avoiding injury

Some workers perceived that the risk-awareness program made them more aware and encouraged them to think about hazards and ways to avoid being injured. In this way the risk-awareness program was seen as being a part of the safety culture:

> *Safety culture … well I guess doing risk-awareness programs would be part of the safety culture um …*
>
> [In what way?]
>
> *Well it makes you think about your um … the safety … your environment your working environment before you start immediately gets that sort of thinking into your head um before you actually go out and begin work.*

Other workers also supported the view that the risk-awareness program makes you think and increases awareness with comments like: *makes you stop and think, thinking about what's ahead and what you need to do to hopefully avoid injury, I think it is being aware …aware of the hazards … just a reminder of things that can go wrong*.

It would appear from these comments that the risk-awareness program is successful in encouraging workers to be more mindful of risk. However, all the comments are directed

toward individual workers being more risk-aware whereas Hopkins (2005a) argues that risk-awareness must operate at both the individual and organisational level. Workers make no mention of managers in their comments. Hopkins (2005a, p. 19) also argues that "a culture of risk-awareness will not be brought about simply by preaching its virtues: practices which encourage it must be embedded within the organisation". The program clearly operates at the individual level. For example, this worker perceives that the risk-awareness program makes individual workers more responsible for their own safety:

> *… it is good to see that the company is trying to train people to look after themselves … we are being taught to be responsible for our own safety but we do need guidance on the fact of how to do that safely …*

Furthermore, a number of practices are in place at the organisational level (more particularly the site level) that supports workers to be more risk aware. Toolbox meetings are used by managers and supervisors to communicate their expectations that workers comply with and use the risk-awareness program. The risk-awareness program is the first item on monthly safety audits conducted in the field. The organisation (not just the individual site) has a safety performance monitoring system that elevates data on safety performance to the very top of the organisation on a monthly basis. No data from the risk-awareness program is included in this system as the monitoring of the risk-awareness program is left to individual sites. At the site level, the overriding concern is that workers complete the paperwork work. Paradoxically, this focus on the paperwork at the site level is in part motivated by a desire by sites to comply with the organisation's requirement that sites use the risk-awareness program, even though the organisation does not monitor the effectiveness of the program. By comparison, Hopkins (2005a) provides examples of organisational practices from industries using risk-awareness programs. In these organisations, the focus is not on the paperwork, but a set of practices that encourage supervisors to firstly talk to workers about instances where workers have used the risk-awareness program and secondly, for supervisors to report examples of the risk-awareness program to managers. In the organisation that is the focus of this research,

perhaps, as Hopkins (2005a, p. 19) puts it, the right practices which encourage the use of risk-awareness are not "embedded within the organisation".

5.3.5.3 Risk-awareness means just another bit of paper

Although the workers perceive that the risk-awareness program encourages them to think and become more aware of avoiding injury, ironically the paperwork that supports the program is met with resentment. As one worker said:

> *… it's just another bit of paper we have got to fill out. It gets to the point where we don't see the use in it because we do it so often it becomes automatic, we don't think about it, we are in a place that we have been to a hundred times before, we know the risks and it is just a waste of time which almost gets you resenting it.*

This comment is important because it contradicts the view that the risk-awareness program has had a positive impact on safety culture. The impact of the program is mediated by the paperwork which is driving a wedge between corporate intent and workers' practices. This perception is widespread among the workers:

> *No, they are a backward step I think because people hate filling them in …*
>
> *They are wasting my time and they don't mean anything to me …*
>
> [Does it help you?]
>
> *Not really … nup … that doesn't help me at all … you just go to tick, tick, tick, tick and because we know what we're doing it goes into a folder and you don't think about it again…*

The organisation was aware of the issues surrounding the paperwork and had responded by simplifying the form, hence the reference in the comment above to *tick tick tick tick.* Originally workers were required to identify and write down the hazards and their

associated risk controls, but to make the form easier to use and more user friendly the form had been redesigned to a checklist requiring the workers to tick the hazards that applied on a given job. However, not all workers perceived the changes to the form to be an improvement. For example, these workers said:

> *The new ones I don't like. Where it was more paperwork the old ones but you could write down each hazard instead of just ticking a box.*
>
> *What is the benefit of writing it down? I suppose you think about it more … they know that you have actually considered the risk where anyone can just tick a box …*

There is some irony in these comments. Workers generally resent the paperwork because it takes too long to complete. Nevertheless, they believe that writing down the hazards, which takes longer, is preferable to ticking boxes because the process of writing encourages thinking. Hopkins (2006b, p. 590) identifies the dangers of risk-awareness programs degenerating into an "ineffective ritual … when workers are asked to fill out cards routinely and hand them to supervisors to be filed without further comment".

A further issue that workers have with the paperwork is that it is *unrealistic* relative to the demands of the job:

> *I think it is a waste of my time personally …well there are unrealistic things on there.*
>
> [Can you give me an example?]
>
> *Well they want us to say that we have walked across the reserve and picked up all the rocks, it's unrealistic … It's such a big area you just can't do it. When I am on the mower I look out for them and I will pick it up rather than run over it. So that is sort of how I look at doing it. There are unrealistic things on there. I'm not sure if this one says it, the old one used to say there is a sign at every exit … entry and exit*

yet again it is impossible to do and it won't necessarily help you because people don't walk on foot paths it's common sense stuff for myself.

This observation is important because it surfaces a limitation with a program that focuses on workers being risk-aware mainly at the start of a job. There is a danger that workers may fall into a trap of thinking about hazards before a job but then switching off once the job commences. As this worker points out, it is *unrealistic* to identify all the hazards of a job before commencing work. One reason for this is that job may cover a significant geographical area or as this worker puts it: *it is such a big area*. Another reason is that workplaces are dynamic and that what appeared 'safe' at the start of a job may become less safe as circumstances and risk change as the job unfolds. This is particularly true when working in an uncontrolled environment such as public spaces. To combat this limitation, this worker prefers to rely upon c*ommon sense*.

A further issue that is coupled with the issue that the program is unrealistic relative to the demands of the job is that of the time that is made available to complete the paperwork. In relation to this issue, one worker said:

Because it actually slows you down. I guess they want us to slow down and think, but you don't always have time to slow down and think.

[Does ****** give you the time to slow down and think and do your paperwork?]

They will say yes but they mean no. There is so much to do and not enough people or time to do it, that having to stop every job and fill one in and walk across a reserve you couldn't do it. There is no way known that we could do our job with the number of people that we have now following the procedures and everything that they have got in their contract and whatever it is impossible

There are two important aspects to this excerpt. The first is that this worker perceives that *you don't always have time to slow down and think* because of a lack of resources. This is important because the risk-awareness programs are built around the principle of stopping

to think about risks before starting work. For this principle to be realised in practice the organisation must provide workers with the time to stop and think about risks. Furthermore, this worker perceives that in relation to support *they will say yes but they mean no*. The worker goes on to say that the job could not be done *following the procedures*.

Time also says something about culture – possibly in relation to the gap between work as imagined and work as actually performed, a gap exacerbated by the wedge called paperwork. In other words, if the workers were to follow the procedures they would not get the required work completed with the people and time available. Therefore, procedures and paperwork may represent a wedge between the community of managers on the one hand and the community of workers on the other. The wedge may create a disconnectedness at the boundary of the two communities based upon confusion over bureaucratic accountability and the tension between being rule governed (the community of managers) and rule oriented (the community of workers) (Ueno, 2000). In the latter case, rules are viewed not as normative or formalistic; but as a resource that complements common sense and situated practice. The paperwork is thus reduced to a process of 'tick, flick and file' with the result being that the risk-awareness program has minimum impact upon the culture of safety and is viewed by workers as: *probably a lot of arse-covering … basically all it is … I mean it's okay, it's a good thing for them*.

5.3.6 Site B managers' perceptions of risk-awareness and culture

Three of the four managers had heard the term 'safety culture' with one manager requesting clarification. The managers perceived that safety culture meant engendering a shared awareness and ownership of safety among workers. In particular, managers perceived that they were trying to engender a culture of saying 'no' to unsafe work. Managers perceived that the risk-awareness program was driving culture, but that the program was generating more and more paperwork.

Managers, like the workers, also perceived safety and what safety culture means in terms of a value. Safety, as a value, was expressed through an expectation that workers would come home safe to friends and family following a day's work:

> *Well, safety culture, you turn on the TV and you see the WorkCover advertisements and that and I think it is just this continued reinforcement of ensuring that everybody has this expectation of going to work and coming home safely to their friends and family. So that is what safety culture means to me.*

5.3.6.1 Safety culture means engendering shared awareness and ownership

The senior manager on site perceived safety culture to mean a shared awareness of client needs:

> *Safety culture means to me that basically everybody who is on this contract is aware of what we are trying to achieve from a service delivery perspective for the client. They have been trained in their specific field of expertise so the expectation is that they have a certain level of knowledge there. What generally they don't have is a level of knowledge in safety.*

According this manager, workers are employed because of their knowledge and expertise in their field but this manager perceives that what workers may lack is *knowledge in safety*. The risk-awareness program is a means for increasing the safety knowledge of workers:

> *… what we want them to do is to understand that safety is a whole lot more, it is not only about protecting themselves, it's about protecting their team that they work with, as well as protecting any of the general public who are there as well. So to have a safety culture means that you can have this rolling along without having to have too much input into it. Basically you can nudge it along in the right direction as you need to, but rather than it being something that you are forcing down onto*

the guys working in the field they are basically running with it themselves and making sure that it is working so it is self propelling.

This comments highlights that this manager perceives that the role of leadership is to *nudge it along* but this role is coupled with a desire to give workers ownership of the program or *running with it themselves and making sure that it is working so it is self propelling*. This notion of ownership is also shared by a supervisor who believes that a safety culture is achieved through education and ownership resulting in people that are like-minded about safety:

… obviously you have got to get people wanting to take ownership of the system so you have got to educate them as to why it is there, what you are hoping to achieve. You are then trying to engender some ownership from them so that they hear what you're saying and they are saying yes, we agree with that we want to run with it and then basically if you can get enough people that are like-minded, it will just start to spread …

This is also a comment on how leadership influences safety culture. In this case, the supervisor perceives that it is the role of leaders to educate workers so that workers can *take ownership of the system*. However, this supervisor realises that workers will need to perceive value in the risk-awareness program and to say: *we agree with that we want to run with it*. This supervisor perceives that a change of culture takes hold when *you can get enough people that are like-minded, it will just start to spread.*

Taken together, these comments from managers suggest that safety culture is something that has to be shared and owned by the group. These views of culture are consistent with the notion that culture is shared and is a characteristic of groups (Hofstede & Hofstede, 2005; Hopkins, 2005a; Schein, 2004). But these views also highlight the realisation by managers that programs like the risk-awareness program cannot be ‘forced down’ and that workers must ‘agree’ to the value of the program before a change in safety culture can take hold. These views are consistent with Schein’s (2004) definition of

organisational culture as being shared assumptions that a group comes to value because they work. In this sense, culture change is as much about the power of the workers as it is the power of leaders and managers, a view that is consistent with Latour's (1986) translation model of power. Therefore, it is argued, culture change is inextricably linked to power.

5.3.6.2 Saying 'no' to unsafe work

For their part, managers reinforce safety as a value through encouraging workers to say 'no' to unsafe work. One manager said:

> *… people aren't afraid here ah to bring up a safety issue. So there is no retribution for someone saying well, I'm actually not going to use that machine um because of xyz, I am going to tag it out. Or it's very much, I believe, a culture that if a task they believe isn't safe then it won't be done … it would then be talked about: ' well I don't think this is safe', so yeah … I think the general culture is good, I think the paperwork may not be …*

This comment raises two issues of importance. The first is the belief by this manager that a safety culture already exists where *people aren't afraid here ah to bring up a safety issue* or what Reason refers to as a reporting culture (Reason, 1997). This reporting culture extends to a culture within which workers feel comfortable saying 'no' to unsafe work, or as this managers puts it: *it's very much I believe a culture that if a task they believe isn't safe that it won't be done*. The second issue is that this manager perceives that although the *general culture is good the paperwork may not be*.

The culture of saying 'no' to unsafe work originated from the values of the most senior manager on site. When asked during interview what does safety culture mean to you; the manager said:

> *What does it mean to me personally? Well, basically I think one of the first things that I said to you was that when I got here on site I told everyone that they all had*

one powerful word that they could use in health and safety and that was the word 'stop', and if they used the word stop there wasn't going to be any finger-pointing done. That is to say well, you have just cost us $2000 because we stopped a whole large project and that really wasn't a good reason which takes away that sort of I'm too scared to put my hand up and comment, which is when you find things start to go wrong because the quiet voice is usually the one that has got the most intelligent thing to say. So, by trying to engender that culture, and that no blame culture, was an attempt to tell everyone that they have the right to think about safety and they have the right to talk about it and that no one person is right at any one time. So just because a team leader is in charge of a job doesn't mean you can't question what he is asking. Just because a manager says to do it, one way doesn't mean you can't suggest another way that might be safer.

This comment represents an example of how leader's personal values may influence culture and practice by what they pay attention to. The values expressed in this comment are consistent with the processes that would be required for collective mindfulness (Weick & Sutcliffe, 2001; Weick et al., 1999) and an informed safety culture (Reason, 1997). Hopkins (2005a, p. 22) argues that collective mindfulness, an informed safety culture and risk-awareness are "largely interchangeable" and all are aspects of an organisational culture that is "conducive to safety". The manager's values align with an organisational culture, that in terms of espoused values (Schein, 2004) at least, is conducive to safety:

*… ****** have a lot of systems and processes in place and believe that they work and that therefore that's forming a culture and that … it's drummed … if you have watched the induction video, it's drummed into you that safety is first and I guess that it is corporately and I believe that it is more than just corporately though. For the hierarchy to believe because yeah … coming from somewhere else I believe that safety does come first here…*

Both the manager and the larger organisation espouse safety as a value. In organisational terms this is expressed by this manager as *safety is first*. However, where the site manager enacts his values through practices, that is, encouraging workers to stop work that they may think is unsafe; the organisational values are *drummed into you*. The 'safety is first' message may only be as successful as the site practices that workers perceive align with this message. That is, although a culture of risk-awareness may be observable in artifacts like the risk-awareness program, and espoused beliefs and values (saying 'no' to unsafe work) these may reflect what Schein (2004, p. 36) refers to as "rationalizations and aspirations" whereas culture exists at the level of the groups basic underlying assumptions about the usefulness of the risk-awareness program.

The 'safety first' message, as an organisational value, may not travel though all contracts equally. This manager perceives that the message is enacted differently in different contracts depending upon risk. The manager said:

> *There are differences and some of those differences are driven by the industries. Obviously in the petrochemical industry there is some different consequences of the risks that are there, so they actually will pay for a higher level of quality and a higher focus on safety. Facility management, on the other hand, is at the commodity end of the market so therefore, driving the price down to the lowest dollar is very much a focus. So from that point of view, there has to be something that gives way to enable the overheads on the contract to shrink enough that we can actually win the jobs. So there are difficulties and differences that arise from the different client expectations and then once you run with them if you forget to look back over your shoulder, you can suddenly find that there is a wide chasm between where the two different industry groups have headed.*

Furthermore, this senior manager referred to a *culture of silos* meaning that funding for safety is dependant upon the inherent risk of the individual contract. For a contract with high risk, money is made available within the contract to manage safety, for contracts with lower perceived risk monies are borrowed from safety to run the contract. This

could be interpreted to mean that the espoused organisational value of 'safety first' is supported by different basic underlying assumptions depending upon the industry sector and risk. The site under study here is perceived to be lower risk, and therefore the same level of funding for safety is not built into the contract price. Notwithstanding this constraint, managers perceive that the risk-awareness program is driving safety culture.

5.3.6.3 Risk-awareness drives safety culture

Managers perceive that the risk-awareness program is driving safety culture because of the time that is made available to workers to think about safety before starting work. As one manager said:

> *Well, one of the things that it shows is that we are willing to give time for people to think about health and safety ... what we are actually doing is making a positive concrete step in saying no, we want you to physically stop and think through the health and safety aspects of the job that you are doing…*

This comment is important because it highlights that giving workers time to *think about health and safety* is sending an important cultural message to workers about the culture of safety this is valued by the managers and the organisation. This view is consistent with a changing practices view of safety culture (Hopkins, 2005a). Hopkins (2005a, p. 8) argues that "changing practices will in the end change values and assumptions as well". But unbeknownst to the organisation, workers may already value safety – they just do not value paperwork. Furthermore, managers' assumptions may need to change such that 'safety first' is a value in all contracts, irrespective of risk. At this site, managers, like workers, perceive that the risk-awareness program has brought with it more and more paperwork.

5.3.6.4 More and more paperwork

Managers were cynical about the relevance of the paperwork that is required by the risk-awareness program as captured in the following comments:

****** like to think that these go in everyday. Everyday, every job, they can record, they can say we have brought umpteen numbers of *** ****** in this month. I am a bit cynical in that regard.*

*Well it's … it had to be done it's … um … I don't know how to answer it um … ******, it's part of their business you know. These things that come out and our people here … more paperwork, more paperwork, and it's more filing of stuff for me. But that's part of their business.*

The importance of these comments is that managers, like workers, are not convinced by the value of the paperwork. Although the organisation counts the number of risk-awareness forms completed, this is not necessarily a measure of increased risk-awareness or better risk control practices. The issue of paperwork is compounded when the full range of risk assessment techniques is considered, or more importantly which techniques should be used and when. In response to the question 'how do job safety analysis, work instructions and risk-awareness programs all work together' this manager replied with *jumbled confusion*:

From my perspective, in all honesty, a jumbled confusion, which it tends to be in some senses. They say that if you have a generic job safety analysis and a documented risk-awareness process, then the mental risk-awareness cards is enough then to back it up each day. But whether that's true, it's hard for me to distinguish when … for me personally it is hard for me to distinguish when I am to do a job safety analysis compared to one of these either of these methods which is not a hierarchical control that is associated with the risk. So in some senses we probably need to do, or I need to look at job safety analysis for everything, so that then I create the hierarchy of control which falls down to a documented risk-awareness process or mental risk-awareness process.

This comment points to the confusion that can be created by corporate processes. It is arguable that if a supervisor is unable to *distinguish* what processes apply when, then it is

not unreasonable to expect workers to be even more bemused. Artifacts and espoused values, when perceived to be a *jumbled confusion*, are unlikely to lead to a pattern of shared basic assumptions that these programs work.

5.3.7 Site B anecdotes from the field

The two anecdotes included here are both drawn from my observations in the field and reinforce two issues that arose during the interviews. First is the issue that the risk-awareness program is perceived by workers to be putting more responsibility back onto workers. Second is the issue that the 'paperwork' associated with the risk-awareness program is perceived by workers to be creating a culture of resentment.

Both anecdotes are drawn from a day I spent in the field with two workers who I will call 'Daniel' and 'Ritchie'. Daniel and Ritchie are part of the environmental team and in part are responsible for a program that aims to re-vegetate and maintain diverse habitats. After loading the truck at the depot, we headed off on what turned out to be a one and half hour drive to reach our first destination – a remote bush track in the country side. It was early in the morning when we set off and the sun was already hot on this mid-summer's day. By noon, about the time of the first anecdote, it was scorching hot. Daniel, Ritchie and I chatted in the truck on the way to the job and continued to chat as they went about their work. The conversation drifted naturally around their thoughts about work and the impact that the risk-awareness program was having on their work.

5.3.7.1 Putting more responsibility back onto the worker

This anecdote supports the views expressed during interview that Risk-awareness program is perceived to push more responsibility back onto workers. This anecdote also supports the view that the paperwork is not valued.

> *I had an interesting conversation with Daniel about the risk-awareness program while he was setting up his laptop computer on the back of the truck. Daniel made the point to me that they have to get into a routine with doing their risk-awareness processes but he was also cautious about that because he said that 'it may*

*encourage management to care less'. He said that he felt that through the risk-awareness program that the responsibility for safety was being pushed back to workers. Daniel said to me that 'once the *** ***** had been done and the boxes had been ticked, the managers wouldn't worry any further about providing a safe workplace'. I have never heard this said before, but Daniel kept making the point to me 'I will get into the routine of doing the *** ******' but he also made the point that 'once you get into the routine that it may lull you into a false sense of security'. Daniel also said to me 'I think that communication is more important than the paper'. In relation to the paperwork he went on to say to me 'you're not thinking when you are ticking'.*

5.3.7.2 A culture of resentment

By now it was the middle of the afternoon and we had moved onto another job which was to inspect re-growth beneath a line of trees adjacent to a country road. The job was simple enough, simply walking over the site to inspect how nature was taking hold following the removal of blackberries. But again, it provided time for conversation and reflection about the risk-awareness program.

*Daniel made another comment to me that I found interesting, he said that 'it was part of human nature to be aware of hazards'. He went on to say that 'new people in particular need some advice on what those hazards are'. Daniel then told me that Ritchie was a case in point. Daniel said 'I am always teaching Ritchie on-the-job about the hazards of the task, as well as the task itself, this is how Ritchie learns things'. Ritchie joined-in on the conversation and said to me 'you can actually get a culture of resentment rather than anything else because of the paperwork. I think that the paperwork perhaps creates a totally different culture than the one ****** wants'.*

This comment highlights that workers perceive that learning about safety takes place in the field and not through the completion of paperwork.

5.3.8 Within-site comparison of findings

Workers and managers have similar perceptions of how the risk-awareness program is impacting upon the culture of safety. The risk-awareness program is seen by both parties as a means for developing a shared way of working safely. Managers perceive that they are fostering a culture of safety that is owned by the workers. For their part, the workers view the risk-awareness program positively and believe that it makes them think more about risk.

There were differences, however, both within the views of the workers and between workers and managers. Although some workers view that program positively, others workers view the program as a waste of time. Managers believe that they provide workers with the time to stop and think, but this is refuted by some workers.

Paperwork is again an issue for both workers and managers, that is, the paperwork is not valued even though the principle of the risk-awareness program has received some acceptance.

5.3.9 Between-site comparison of findings

There are both similarities and differences between the sites. Both sites are unanimous in their widespread resentment of the paperwork associated with the risk-awareness program.

Safety as a value is shared by both sites. However, site A differs to site B in that site A values getting the job done whereas site B values workers saying ‘no’ to unsafe work. Therefore, within the one organisation different sites may be said to have different cultures which in turn may impact on the success of the risk-awareness program.

Furthermore, corporate artifacts like the risk-awareness program and espoused values such as ‘safety first’ will only impact upon culture to the extent that workers believe the processes work and adopt them into their shared basic underlying assumptions and deem

them worthy to teach to new workers. In this way, culture change is inseparable from issues of power. The organisation may believe that the risk-awareness program is working, as evidenced by the paperwork, but this may be little more than an illusion of safety and may mask the extent to which the program does or does not increase workers' awareness of risk and does or does not result in the appropriate risk control practices.

5.4 Common Sense and the Practice of Safety

Theme one highlighted that although leaders may have a degree of power and influence over the workers completing the paperwork associated with the risk-awareness program, theme two highlighted that this influence may not extend to changing workers' values and beliefs about what it means to work safely. In fact the workers believe that the paperwork is a waste of time and therefore do not value the paperwork as a means for making the workplace safe. Workers, however, do value their own safety and theme three reveals that workers believe that they are able to work safely by exercising 'common sense'.

The use of the term common sense was widespread among, but isolated to, the workers. Interestingly, common sense is rarely mentioned in the safety culture literature, therefore it was not taken into the field as a sensitising concept; rather it was an unexpected outcome of the fieldwork. Common sense is a concept that would probably be at odds with the intent of most occupational health and safety law and possibly the view held by other sections of society that it is common sense that safety is not common sense. This view is supported by reports commissioned at different times and for different reasons by government agencies responsible for occupational health and safety in New Zealand and Australia. These reports are also examples of those rare occasions where common sense and safety culture are mentioned in the literature.

The New Zealand reports were commissioned by the Department of Labour to evaluate the impact of legislative changes upon safety management (Centre for Research on Work Education and Business Limited, 1999, 2000). The two phases of the research involved 20 organisations representing a cross-section of industry (Centre for Research on Work Education and Business Limited, 1999, 2000). Data was collected through interviews with a range of stakeholders including employers and employees. One finding was that workers and supervisors believed safety was common sense, an assumption that was rejected by senior managers (Centre for Research on Work Education and Business Limited, 1999, 2000). Phase one of the research identified three clusters within the data

that reflected the maturity of safety management: laissez faire (stage one), active (stage two) and integrated (stage three) (Centre for Research on Work Education and Business Limited, 1999, 2000). The research located common sense within the least developed phase, stage one the laissez faire stage (Centre for Research on Work Education and Business Limited, 1999, 2000). This result is significant because it highlights that different groups of actors within the same safety system can have contradicting values and beliefs. The regulator places a low value on common sense, whereas workers place a high value on common sense.

The Australian report was commissioned by the Australian Safety and Compensation Council to identify the drivers and barriers to improved occupational health and safety performance within the agriculture sector (O'BrienRich Research Group, 2006). Data was collected through 37 interviews with farmers and safety experts (O'BrienRich Research Group, 2006). Again, the research found that a significant barrier to improved occupational health and safety performance was the belief among farmers that safety is common sense (O'BrienRich Research Group, 2006). The report, titled "Beyond Common Sense" does not offer any further insight into common sense, except that it is a barrier, and again highlights that different groups of actors within the same safety system can have contradicting values and beliefs.

Gerber (2001, p. 72) however, in a phenomenographic study of common sense that involved interviewing 56 workers in a range of industries on their "experience of and practice in using common sense in their work" found that common sense was associated with acting and working safely because "they have anticipated the problems in performing a work task and they avoid any risky behaviours". This view of common sense may have something in common with risk-awareness, in fact Gerber argues that common sense may be an example of acting mindfully (Gerber, 2000).

Common sense also emerged as a factor in two separate studies of the mining industry in Australia. In the first study, Somerville and Abrahamsson (2003) explored how mine workers learn safe work practices and found that workers referred to and preferred to use

“common sense” rather than safety rules. Similarly, in a study of safety rules at a mine site Laurence (2005) also found some support for the view that safety rules should reflect common sense. These findings may reflect Turner’s (1996) view that beliefs about what constitutes safe work practices may be embedded in “common sense” and culturally accepted views of work. Although Turner’s work is in the area of disaster research, it may be that even for mundane and every-day risks, common sense views may prevail until a serious injury occurs. The serious injury may challenge existing beliefs about safe work practices and render them incommensurate with previously held common sense. As a result, cultural re-adjustment (Turner & Pidgeon, 1996) may occur that also includes some re-adjustment of what constitutes common sense in relation to safe work practices.

The literature on common sense has its roots in philosophy (Lonergan, 1957, 1980), anthropology (Geertz, 2000) and the study of health behaviours (Diefenbach & Leventhal, 1996; Leventhal et al., 1980). Common sense knowledge, a concept derived from philosophy and anthropology, and as opposed to theoretical knowledge, is characterised by knowing for the sake of doing (Gerber, 2000, 2001; Stewart, 1996). This type of knowledge is practical, concrete, immediate and localized (Stewart, 1996). Common sense, therefore, can develop into a shared network or system of beliefs (Forguson, 1989; Linde, 1993) about the world and be thought of as a cultural system (Geertz, 2000). On this basis, common sense may be a powerful part of workplace learning because it draws upon insight and intuition when making decisions. Insight is the understandings people hold to perform certain actions (Gerber, 2000; Lonergan, 1957, 1980; Stewart, 1996). Intuition is the translation of experience into action (Klein, 2003). Common sense is defined by Lonergan (1980) as:

> A basic nucleus of insights that enables a person to deal successfully with personal and material situations of the sort that arise in his ordinary living, according to the standards of the culture and the class to which he belongs. (p. 111)

As such, common sense knowledge does not aim to produce knowledge that is “universally valid”; rather validity is tested by the ability of common sense to deliver “practical results” (Stewart, 1996, p. 16). Common sense insights are always incomplete

and will differ across time and place, that is, common sense knowledge is a form of situated knowledge that is specific to a particular culture or community (Geertz, 2000; Gerber, 2000, 2001; Stewart, 1996).

The workers in this study would probably subscribe to this action oriented view of common sense knowledge. Workers believe in and value common sense resulting in a network of basic underlying assumptions among the workers. These assumptions have a high impact on culture in that they are difficult to change (Schein, 2004). The workers' basic underlying assumptions that safety is common sense may be at odds with the basic underlying assumptions held by managers, or at least as espoused by managers.

It is against this understanding of what constitutes common sense knowledge that I will present what common sense meant to the workers in this study in the context of the risk-awareness program and safety.

5.4.1 Site A workers' perceptions of common sense and safety

5.4.1.1 Safety is common sense

There was a widespread perception among the workers that safety in general and the risk-awareness program in particular is 'common sense', a belief that is summed up in the following comment:

> *… and do just the common sense things to make the job safe for myself, and for everybody else that is working with me or working around me so they are not going to get injured in doing that job.*

This excerpt reinforces the view that workers value their own safety and the safety of others around them and believe that through taking responsibility for their own safety by exercising common sense that they will not get injured. Geertz (2000, p. 76) argues that common sense as a cultural system rests on " the conviction by those whose possession it is of its value and validity", in this case, workers value common sense as a valid way to not get injured and it is this basic underlying assumption, held by the workers, that reduces the ability of the risk-awareness program to change culture because basic underlying assumptions "are extremely difficult to change" (Schein, 2004, p. 31).

But this worker also acknowledges that complacency can be the enemy of common sense and that the risk-awareness program is one way that the organisation can ensure that common sense is exercised:

> *… we need to be constantly reminded to exercise our common sense and not to get complacent and fall into all the usual human conditions, and this is probably management's way of just giving us a reminder and that. But then, of course, in this day and age, paperwork becomes more important…*

An example of the application of common sense to the practice of safety was provided by this worker:

*Well for argument's sake, if you are working around a wet well and you have got the lid open, well, you chuck a few hats around so the public, plus the people that are working with you, know that there is obviously a hazard there that someone could get injured or something so you eliminate that risk … and this sort of thing … is the *** ***** sorta … it's doing that, same as what I was normally thinking anyway before we got the *** ****** …*

This example of common sense and the practice of safety is consistent with Lonergan's (1980, p. 111) view that common sense consists of insight that allows, in this case the workers to "deal successfully … with a situation of the sort that arise in his ordinary living", that is, *chuck a few hats around* an open sewer well to *eliminate the risk*. This insight, that is, placing hats around open sewer wells alerts people to the danger and prevents them from falling in, has been learnt over time as a concrete and practical way to deal with the risk of an open well and has been added to this workers "storehouse of information, of understanding how to deal with a given situation" (Stewart, 1996, p. 14). This view is supported by another worker who stated that: *it is pretty much common sense, not so much common sense, learnt common sense from experience*.

The notion that safety is learnt common sense from experience is supported by this worker when reflecting on the two versions of the risk-awareness program. This worker said:

*…the card which was introduced a lot later. To me it's just a variation on the *** ***** theme only that nothing is written down; it's just a handy reminder of the sort of mental processes that you should be using as you approach a job. Obviously most experienced tradesmen are doing that subconsciously anyhow without standing there with a glossy card in their hand…*

[I'm interested in your views on that?]

Probably as tradesmen get experience, once they're been out of their time for a few years, they have a large general knowledge and common sense sort of component to their outlook, and that's what makes us tradesmen and technicians, and that's what makes experienced people valuable is that they can generally do a lot of the basic tasks with only a bit of mental planning and they generally get through it without … we always get through it without hurting ourselves or creating any problems…

This excerpt highlights that workers also value their existing knowledge and experience learnt on the job. This time on the job also develops common sense and in the view of this worker, is what makes experienced workers valuable to an organisation. One implication of this view, however, is that novices may not have developed the same level of common sense as experts. Practical safety knowledge, both tacit and explicit is said to be stored and transmitted within a community of practice (Gherardi et al., 1998). Communities of practice also transmit knowledge about danger and safe work practices to newcomers (Gherardi et al., 1998). The notion of practical safety knowledge, stored within communities of practice, may have a lot in common with what the workers refer to as common sense. Therefore, communities of practice may be highly influential in developing common sense safety practices in novices who will be enculturated into the community by the more experienced and more knowledgeable experts. However, if the common sense of the 'experts' is incomplete relative to the risks they face, then common sense, no matter how widely valued within the community, will fall short of providing the level of personal safety that workers value. Nevertheless, the workers' belief that safety is common sense is widespread and the risk-awareness program does not offer them anything over and above what they believe to be common sense anyway. An example of this is captured in the following comments where workers said:

Well, none. I just go about it the way I always gone about it before they came in. As I said, it's just common sense that you go through the process that you normally would about thinking about what you have got to do with a job, what hazards there are and try and eliminate as many hazards as you can.

*… but with the risk-awareness program it's just like common sense, it's just a common sense thing, you should know everything that is down on that *** *****, you should know anyway before you start the job you should be thinking about them sort of things …*

Interestingly, workers can distinguish between what they believe is common sense and what is not common sense. This worker said:

*… there might be things that I might do that someone else might not be capable of doing … or if it needs two people you get two people to do it; to lift that thing up on the truck, well, geez, it might be too heavy for me, come over here give us a hand, it's just common sense. I mean at times everyone sort of steps over the line oh shit, there is no one there and you might lift something that is a bit heavy and you might struggle, it might be okay you know, but if you get hurt you think, oh what the fuck did I do that for, or if you get up oh geez, the back's a bit sore after that and that's sort of probably not common sense … but is a *** ***** … if you fill out that and say oh, uncontrolled hazards lifting hazard and you tick oh I'll get someone else to help you and there's no one else around, you still do it anyway. Just because it's on this it isn't going to protect me, all it is going to do is show to the boss he's done something that he shouldn't have done and it's written here and signed for…*

This excerpt is significant for three reasons. First, it illustrates that workers also have the ability to identify what is not common sense, that is: *you might lift something that is a bit heavy … the back's a bit sore after that and that's sort of probably not common sense*. Second, resources also influence their safety practices irrespective of common sense, that is, if *there's no one else around, you still do it anyway*. This indicates that 'safety' is a construct that transcends the individual. The individual works within a system and if that system is not providing the necessary human resources for a task, then safety may be compromised. Finally, the worker is pragmatic enough to realise that the paperwork offers no protection when common sense is compromised by a lack of resources: *just because it's on this it isn't going to protect me*. Therefore, in this case, the paperwork may

be creating an illusion of safety rather than a culture of safety. To break the illusion of safety created by the paperwork, workers believe that the organisation must implement 'common sense safety systems': As this worker said:

> *Well if you have got a good organisational culture, if management can implement … if they implement intelligent, common sense safety systems they will be embraced better by the workforce, and people would be more prepared to participate in them and use them and then overall, the safety culture will look fairly good too…*

This worker goes on to point out that historically, the culture of 'getting the job done' using informal systems and common sense had worked efficiently and without incident:

> *…here I think we've got quite a good safety culture. We have had to, especially in the early stages of the contract, where we were fairly conscious of performing efficient, giving them an efficient service to keep the customer happy. We managed to complete thousands of tasks without any major incident even though back then there was less of a formal system guiding us. To me, that was testament to experience and common sense and commitment from the fellas…*

Experience emerged as a critical factor associated with developing common sense. This worker, when asked how common sense is developed also identifies experience as a critical factor, but also identifies that not all people have common sense:

> *Perhaps yeah, you are born with some of it and the rest of it can be developed through experience and being put in different situations and being forced to think about things, and if someone is sticking this in front (slams the form on the desk with his hand) of you, 'and by the way, you have to fill this sheet out before you start the job', well then that pre thought becomes mandatory so you will go through a process. This is all ridiculous but okay, we are going to go through this process but then you will by ticking the boxes go through the process but does that develop common sense? No. But I think that over time you will develop an approach, a*

systematic approach where you, at least do for people who don't have common sense and wider view of things, will at least take in the hazards that they would otherwise not have …

This comment highlights that the risk-awareness program does not develop common sense in those workers who are perceived to have common sense, but may help develop common sense in those workers who are perceived to not have common sense. This comment suggests that it is possible to develop common sense in workers, that common sense can be taught, a view supported by Geertz (2000, p. 76) who argues that common sense can be "questioned, disputed, affirmed, developed, formalized, contemplated, even taught". Gerber (2001) argues that managers should identify workers who exhibit common sense and use them as leaders to help solve problems.

5.4.2 Site A managers' perceptions that safety is common sense

5.4.2.1 There is no such thing as common sense and safety

There was a view expressed by some workers that safety in general and the risk-awareness in particular is common sense. Although there was no interview question that related to common sense, managers views of common sense were sought because of the frequent reference to common sense made by the workers.

Managers were adamant that there is no such thing as common sense as reflected in the comment that *common sense does not exist*. This finding supports the findings of the New Zealand study that evaluated the impact of legislative changes upon safety management that although common sense was valued by workers, it was rejected by senior managers (Centre for Research on Work Education and Business Limited, 1999, 2000).

The opening word on common sense goes to a manager who echoes the closing sentiment from the previous section that the legal system is unlikely to accept common sense as a defense after the fact: *well it's hard to prove commonsense when it goes to a court of law*.

The perception of this manager contradicts the workers' view that common sense is built on knowledge and experience. This manager said:

> *It's not common sense, that's the issue. It's not when in actual fact you say to people well, use your experience and use your knowledge and people say well, I do, I am an electrician, for example I don't touch that wire until I test it every time? Nearly every time? Have you been electrocuted or got a shock? Oh yeah, got a couple of hits. I said well, if you test it every time how did you get a couple of hits? Oh, in a hurry …people are risk takers… pushing that aside (referring to the risk-awareness processes) and saying use common sense. It doesn't work. Because if they haven't experienced it before, or if they have got no knowledge of it, then the whole process will fail.*

This excerpt is significant because it makes the point that common sense is not enough when the demands of the current situation exceed the existing knowledge and experience of the worker, or as this manager puts it: *saying use common sense doesn't work because if they haven't experienced it before or if they have got no knowledge of it, then the whole process will fail*. This view implies that common sense knowledge must at least be equal to the range of risks faced on the job. Therefore, training, as well as experience, is important as the example given by this manager illustrates:

> *I don't think it is common sense, a lot of it, some of it is common sense I suppose, but not all of it, no, it's not common sense. The practices you'd put in place to do an excavation, to shore it up properly, all these sort of things, to safely block off a road for example, that's not common sense, so there is a lot of training as well as common sense in safety. It's common sense before you pick up something hot, put a glove on, that's common sense. I wouldn't say it's all common sense, no, there has got to be a fair bit of training rolled into it as well. Common sense probably comes into play then when you think well, it's common sense to know what training I now use to do this…*

5.4.3 Site A anecdotes from the field

The three anecdotes that I include here are all taken from my observations in the field and are included here to amplify different aspects of common sense and the practice of safety. The first anecdote 'decommissioning an aerator' illustrates how workers use common sense to improvise and solve problems. The second anecdote 'a loose telemetry wire on a windy day' illustrates how this worker uses common sense as part of decision making about risk on the job. The third anecdote 'summertime and a hot truck exhaust on dry grass' illustrates that common sense is very situation specific and may not transfer from one situation to an other like situation.

5.4.3.1 Decommissioning an aerator

This anecdote captures how workers value common sense and improvisation and use common sense knowledge to solve real and immediate problems. I will refer to the two workers as 'Pat' and 'Jim'.

> *Today I traveled from ****** to ****** with Pat. We arrived at the Trade Waste Water Plant that takes trade waste from ****** when their system fails. There were a number of aerators in a large pond with one thrashing the water. The task was to remove the electrical cable from an aerator located about three metres off-shore. This aerator was being decommissioned because its gear box had failed. A crane was due the next morning to lift the aerator from the pond. Not long after we arrived Jim arrived and Pat and Jim discussed the job. Pat started to write a ***** ***** for the job and Jim passed by and asked Pat 'are you only doing it because David's there'? Pat admitted that this was the case and that the process was "bullshit" and that what applied was* ***"common sense"****.*
>
> *The water on the pond was still with the exception of some gentle turbulence created by the nearby aerator that was thrashing away madly. There were signs of blue green algae (according to Pat and Jim) close to the shore. The weather was pleasantly warm. The task would clearly be different if it was raining and windy which would make the water choppy and the aerator, particularly the ballast tanks,*

slippery. The plan of attack was to gain access to the aerator and to do whatever it took to cut the electrical wires. Jim arrived with life jackets which they both placed over their heads. They both also wore rubber gloves. Jim removed an aluminium ladder from the roof of his van to use as bridge from the shore to the aerator. He turned to me and asked me: 'is using a ladder ***common sense****'? With spanners and other tools in hand both Pat and Jim tentatively made their way across the ladder and onto the aerator. Pat started to cut away the electrical wire, a task that at one point required him to balance precariously over the edge of the pontoon to undo the last remaining bolts holding the wire. One slip and he would have fallen in. In fact, he nearly dropped his spanner into the water (they use a magnet to retrieve dropped items or simply buy new ones). Finally, the wire was free and was thrown into the water. They both made their way back across the aluminium ladder to dry land, with Jim nearly slipping off the ladder in the process as the ladder moved under his damp boots. Once on shore, the two of them heaved the heavy cable from the water and placed it on the shore line. By the end, Pat had torn the finger out of his glove from handling the cable.*

In general discussion afterwards it was revealed that they normally use a boat to access the aerators but Pat does not have a license.

This anecdote is significant because it supports the view that workers value and use common sense knowledge because it delivers practical results, in this case, using a ladder to gain access to the aerator. The fact that the workers completed the task successfully reinforces their belief that safety is common sense. Had 'Jim' fallen off the ladder and injured himself, then using the ladder as a means of access may no longer have been deemed common sense. New stories might abound about how Jim fell in the waste water. These stories could be passed on to newcomers and novices as an example of how not to access aerators, thus forming new underlying assumptions within the culture of the community of practice. This is an example of what Geertz (2000, p. 78) refers to as "truth claims of colloquial reason"; claims that hold true within the culture until disputed by new evidence.

5.4.3.2 A loose telemetry wire on a windy day

This anecdote, which occurred during a visit to a water treatment plant, captures how this worker uses common sense as part of his decision making about risk on the job. I will refer to the worker as 'Seb'. I derived this anecdote from observations in the field and the observation was used as a focus for discussion during a semi-structured interview with the same worker. The first part of the anecdote is drawn from my field notes, whilst the second part is an excerpt from the interview with the worker.

Field Note:

*From ****** we headed back to ****** for lunch before heading off for a scenic drive to the coast to the ****** water treatment plant. At ****** we met the operator and discussed a number of jobs. One was reconnecting the telemetry wire to a guy wire. The telemetry wire had broken free in the strong winds and was dangling in mid-air. Seb said that he would use a scissor lift on the back of a trailer to do the task but that he would have to wait until the winds reduced. This seemed to represent good situation awareness.*

Interview:

[When we were at ****** plant you were talking about the weather in relation to going up … to reattach the telemetry wire and saying it was too windy]

Yeah, yeah, well that's right, yeah, you're not going to work in a trailer mounted on a cherry picker on a day like today because it is just far too windy, you are going to pick a day … it's the same sort of thing, you look at the job and you go, okay what do I need to do … well okay, I need to do get some sort of cherry picker that can level up because it is on uneven ground, you need to look at the conditions of the weather; if it is raining, if it is windy on that job that … you can't work in them sort of conditions, it's just ***common sense****. That was even before I have started the job but that's even before you even grab the *** *****.*

This anecdote is significant because in this case, it supports the workers argument that the practice of safety is common sense. This worker was able to arrive at the decision to delay the job, because it was too windy, without the use of the risk-awareness processes, relying instead upon common sense. This anecdote supports the view that common sense might be an example of acting mindfully (Gerber, 2000).

5.4.3.3 Summertime and a hot truck exhaust on dry grass

This anecdote occurred at a road side sewer pump station and captures how common sense is not enough to identify all risks on a job. Furthermore, it highlights that common sense knowledge may be very situation specific. This anecdote begins with my field note for the purposes of setting the scene and concludes with an excerpt from an interview with one of the workers present that day.

Field note:

*The task was to have a look at the job and prepare it for installation of a flow meter. The job was located at a sewer pump station in a nearby rural town. The sewer pump station was located adjacent to a road and close to a five way intersection. There was not a cloud in the blue sky and the early morning sun was already noticeably hot. The area was flat and gum tress dotted the adjacent paddocks. A woman in a nearby house mowed her lawn. The sewer pump station was comprised of a tall green box containing electronics, a well that contained pumps and that was deemed a confined space, a well with an air valve, and a substantial trench barricaded by star pickets and tape. The trench had been dug the previous night and was approximately 1 metre by 2 metres and 1.5 metres deep. A pile of clay lay at the side of the trench. In the trench there was exposed pipe work and what I learnt was a flow meter. The flow meter was not working and was covered by an old towel. The job was to remove the flow meter and replace it with a new one which another fitter was picking up from ******. Tony surveyed the situation and made passing comments such as that doing a task like this was "like the blind leading the blind" He had never seen this sewer pump station before and even had had some trouble finding it. He opened the lid to the confined space and*

peered inside exclaiming that he had "no intention of getting in there". His main concern seemed to be for electrical isolation and for isolation of the sewer line.

*Tony completed a *** ***** in the truck with the view that it was "book keeping" and that it "doesn't alter what I am going to do". He muttered that it was "compulsory paper work". He also admitted that he didn't feel safe and had argued, unsuccessfully, for a permit system similar to what he had used at the power station, even though it took longer he felt it was a safer option. He was told that that wasn't the pathway ****** was going down. Tony's view was that not too many *** ****** were performed and that many were performed after the job.*

Tony jumped in the trench and with a crowbar and shovel began clearing clay away from around the broken flow meter. Once he had done that he loosed the nuts holding the flow meter in line or as he put it: "cracking" the nuts on the pipe. He quipped that he wouldn't do it on a steam line but thought that he could get away with it here and that he would take the risk. Nothing leaked from the pipes. He then seemed unsure about where or how to isolate the sewer line. He looked in both other pits. Finally he called Robert back at the depot and Robert said he would come out and have a look. Robert arrived on site and quickly decided that the best way of emptying the sewer line was to empty the contents at the air valve and into a 'sucker' truck. Robert arranged for a truck to be on site. Robert also said he would do a Job Analysis for the job. We returned to the depot for Tony to get further parts.

*We returned to the job and waited for Robert, the truck and the fitter to return from ****** with the new flow pump. Tony laughed when I asked had Robert done the Job Analysis. Robert arrived with Teriq the new fitter on board. This was part of Teriq's orientation. Robert had a "generic" or "developed" Job Analysis with him which he ran through with both Teriq and Tony. Robert then went on to explain the *** ***** and Job Analysis in some detail to Teriq on the back of Robert's truck. Robert kept referring to the items on both the Job Analysis and the *** ***** as*

*just a "prompt". Teriq had never seen a Job Analysis before and Robert advised him that he had better get used to doing the paper work. Darren arrived from ****** with the new flow meter and called the depot for a special tape that the flow meter would be wrapped with in the ground. The sucker truck finally arrived after being delayed and backed up onto the grass on the side of the road near the pit. In accord with the Job Analysis, everyone wore reflective vests (except me and the instrument technician). Tony climbed into the pit housing the air valve to attach the adapter. The truck began pumping waste from the line. Talk about the job flowed constantly between all on site with the exception of Teriq, the new guy, who like me, just watched on. Whilst the truck was emptying the line Gary (the HSE guy) arrived with one of the boys from upstairs. The feel on the job changed noticeably and one has to wonder if Robert's concern for completing the *** ***** and Job Analysis was done in response to the impending presence of the HSE guy. Interestingly, the HSE guy smoked a cigarette as he watched the guys go about their work. A safety vest was found for me. Gary and Robert had a long conversation at the side of Robert's truck. I wandered over and they were discussing the *** ***** and Job Analysis. Gary had some concerns that items specific to the job had not been included. In particular, no one had picked up the risk of the hot truck exhaust on the dry grass (mind you, the HSE guy was smoking).*

Once the line was empty, Tony climbed back into the trench and began to loosen the nuts to remove the old flow meter. This seemed to take quite some physical effort and more digging. When finished he used a crow bar to dislodge the flow meter from the line, allowing sewerage to enter the trench. He lifted the heavy flow meter to the side of the trench. The sucker truck operator prepared to drain the trench to allow the new pump to be fitted. At this point I left with Robert.

This interview was conducted with 'Teriq' who was new to the site having only commenced that week. We were talking about the job described above and I had asked Teriq could he give me examples of hazards on that task. Here is how the conversation unfolded.

Interview:

[Could you give me another example of a hazard on that task?]

Well, there is a falling hazard into the pit and also they had the top open occasionally for the well, that was a falling hazard.

[How could that occur?]

Not looking where you were going, the big hole was roped off anyway but looking what your doing not assessing the situation properly … jumping over in and out .. the sort of thing you have to be very careful of. The impact, the most likely result is falling in the hole, some of them holes are pretty deep plus full of water sewerage in that case so it's not the best thing. The other hazards were the truck driving around and coming in and out, you had to keep an eye on that although it didn't move but it could have, plus next to the roadway as well, you have got to be careful of cars coming past.

[Could you think of a less obvious hazard on that particular day in that environment?]

Less obvious one? I know it was bloody hot! It was getting hot.

[What Gary picked up was the dry grass with the truck and exhaust.]

A fire hazard! I never thought about that actually

[It's interesting to think about that hazard in relation to common sense when you think you can see everything ...]

Yeah

[But perhaps sometimes you cannot …]

Yeah

[I wondered if the risk-awareness program would have helped you see that hazard?]

Probably not from that point of view actually, but it's actually strange because you think about it when you're driving, or I do anyway because I do a lot of four-wheel driving, and that's one thing I think about, if you're driving over long grass you have got to be careful about that, it's quite easy to start a fire, but not in that situation I didn't though.

[I wondered whether either risk-awareness processes would have picked this up?]

Either didn't really.

[Did they?]

No

[Would you could say that that is common sense?]

Well that's very much common sense.

In responding to questions about the hazards and risks faced on this job, the worker failed to identify the fire risk associated with the hazard of a hot exhaust pipe of the sucker truck contacting tinder dry grass. This is despite the fact that the worker is a member of a four wheel drive club in his spare time, and the risk of fire from a hot exhaust pipe is always forefront in his mind when he is driving his four wheel drive in long dry grass. It is also worth noting that the paperwork associated with the risk-awareness program was completed for this task, but that process also failed to identify this risk. The key point is, neither common sense nor the paperwork was sufficient to perceive this risk.

The significance of this anecdote to the discussion of common sense is that it supports the view that common sense knowledge is highly specific to a particular situation and culture (Geertz, 2000; Gerber, 2000). Teriq was well aware of the risk of a hot exhaust setting fire to dry grass when participating in four-wheel drive activities, but this knowledge did

not transfer across to the workplace even though the circumstance, in principle, were the same. Therefore, common sense may be creating an illusion of safety for workers as much as the paperwork is creating an illusion of safety for managers.

5.4.4 Site A within-site comparison of findings

Workers and managers have very different perceptions in relation to common sense and the practice of safety. Where workers perceive safety and risk-awareness to be 'common sense' gained on the basis of knowledge and experience on the job, managers perceive that common sense does not exist and that training is required to provide workers with the necessary knowledge to perform their tasks safely.

Observations from the field both support and dispute the managers' perspective. Common sense works in some situations and not others, the hot exhaust on the dry grass is a case in point. But the risk-awareness program also failed to identify this risk so both common sense and paperwork may be creating an illusion of safety.

5.4.5 Site B workers' perceptions that safety is common sense

5.4.5.1 Safety is common sense

A small number of workers believed that safety in general and the risk-awareness program in particular is 'common sense', a sentiment summed up well by this worker in the following comment:

> *… me, personally, I think that common sense prevents injuries to a great extent. This does a great job, but at the end of the day the person who has got the saw in their hand or the bucket at their controls needs common sense …*

This comment is consistent with other research that has found that workers refer to safety as common sense (Centre for Research on Work Education and Business Limited, 1999, 2000; O'BrienRich Research Group, 2006).

Furthermore, workers perceive that they use common sense on the job, rather than the risk-awareness program, to assess risk and make risk-based decisions about their work. One worker said:

> *… it's common sense stuff for myself.*
>
> [What do you mean by common sense?]
>
> *Things like rocks and near playgrounds, you don't mow if there are kids playing on the playground, you don't mow up next to them. They want you to write it down and say, okay, there are kids at the playground and then stop. So really you have filled it in for nothing because you were not going to do the job … you have got to think about everything and writing it down won't necessarily make you think about it …*

The significance of this quote is that it again highlights the paperwork or 'writing it down' is an issue. The perception of this worker is that thinking about risk is common sense and that *writing it down … won't necessarily make you think about it*. Workers

view themselves as capable of using their common sense to think about risk and to make risk-based decisions, for example, in relation to the playground: *if there are kids playing on the playground, you don't mow up next to them*. This, again, is an example of workers using common sense knowledge to solve practical problems (Stewart, 1996).

Workers, therefore, equate risk-awareness with common sense, not paperwork, and are confident in their ability to be aware of hazards. Another worker said:

> *… I am aware of what is going on, of hazards and it's just a common sense thing David, do you know what I mean?*
>
> [What does common sense mean to you?]
>
> *Well basically um awareness of what is going on and safety issues and the way to deal with things and … making sure I am not being silly …*

But this worker concedes that you may need to be reminded to exercise common sense because you 'drift away':

> *But you have got to be reminded of common sense … now and then. Sometimes you drift away and you get too wrapped up in what you're doing…*

This worker also agrees that you need to be reminded to exercise common sense:

Um, it's reminding us of that common sense, and sometimes you can't remember everything to do with common sense and need looking at it, it reminds me and as much as I don't like them, that's my honest opinion, I have to do them and I am aware of that, totally aware of it.

Both these excerpts reveal that although workers value their common sense over the risk-awareness program, they concede that there are limitations to common sense and that the risk-awareness program plays a role in reminding them to exercise their common sense.

5.4.6 Site B managers' perceptions that safety is common sense

The managers at this site were not questioned in relation to the idea that safety is common sense because workers use the term less frequently compared to site A.

5.4.7 Site B anecdotes from the field

The two anecdotes that I include here are taken from my observations in the field and are included here to amplify different aspects of common sense and the practice of safety. The first anecdote 'common sense and thinking in terms of cause and effect' illustrates that risk-awareness must be a thought process that is ongoing throughout the job. The second anecdote 'circular saws and power leads' is an example of what common sense means to one worker.

5.4.7.1 Common sense and thinking in terms of cause and effect

This anecdote arose during a conversation in a truck on the way to a job. The worker, who I will call Ethan, and I were discussing the risk-awareness program. The conversation was prompted by a toolbox meeting that morning where the contract manager had reinforced the need to complete Risk-awareness programs.

The drive from the depot to the job only took about 15 minutes, but was enough time for Ethan to put forward what I thought to be a different and useful view of common sense and the risk-awareness program.

Here is how I captured the conversation in my field notes:

> *In the truck on the way to the job Ethan and I had a chat about *** ******. Ethan admitted that he doesn't do *** ****** but said he will start doing them following the toolbox meeting this morning. Ethan said he 'would do what he was told to do' It was evident that Ethan didn't think highly of *** ******. He didn't think they were useful and he said that 'I have developed a second nature'. Ethan told me this*

twice and the second time he said 'second nature common sense, I know what I am doing'.

Ethan's view was that 'not enough people today think ahead, they don't use fore-thought in terms of what they are going to do. I would like to know how you can teach people this, how people can learn to develop fore-thought, to be able to think ahead. I do that all the time when I am going through the job, I don't do it just once when I fill in a bit of paper, I do it all the time'.

Ethan believed that it was artificial to believe that thinking occurs just at the one point in time when you fill in the paper, rather, it is ongoing throughout the job. For example, he said 'if you're going to move something from A to B, what's its impact on some other point, say C?' Ethan thought that it would be useful if you could develop this forward thinking in people and he thought the problem is that 'a lot of the time people don't do this, they just jump in and do the job without thinking'. Ethan used the example where Roger had dropped the limb onto the fence and smashed the fence. Ethan said Roger should have been able to foresee that and think that if you're going to cut that whole limb down, what could happen when you do?'

Ethan's insights raise a number of interesting points. Firstly, Ethan is prepared to comply with the risk-awareness program because he has been instructed to do so by his senior manager, but he retains his belief that they are not useful, a pattern identified earlier in themes one and two. The second point of interest is how Ethan thinks about risk and the job, that is, in terms of cause and effect. For Ethan, this is something that he has developed that he calls 'second nature common sense'. The current risk-awareness program, with it reliance at this site on a 'tick-a-box' checklist probably does not facilitate cause and effect thinking. The third point, which is related to the second point, is when to use cause and effect thinking. Ethan makes the point that it is not enough to think about risk only at the start of the job, it needs to be an ongoing thought process throughout the job. The risk-awareness program with its focus on assessing risk either

formally or informally at the start of a job may be limiting thinking whereas risk-awareness requires a ‘life of job’ awareness of the risks so that the unexpected can be identified and managed (Weick & Sutcliffe, 2001).

5.4.7.2 Circular saws and power leads

I have already made the point that the use of the term ‘common sense’ was less prevalent at this site than site A. However, during my time spent in the field, workers from time to time would mention that safety is common sense. I have included here one small snippet from my field notes where a worker did refer to, and gave a practical example of, common sense and the practice of safety:

> *Adrian said that he sees *** ****** as arse-covering and felt that they were only useful for those that don't know what they are doing. Adrian said he knew what he was doing, for example, using the circular saw. Ever since he has used a circular saw he knows not to get it near the power lead: ‘you don't cut the power lead with the circular saw, which is just common sense. Maybe *** ***** is useful for those guys, and I don’t know if they are out there, that wouldn't think of that sort of thing’.*

This is a very simple example and almost not worth including here because most people would agree with Adrian that this is common sense, that is, it is so obvious to most people that it is common and makes sense. However, although it may be common sense, it is still possible to cut through the power lead with the saw. In fact according to a manager, it has happened at this site. Therefore, common sense might not equate with awareness as the workers believe. In the heat of the moment, a worker could lose situation awareness (Endsley, 1995b) due to a variety of factors, for example, distraction, information overload and time pressure and inadvertently cut though the power lead – even though he or she knows full well that it is common sense not to. This view reinforces Ethan’s earlier view that thinking and awareness must extend beyond the start of the job to encompass what I have called ‘life of job’ awareness.

5.4.8 Within-site comparison of findings

It is not possible to make within site comparison of findings because I did not question managers on their views on common sense nor did managers naturally refer to common sense in either informal conversations or during interviews. It is possible to say, however, that workers did mention common sense and mangers did not.

When workers mentioned common sense it was often equated with risk-awareness, although workers conceded that they may need to be reminded to use common sense.

5.4.9 Between-site comparison of findings

Workers at both sites A and B referred to safety and risk-awareness as ‘common sense’. However, the use of the term common sense was more widespread among workers at site A than site B. Cultural differences between the sites may be one explanation for this difference. At site A workers and managers talked of a culture of ‘getting the job done’. This type of culture, coupled with a lean organisational structure may force workers to rely more heavily on their common sense than site B where the contract manager is fostering a culture of saying ‘no’ to unsafe work and providing the time for workers to stop and think about risk before starting work. Workers at site A equated common sense with knowledge and experience whereas workers at site B equated it with an ability to be aware of hazards and risks.

However, the main difference lies between workers’ and managers’ perceptions. At site A managers were adamant that common sense does not exist and that training plays a key role. Managers at site B were silent on the matter of common sense. Therefore common sense seems to be something that is valued by workers more than managers, and valued more highly at site A than site B.

The key insight up to this point in the narrative is that common sense may be creating an illusion of safety for workers as much as the paperwork is creating an illusion of safety for managers.

5.5 The Practice of Risk-awareness on the Job

Risk-awareness is an approach to culture and safety that, it is argued, is similar in approach to the concepts of collective mindfulness and an informed safety culture (Hopkins, 2002; Hopkins, 2005a). Risk-awareness programs are "mini risk assessments" (Hopkins, 2005b) that, although they take place in workers' heads, must be supported by organisational processes and structures and management practices (Hopkins, 2002; Hopkins, 2005a; Hopkins, 2006a). The concept of risk-awareness is similar to the concept of situation awareness (Flin, 2006). Situation awareness is one component of being sensitive to operations; one of the five processes associated with collective mindfulness (Weick & Sutcliffe, 2001; Weick et al., 1999).

Situation awareness is an approach to understanding the cognitive processes involved in decision making in complex and dynamic environments (Endsley, 1995a). Although situation awareness has its origins in aviation (Endsley, 1995b; Stanton et al., 2001), it is applicable to a range of working environments and, according to Endsley (1995b, p. 33) "even everyday activities call for a dynamic update of the situation to function effectively".

Endsley (1995b) proposes that situation awareness is about "knowing what is going on" and defines situation awareness as:

> … the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future. (p. 36)

Endsley (1995b), has proposed a model of situation awareness in dynamic decision making that includes a three-level hierarchy, or three steps toward achieving situation awareness from which decisions and actions flow. The first level, perception of elements in the environment, is influenced by the ability of the individual to pay attention to the relevant elements. This ability is influenced by experience, training and the availability of cues in the environment. The second level encompasses how people interpret and integrate information relative to their goals. Experience plays a role as does existing

mental models against which the picture of the situation is compared. The third level, projection of future status, is influenced by how effectively meaning is comprehended so that future status can be predicted for decision making.

Situation awareness is affected by a combination of human as well as task and system factors (Endsley, 1995b). A person's limited attention and working memory capacity both restrict situation awareness, but these limitations can be compensated for by mental models developed through training and experience (Endsley, 1995a).

Situation awareness has parallels with risk-awareness and provides a theoretical framework for understanding the cognitive processes involved in being risk-aware. For example, the three levels of situation awareness could equally apply to risk-awareness. In the case of risk-awareness, the elements in the environment that could be of interest (perception) include the hazards associated with a particular task, the adequacy of existing safety rules, time pressure, changes in the environment and the availability of equipment and other people to assist with the task and provide additional knowledge. By integrating this information (comprehending), a picture should emerge of how things could go wrong (projection) allowing for decisions to be made about how to control risk, for example, stop work, report an error or take other risk control action as appropriate. This last point is consistent with Hopkins' (2005a, p. 73) view that workers must be empowered to act including being empowered to decide "that the job should not be done because it cannot be done safely".

Endley's (1995b) model of situation awareness will be used in this theme as a framework to explore how well the risk-awareness program has developed the workers' and managers' awareness of risk. But risk-awareness is more than a cognitive process, risk-awareness, like safety more generally, is learnt and enacted within communities of practice (Gherardi, 2006; Gherardi & Nicolini, 2000a). It is instructive, therefore, to have a working understanding of how workers enact the practice of risk-awareness on the job.

Risk-awareness programs, as enacted by workers on the job, typically comprise a combination of social practices and cognitive processes that, for the purposes of clarity of understanding, can be thought of as taking place in three stages.

Stage one involves the social practice of stopping before starting work in order to think about the job and its risks (Hopkins, 2006b). It does not matter if workers are working alone or in groups, so long as the act of stopping takes place it can be considered a social practice, irrespective of whether it is distributed across individuals distant in time or space or is localised to a group operating in the same time and space.

Stage two involves the cognitive processes that takes place both individually and collectively and that are associated with identifying risks and deciding upon what actions to take in relation to those risks. Stage two is closely aligned with Endsley's (1995b) three steps of situation awareness of perception, comprehension and projection that lead to decision making and action.

Stage three involves the second social practice that involves bringing the risk-awareness process to a close by recording the results of stage two and ensuring that all workers are aware of and agree to the results and actions to be performed to control risk. Closure can occur irrespective of whether workers are working alone or in groups, or if the results are recorded and agreed to in the head of the worker/s or on a piece of paper. So long as this practice is shared across individuals and groups, then it is construed to be a social practice that takes place within a community of practice (Gherardi & Nicolini, 2000a). At the end of stage three, the risk-awareness process is complete and work can commence.

It is against this backdrop to the practice of risk-awareness on the job that I will present the findings from the field.

5.5.1 Site A workers' perceptions of the practice of risk-awareness

The workers' perceptions of the practice of risk-awareness on the job were explored through a number of questions designed to uncover what the steps in the risk-awareness process meant to the workers in practice. Workers were asked what they look for when they stop, step back and observe (stage one – social practice); what are they thinking about when asked to think through the task and assess the hazards, pathways and impact (stage two – cognitive process) and how often they document their findings (stage three – social practice).

5.5.1.1 Already thinking about risk before starting work

In practice, the workers perceived that they did not make a clear distinction between the social practice of stopping and the cognitive processes of observing, thinking and assessing. Instead workers integrate these steps into a web of thinking about the job and its risks. Some workers perceived that the risk-awareness program did not make them any more aware of risk because they were already thinking this way, even before the introduction of the risk-awareness program, a viewed summed up in this comment from one worker: *the stuff that they have got written down on the *** ***** and ***** ***** card is what you were doing before they came in, you're automatically thinking about that anyway.* This view is reinforced by another worker who perceives that the process only applies to others:

> *… I suppose so, it makes people think. It makes people think about the job that previously they might not have been thinking about. But for myself, everything that is written down there practically is what I was thinking anyway. What tools I am going to need for the job, what the hazards are there, what risks could be there - like you could fall down the well, what risks, tripping hazards and all that sort of stuff is all on that sheet that you're already thinking of anyway …*

Furthermore, this worker takes the view that it is common sense to think about risk:

Well like I said, most tradesmen … pretty much you're going through most of these steps as you approach the job. You get out of the car, you have been advised what the possible problem is … you are going to do step one stop, step back and observe well, you are doing that as you are approaching the job, think through the task well with years of experience you're pretty much saying, well, that will be broken and that will need fixing and I will need one of them, and at the same time you're assessing, your thinking what hazards you're going to create. In my trade there are other things you have to think about too. The impact of the work you are doing on the plant controls … so some of it is pretty much common sense, not so much common sense, learnt common sense from experience…

The pattern that emerges here is that workers believe that they were already thinking about risk before starting work and certainly prior to the introduction of the risk-awareness program. The last comment serves to reinforce the value that workers place on their common sense.

To better understand how workers think about risk and to qualitatively assess their capacity for risk-awareness, they were asked to talk through a practical example of how they think about risk. An attempt has been made to classify their responses according to the three hierarchical phases in Endsley's (1995b) model of situation awareness and the results are shown in Table 6.

Table 6

Comparing the workers' ability to think about risk with Endsley's model of situation awareness and decision-making (Site A)

		The Three Hierarchical Phases of Situation Awareness			
Worker number	**General comments**	**Perception of the elements in the environment**	**Comprehension of the current situation**	**Projection of future status**	**Decision and performance of action**
1	*The first thing that I would do when I get onto any job, and yesterday was pretty typical, I'm sent out to a job but I have never been to before so the first thing I do is try and find where it is.* *well what are the other risks?*	*Then when I get there I try and find out what is it I am working on and what it does, in this case a sewer pump station - a remote sewer pump station, relatively remote* *Well it was close to traffic, close to a road. Who was I working with?*	*and it pumps sewerage from one pit to another and it's got a fault. So I am trying to identify what the fault is, what part of the process is this fault in when I have found that out then I will know what the risks are*	*I could get covered in sewerage if the pipe broke and*	*okay how do I isolate that sewerage, how do I get rid of it, there are pumps the other side so we have to isolate them electrically, you might have to isolate them physically too with valves and whatever so that is all part of a step back and observe okay, I'm looking around,*
2	*All right, the job you came out on the other day. I got the phone call to go and check the job out. They didn't know where the fault was. Found the initial fault, roll up on the job -*	*you know it's a roadside job*	*because you've got to block the road off to open the well.*		*so you've either got your vest on or supposed to have a vest on.* *we have got to have signs out and that … so I'm thinking, alright, while he's coming I will get the signs ready while I'm waiting and to know that we have to have someone with the stop/go bat because we have got half the road shut …*
3	*Alright, if I pull up at a sewer pump station on the road somewhere in ****** pull up, stop the car*	*if I'm on a busy road* *If I have got to open a pit lid look up the street see that there is no one around, if there are going to be pedestrians*	*… if it is a high pedestrian area and it is a job that can wait*		*put the hazard lights on, get out of the car.* *I will come back another time at a quieter time,*

Source: Adapted from Endsley (1995)

Even though the workers perceive that they are already thinking about risk, their responses suggest that the workers' ability to achieve situation awareness may be incomplete. For example, although all three workers were able to perceive at least some of the relevant elements in the environment that would be related to the goal of working safely; for example, *it's a roadside*, it might be reasonable to assume that this worker (worker number two) would also have perceived 'cars' to be a relevant element to the goal of working safely. One explanation may be that for the worker, 'cars' are assumed to be an implicit element in the comment 'it's a roadside'.

However, all three workers were also able to move from awareness to comprehension, in other words, to synthesise the elements and to understand their significance relative to the goal of working safely, or what Endsley (1995b, p. 37) refers to as forming a "holistic picture of the environment". For example *you've got to block the road off to open the well*.

The workers situation awareness was most incomplete at the third level in the hierarchy, the ability to project the future status of the elements in the environment (Endsley, 1995b). Only one of the three workers (the first worker) was able to move from comprehending the current situation to projecting future status, in this case risk: *I could get covered in sewerage if the pipe broke*. The remaining two workers moved directly from the comprehension level to decision making without projecting how their safety could be compromised. For example, and returning to the roadside example (the second worker), this worker does not project future status of risk which presumably could include being hit by a car, instead the worker moves directly to a decision on how to control risk: *we have got to have signs out … we have to have someone with the stop/go bat* … Again, this worker's projection of risk may be implicit in their decision, that is, there is a need to control traffic, but the worker does not make this thinking explicit. Worker three decides that: *I will come back another time at a quieter time* and this decision could be interpreted to mean that the worker feels empowered to make decisions, a key characteristic of a culture of safety that is risk aware (Hopkins, 2005a).

The “assess” step in the risk-awareness program is built on a “hazard, pathway, impact” model of understanding risk. This model is designed as a prompt to help workers think about risk. The workers were asked to explain what these terms mean to them and to provide practical examples. Their responses are shown in Table 7.

Table 7

Workers’ understanding of the key terms for assessing risk in the risk-awareness program (Site A)

Worker number	**Key terms for assessing risk**	**Definition**	**Examples**
1	Hazard	*The hazard, the pathway and the impact, not a lot. What's the hazard?*	*The hazard that the pumps could start up.*
	Pathway	*The pathway, I don't understand that.*	-
	Impact		*Impact, well the pump could start up, water coming out at pressure while I’m standing inside a pit, you could be engulfed with sewerage at the very least, cop it in the mouth, you could blow a valve off if it came out at high enough pressure and hit you.*
	Comment	*… but yeah, the hazard pathway impact that is pretty vague it's really not much use to me…*	
2	Hazard	-	-
	Pathway	-	*… well we were not on the pathway we were on the road weren’t we? (laugh)*
	Impact	-	*Hadn’t got hit by a car so there was no impact was there?*
3	Hazard	-	*… the hazard would be the road, hazard, the chance of being hit by a car, the chance of someone getting hurt on the roadway.*
	Pathway	-	*The pathway would be what you're going to do to rectify that or to control that …*
	Impact	-	*The impact could be that if you don't do this someone could get hurt someone could wreck a car…*
	Comment	[Have your heard the term?] *No I haven’t.*	
4	Hazard	-	*I don't know … assess the hazards, that's what I was saying about like you get to a wet well and you assess it you assess as you go, well there is a chance someone could trip and fall down the well or whatever …*
	Pathway	-	-
	Impact	-	-

Some of the workers had not heard the terms ‘hazard, pathway, impact’ but for those who had, most were unable to define what the terms mean to them, or in the words of one worker: *the hazard, pathway, impact; that is pretty vague, it's really not much use to me*. The term ‘pathway’ was particularly problematic and none of the workers were able to define or understand what this term meant.

Both tables of results are significant for a number of reasons. Table 6 highlights that neither the risk-awareness program nor the workers' common sense may be sufficient for the workers to achieve situation awareness.

The limitations of common sense in the context of situation awareness may best be illustrated by the story of the "hot exhaust on the dry grass" from the previous theme. The ability to achieve situation awareness is influenced by a combination of individual, system and task environment factors (Endsley, 1995b). At the level of the individual, Endsley (1995b, p. 40) states that "in combination, the mechanisms of short-term sensory memory, perception, working memory, and long term memory form the basic structures on which SA is based". The limitations of working memory can be compensated for by using mental models stored in the long-term memory (Endsley, 1995b). Mental models are mental representations of situations that people build based upon their experience of the world (Langan-Fox et al., 2004) and are developed through "training and experience in a given environment" (Endsley, 1995b, p. 44). When workers refer to common sense they may in fact be referring to mental models, that is, their experience developed in a given environment. If this is the case, then in the story of the "hot exhaust on the dry grass" it may explain why the worker could not translate awareness from one situation to another. In this case, although the worker was aware of the fire risks associated with a hot exhaust on dry grass when engaging in recreational four wheel driving activities (experience in a given environment) he was unable to perceive of the same elements when they were presented in a different environment – the workplace. Therefore, common sense is limited because like situation awareness, it is environment specific. Even when workers do have experience in an environment, they need training to develop their situation awareness, if this training is lacking then their situation awareness will be more incomplete as indicated by the results in Table 6.

Table 7 highlights one of the limitations of the risk-awareness program in achieving situation awareness, that is, workers do not understand the key conceptual model of risk that is designed to prompt them to be aware of risk. This lack of understanding may also be a contributing factor to the workers inability to achieve situation awareness. However,

if the workers are not using the risk-awareness program in the first place, or are using it, but only to comply with the requirements to complete the paperwork, then it is likely that their lack of understanding of the conceptual model of risk is not having any bearing on their ability to achieve situation awareness. In support of this point, field observations confirmed that the risk-awareness program was not used on over two thirds of the jobs that I observed. When it was used, it was often my presence that motivated the workers to change their practices. In some cases the workers said that they filled-in the paperwork after the job is completed: *well technically I fill it out but after the fact and that would happen more often than not* and *I probably do them more afterwards when I'm doing the paperwork later on, just to cover their arse to say that they're doing it*.

The risk-awareness program, with its focus on completing paperwork, is not only falling short of developing shared mental models of how to think about risk in general among workers; it is also falling short of providing workers with the specific training that would enable them to build and share mental models of risk in particular work environments. This latter point is reinforced by the view of another worker present while "the hot exhaust on the dry grass" story unfolded:

> *Well yesterday was a good one. He had a truck running with a hot exhaust going straight down onto the ground, for a minute there I thought that I could smell grass burning. There was a lot of grass and it had been cut, it had been lying there and dried out. Now that obviously would be a hazard. It would be a hazard on other jobs especially coming to this time of year, but you would never really discuss that on a job before you started. You would always react you wouldn't plan.*

5.5.2 Site A managers' perceptions of the practice of risk-awareness

The managers' perceptions of the practice of risk-awareness on the job were explored through a number of questions designed to uncover how managers expect workers to apply the steps in the risk-awareness process. Not surprisingly managers expect workers to think about risk before starting work.

5.5.2.1 Thinking about risk before starting work

The three stage model of risk-awareness will be used to frame the managers' responses. Stage one involves the social practice of stopping before starting work in order to think about the job and its risks.

The expectation is that workers will undertake this step on the way the way to the job. One manager said:

> *…what I'm trying to get across to the guys is there are moments as we approach a job …and the best time is when you are in the vehicle. Probably 98% of the work we have to do we have to travel to get there, so it is an opportunity to roll through things on the way to the job, think about what you would expect to find … think your way through it before even stepping out of the vehicle…you should really not be physically stopping but think what's ahead of you…*

There are two significant aspects to this excerpt. First the manager expects workers to be thinking through the job ahead of time. This view is not dissimilar to that of the workers who claim that they are used to thinking about the job and its risks. Second this manager does not expect that workers physically stop, but rather *roll through things* in their head on the way to the job. As such, stage two, the cognitive process is well underway as workers approach their job.

Stage two involves the cognitive process contained in the model of situation awareness and equates with the process of identifying risks and deciding upon what actions to take in relation to those risks.

The expectation from this manager is that workers will think about the following:

> *All right, where is it, is it in a treatment plant, is there someone that we need to notify, it could be a roadside asset where obviously there is some traffic issues or pedestrian issues, and if it's a pump station then there's lifting equipment involved. Those sorts of things and these things I know the guys are automatically thinking about what the approach to the job will be.*

This response is very general and less detailed than that provided by the workers, but it does support the workers' view that they already think about risk before starting a job.

The view from this manager is even more general:

> *…stop and think about what you're doing to assess, what hazards you have got out there and to make sure that you have got the right control measures in place…*

Stage three involves the social practice of bringing the risk-awareness process to a close by recording the results of the assessment. However, this manager perceives that the findings are documented for only about 40% of jobs. The manager said:

> *Yeah, probably in about 40% of our jobs they are completed on. I know there is a large portion of jobs that we don't fill them out on because a lot of the jobs we do are preventative maintenance jobs and they are jobs that we had identified in this hazard register that the risks are low…*

5.5.3 Site A anecdotes from the field

The four anecdotes that I include here are all taken from my observations of the application of the risk-awareness process in the field. The first anecdote 'removing a pump from a waste water pump station' illustrates that even when workers comply with the risk-awareness program, some risks are still missed. The second anecdote 'maintaining a backwash blower' illustrates how a worker is thinking about risk during a job and how that worker improvises on the job to compensate for a risk that was not identified in the risk-awareness program. The third anecdote 'working in the middle of the road without the paperwork' illustrates that work can be undertaken without incident even when a Risk-awareness program is not completed. The fourth anecdote 'draining a dam into another dam' illustrates that workers may fail to perceive risk.

5.5.3.1 Removing a pump from a waste water pump station

This anecdote reveals how easily workers may miss seeing a risk, even when they have completed a risk-awareness process.

> *Today I traveled with Aaron to ****** to meet up with Lado. Our job was to investigate a problem with a new waste water pump station. During the 30 minute drive down the highway to ******, Aaron said "I don't use *** ****** but I do use the ***** ***** card". Aaron also said that "I think that the risk-awareness processes have had an impact and I think that it is taken seriously". When we arrived at the ****** Street pump station I was introduced to Lado who was going to assist us with the job.*
>
> *The pump station was located on a corner at the bottom of a steep hill near a new housing estate. Aaron got out the risk-awareness form before starting work and filled it in on the back of the truck.*
>
> *The task itself involved removing the pump from the well. To do this, Aaron had to remove the well washer to access the pump. The well washer, which had arms like a garden sprinkler and was attached to a long steel pole, was placed on the ground*

near the unprotected opening to the four metre deep well. The pump in the well was electrically operated and controlled by an above-ground control box. The well washer automatically starts when the pumps starts. After the job was finished Aaron realised that the pump had not been isolated and that if it started, the well washer would also have started. Aaron then saw the risk that the well washer thrashing around on the ground and spraying water everywhere could have caused one of us to step back and fall into the unprotected well. Aaron was shocked at this realisation and said "I did not give it a thought".

This anecdote is significant because it illustrates that even when workers comply with and use the risk-awareness program there is no guarantee that the program will ensure that all risks have been identified. Furthermore, neither Aaron nor Lado identified the risk associated with the well washer starting when the pump started. Therefore, the workers' common sense was also insufficient to compensate for the deficiencies in the program. In this case the workers failed to achieve situation awareness and commenced work under an illusion of safety. One reason for this might be that the workers were lulled into believing that completed paperwork equals a safe workplace. If this is the case, then it highlights the need for ongoing situation awareness, irrespective of paperwork.

5.5.3.2 Maintaining a backwash blower

This anecdote comes from my time spent with Kai at a water treatment plant undertaking a number of maintenance tasks. This anecdote reveals how workers can compensate for deficiencies in the risk-awareness process.

The next task involved the backwash blowers which required Kai to remove the intake to the air blower for inspection. This was a routine preventative maintenance task and a risk-awareness process was done before the job commenced. The backwash blower was situated inside a large shed which was a designated hearing protection area. The shed was very noisy, but Kai shrugged off the need to wear hearing protection and I followed suit.

The backwash blower itself was located within a large acoustic enclosure. Kai's task was to climb inside the enclosure through a rather small opening to inspect the v-belt. The conditions inside the acoustic enclosure were very dark and cramped. I watched on from outside the enclosure whilst Kai gave me a running commentary on what he was doing from within. I could only just see Kai, thanks to his orange fluorescent safety vest. Kai removed the intake manifold which he estimated weighed between 15-20kgs. Kai found it hard to handle this weight in such a confined space, so he developed a manual handling solution on the run, or as Kai said "a good tradesman thinks of things as he goes". Kai used a pivot point to help him manually handle the intake manifold in the confined space. He said "I learn this sort of trick from working on my own".

Interestingly, this particular part of the job was not identified by the risk-awareness program and again Kai made the point that he was "still thinking about it as you go".

This anecdote again highlights the limitations of the risk-awareness program in identifying all risks. In this case, however, the workers did identify the risk and as such was able to implement an innovative solution on the spot to compensate for the limitations of the risk-awareness program. What the worker did could be referred to as common sense compensation based on his experience. This anecdote also supports the view that situation awareness must be ongoing and that a process of risk-awareness conducted at a point in time (before the job) is insufficient to develop the requisite awareness; particularly in new, novel or changing circumstances.

There is one other aspect of this anecdote that is significant. Kai took a decision to breach the safety rules and not wear hearing protection when entering the shed. In this instance, Kai was well aware of the risk; he pointed out to me the sign that read "hearing protection must be worn" but he decided that he was not going to wear hearing protection. This breach of the site safety rules is interesting for two reasons. First it exposes, as Endsley (1995b) argues, that situation awareness is a separate set of processes

to those of decision making and action. In this case the worker had achieved situation awareness, but still took a decision not to wear hearing protection. In other words, there is the potential for a gap to open up between situation awareness and what is deemed to be appropriate risk control action. Second, it shines a light on how culture feels and is reproduced in practice. I felt obliged to follow Kai's lead and as a result I did not wear hearing protection, even though I knew that I should. This is consistent with the view that that safety is socially constructed and learnt within communities of practices (Gherardi, 2006; Gherardi & Nicolini, 2000a; Gherardi et al., 1998). This cultural view of safety, learning and practice brings into focus the limitations of developing an individual's mental model to build situation awareness, because learning not only take place in the heads of workers, it is situated in practice (Gherardi & Nicolini, 2000a; Gherardi et al., 1998). It is these situated practices or "situated safety" (Gherardi et al., 1998) that may override mental models as my experience shows.

5.5.3.3 Working in the middle of the road without the paperwork

This anecdote comes from my time spent with Bart and Finbar. This anecdote reveals that even if a risk-awareness process is not completed, work can be undertaken without incident.

> *We then drove on to ****** Street in ****** where we met Finbar. Waste water pump station number five had an electrical fault and Bart and Finbar thought that there was something caught in the pump. This meant that the pump would have to be lifted out of the well. By this time it was close to three o'clock in the afternoon. The well was located in the middle of a road that was adjacent to a school. We were all conscious that very soon we would strike school traffic.*
>
> *Bart parked the truck on the road in front of the well to act as a barrier between us an oncoming traffic. I was given the job of using the stop and go bat to control traffic whilst they opened the well. No risk-awareness process was undertaken for this job because according to Bart he "wasn't in the mood". Bart put on his gloves*

and lifted the pump out of the well, inspected it, cleaned it, put it back and the whole job was completed safely and successfully within about half an hour.

This anecdote serves to highlight that risk-awareness and safety is not determined solely by the risk-awareness program. In this case, both Bart and Finbar were well aware of the risks of being hit by cars and of handling a contaminated pump and took action to control the risks. It could be said that they used common sense to compensate for not using a risk-awareness program

5.5.3.4 Draining a dam into another dam

This anecdote reveals that some workers seem to not perceive the risk in a situation, or if they do, they take a decision to discount the risk as being trivial. This anecdote is drawn from one of a number of days that I spent riding with Edward.

*The main task for today was to drain one dam into another dam. The dams are located in a scenic bush setting near ******, a timber town at the foot of the high country. The task was first discussed in the depot office where John the supervisor drew Edward a schematic of how the job was to be done on a white board.*

Edward then drove us to the back of the depot where we hooked-up a large diesel driven pump to the truck. We also loaded a very heavy role of lay-flat hose and two sections of suction hose onto the back of the truck. Edward was struggling to lift the hose so I gave him a hand. The hose was heavy and awkward to handle. At this stage no risk-awareness form had been filled-in.

We then drove for about an hour to a town near the foothills of the high country. The sun was already stinking hot on what was going to be an even hotter day. The site itself was quite picturesque with a dam on the left and the right of us, separated by an overgrown track. As we pulled in, another smaller truck pulled up behind us and two guys got out. They confirmed that we were here to drain the dam and which dam was to be drained (the north dam). We parked the truck and we both got

*out. Edward looked over the job and assessed the best way to do it. No risk-awareness process was undertaken and Edward said that "John (his supervisor) would not expect one to be done". Neither did Edward use the risk-awareness card because, as he said "there's nothing dangerous about it and that the *** ***** doesn't make any difference anyway".*

After inspecting the site it was apparent that the point where John had suggested Edward cut into the line lay at the opening of an underground pipe tunnel. The pipe was partially buried in the ground and was surrounded by masses of long grass. The bolts showed signs of corrosion. Edward said to me that he was "concerned about snakes" in the long moist grass. I found this to my amusement given that moments before Edward had said that there was nothing dangerous about the job. Then, while we were still inspecting the site, the guys in the truck returned (turns out that they were the contract excavators). One started a large yellow bulldozer and began smashing through the trees immediately behind us, only metres from where we stood. Even Edward was stunned by the actions of the excavator driver who was forcing the noisy machine to lurch and bully its way through the undergrowth. Who said it is not dangerous! Finally Edward decided to simply lay the hose in the dam to be drained, connect it to the pump and pump the water into the adjacent dam via the lay flat hose. I helped Edward with the set-up and pumping commenced. As far as Edward was concerned the job was complete and we climbed into the truck for the long and hot drive back to the depot.

This anecdote illustrates that some workers may fail to perceive and comprehend elements in their environment as being dangerous. Edward did not use either risk-awareness process and also failed to identify all the risks inherent in this job. It could be said that Edward was operating under an illusion of safety, although he did acknowledge and was worried about snakes. Therefore, it may be more accurate to say that Edward was able to perceive some risks (snakes) and not others, for example, manually handling the lay-flat hose.

Taken together, the practice of risk-awareness on the job varies and results in a typology of risk-awareness outcomes as shown in Figure 11.

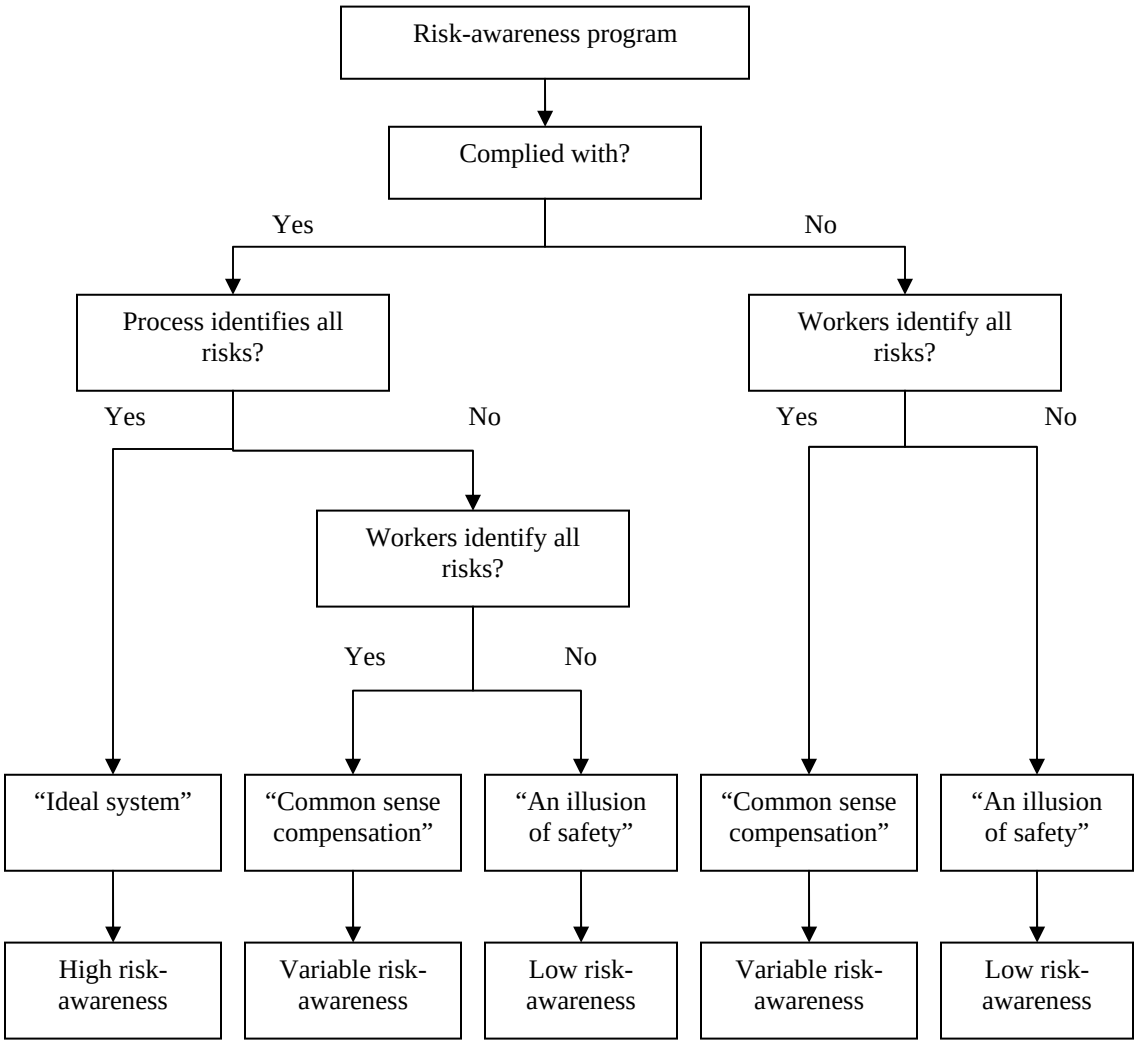


Figure 11 Decision tree leading to a typology of risk-awareness outcomes

This typology suggests that risk-awareness outcomes fall into three categories:

1. High risk-awareness;
2. Variable risk-awareness;
3. Low risk-awareness.

The first category, high risk-awareness, is associated with an 'ideal system' and assumes that all workers comply with all of the requirements of the risk-awareness process and that in turn, the process is capable of prompting workers to perceive and comprehend all risks. It could be assumed that high risk-awareness would result in lower levels of risk. The second category, variable risk-awareness, is associated with a 'common sense compensation' and assumes that workers use their common sense to make-up for deficiencies in the risk-awareness process, or alternatively, when workers decide to circumvent the risk-awareness process and rely solely on their common sense. It could be assumed that varying risk-awareness would result in varying levels of risk. The third category, low risk-awareness, is associated with 'an illusion of safety' that is the result of workers failing to perceive and comprehend all risks, irrespective of whether or not they are using the risk-awareness process. It could be assumed that low risk-awareness would result in higher levels of risk.

Table 8 illustrates how the four anecdotes discussed above correspond to these three categories of risk-awareness outcomes.

Table 8

Matching the anecdotes from the field to the three categories of risk-awareness outcomes (Site A)

Anecdote	**Category of risk-awareness outcome**
Removing a pump from a waste water pump station	An illusion of safety – low risk-awareness and higher level of risk
Maintaining a backwash blower	Common sense compensation – variable risk-awareness and variable level of risk
Working in the middle of the road without the paperwork	Common sense compensation – variable risk-awareness and variable level of risk
Draining a dam into another dam	An illusion of safety – low risk-awareness and higher level of risk

These results show that the anecdotes are split evenly between creating ‘an illusion of safety’, or low risk-awareness, and ‘common sense compensation’, or variable risk-awareness. No anecdotes are classified as an ‘ideal system’ outcome or high risk-awareness. The level of risk ranged from variable to high. However, being aware of risk, or achieving situation awareness is insufficient to influence the level of risk because it is only one stage in the overall decision-making process that results in action in relation to risk control (Endsley, 1995b). Therefore, what is missing is an understanding of how well risk-awareness outcomes are linked, through decision making, to risk control practices. It is risk control practices that will have an influence on the level of risk. This relationship between risk-awareness outcomes, risk control practices and levels of risk is shown as a matrix in Table 9.

Table 9

The relationship between risk-awareness outcomes, risk control practices and level of risk

Risk-awareness outcome	**Risk control practices**	**Level of risk**
High risk-awareness	Control all risks	Lower
	Do not control all risks	Moderate
Variable risk-awareness	Variable control of risk	Variable
Low risk-awareness	Do not control all risks	Higher

Table 9 shows that high risk-awareness could result in two categories of risk control practices with different influences upon the level of risk. Firstly, in the context of high risk-awareness, if the worker’s practices control all the risks that the worker has become aware of, then the resultant level of risk will be lower. Alternatively, and again in the context of high risk-awareness, if the worker’s practices do not control all the risks that the worker has become aware of, then the level of risk may increase. In both cases, it is possible that cultural factors at either the organisational or group level, such as time or peer pressure, together with personal factors such as training and experience, may impact upon the worker’s risk control practices. Furthermore, high risk-awareness may not be

achievable in practice. The reason for this is that high risk-awareness relies on workers complying with the risk-awareness program and that in turn, that the program is capable of identifying all risks. Workers resent complying with the program and there is little evidence that the program alone is capable of achieving high risk-awareness in workers. Therefore, risk-awareness programs may be incapable of achieving lower levels of risk under these circumstances.

By comparison, variable risk-awareness, at best, will result in variable risk control practices and varying levels of risk. The reason for this is that variable risk-awareness is an outcome of applying common sense, and common sense has been shown to be situation specific. Given the difficulties of achieving high risk-awareness through compliance with a risk-awareness program, an alternative strategy may be to increase workers' 'base-line of common sense'. This may be achieved through learning strategies that encourage and build workers' 'pictures of risk', thus reducing the variability in their risk-awareness outcomes and risk control practices, resulting in lower levels of risk.

Low risk-awareness means by definition that workers are not aware of all the risks they might face on the job. Therefore, if workers are not aware of risks it is not possible for them to control all risks. In these circumstances, the result is higher levels of risk.

Current risk-awareness programs may be focusing too heavily on risk-awareness outcomes at the expense of risk control practices. Yet it is risk control practices that will impact upon the level of risk. The matrix in Table 9 may provide a useful frame of reference for organisations wishing to reflect on the effectiveness of their risk-awareness programs. The matrix may allow organisations to identity points where they can intervene to improve the effectiveness of their programs. It may also provide organisations with a means for reflecting on cultural factors that may be impacting upon risk-awareness outcomes and risk control practices.

5.5.4 Site A within-site comparison of findings

Workers perceive that they were already thinking about risk prior to the introduction of the risk-awareness program, whereas managers perceive that it is their job to get workers to think about risk before starting work. As a result there is a gap between the workers' and managers' perceptions of the practice of risk-awareness on the job.

Workers were better able to think about and articulate risk than managers were, but workers' ability to achieve situation awareness was incomplete.

Both workers and managers struggled to interpret the concepts and language used by the risk-awareness program.

5.5.5 Site B workers' perceptions of the practice of risk-awareness

The workers' perceptions of the practice of risk-awareness on the job were explored through a number of questions designed to uncover what the steps in the risk-awareness process meant to the workers in practice. Workers were asked what they look for when they stop, step back and observe (stage one – social practice); what are they thinking about when asked to think through the task and assess the hazards, pathways and impact (stage two – cognitive process) and how often they document their findings (stage three – social practice).

5.5.5.1 Already thinking about risk before starting work

In practice, the workers perceived that they did not make a clear distinction between the social practice of stopping and the cognitive processes of observing, thinking and assessing. Instead workers integrate these steps into a web of thinking about the job and its risks. In particular the workers also perceive that *we know what the risks are* or as this worker said: *well, we are quite aware of the hazards on the job we thought without a piece of paper really*. This worker provides an example of how workers were already thinking about risk prior to the introduction of the risk-awareness program or as this worker puts it: *it's in your mind all the time:*

> *Basically when I start a job I look at the job anyway um regardless of what it is and depending on who you are with or whether you are leading a crew or not um you do that if there is two of us doing line clearing, which is what is usual, there is two of us, um we are always talking anyway … whether we are setting up we are talking. We might see something or just mention it to the other bloke or he will mention it to me and you are always aware because there is no second chances with power lines so you have got to be aware regardless … it's in your mind all the time.*

In an attempt to better understand how workers think about risk and to qualitatively assess their capacity for risk-awareness, respondents were asked to talk through a practical example of how they think about risk. An attempt has been made to classify

their responses according to the three hierarchical phases in Endsley's (1995b) model of situation awareness and the results are shown in Table 10.

Table 10

Comparing the workers' ability to think about risk with Endsley's model of situation awareness and decision making (Site B)

		The Three Hierarchical Phases of Situation Awareness			
Worker number	**General comment**	**Perception of the elements in the environment**	**Comprehension of the current situation**	**Projection of future status**	**Decision and performance of action**
1	*thinking about things before you even get there … knowing what problems are going to come and doing something about it first*	*it's a pre-school* *it's a car park*			*I had better get there before 9:30 so the kids aren't there yet* *do it first before cars get there*
2	*safety for us blokes we look around and make sure there is no one in sight*			*as you know a brush cutter could flick out and hit someone … hit a little kid in head or in the eye*	
3	*we'd by thinking through it with all the boys before we start and say right this is the safest way to do this*				
4	*I'm looking for all the things that I think … is going to create problems*	*traffic, how busy the road is, I'm looking for drop zones when we cut trees, I'm looking for holes in the road potholes, soft shoulders*		*soft shoulders, the truck could end up on a bank or it could turn over*	
5	*look at the risks and safety issues on the job*				
6	*what can go wrong what might be in your road*	*maybe there is a ***** wire going through a tree*	*that you don't see because it is camouflaged in the tree. So you have got to make sure you go back each side of the tree to see where it is coming in and where it is going out*		
7	*what's around you what could happen*	*the Malaleucas out there on the really windy day*	*they can just snap like that and I have seen a lot of them that have broken*	*so if it is windy I would have a look around and see if there was trees close by that might fall*	
8	*Um … I dunno, I suppose you are always looking*	*for uneven ground, broken limbs on trees*			

Source: Adapted from Endsley (1995)

Even though the workers perceive that they are already thinking about risk, their responses suggest that the workers' ability to achieve situation awareness may be incomplete. The workers performed best at level one of the hierarchy of situation awareness, perception of the elements in the situation (Endsley, 1995b) with five out of the eight workers being able to perceive at least some elements. Take worker number seven, for example, who is able to perceive at least two elements, trees and weather conditions: *malaleucas* (trees) *out there on the really windy day* (weather conditions).

The workers situation awareness was most incomplete at the comprehension and projection levels of the hierarchy of situation awareness. Only two out of the eight workers were able to comprehend the significance of the elements whilst they were marginally better at projecting future states with three out of eight workers making an attempt to integrate the information to project the future status of the elements. Again, worker number seven provides a good example of how this worker is able to comprehend the elements in the situation based upon experience: *they can just snap like that and I have seen a lot of them that have broken* and move on to the third and highest level of situation awareness, projecting future status: *so if it is windy I would have a look around and see if there was trees close by that might fall*.

Interestingly, only one of the eight workers, worker number one, went on to make a decision, yet that decision was not the result of thinking that escalated through the three levels of the hierarchy of situation awareness. This worker took one element *it's a preschool*, and on that basis decided to *better get there before 9:30 so the kids aren't there yet* as a strategy for controlling risk. In this case the decision, if followed through, would seem to be reasonable and the apparent gaps in the workers' situation awareness may be explained by a combination of experience and a relatively simple task. In other words the workers' situation awareness is implicit in the workers' thinking, thus the worker uses 'mental short hand' to articulate how he thinks about risk.

Overall, however, the results may indicate a shortcoming in both the risk-awareness program and the workers' knowledge and experience. Workers may incorrectly over-

value their knowledge and experience and managers may over-value the effects of the paperwork, in both cases the result is an illusion of safety.

To further explore how workers think about risk, they were asked what "assess, hazards, pathway, impact", the third step in the risk-awareness program, meant to them and to provide practical examples. Their responses are shown in Table 11.

Table 11

Workers' understanding of the key terms for assessing risk in the risk-awareness program (Site B)

Worker number	**Key terms for assessing risk**	**Definition**	**Examples**
1	Hazard Pathway Impact	- *I am a little bit stuck on that* *I make sure that everyone is doing the right thing no ones doing nothing wrong*	*pit lids or again holes in the ground* - -
2	Hazard Pathway Impact	*Anything dangerous* *No idea, don't know* -	- - -
3	Hazard Pathway Impact	*Well a hazard is anything that can harm you* *How it happened how did it occur* *The result of what happened*	*getting hit by a tree* *obviously there was no spotters* -
4	Hazard Pathway Impact	*Hazard is something dangerous … the possibility of inflicting damage or pain or injury* - -	*Like a rock you can't see initially* *You could hit the rock and it could fly"* *"and hit kid or hit anyone*
5	Hazard Pathway Impact	*Well hazard basically … warning be careful there could be a hazard there* *the way we are going to do things … no I know but you have caught me out I am not really sure* *Impact basically that's another one like pathway probably impact what impact have I got to make this workplace safer… I don't know*	*Um working on the sides of roads cars coming past us* - *for example at the cars the hazard the impact would be a fatality … But I don't want to go there do you know what I mean?*
6	Hazard Pathway Impact	*Anything that could torment you while you are doing your job* *Pathway? Means something to walk on … I've never seen that word on there before actually … the way you go about doing something I suppose it's a bit of a strange sort of word really … nup* *what happens at the end when the branch hits the ground or a person before the ground what is it going to do is it going to smash the fence is it going to kill somebody … the end result basically*	*it could be a citizen come out a resident come out and hassle you … parked cars traffic um it could even be a dog getting underneath your legs wanting to yap and won't go away* - -
7	Hazard Pathway Impact	*Anything that could become a liability or a problem* - *Impact to me would be either impact on environment or impact on person in an accident … an injury*	*trees on a windy day* *for example pushing the wheelbarrow down the boardwalk pathway to me is like the spot where you are working or have to walk to get to where you are working* *like a hit with a branch or falling off the boardwalk*

8	Hazard	-	*a hazard to me is a certain tree down the road which needs some limbs taken off it*
	Pathway	*Pathway to me is the way I look at … pathway is getting from where you have got to go from your equipment to where you have got to go for the job to do the work and to ensure that your pathway from A to B is clear*	*like the truck over there and I've got to get out of here sort of thing I have got just a limited amount of room between these vehicles to get out but there is nothing in the middle of them to trip over*
	Impact	*Impact for me is hitting something*	*if you have removed the hazards and the pathways clear to get to the job well there's probably no impact or the impact is that you have done the job properly in the first place*
9	Hazard	*Hazard is something that can cause an injury in my mind*	*if I was spraying and I don't watch what I am doing with the spray and the wind picks it up and carries the spray drift might kill plants that I want to stay and not go on the weeds that's a hazard to me*
	Pathway	*Um … I'm not really sure about that … that hasn't been explained*	-
	Impact	*Well I could make something up I have a general idea of what the word impact means but in this specific instance of a risk-awareness program I probably don't really know*	*whether it's a spray that would damage some vegetation that we want to stay that's an impact a negative impact or whether it's very hot today and people are going to get dehydrated that's an impact in a way but … we could probably improve that aspect of the form to make it easier for people to actually know what that really means*
10	Hazard	*Hazard is a risk something that could injure you*	*slippery ground, overhead branches, things like that*
	Pathway	*Pathway is how you end up in line with the risk isn't it? I would have thought. That is the route which you take to end up in danger I would have thought what pathway means*	-
	Impact	*Impact is the impact to the risk if you actually fall victim to it*	*A falling tree falls on you you're dead, slippery ground you might twist an ankle*
11	Hazard	*Something that could injure myself, crew or someone else*	*Um … going up in a bucket where you are going to get a hanger, whether it's caught up in there and it's not going to go anywhere*
	Pathway	*Um … not really, wouldn't have a clue … pathway a bit confusing*	-
	Impact	*what could happen if things go wrong what could happen if things go right*	*it could drop on yourself*
12	Hazard	*hazard to me means anything that can be damaged*	*power lines, house service wires … private fence lines, vehicles*
	Pathway	*For me would me specifically like the job site that you are on and what's within that job site*	-
	Impact	*Would be the finished product if something did go wrong*	*If you did hit a fence*

None of the workers were able to define all the terms and give examples. However, 10 out of the 12 workers were able to offer a definition of hazard and impact. The term "pathway" was the least understood term with over two thirds of the workers not understanding what the term means. Some workers were confused by the term and interpreted pathway quite literally to mean something that you walk on, *for example, means something to walk on … I've never seen that word on there before actually*.

These results are significant because it would seem that the key step in the risk-awareness program designed to prompt workers to think about risk and to achieve situation awareness is poorly understood and applied by the workers. The implications of this are

that if workers do not have a means for thinking about risk in general, then they may be less likely to achieve situation awareness in particular circumstances. Therefore, workers may benefit from two levels of training. The aim of the first level would be to develop shared understandings of risk concepts. The aim of the second level would be to develop shared situation awareness within communities of practices based upon a combination of shared practical experience and the ability to think conceptually about risk.

However, if the workers are not using the risk-awareness program, then these criticisms of the program become less relevant. Workers complete the paperwork for approximately two-thirds of jobs; however, compliance with the paperwork does not guarantee that workers have achieved situation awareness as the results of Table 10 and Table 11 have indicated. Therefore, the paperwork may be creating an illusion of safety that is not always there in practice.

5.5.6 Site B managers' perceptions of the practice of risk-awareness

Managers were asked if they believed that completing the paperwork associated with the risk-awareness program helped workers to think about risk. This manager acknowledged that there is gap between the paperwork and the workers' thinking about risk:

> *I don't think so um in honesty like I … this is almost forced upon them, the *** *****, and so I know in the past that one, they are not always thinking about what they are doing … like I have seen them done back at the yard, so they have been working all day and then they think oh ****** or ****** are going to whip us for this, we had better fill them out because they will check and notice that they are not there. So I say it gives me comfort, but at the same time forcing the guys to do it probably doesn't make them actually do it properly.*

This comment is significant because it again illustrates that leaders face great difficulties when attempting to change culture through organisational structures and processes designed to change workers' practices. Workers are capable of resisting such changes, as discussed in theme two, and in particular this manager identifies the futility of *forcing the guys to do it* because it *probably doesn't make them actually do it properly*. This supports the argument that the paperwork may be creating an illusion of safety that is not always there in practice.

Irrespective of the role of paperwork in the process, the managers' perceptions of the practice of risk-awareness on the job were explored through a number of questions designed to uncover how managers expect workers to apply the steps in the risk-awareness process. Not surprisingly managers expect workers to think about risk before starting work.

5.5.6.1 Stopping and thinking about risk before starting work

As for Site A, the three stage model of risk-awareness will be used to frame the managers' responses. Stage one involves the social practice of stopping before starting

work in order to think about the job and its risks. Here are three examples of what three different managers said about what they expect workers to do:

> *… they are approaching the tree and having a look at it so they have already stopped, had a look at the workplace and looked at the workplace as a whole larger area. Now they are coming to an individual part of that workplace and they are going through the ***** process in their minds, so they are stopping again, having a look at the tree and making a decision before rushing in to do the job…*
>
> *I would expect them to stop, stand around and say, okay, we are pulled up at the job. They may start to put their signs out because they have obviously pulled up onto the road and start to put their signs up.*
>
> *…before they even start they need to just stop and observe …*

The managers expect workers to physically stop before starting work and to generally observe the work place, although it is unclear at this point what they expect workers to observe.

Stage two involves the cognitive process contained in the model of situation awareness and equates with the process of identifying risks and deciding upon what actions to take in relation to those risks. To better understand managers' expectations of what workers should think about, respondents were asked to talk through a practical example. An attempt has been made to classify their responses according to the three hierarchical phases in Endsley's (1995b) model of situation awareness and the results are shown in Table 12.

Table 12

Comparing managers' expectations in relation to the workers' ability to think about risk using Endsley's model of situation awareness and decision-making (Site B)

		The Three Hierarchical Phases of Situation Awareness			
Manager number	**General comments**	**Perception of the elements in the environment**	**Comprehension of the current situation**	**Projection of future status**	**Decision and performance of action**
1	*let's say they are removing a tree*	*as they are approaching the tree to do the work they have got to be figuring out okay I'm going to bring this tree down I'm not going to clear fell*	*because there are too many things in the area there are other trees*	*I might damage fences*	*so they might decide then that they are going to block it down which means they are going to cut portions off it and lower it to the ground which is safer*
2	*the team leader would call them*	*I would expect them to look at traffic and pedestrians, overhead services, clear drop zones …that their tools are in good condition … ensuring that they have got all the personal protective gear*	*clear drop zones*	*then if they see that there is something lacking they identify that and make appropriate changes*	*know where they are going to set their tower up, know where they are going to set their truck and chipper up*
3	*they need to look at their personal safety and things around them that is going to be affected*	*observe if there is anyone around so the public and then themselves and looking at the task they are about to perform and seeing what potentially could be a problem to them whether it is the public, whether it is the surface conditions um the heat*		*is there something that could potentially happen*	
4	*Um, probably all the things that are written on the risk-awareness program here*	*if there is slippery ground* *if there is rocks*	 *rocks are a projectile*	*there is going to be a problem with the mowers* *they will throw them out with the mowers*	*make sure they have got signs up …if they are cutting grass make sure there is no pedestrians in the vicinity*

Source: Adapted from Endsley (1995)

Table 12 shows that the managers' ability to achieve situation awareness may be better developed than that of the workers. Three out of the four managers demonstrated an awareness at all three levels of Endsley's (1995b) hierarchy of situation awareness whilst all four managers moved from situation awareness to a decision on risk control action.

However, the completeness and accuracy of their awareness could still be questioned, for example, in terms of projecting future status worker number three states: *is there something that could potentially happen*. In fact, three of the four managers (managers two to four) make vague projections of future status.

To further explore how managers think about risk, they were asked what "assess, hazards, pathway, impact", the third step in the risk-awareness process, meant to them and to provide practical examples. Their responses are shown in Table 13.

Table 13

Managers' understanding of the key terms for assessing risk in the risk-awareness program (Site B)

Manager number	**Key terms for assessing risk**	**Definition**	**Examples**
1	Hazard Pathway Impact	*what is it that is likely to occur* - -	*a car running off the road* *that it loses control* *could be that it kills people*
2	Hazard Pathway Impact	- - -	*a falling limb* *would be ensuring that the workers have got a clear path to say retrieve that falling limb and that there is also a pathway for pedestrians to follow outside of the work zone"* *"the branch striking something whether that be a vehicle or a person*
3	Hazard Pathway Impact	*a hazard could be something that could cause you or someone else harm* *Now I get … the pathway and impact … the pathway is … now … forget this … um …* -	*a tree limb above the boardwalk that's hanging, potentially it may never fall down but it is a hazard* *that say the branch could hit you on the head.* *The falling of the branch is the pathway* *the impact would be it would hit you on the head and then it would be an injury*
4	Hazard Pathway Impact	*anything that could be dangerous that could injure anybody* *Pathway? Um … no I don't … I don't know what that means as in that um I don't believe it means pathway …* *what could happen*	*that could be a hole in the ground* - -

Like the workers, none of the managers were able to define all the terms and give examples. The managers too are uncertain about what the term "pathway" means, for example, *Pathway? Um … no I don't … I don't know what that means as in that um I don't believe it means pathway*.

Managers acknowledge their lack of understanding and also acknowledge that workers may not understand the terms either:

> [Do you think your crews understand that process?]
>
> *Probably not because … I aren't … I am not …*
>
> [Has there been any training to understand the process?]
>
> *No and that's … not in my knowledge because that is part of my problem. When I'm doing the JSA there is a definition with hazard, pathway, impact there is a definition, but when I was looking at previous JSA to try to understand that, it is not totally clear about which is which and so, I guess since I don't understand it properly, neither do my guys …*

The significance of this result is that a lack of understanding of the language of risk may make communication more difficult both within and between the worker and manager groups.

Notwithstanding this finding, this manager provides a practical example of situation awareness, decision making and action on the job and how an awareness of changing circumstance took precedence over the paperwork. The manager said:

> *… an example would be we were scraping or removing copious amounts of soil off ****** fore-shore. We had two excavators and two trucks and dogs working continuously off ****** fore-shore, a major public open space, and we were right until we found out that 750 kindergarten children were about to show up and so I guess we never documented that …*
>
> [What is more important the action or the paper?]

*The action is far more important than the paper …it was never documented we just stopped the job … and I guess we did the ***** **** um … even though we like the bits of paper, I would always like to think that the action happens regardless of the bit of paper. I would prefer the guys to pull the pin or change their work how they are doing their work if something changes. If it's not documented I guess it's not the end of the world … they just don't remember to write down and if they are doing the ***** *****, if they are thinking about the job, what more can you ask?*

The excerpt is significant for two reasons, both of which are related to culture. The first is that for this manager, taking action to control risk is ultimately valued more highly than completing the paperwork, and this manager admits that *it was never documented we just stopped the job* and goes on to add that *I would always like to think that the action happens regardless of the bit of paper.* The second is that for this manager, workers are empowered to stop work: *I would prefer the guys to pull the pin or change their work.* The views of this manager would suggest that a culture of risk-awareness is "embedded within the organisation" (Hopkins, 2005a, p. 19).

5.5.7 Site B anecdotes from the field

The two that I include here are taken from my observations of the application of the risk-awareness process in the field. The first anecdote ‘dropping a tree limb onto a fence’ was used to introduce this chapter but is told here in more detail to illustrate that even when workers comply with the risk-awareness program, some risks are still missed. The second anecdote ‘seeing the trees in the forest’ illustrates that even when the risk-awareness program is completed it does not identify all risks.

5.5.7.1 Dropping a tree limb onto a fence

This anecdote reveals how easily workers may miss seeing a risk, even when they have completed a risk-awareness process.

> *The particular job that we went to was on a very steep road out the back of ****** where a tree had suffered wind damage the night before. A huge limb was hanging in the tree with various other limbs and branches littering the ground. The damaged tree was on a nature strip between private property and a busy road. The front of the property, adjacent to the damaged tree, was separated from the nature strip by a white picket fence. It was still early in the morning and Casey drove the truck and chipper onto the resident’s property where he parked on the grass just inside the gate. Ashley, a young apprentice arborist was also working under Casey’s supervision today. The three of us climbed out of the truck and inspected the damage to the tree, as we did, we couldn’t believe our eyes as a semi-trailer sped down the hill, clipping power lines and tree branches in the process.*
>
> *We then walked back to the truck where Casey and Ashley completed a risk-awareness form. There was little, if any, talk between the two in relation to the content of the risk-awareness form, before they both signed the form and started work. Casey said “well that’s the paperwork done".*
>
> *Casey and Ashley commenced clearing the debris using pole saws and chainsaws and fed the branches into the chipper. Casey then went and sat in the cabin of the*

truck as Ashley stood inside the white picket fence, and with a pole saw, commenced undercutting the large hanging limb. I elected to stand outside the fence line at a safe distance of about five metres. The limb was approximately 30 cm in diameter at its base and approximately five metres long. Ashley was having trouble with his undercuts and his cuts on the top of the limb. Then, seemingly without warning, the whole branch gave-way and fell, smashing the fence. The large limb landed on the ground with a loud thud, about two metres from where Ashley stood. Disbelief was written all over Ashley's face. He was clearly horrified and upset about what had just happened. Casey came running from the cabin of the truck and said "I turned my back at the wrong time, I should have been watching". Casey accepted full responsibility for what happened and said "we should have used ropes to guide the branch down", Ashley, by his own admission said "I'm inexperienced; I didn't think that the branch was going to do what it did". He went on to say that "I thought that I could get a couple more cuts in and then perhaps use the ropes". By this time Ashley was visibly upset and he said to me "I have never fucked up before". We then drove back to the depot so that Ashley could fill-out an incident report form.

This anecdote is significant because it illustrates that even when workers do comply with and use the risk-awareness program there is no guarantee that the program will ensure that all risks have been identified. In this case, the program was complied with but neither the program nor the workers identified all the risks resulting in an illusion of safety. There are at least three explanations for what happened in this case. The first is that although the workers completed the paperwork, they did so mindlessly rather than mindfully. The workers comment *well that's the paperwork done* suggests that the paperwork has become an ineffective ritual or an end in itself rather than as a means to an end, that is, to prompt workers to achieve situation awareness. This finding supports Hopkins (2006b, p. 590) view that if risk-awareness programs are "not carefully managed" that they "can degenerate into an ineffective ritual". The second explanation is that a novice's ability to perceive and comprehend a situation may not be as well developed as that of an expert and that incomplete or inaccurate situation awareness may

lead to poor performance. In this case, the young apprentice arborist probably lacked the experience to perceive, comprehend and project what was going to happen as he cut, or in his own words: *I'm inexperienced; I didn't think that the branch was going to do what it did*. The third explanation is that both workers were actually aware of the risk of a limb falling and how to control the risk, that is, control the decent of the limb. For example, the supervisor said after the event that *we should have used ropes to guide the branch down* and the apprentice arborist said *I thought that I could get a couple more cuts in and then perhaps use the ropes*. In the case of the supervisor, a poor decision (not to use ropes) followed from well developed situation awareness. However, in the case of the apprentice arborist, it was not so much a poor decision as inexperience that resulted in incomplete situation awareness.

5.5.7.2 Seeing the trees in the forest

This anecdote reveals that workers are able to see other risks on the job that are not identified by the risk-awareness program.

> *Today I observed a crew of four who were restoring a board walk. To access the board walk we drove down a dirt road to an estuary tucked away across the road from the bay. The setting was picturesque and framed by blues skies reflected in clear water with the sound of kookaburras in the abundant paper bark trees.*
>
> *A risk-awareness form was completed on the trailer at the rear of the truck before work commenced.*
>
> *I worked with Earl and Polo whose job it was to screw the new decking to the new bearers. Conversation turned to matters of safety and the risk-awareness program, so I asked Earl to imagine what could kill you on this job. Earl identified "if you walked on the joists you could slip and hit your head, that could kill you, but it is common sense that you don't do that". Although we all did! Polo then came into the conversation and Earl posed the same question to Polo. Where Earl had looked down, Polo looked up to the trees and said "look at the dead tree there, that dead*

tree could fall on you". I was taken-aback because it was something I had not considered. Polo went on to say that "it would fall because parts of the tree are well and truly dead and termites like that sort of tree. They eat it from the inside out so it can fall at any time". I looked at the tree with renewed interest; it had limbs the size of a telegraph pole. Polo went on to say "if it did fall, the generator would be underneath it, people are working around the generator, and it would probably fall on the board walk, or very close to it. It could hit someone, it could damage the boardwalk. Or if I, or other people were working around the generator, it could hit them on the head and kill them".

This anecdote is significant because it illustrates that even though the workers diligently applied the risk-awareness process, the process fell short of prompting workers to identify all risks in this situation. In fact the workers used their common sense to compensate for the shortcomings of the process. What is also significant about this anecdote is that the two workers saw two very different risks. This is possibly explained by the individual experience of the two workers. In fact Polo said that it was his experience that enabled him to perceive and comprehend the risk of the dead tree. This anecdote reveals that the risk-awareness program does not capture the collective experiences of the workers in a manner that can be shared by the group. Furthermore, the risk-awareness program imposes a further limitation on workers' thinking, that is, it is done once (before starting work) and sometimes, as in this case, it is done at some distance from the actual work location.

These two anecdotes have been classified according to the typology of risk-awareness outcomes (see Figure 11) as shown in Table 14.

Table 14

Matching the anecdotes from the field to the three categories of risk-awareness outcomes (Site B)

Anecdote	**Category of risk-awareness outcome**
Dropping a tree limb onto a fence	An illusion of safety – low risk-awareness and higher level of risk
Seeing the trees in the forest	Common sense compensation – variable risk-awareness and variable level of risk

In the case of both anecdotes workers complied with the risk-awareness program but with different outcomes. In the case of the first anecdote, the risk-awareness process failed to identify the risk of the tree limb falling. Furthermore, the worker also failed to make up for this shortfall in the process and, although they may have been aware of the risk, their risk control practices allowed the higher level of risk to be realised as evidenced by the tree branch falling onto the fence.

The second anecdote illustrates that different workers will see different risks, and that sometimes, the risks that they see will not be captured by the risk-awareness process. This insight reinforces the view that common sense varies according to the experience of individual workers. Although common sense may compensate for the limitations of the risk-awareness process, it is not something that is evenly distributed either across workers or situations. Therefore, it is possible to say that what is called ‘common sense’ varies within and between workers resulting in varying levels of risk.

5.5.8 Site B within-site comparison of findings

Workers perceive that they were already thinking about risk prior to the introduction of the risk-awareness program whereas managers perceive that it is their job to get workers to think about risk before starting work. As a result there is a gap between the workers' and managers' perceptions of the practice of risk-awareness on the job.

Managers' ability to achieve situation awareness is subjectively judged to be better than the workers, however, both managers' and workers' situation awareness was incomplete. Furthermore, both workers and managers struggled to interpret the concepts and language used by the risk-awareness program.

5.5.9 Between-site comparison of findings

The results for both sites tend to mirror each other, for example, at both sites workers' and managers' situation awareness was qualitatively judged to be incomplete. Furthermore, workers and managers at both sites struggled to interpret the concepts and language used by the risk-awareness program. Workers at both sites also demonstrated variable risk-awareness practices with compliance with the program being around 40% in both cases.

5.6 Decision-making and Rule-breaking on the Job

The story so far is that whilst managers and leaders have an ability to exert power, that ability may be moderated or even negated by workers pre-existing values and beliefs. With regard to the risk-awareness program, managers value compliance and believe paperwork will deliver that compliance. In contrast, workers value retuning home safe after a day's work and believe that their common sense will be enough to keep them safe. Workers, however, will comply with the paperwork when asked to by managers, but compliance with the paperwork does not result in workers achieving situation awareness. Completing paperwork for compliance reasons also runs the risk of making workers either less mindful of risk, or giving them a false sense of security that the job is safe. However, common sense may not ensure that workers will achieve situation awareness either. The result is an illusion of safety, that is, for managers the paperwork creates an illusion of safety in the same manner that common sense does for workers. This is because the values and beliefs of managers may be inconsistent with the values and beliefs of workers. Sometimes workers see risks that the risk-awareness process does not; but different workers may see different risks on the same work-site. Furthermore, this knowledge about risk remains hidden in the heads of individual workers. However, maintaining a safe workplace, whether it is for organisational or individual reasons, requires more than an awareness of risk, it requires decision making and action. For individual workers, achieving situation awareness should be followed by appropriate risk control decisions and risk control actions. A key observation from the field was that workers routinely and knowingly broke safety rules even when they were fully aware of the risks. Therefore, this theme will explore decision-making and rule breaking on the job.

Hopkins (2005a) argues that one rationale for promoting risk-awareness is the impossibility of writing a safety rule to cover every work situation. Therefore, risk-awareness occupies the space between where the rules run out and the boundary of safety, or alternatively it can also be used within the boundary of the safety rules to identify when rules no longer apply or need to be adapted. This view is supported by

Dekker (2003) who argues that, rather than telling workers to simply follow procedures, that organisations would do better to give workers the skills in knowing when and how to adapt to surprises. This level of skill requires insight as Dekker (2003) states:

> Circumstances change, or are not as were foreseen by those who designed the procedures. Safety, then, is not the result of rote rule following; it is the result of people's insights into the features of situations that demand certain actions. (p. 235)

This view that safety is brought about by people's insights would seem to complement the notion of achieving situation awareness. Therefore, in theory at least, risk-awareness programs should be the ideal vehicle for developing workers' insights resulting in workers being mindfully rule-guided rather than mindlessly "rule-bound" (Marcus, 1988) or blindly following rules without thinking (Hale et al., 2003).

Dekker (2003) argues that organisations must also monitor the gap between procedures and practice and invest effort in understanding the reasons for the gap. However, many organisations may not know that a gap exists between procedures and practice, or chose to not want to know (Dekker, 2003). To identify this gap, organisations require an active rule management system such as that developed for the Dutch railway system (Larsen et al., 2004). The Dutch railways rules management process gives emphasis to monitoring the gap between procedures and practice with the opportunity to make modifications to the rules where required (Hale et al., 2003; Hopkins, 2005a; Larsen et al., 2004).

Studies have identified that workers violate safety rules for a variety of reasons. For example, based upon a survey of UK railway shunters, Lawton (1998) developed a violations classification scheme as follows: exceptional violations, for example in response to a novel problem; situational violations, for example in response to time pressure and routine violations, for example short cuts which have become the normal way of working.

Furthermore, Reason (1997; 1998) distinguished between six types of rule-related behaviour: correct compliance (where behaviour is correct and psychologically rewarding

leading to a safe outcome), correct violations (correct and psychologically rewarding deviation from an inappropriate rule leading a safe outcome), correct improvisation (correct and psychologically rewarding in the absence of rules leading to a safe outcome), misventions (incorrect and not psychologically rewarding deviation from an appropriate rule leading to an unsafe outcome), mispliances (incorrect and not psychologically rewarding compliance with an inappropriate rule leading to an unsafe outcome), mistakes (unsuccessful action in the absence of a rule leading to an unsafe outcome).

Alternatively, Hollnagel (2004) argues that workers are often forced to make efficiency-thoroughness trade-offs because work is often irregular and unpredictable requiring workers to take short-cuts. Workers may simply not have the time to evaluate events and select action alternatives relative to the time available to do the tasks (Hollnagel, 2002). This has implications for workers attempting to achieve situation awareness and comply with safety rules. Firstly, workers may not feel that they have the time to stop, think, decide and act in relation to safety relative to the time that they perceive that they have available to do the job. Secondly, workers may also be inundated with a number of decisions that simultaneously require their attention or as Hollnagel (2002, p. 152) argues "human action is … not the execution of a single sequence of steps, but rather a set of concurrent activities that address goals or objectives with different time frames and changing priorities", as a result, workers may defer to a more time-efficient (but perhaps less safe) short-cut. This efficiency-thoroughness trade-off principle was evident in a study of the operation of a rotary press (Polet et al., 2002) which found that workers violated procedures, for example, not wearing rubber gloves to handle solvents and working on the rotating rolls while the machine was still running, in order to save a total of 90 seconds of time.

The findings from the field will now be presented framed by this understanding of decision-making and rule-breaking on the job.

5.6.1 Site A workers' perceptions of safety rules

Workers were not formally asked for their perceptions of safety rules; nor did the topic arise naturally during the course of the interviews. The reason for this is that the topic of safety rules emerged during the participant observations phase of the field work.

5.6.2 Site A managers' perceptions of safety rules

Managers were not formally asked for their perceptions of safety rules; however the topic did arise naturally during the course of the interviews.

Based upon my observations of rule-breaking in the field, I decided to ask this manager how many of the jobs were governed by some form of safety rule. This manager said:

> *It really depends on what they are doing. A lot of the routine stuff isn't covered by individual procedures, it's covered by an overall procedure on the workflow, and the board tells them what they need to be doing as in, "check this, check this, check this" and then the other work they do, the breakdown work, well that could be any pumps aren't working, so the guys themselves have got to work out what their job steps are to work out ….*

This comment suggests that workers have a degree of freedom to decide the best way to do a job. I then made the question more specific, relating it to the task of accessing an aerator (this anecdote appears under the theme "common sense and the practice of safety"). I asked the manager was there a written procedure for accessing the aerator safely. The manager said:

> *To actually do the task there is no procedure and because you don't know what the task you're doing is before you start … you should be filling out your risk-awareness program or a JA based on the outcome of the risk-awareness program sheet …*

The manager acknowledges again that the workers have the freedom to decide the best way to do the job which may explain why the workers defer to what they call their "common sense". However, the manager went on to say that for other jobs, for example entry into confined spaces, maintaining a safe workplace relied upon workers following safety rules:

> *…a good proportion of the work here involves confined space entrance, very risky probably one of the most riskiest aspects of this contract and the guys are completely versed in terms of what needs to take place, the forms that need to be filled out, the processes involved…*

This excerpt is significant because it illustrates an awareness of the risk of entry into a confined space or as this manager puts it *very risky probably one of the most riskiest aspects of this contract*. Risk-awareness is not in question here, the risk has been identified and the control of that risk relies upon workers complying with the safety rules for entry into confined spaces and according to this manager: *the guys are completely versed in terms of what needs to take place, the forms that need to be filled out the processes involved*. However, as the first two anecdotes from the field will reveal, there can be as Dekker (2003) identified, a gap between the procedure, in this case for entering a confined space, and practice.

5.6.3 Site A anecdotes from the field

The first two anecdotes 'not completing a permit to enter a confined space' and 'breaking the confined space entry rules' illustrate the gap between procedures and practice during what is known to be high risk work. The third anecdote 'not wearing gloves to handle a waste water pump' illustrates that even when they are aware of the risk, individual workers will make their own decisions in relation to risk control practices that defy the practices of the community of workers. The fourth anecdote 'going from rule following to rule breaking over time' illustrates that safety practices can degrade over time as a function of increasing frustration with the job.

5.6.3.1 Not completing a permit to enter a confined space

The job to which this anecdote relates was just one of many jobs that were completed on this day. In fact this job was not a planned job; rather it was in response to a request from an engineer for the client to investigate an alarm at a sewer pumping station.

> *We then left the treatment plant and moved on to the pressure return valve job in ******. The pressure return valve station was located adjacent to the south-east corner of a flat piece of land in what appeared to me to be a fairly desolate part of town. Peter had been given the job by an engineer from ****** who was concerned with the amount of amps that the pressure return valve was pulling. The engineer contacted Peter on his mobile phone and asked him to go and have a look at the site. The site was not much more than a control box above the ground and some valves and pipe work in a pit which was covered by a metal checker-plate cover. The pit was a designated confined space and there was also a sign on the control box advising that eye protection must be worn. There was a very strong smell of chlorine and I could see water on the floor of the pit. A confined space entry permit should have been completed for this task but it wasn't. No risk-awareness form was completed either. Peter did not wear eye protection. The task took around 15 to 20 minutes to complete and involved Peter raising the metal grate and climbing inside the pit to investigate the problem. Eventually Peter decided to increase the output of the valve by half a metre to correct the problem. Peter advised the engineer of his action and we moved onto the next job.*

At least three rules were broken during this task which can be categorised into two types of rule: management system rule and risk control rules. The fact that Peter did not complete a risk-awareness form was a breach of a management system rule. The fact that Peter did not wear protective eye wear or complete a confined space entry permit was a breach of risk control rules.

The fact that Peter did not complete a risk-awareness form is not particularly unusual as a culture has developed where risk-awareness is carried out in an ad-hoc manner anyway.

By this I mean that the practice of completing a risk-awareness form varies not only between workers, but within workers too. For example, although Peter thought that the risk-awareness process and in particular, the risk-awareness prompt card was a *brilliant little thing*, nevertheless, his practices varied from job to job and from day to day. He would explain away this variation by saying *I'm not in the mood today* or when he was busy he would say *they have gone out the window this week.*

But the fact that Peter did not complete a confined space entry permit was unusual. Entry into confined spaces is one of the higher risk tasks that the workers face and violating the safety rule would seem to directly increase the level of risk. I did not ask Peter why he didn't complete a permit for two reasons. First I did not want my inquiry to alter his normal work practices. Second I didn't want the trust that we had built up to be compromised if he thought I might report him to management.

Therefore, because I chose not to question Peter in relation to the fact that he violated known safety rules all I can do is speculate on the reasons for the violation. But before doing so, I would like to make two other points. First, the worker was aware of the risks so it is not a failure of risk awareness, but decision making in the face of that risk. Second, it is unlikely that the organisation was aware of this gap between procedure and practice. Returning to speculating on the reasons for this violation, one explanation could be that Peter had undertaken many jobs that day, and this one was both unplanned and urgent. It was urgent in that if the flow was low, then that has flow-on implications for both the client and the local population. Using Reason's (1997) six varieties of rule-related behaviour, this violation may be classified as a "misvention" or a deviation from a good rule leading to an unsafe outcome. Although for the worker, the job was completed without incident – perhaps introducing yet another illusion of safety in the mind of this worker.

Equally, what the worker did may be classified as an efficiency-thoroughness trade-off (Hollnagel, 2004). If Peter had completed a confined space entry permit, which is a time consuming process, then Peter may have felt that he would not have enough time to

complete the remaining jobs for that day. Time was also an issue because the overriding priority was the effectiveness of the waste water system – there was a need to fix the problem quickly. Therefore, he successfully traded thoroughness for efficiency.

Viewing Peter's actions in the context of an organisational culture that values 'getting the job' done, then Peter's actions might be deemed normal and acceptable.

However, another explanation is also possible. Peter did informally assess the site before he commenced work. He noted that it was a confined space; he commented that the smell of chlorine was not strong and that the pit was relatively shallow with good ventilation. Under this interpretation, Peter achieved situation awareness based upon his common sense.

But the question remains, was the organisation aware of this gap between procedure and practice, or did it care to be aware? In the highly competitive contract maintenance environment where 'getting the job done' retains contracts, then it may be perceived that there is little incentive to be aware.

5.6.3.2 Breaking the confined space entry rules

This anecdote supports a case being made that rule-breaking was culturally accepted practice. In this anecdote, it is a supervisor who breaks the confined space entry rules.

The planning for this job had been going on for some time and there was an air of anticipation and excitement in the depot in the days leading up to the job. The job was located in a town about a one hour drive away from the depot. I traveled to the job with the supervisor.

> *I drove to ****** with Ken. He was clearly excited about this job as he sped down the highway whilst talking in an animated fashion on his mobile phone. He seemed convinced that ****** would "stuff up" and that he would have to save the day.*

*We arrived at ****** where the scene is a main sewer pump station located on a busy street corner close to the centre of town. The time is 8.00 am on what is going to be a hot summer's day. The work site is no more than 50 metres square and is fenced off to prohibit entry to unauthorised persons. The worksite itself is littered with trenches, open sewer wells and large pipes. Approximately 30-40 workers representing about five different contractors are milling around on site, some working some waiting to work. All are wearing orange or yellow safety vests. A number of tasks are being carried out simultaneously. A gerni operated by one contractor in a sewer well catches fire. An excavator manoeuvres delicately around the site – and other workers! The stench of sewage permeates the warm morning air. Amongst the workers there is an air of urgency and excitement, this is because the sewer system to the town is to be shut down to allow for the connection of new pipes. If the various jobs are not completed in a timely manner the sewer could back up and over-flow. There is much talk between contractors and some confusion over who is doing what when.*

One task for our crew is to enter a confined space (a sewer well) to open a large valve. A confined space entry permit is completed on an adjacent wheelbarrow and gas readings from the well are recorded on the entry permit. The workers all sign-off on the permit. A gas detector is hung in the well to alert workers to any increase in gas concentration. The task requires one person to work in a three metre deep well and according to the rules, for two people to act as observers above. The person is lowered from the tripod into the well via his safety harness. However, the task of closing the valve proves more difficult than first thought, so the supervisor also climbs into the well, without a harness, to help.

The supervisor broke a number of rules, the main one being entry into a confined space without a safety harness. Had something gone wrong, it would have been difficult to extricate the supervisor from the well. This anecdote can be interpreted in much the same way as the previous one but in this case the management system rule, that is, complete a confined space entry permit, had been complied with. The supervisor's behaviour could,

like the workers in the previous anecdote, be classified as a either a misvention or an example of an efficiency-thoroughness trade-off. But the significance of this anecdote is that it points to a culture where rule-breaking is culturally accepted practice. Therefore, effort expended in convincing workers to comply with the risk-awareness program will be wasted unless the organisation addresses the gap between paperwork and practice

5.6.3.3 Not wearing gloves to handle a waste water pump

This anecdote is the second half of an anecdote introduced under the theme 'the practice of risk-awareness on the job' called 'removing a pump from a waste water pump station'. The earlier anecdote made the observation that workers still miss seeing some risks even when the risk-awareness process is followed. This short anecdote illustrates that even when workers are aware of the risk, individual workers will make their own decisions in relation to risk control practices that defy the practices of the community of workers.

> *Lado then proceeded to lift and inspect the contaminated sewer pump using his bare hands. Lado said to me "I used to work in an abattoir and my hands are tough, I don't feel that I need to wear gloves". Once the job was complete Lado wiped his hands on his trousers and we climbed back into the truck and drove to the next job.*

It is unclear if a formal safety rule exists for undertaking this task. However, it was not the practice of the rest of the community of workers not to wear gloves. In fact, the workers were aware of Lado's work practices and on more than one occasion talked about them in disbelief. Taking the view that there is no rule written for this task, then applying Reason's (1997) six varieties of rule-related behaviour Lano's practice of not wearing gloves could be classified as a 'mistake', that is, an unsuitable plan of action carried out in the absence of a safety rule resulting in an unsafe outcome. However, that is my interpretation. Lado may see it differently. In fact he did. He was aware of the risk but used what he might call 'common sense' to make a risk control decision that made sense to him. Lado might equally classify his action as a 'correct improvisation' – an action taken in the absence of a safety rule that lead to a safe outcome. The difficulty

rests in deciding what constitutes a ‘safe outcome’. For Lado the job was completed successfully and without incident - a safe outcome which reinforces the practice of not wearing gloves. If, however, Lado contracted a disease from handling the pump, he might reframe his actions as a mistake that has resulted in an unsafe outcome.

This anecdote is interesting for two other reasons. First the practices of other workers (who did wear gloves) did not impact upon Lado’s practices, an outcome which is not consistent with the view that what is learnt is not safety, but safe work practices (Gherardi & Nicolini, 2000a; Gherardi et al., 1998). Second the organisation had knowledge of Lado’s practices but chose not to intervene. Paradoxically, Lado’s practices, in this instance, could be said to be outside of the culture of the community of practice, that is, it is unlikely that the workers who constitute the community would deem that not wearing gloves was a valid way of working such that it should be taught to new members of the community (Schein, 2004). But equally his practices are tacitly condoned by the wider organisational culture. This suggests that there are multiple cultures at play here, that culture that is reflected in the practices of the community of workers and that is reflected in the practices of the community of managers.

5.6.3.4 Going from rule following to rule breaking over time

This anecdote illustrates that safety practices can degrade over time as a function of increasing frustration with the job. The job at the centre of this anecdote was carried out by a supervisor. The task was to install a new chemical dosing pump in a water filtration system.

> *… it turned out to be a more difficult job than first imagined and took all day to complete. A risk-awareness form was completed and which identified that Al would be handling chemicals which the material safety data sheet in the office identified as an ‘irritant’. As a result of what had been identified on the risk-awareness form, Al wore eye protection and chemical resistant gloves most of the day. As the day progressed, Al encountered increasing difficulty getting the pump to work. By mid-afternoon in frustration Al abandoned the use of his eye protection and gloves.*

This anecdote is significant because although initial awareness of the risk led to appropriate risk control action and the following of the safety rules, that action was compromised as job frustration increased.

Taken together, the four anecdotes reveal that rule-breaking is culturally accepted practice. This leads to a situation where it could be said that neither the paperwork nor common sense is a guarantee of situation awareness; but achieving situation awareness is no guarantee of a decision to act in compliance with the safety rules. This is consistent with the view presented in Table 9 that being aware of risks is only one aspect of the risk-awareness process. It is the risk control practices that follow from that awareness that impacts upon the level of risk. The point where risk control practices deviate from safety rules, for whatever reason, is what Dekker (2003, p. 235) refers to as the gap between "procedures and practice".

5.6.4 Site A within-site comparison of findings

The main finding for this site has been that rule-breaking is culturally accepted practice. For example, even though the manager acknowledges that confined space entry is a high risk job for which workers have received training, workers and supervisors still violate the confined space entry rules. Organisational effort may do well to focus as much on the gap between procedure and practice as it does on forcing workers to complete the paperwork associated with the risk-awareness process.

5.6.5 Site B workers' perceptions of safety rules

Workers were not formally asked for their perceptions of safety rules; however the topic did arise naturally during the course of the interviews and built upon the time that I spent in the field with the workers. Therefore, the 'anecdotes from the field' at the end of this section will at times reflect a combination of interview and field observation data.

In most cases workers were able to provide reasons for breaking the safety rules and believed that the rules do not always cover what they do.

5.6.5.1 Reasons for breaking the rules

One worker believed that it is safer to break the rules. In responding to a question in relation to a rule that required workers to not roll their short sleeves up, this worker said:

> [And what about your sleeves, do you still roll them up?]
>
> *I still roll them up yeah …*
>
> [Yet there is a ****** policy of having them rolled down?]
>
> *There is a policy of having them roll down - generally try and leave them down in the workshop unless I am using a power saw which I have been doing this morning*
>
> [When you're around equipment you roll them up?]
>
> *I think it's safer.*

The significance of this comment is that this worker is able to justify why he breaks the rules. The worker does not believe that the rule, keep shirts sleeves rolled down, increases his safety, particularly around power saws. Because of this the worker decides to break the safety rule because he believes it is safer to do so. Returning to Reason's (1997) six varieties of rule-related performance again, this violation may be viewed from two perspectives giving two different outcomes. From the perspective of the worker the violation could be classified as a 'correct violation' or correct performance is achieved by

deviating from an inappropriate rule. However, from the perspective of a manager the violation could be classified as a 'misvention' or a deviation from an appropriate rule leading to an unsafe outcome. Whichever is the case, the reality is that there is a gap between procedure and practice (Dekker, 2003) with the worker and the organisation holding different perceptions of the risk. This excerpt reinforces the point that there is a perception that the rules do not cover what workers do.

5.6.5.2 The rules don't cover what we do

This worker is cynical about the reasons for the safety rules and believes that the rules are designed to protect the organisation not the worker:

> *The procedures: We go through those at toolboxes, we're having one this afternoon and they would just pick one out at random this week and we will read through it … but somebody in the office has decided this sounds right, this is what we do, but they don't cover what we do, the people who write them don't do the work, they don't understand what we're doing, they are kind of strange, just covering themselves …*

This excerpt is significant because it highlights this worker's dissatisfaction with the rule management system. This worker feels that the rule makers *don't understand what we're doing* and as a result the rules *don't cover what we do*. In this example the organisation is using toolbox meetings to monitor the gap between the procedures and practice but this attempt to monitor this gap is viewed cynically by the worker because *the people who write them don't do the work*. Not involving workers in the development of safety rules is inconsistent with the view put forward by Hale et al. (2003) that rule users should be involved in developing the rules.

5.6.6 Site B managers' perceptions of safety rules

Managers were not formally asked for their perceptions of safety rules; however, the topic did arise naturally during the course of the interviews. In this example, the manager was responding to a question that related to safety culture but the manager sidetracked the conversation to comment on the number of rules that managers and workers are expected to know and follow.

5.6.6.1 Too many rules

This manager perceives that the number of and length of some safety rules makes them difficult to learn:

> *… but I guess as a sidetrack there are so many procedures to follow that there is no way that anyone of us knows each one of them because you can look at one job and you could have seven or eight procedures relating to that one job which the documents can be between one and perhaps four pages long it is hard to actually learn them …*

This excerpt is significant in that it is a manager who is critical of the safety rules. This manager's insight that *there are so many procedures to follow that there is no way that anyone of us knows each one of them* may also be one explanation for the gap between procedures and the workers risk control practices.

5.6.7 Site B anecdotes from the field

The following anecdotes: ‘not wearing a safety harness in a cherry picker’ and ‘not wearing a helmet when riding a quad bike’ illustrate the gap between procedures and practice. The anecdotes also provide insight into why workers decide to violate the safety rules.

5.6.7.1 Not wearing a safety harness in a ‘cherry-picker’

This anecdote first emerged from my field observations during which ‘Wayne’ had told me that he doesn’t attach his lanyard to the bucket as required when he is elevated in the 12 metre high ‘cherry picker’. I further explored Wayne’s reasons for deciding not to attach to the bucket during interview:

> [When you're up in a bucket you are supposed to wear a harness and I think you had some views on attaching the harness]
>
> *It's a personal thing for me that I don't … it's just a personal thing that I don't like to … I mean if I was in a different situation … I do use them occasionally when I think there could be a bit of a hoo ha coming - might be a hanger that I can't quite reach, I have got to really stretch up to get it, something else could fall down or something else could drag or catch hold of me and drag me out of the bucket, then I will hang on and attach. But in a line clearing situation I'm just going around the tree I am only, you know, not far off the ground. Okay it would bloody hurt if I do fall out but it's restrictive.*
>
> [Can you explain to me why you do not attach?]
>
> *Well, if you are attached to the bucket and you fall out okay, it is going to arrest you, but if the truck is going to fall over, which can happen, a leg could break, you can go through the ground, just topple over. If you are attached what it is going to do is whip you onto the ground. I would rather just ride it to the ground and jump out at the last bit. If I break a leg well okay but I am not going to get whipped on*

the ground and have my whole body broken … the whip effect because you are attached with the lead, but I do use them occasionally.

By rights I am supposed to. If I get caught without it I can be written up for no OH&S. Some people, they will just put it over their shoulder and won't even put the leg straps in and that's a little bit ridiculous. I said to one yesterday he was going to get up the bucket without … just over the shoulder, I says: hang on a minute, I don't care how other people have been … taught you how to do it, but if you fall out of the bucket without your leg straps and kill yourself you are going to be a mess on the ground, there is going to be an inquiry come out why wasn't he wearing his leg straps? And point to me and say why didn't you make him wear his leg straps? So it will all go all the way up…

This anecdote illustrates that workers break the safety rules for what they believe to be valid reasons. In this case, 'Wayne' felt safer by not attaching his safety harness to the bucket because he believed that if the truck tipped over he could jump clear. However, from the perspective of the organisation, this violation could be classified as a 'misvention' – a deviation from a good rule with an unsafe outcome. Nevertheless, in this case the worker has exhibited an ability to identify and think about risk, but the worker's judgment in relation to risk control may or may not be accurate. Anecdotes like these raise questions in regard to how organisations can encourage workers to comply with safety rules that are at odds with the workers perceptions of risk and the appropriateness of the safety rule relative to the risk. Reason (1997) argues that one component of a safety culture is a "just culture". A just culture draws a line between acceptable and unacceptable behaviour (Reason, 1997). To determine what constitutes unacceptable behaviour, Reason developed a decision tree built on the "substitution test" which, in basic terms, asks if someone else was faced with the same set of circumstances would they act in the same way (Reason, 1997). Reason (1997) argues, however, that in as many as 90% of cases the workers behaviour is blameless. Applying the decision tree to this case it could be said that the worker knowingly violated a safe operating procedure that was available and workable, therefore the worker's behaviour would be classified as a

reckless violation. A reckless violation might attract a “final warning letter” (Hudson, 2007). This is one means for determining what constitutes unsafe behaviour and correcting that behaviour through a negative consequence (final warning letter). But this approach still does not address the worker’s belief that not attaching his safety harness is safer than attaching it. The dilemma here then is that there is a gap between the worker’s and the organisation’s perception of risk and the best way to control that risk. As a result workers feel the need to break the safety rules to feel safe. This same dilemma also arises in the next anecdote.

5.6.7.2 Not wearing a helmet when riding a quad bike

This anecdote first emerged from my field observations during which ‘Ted’ had told me he does not wear a helmet when riding his quad bike – which is a registered vehicle. The quad bike is specially equipped to carry out chemical spraying of weeds in public spaces, for example, car parks.

Here I have included my original field note to set then scene followed by an excerpt from an interview with Ted where I further explored his reasons for not wearing a helmet.

> Field note:
> *We then moved on to another small corner block of land … this is the first time the quad bike came off the trailer to do the job. Ted made the point to me, as he took the bike off the trailer, that he should wear a helmet now but that he wasn’t going to. Ted said “I am supposed to wear a full bike helmet. I am bikie myself. I would never ride on the road without my gloves, helmet and trousers”. Ted went on to say that the quad bike is different to his road bike. He said he doesn’t wear a helmet when riding the quad bike because “it reduces what I can see and hear and it gets very hot in summer”.*
>
> Interview:
> [I also remember you saying that you were supposed to wear a helmet when you're riding a quad bike on the road.]

But that doesn't make the job any easier. I suppose it is safer if you get run over … it's a heightened vision sort of problem … it's a hearing and vision problem … you can't hear and see as well with the helmet on as without … the helmet sort of blind sides you …

[Why is it different on the motorbike to the quad bike?]

Because on the motorbike you are actually travelling with traffic, when you are spraying you are travelling around traffic and you need to be … you are putting yourself in places that you wouldn't be on a motorbike … on a motorbike you position yourself on the road … when you are spraying you are all over the place you really need to be able to hear and people … you can hear people coming up behind you whereas on a motorbike you don't have that sort of issue because they are not stepping into the traffic.

[But the fact that you need to wear a helmet would not be picked up on this risk-awareness program form would it?]

It might be under chemical spraying like with the bike it might be in the procedure … on roads you need to be wearing a helmet

[So you might be breaking the procedure?]

Yes. I have never seen the procedure for it I'm not sure but probably I would say they would say on the road you need to have it on.

[But am I hearing you say that it is safer not to have it on?]

Yes

Here again this anecdote illustrates that workers break the safety rules for what they believe to be valid reasons. In this case, 'Ted' felt safer by not wearing a helmet when riding the quad bike. Like the previous anecdote, this could be classified as a 'misvention'. However, such a classification may not be helpful when there is a gap

between the worker's and the organisation's perception of risk and the best way to control that risk. A gap that results in this worker feeling the need to break the safety rules to feel safe.

5.6.8 Site B within-site comparison of findings

Both workers and managers perceive that there are problems with the safety rules. For managers, there are too many rules and for workers, they are the wrong rules. In particular, workers feel that they need to violate the safety rules to feel safe.

5.6.9 Between-site comparison of findings

Rule breaking was rife at both sites, but perhaps for different reasons. For site A, rule-breaking had become culturally accepted practice. At site B, workers felt that they had to break the safety rules to feel safe.

As a result, there are gaps in the practice of risk-awareness. Encouraging workers to be risk aware is not enough. Risk aware workers may still decide to deviate from the safety rules. Therefore, there is a need to monitor and understand the gap between procedures and practice.

5.7 Reporting Practices and Risk-awareness

A system for reporting hazards, near misses, incidents and errors is considered a defining characteristic of a safety culture. For example, Reason (1997) argues that a "reporting culture" is one of four subcultures that make up an "informed safety culture". Similarly, Weick and his colleagues (Weick & Sutcliffe, 2001; Weick et al., 1999) argue that reporting is a key element associated with being preoccupied with failure; one of five processes associated with collective mindfulness. The purpose of a reporting culture is to generate opportunities for organisational learning about risk that ideally leads to change and a safer workplace (Reason & Hobbs, 2003).

Hopkins (2005a) argues that risk-awareness is a cultural approach to safety that is largely interchangeable with an informed safety culture and collective mindfulness. In particular, Hopkins (2005a, p. 18) argues that a risk-aware culture is an informed culture and that risk-aware workers "are more likely to report matters of concern and more likely to make suggestions for safety improvements". More recently, Hopkins (2007, p. 107) has argued for a philosophy of "specifying triggers and corresponding action plans (TARP)". Hopkins (2007) proposes that TARP resolves the debate between the view that safety culture is individual risk-awareness and the opposing view that safety culture operates at the organisational level as a set of processes designed to collect information before an incident occurs, by integrating the two views. He goes on to propose that TARP "sets up *systems* that encourage *individual* risk-awareness" (Hopkins, 2007, p. 112). The TARP philosophy requires managers to make workers fully aware of the triggers to look for and report in a given environment that are a warning sign of emerging risk, and for managers to respond accordingly (Hopkins, 2007). In some respects then, the notion of a "trigger" is similar to achieving situation awareness except that the organisation is doing some of the work by providing workers with more specific items to perceive and comprehend in a given environment. Risk-awareness programs, and in particular the one under study here, already provide prompts for workers but perhaps the difference rests in the specificity of the triggers (or prompts) relative to a given risk. However, it is likely that the capacity for circumstances and risk to change in a given environment will always exceed the available

triggers. Therefore, although triggers can complement workers' thinking, they should not replace workers' "license to think" (Adamaski & Westrum, 2003) because "what looks acceptable today may not look so tomorrow" (Pidgeon, 1988, p. 365).

Therefore, for reporting systems to be successful, workers must be encouraged and empowered to report and for the organisation to respond to those reports in a timely and appropriate way (Hopkins, 2005a). For this to occur it is recognised that the level of trust that exists between workers and managers is a critical factor; that is, workers must feel safe to report without fear of recrimination (Burns et al., 2006; Reason, 1997).

In theory then, a successful risk-awareness program, operating at both the system and individual level, will not only make workers more aware of risk on the job, but as workers become more risk aware, they will report more too. To determine if this is the case in practice, workers and managers were asked a series of questions designed to explore the relationship between risk-awareness and the reporting of hazards, near misses, incidents and errors. The organisation operates a formal reporting system and recently commenced a program of actively encouraging a reporting culture through an incentive scheme designed to reward workers for reporting. Within the risk-awareness program there is a potential bridge to the reporting system via a question that asks workers to consider if there are any uncontrolled hazards. The notion of an "uncontrolled hazard" is similar to the "trigger" referred to by Hopkins (2007), although the term "uncontrolled hazards" perhaps lacks the specificity envisaged by Hopkins (2007). Therefore, during interview workers and managers were asked what the term "uncontrolled hazards" means to them and what they are expected to do about uncontrolled hazards. Furthermore, workers and managers were also questioned explicitly about the operation of the reporting system and reporting practices.

It is against this backdrop to reporting practices and risk-awareness that I will present the findings from the field.

5.7.1 Site A workers' perceptions of reporting practices

Workers perceived that in general all hazards can be controlled and as result did not use the reporting system. If they felt that they should report something then they would do so informally. However, what is reported, even informally, is subject to a risk-assessment, that is, the greater workers perceive the potential for harm the more like they are to report.

5.7.1.1 All hazards can be controlled

Workers perceived and in fact were optimistic that all hazards can be controlled. The comment that follows is in response to asking this worker what are they expected to do about uncontrolled hazards. For this worker, there are no hazards that cannot be controlled through some form of safety rule:

> *Well, that's where you your job analysis tends to cover those sorts of things. For example if your task was in a confined space you follow the confined space permit and your job analysis, even though I don't agree that you need two. Your uncontrolled hazards in that instance is your… is the atmosphere that you can't quantify and you take steps to measure that and determine whether it's a safe environment and pretty much a lot of the work I do, there is not a lot of uncontrolled hazards or they are very minor and they are easily dealt with. If we have to have an isolation performed, well we usually do that in a method that controls the hazard.*

This excerpt is significant for two reasons. First it suggests that this worker relies heavily upon the safety rules to eliminate uncontrolled hazards. One reason for encouraging risk-awareness in the first place is to focus workers' attention on risk and away from mindlessly complying with safety rules (Hopkins, 2005a). Yet in this instance this does not seem to be the case and it may be another example where safety is illusionary rather than real. This interpretation is supported by the second point that although this worker believes all hazards can be controlled by a safety rule; there is evidence that rule-breaking

is wide-spread and a culturally accepted practice. Therefore, in actual practice, all hazards are not controlled and the illusion of safety argument holds.

The optimistic view put forward by this worker that all hazards can be controlled was well supported by other workers. Workers were asked to give examples of uncontrolled hazards and what they do about them and the responses were remarkably similar, all hazards can be controlled as the following excerpts from three workers illustrate:

> *No, none that I can think of … uncontrolled hazards … well you could say the traffic's uncontrolled; other than they are supposed to follow the rules and stay on the road. But if you're working in close proximity to a road like that you would erect a barricade at least …*

> *Pedestrians, car drivers, snakes and insects … are there any uncontrolled hazards? If you say "yes" well then you would probably go to do a risk-awareness program and you would identify your uncontrolled hazards whatever they might be. What could be an uncontrolled hazard here? Oh well pedestrians so yes there is an uncontrolled hazard so I will probably go and do a *** ***** so yeah you have identified your uncontrolled hazard whatever it is and if pedestrians was it, put up barricades signage whatever, whatever you needed in place to get rid of the hazard or reduce it. What could be another uncontrolled hazard? Welding in a lot of instances …you might need to use a hot work permit …*

> *Uncontrolled hazards would be would be stuff like … I'll come back to the wet well, uncontrolled hazards? You have got a lid open, you are going to lift a pump out, there is not a great deal you can do to stop that hole from being open because you are trying to lift a sizeable pump out of a hole, you can't put a lid back over the hole because you are trying to lift a pump out so that's an uncontrolled hazard I suppose that's why you come to put hats around or something like that and then you keep an eye on the worksite for the public coming past …*

The reasoning for asking workers questions in relation to uncontrolled hazards was to determine if there was a link between the notion of an uncontrolled hazard and the reporting system. It was assumed that some hazards might be within workers' control but not all hazards. It is reasonable to assume, that in a reporting culture, hazards that workers cannot control will be reported up the organisational structure for action. Therefore, it is significant that workers believe that they can control all hazards. There are two ways to interpret this. First is that workers are empowered to manage risks locally. The second is that the workers awareness of risk is such that they have not identified all the hazards that should have been reported or if they did, did not deem them worthy of reporting. There is some evidence for the first interpretation as there is a sentiment among parts of the community that they are a family empowered to act. As one worker said:

> *… like I pointed out to one of the fellas the other day, all his front tyres on his van were bald badly to me … I haven't formally gone to the supervisor, we work closely together here we are a bit more of a family than a bunch of individuals that turn up to work who are spoon fed by management because we can do certain things without involving management. That near miss or potential hazard the tradesperson can deal with it himself. He can just go down the street and get two new tyres fitted … I'd better check up with him to see if he did it … we spend a lot of time together and we're a bigger group with various personalities but you know you don't have to go to the supervisor and say or the manager because we really only have a manager we don't have to go to him and say I want new tyres on my car and he organises it, it doesn't happen here like that …*

This excerpt is interesting in that there is a culture of empowerment that allows workers to by-pass the reporting system and to make local risk control decisions. Hopkins (2005a, p. 73) argues that empowerment "is a precondition for risk-awareness" therefore against the empowerment test, the organisation is an exemplar of a culture of safety that is risk-aware. The picture that is emerging, however, is that culture is ambiguous (Richter & Koch, 2004). For example, as in the case here, a given community may have a culture

that is able to simultaneously sustain rule-breaking while encouraging empowerment. Ironically, rule-breaking may occur as a consequence of workers feeling empowered.

There is also evidence for the second interpretation, in particular, that if a hazard was identified, it may not be deemed worthy of reporting. To put it another way, workers tend to risk assess a hazard or incident and make personal decisions on what is worth reporting.

5.7.1.2 Risk-assessing reporting

Although workers perceive that they can control all hazards, they still encounter near misses. A near miss is defined here as 'an unwanted release of energy that does not contact workers'. Many near misses go unreported because they are not deemed serious enough by the workers. Workers routinely risk-assess to inform their decisions about what should be reported as the following three excerpts illustrate:

> [What do you call a near miss?]
>
> *You nearly got hurt…there has probably been nothing catastrophic, like catastrophic near miss. But off the top of my head now I couldn't pick one out without sitting down and thinking about it. You are always going to have something that you pick something up and it breaks and drops, it doesn't land on your foot it lands next to it that's a near miss…*
>
> [Are those things reported?]
>
> *No, very rarely - unless it is something that can happen again with a bit of plant that someone else down the line is going to get hurt …*
>
> *I have never reported a near miss …*
>
> [Have you had a near miss?]

Ahum, well they say you are meant to report everything from a little cut on your hand to straining a muscle or whatever … I put a scratch on my leg on a barbed wire fence at work and strained the odd muscle which I have never reported. You are aware of what your body can take and I didn't think any of these things were worth reporting so no, I've never reported a near miss. I've never had a near miss where I've nearly fallen down an open sewer or had an electric shock or had a knock to the head or anything. Probably if I did nearly fall down the sewer or got a decent knock or electric shock or something I daresay I would report it…

To be honest with you near misses … near misses happen all the time I think whether they be minor or great ... but it's probably not something we work with or only if we really consider it as a potential as a potential danger …

These excerpts are significant because they illustrate that the opportunity for organisational learning about risk is being overridden by individual workers deciding what to report or not to report. Ironically, this again may be another downside of a workforce that is empowered to act. These excepts run contrary to Hopkins' (2005a, p. 18) view that risk-aware workers are "more likely to report matters of concern" and illustrates that at best, risk-aware workers and not more likely to report and at worst, that there is little, if any connection between the risk-awareness program and the reporting system.

When workers decide, based upon their assessment of risk, that a hazard, incident near miss or error is worthy of reporting, they prefer to use an informal reporting system.

5.7.1.3 Reporting is an informal process

Some workers are aware of the formal reporting system but prefer to use an informal system which relies on verbally reporting near misses. When asked about the reporting process, this worker said:

Yes you can report your near miss to your supervisor …there is probably a formal system for it but I can't just quite remember it …

[Have you ever used it?]

Not really no … and I'm sure there is a formal procedure for pointing out a near miss or reporting a near miss but we generally deal with them in-house and verbally…

This excerpt is interesting in that this worker could not recall the formal reporting system. Neither could the following worker who again underscores the importance of empowerment. This worker said:

We can point things out to each other just as mates he … it works here because we've got the leeway or the flexibility to go and deal with things ourselves. We can just drive down to the safety shop and grab our safety mask or whatever. If we have got onto a new sort of a job and we are experiencing dust which we don't normally do there is nothing stopping us driving down and grabbing a dust mask even though you might not have one because you'd normally don't have that problem we can deal with situations as we feel like as far as dealing with near misses as a formal process, I'm sure there is a couple of examples but I just can't remember it and we've got a process for doing it …

Although trust is recognised as critical factor in a reporting system (Burns et al., 2006; Reason, 1997) it is not an issue here. Workers feel comfortable reporting, albeit informally, it they believed the situation warranted it:

[If you saw something that was a near miss would you feel comfortable reporting it?]

Yeah, oh yeah, no problem at all …

[What would happen then?]

Well, you would put your near miss in and I think what they do is they actually come out to wherever it was and they investigate it. They just look through and see what happened, where it happened, how we can improve it, how we can fix it from happening again …

Reporting practices therefore, are not so much influenced by risk-awareness or issues of trust as they are by workers perception of risk and their feeling of empowerment. Finally, there was no evidence that the workers had a clear picture of what should be reported, the term “uncontrolled hazards” tended to draw puzzled looks, and certainly there was no evidence that errors in particular were on the workers’ reporting radar.

5.7.2 Site A managers' perceptions of reporting practices

The managers' perceptions confirmed some of the workers' perceptions, in particular that all hazards can be controlled. The most senior manager confirmed that the organisation was proactively attempting to develop a reporting culture, what I will call here "Tell All" by offering workers incentives to report. The manager said:

> *… they have got a new thing called 'Tell All' …the big boss, the Chief Operating Officer, he spoke with a deal of passion about where ***** should be, where they are not and he said he wants two 'Tell All' reports per person per annum as a first target, and then he said he would pay $5,000 to a charity of the contract's choice who gets the most 'Tell All' reports in the next three months. Now that's okay but most people say well fuck the local charity, why should I bother …*

To personalise the reward, the local senior manager is also offering a reward incentive to workers in an effort to develop a 'no blame' reporting culture. The manager feels that his role is to show that he is *fair dinkum* but he also realises that there will be a need to demonstrate to workers the value of the process, or as the manager said:

> *… it's something that I have got to go to them and I am going to say to them … I will give you $20 for each 'Tell All' you submit to me to show that I'm fair dinkum about it and we will tell them until we are blue in the face that it's a no blame culture … We have got to show them the value in reporting that near miss … you just saved your mate from chopping his arm off …*

5.7.2.1 All hazards can be controlled

This manager seemed uncertain what the term "uncontrolled hazards" meant but nevertheless perceived that all hazards could be pushed into a *controlled category*:

> *Look, that's something that I'll always look to some clarification because uncontrolled hazards, when you get into a job analysis situation where you go through an assessment process and you see something that at the moment is an*

uncontrolled hazard and the whole process of going through an analysis and filling out a job analysis is so that you can identify those uncontrolled hazards and that you can push them into a controlled category. I guess what they are saying on... and I'm not sure if I am interpreting this correctly, I think what that might mean is if you have identified some hazards and after approaching it and after assessing it and after filling out your job analysis that it still falls in an uncontrolled hazard category, then the job can't be done.

This manager's interpretation is that if ultimately a hazard remains uncontrolled then *the job can't be done*. What is also significant about this excerpt is the lack of clear understanding that the manager has in relation to the term "uncontrolled hazards". This is a similar situation as was found with the terms "hazard, pathway, impact" and may point to a lack of appropriate training and education in the concepts and terms used by the risk-awareness program. Regardless, the inability of workers and managers to fully understand key terms used in the program is likely to undermine its effectiveness.

5.7.2.2 Reporting is a formal and informal process

This supervisor was aware that there is a formal reporting process and was also aware of the focus on a reporting culture as talked about by the senior manager:

… there is a formal process you can go through and we have got this new process we have now re-named near miss to "Tell All" … you give me a 'Tell All' I'll give you 20 bucks and the COO has put a target on employees for two "Tell Alls' every year from each employee …

However, this supervisor acknowledged that a more informal reporting system was used between workers and managers:

Yeah lots of feedback. I guess that's the support role I am giving these guys and they know that if there is something that evolves during the job or they can see something that probably isn't part of the tick list on the back of their forms, if

something like that comes up that they can't work through or think their way through properly, that's where I do get involved and I can help them through it…

This supervisor saw his role as supporting the workers but from his response it is unclear if he is referring to the reporting of hazards, near misses, incident and errors in the particular or more general job related matters. The main mechanism for informal reporting was by mobile phone with this supervisor saying: *we rely very heavily on mobile communications here*. Even though this manager perceived that there was *lots of feedback* this perception was not always shared.

5.7.2.3 Reporting some things and not others

In contrast to the previous manager, this manager perceives that the reporting rate is low:

The number of reported incidents on this contract is minimum. The number of incidents I would say is much higher because it is abnormally low reporting to the stage where I just don't believe it, hand on heart, hand on the Bible, I'm sorry, that is exactly how I feel. I think it is a pity because there is something not right here about the levels of reporting that is a cultural thing…

This excerpt is significant in that this manager identifies under-reporting as a *cultural thing*. This comment again draws the ambiguity of culture (Richter & Koch, 2004). A culture that is empowered may actually also support a culture of underreporting and rule-breaking.

5.7.3 Site A anecdotes from the field

The two anecdotes that I include here are both taken from my time spent in the field. The first anecdote 'an unguarded v-belt' illustrates that uncontrolled hazards do exist. The second anecdote 'a case of not wanting to look like a wanker' illustrates the worker to worker pressure within a community of practice that can conspire against a reporting culture.

5.7.3.1 An unguarded v-belt

This anecdote was first introduced under the heading of 'maintaining a backwash blower', in theme four 'the practice of risk-awareness on the job'. This time 'Kai' finds an "uncontrolled hazard" – an unguarded v-belt and we follow him through the formal reporting process.

> *Whilst inside the backwash blower Kai identified an unguarded v-belt. More specifically, there was a guard but the design of the guard was such it did not prevent bodily access to the v-belt when working inside the backwash blower cabinet on pieces of plant located behind the v-belt. Kai said to me that "if someone was unfamiliar with this piece of equipment, they could be in the backwash blower while it was running" although he qualified his statement with "the chance of … thinking about it … are pretty remote". Interestingly although a risk-awareness form had been completed for this job it did not detect this risk.*
>
> *I asked Kai: "what are you going to do about this uncontrolled hazard?" and to appease me Kai said he would report it to the operator. It was evident; however, if I wasn't there Kai would not have bothered to report it. We made our way back to the main office and true to his word Kai reported the unguarded v-belt. The operator completed a hazard report form and that was as far as I was able to follow the process. The difficulty is that the piece of plant is under the control of the operator and not ******. So even Kai was uncertain as to what would happen next.*

This anecdote is significant for two reasons. The first has already been well documented and that is the inability of the risk-awareness program to identify all risks and is an example of a 'common sense compensation' on behalf of the worker. The second reason is that it illustrates that uncontrolled hazards exist, but that workers may make reporting decisions based upon their perception of risk. In Kai's case: *"if someone was unfamiliar with this piece of equipment, they could be in the backwash blower while it was running"* but *"the chance of … thinking about it … are pretty remote"*. If I was not being inquisitive Kai would not have reported this uncontrolled hazard.

5.7.3.2 A case of not wanting to look like a 'wanker'

Workers do not report solely on the basis of perceived risk. This anecdote is a conversation that I had in the truck with 'Aaron' on the way back to the depot at the end of a day's work. Aaron and I were discussing if he would report hazards, near misses and incidents. An incident is defined here as 'an unwanted energy release with worker contact'.

> *… I had the opportunity to discuss reporting incidents and near misses with 'Aaron' as we drove back to the depot. He told me "I have sore shoulders and a sore heel on my right foot … I think it is from driving all the time". But Aaron thought that these were "too petty to report" and that "they would not be taken seriously". He said "I think there is a stigma associated with reporting" because people might say "what a wanker" or "other blokes hang shit on you". Aaron solution was to manage his pain himself and keep quiet about it.*

The significance of this anecdote is that for a reporting culture to be effective, it not only requires trust between workers and managers, but acceptance as a practice within the community or practice. In this case Aaron would not report his aches and pains because *other blokes hang shit on you*. Therefore, this might be interpreted to mean that the practice of safety is influenced as much by the community of fellow workers as it is by the hierarchy of managers.

5.7.4 Site A within-site comparison of findings

Both groups, workers and managers, were uncertain what the term “uncontrolled hazards” meant yet they both hold to a belief that all hazards can be controlled. Workers under-report hazards based upon their perception of risk and because they feel empowered to take local risk control action that circumvents the need for a reporting system. Both workers and managers acknowledge that an informal reporting system exists; however, the organisation is attempting to develop a reporting culture. Being more or less risk aware does not seem to be related with the workers’ propensity to report. The overall picture that is starting emerge is that culture is ambiguous and perhaps to an outsider like myself; contradictory.

5.7.5 Site B workers' perceptions of reporting practices

Some workers perceived that there are hazards that they cannot control and were prepared to report hazards, near misses, incidents and errors using the formal reporting system. In some instances what is reported is first subject to a risk-assessment.

5.7.5.1 There will always be uncontrolled hazards

When asked what does the term "uncontrolled hazards" mean to them, workers interpreted the term literally, that is hazards that they cannot control:

> *By the sheer definition … unless it's plain ignorance, by definition of the word I would say it's something that it, is something that is not usually a problem until it is too late as an example you can't think of it until it happens like you picking up something there is a snake under it an aggressive snake or whatever …*

This worker too provides a literal and practical example of an uncontrolled hazard:

> *Something that I can't control … there is always a chance that someone could be sneaking behind you … there is always something that you haven't been able to see like on a big reserve, what's around the fence. Like if you are doing a laneway that goes around the corner when you started there may not have been anyone there but when you get there there is someone there and you can't know that until you get there…*

This excerpt is significant because the worker is referring to how the workplace can change and in the process introduce new hazards. In that sense, then what the worker is alluding to is not so much hazards that cannot be controlled, but hazards that have not been identified.

Other workers were also able to provide examples of uncontrolled hazards as shown in Table 15.

Table 15

Workers' perceptions of what constitutes an uncontrolled hazard (Site B)

Worker	Uncontrolled hazard
1	*… to me that means the residents or the public they are a huge uncontrolled hazard …*
2	*The weather …*
3	*I suppose a car coming could hit us I suppose we can't really control that.*
4	*Well I can't control um the surface of the ground basically the ground's sloping I can't control that…*
5	*Uncontrolled hazard? Well sometimes you will get dropping a branch from a height and all of a sudden a gust of wind will come up and could take that branch anywhere …*

Workers were asked what they are expected to do about uncontrolled hazards to determine if hazards that they could not control were reported up the organisational structure. Some workers responses ranged from saying: *well you just don't do the job* to *I suppose just be wary* and *just make sure it's safe*. These responses are significant for three reasons. First at least one worker feels empowered to not do the job which is an important precondition for a culture of risk-awareness (Hopkins, 2005a). In contrast, other workers take uncontrolled hazards as a personal responsibility to work safely. Third, and perhaps most important, is that the workers fail to make a connection between identifying uncontrolled hazards and the reporting system. This is despite the fact that workers demonstrating some ability to be risk-aware, by virtue of the fact that they can imagine uncontrolled hazards, and contrary to the view that a risk-aware worker will report more (Hopkins, 2005a).

5.7.5.2 Reporting is a formal and informal process

Workers, however, do report and use both formal and informal reporting systems. For example, some workers prefer to report hazards directly to their supervisor:

*…if there was a hazard that I could see something waiting to happen I would go straight to ****** and talk to ******, how am I going to deal with this, how am I going to go about this?*

Workers were asked to give examples of hazards, near misses, incidents and errors that they had personally experienced and were also asked did they report any of these using the formal reporting system. The results are shown in Table 16. To make classifying the respondents' responses easier, the terms hazards, near misses, incidents and errors were defined using the principle that injury is the result of a process of an unwanted energy exchange (Viner, 1996). Reason's (1997) error types of slips, lapses, mistakes and violations were used to classify errors. Table 16 is important because it captures the range of matters of concern that are reported (Hopkins, 2005a). In theory, if risk-aware workers are more likely to report matters of concern, then it might be expected that a range of matters of concern would be reported, particularly errors, as errors provide small opportunities for learning.

Table 16

What workers report (Site B)

Description of what is reported	H	N	I	E	Reported?	Fixed?
… once I threw an engine mount across the road and I reported that because it was pretty good … we only had new chutes and mowers … it only flew that high above the ground (30 cm) but I reported it anyway … flew off the nature strip across the road and into someone's concrete and brick fence about this high hit it nice and hard that was reported as a near miss.		✓			Yes	?
I've been hit by LV a couple of times what's that 240 V … some people it affects more … couple of times I just moved the powerline out of the road because it was a service line just covered just like touching that over there when it is on you don't get zapped there must be a little tiny leakage in it and when I put my hand on top of the tree. Boof! I earthed myself I got a boot out of it			✓		No	-
****** was climbing a tree and was within regulation distances body clearances it was a house service wire so that was definitely as close call that we had to fill out form*				✓	Yes	Yes Disciplinary action
I have nearly been hit by a car but that's only my own fault … I was doing the edge and I sort of come out on the road a little bit too far but that was my own blue you know I should never have done that what I done		✓			Yes	?
… the dual cab Mitsubishi truck …it has got a towbar on it and the towbar was underneath the bottom of the tray by about a foot and when you tow our tool trailer with it which we tow every single day, you have got to get your body in a funny position to hook the trailer on and it is also really hard for reversing and when we take long lengths of timber we have to tie them on top of the truck and the timber would hang off the back tailgate because there was no rack on it and sort of right over the top of the area where you would bend down to hook up the trailer and I had asked for ages to get the towbar moved out and get a rack put on the back of the truck and they kept saying we will look into it and then they came out with his close call stuff and I had actually hit my head on the timbers a couple of times and I thought alright I will fill out a close call so I filled out a close call stating that I hit my head on the timbers that is what I filled out for	✓				Yes	Yes Design fix
… a small dead tree I went past and the vibrations must have snapped it so it fell and clipped the back of the mower and the back of my helmet just the end of it …			✓		Yes	?
I can give you one I've done a couple the last week or so one there for the hole that was in the concrete over there it was just a hazard ID not related to my worksite or anything like that just saw it and said well that's what the process is for and I wrote out a merit case got it fixed within two days …	✓				Yes	Yes Workplace fix

Legend

H = Hazard (in theory: a source of potentially damaging energy. In practice: a factor/s that increases the probability of energy release)

N = Near miss (energy release, no contact with workers)

I = Incident (energy release, contact with worker/s)

E = Error (slips, lapses, mistakes and violations which increase the probability of energy release)

Workers lodged a formal report in six out of the seven cases. Of the six that were reported, three were known to have been resolved by the organisation. Furthermore the workers said that they feel comfortable reporting, for example:

Well I don't see why not because it is totally anonymous there is no names associated with it we don't want to know who reported it we just want to know what is so it really can't be made any easier than that it's totally anonymous there is a box at the front of the office there for them to put them in there is no comeback on anyone it's not a finger-pointing thing is more just tell us about it … Yes I do feel comfortable …

Therefore workers are prepared to report and in turn their reports are met with a suitable organisational response which may be indicative of an informed safety culture (Reason, 1997).

5.7.5.3 Risk-assessing reporting

Some workers said that a decision to report is first subjected to a process of assessment. Before reporting, workers would take into account a range of factors including the level of perceived risk, the perceive degree of personal fault and the potential for embarrassment. For example, one worker said that the severity of the injury would be the decisive point for reporting:

If it was big enough, like I am not going to report it if I get a little scratch that's what they want … but in case it gets infected or that.

[So what would be big enough to report?]

I suppose a big gash or a broken limb.

For another worker, the perceived degree of personal fault would mean that this worker would decide to 'tough it out' rather than report. The worker said:

I haven't filled one in … possibly I um … well … there is probably instances where I could have filled in a close call but I was probably more like thinking well this is something that was my responsibility in the first place to do it better so I haven't filled one in … and … I am probably a bit not … what do I call it … I am probably

a bit from the old school of doing work of working that … just tough it out kind of thing or you just get on with it …

For yet another worker, not wanting to look like an idiot was a barrier to reporting:

No because nobody likes to admit they are a fool the only thing is that if they reported like … you could sort of say like if they have really hurt themselves enough that they have got to go off work then they have got to do something … but if they could handle the situation like I did they probably wouldn't say anything like I said because people are like that we are only human beings and we don't like to do things or make ourselves look like idiots.

In summary then, workers are divided in their preparedness to report, however, reporting practices seem unrelated to risk-awareness. Workers can be risk-aware, that is able to identify uncontrolled hazards, but this does not translate into reporting practice. Therefore it is not the risk-awareness program per se that encourages reporting but other organisational process and individual values and beliefs, in the case of the latter, no one likes to *look like idiots*. Taken together, what emerges is a more ambiguous interpretation of culture (Richter & Koch, 2004).

5.7.6 Site B managers' perceptions of reporting practices

Managers perceive that there will always be uncontrolled hazards and that workers have a range of options available to them to manage those hazards that include reporting a hazard to a supervisor and the right to stop work. Managers perceive that they are actively engaged in leading a reporting culture.

5.7.6.1 There will always be uncontrolled hazards

Unlike the workers, the contract manager acknowledges that the notion of "uncontrolled hazards" is a bridge between the risk-awareness process and the reporting system:

> *For reporting hazards you can use these forms. If you are happy that you can work around them and still work in a safe manner, for example, you might have identified where there might be uncontrolled hazards that you need to work around. If you believe that you can't work around them you can ring up your supervisor and say we can't go through this work because we have this particular problem that we can't get around and more than likely he will tell them to move on to a different site and he will go back with the team leader and have a look through the site and determine what can be done. The point being is it that we don't want to put people in a position where they are going to injure themselves because we'll end up with incidents and will end up with people who are hurt and we can end up with long-term problems*

Supervisors tended to be more like the workers and to interpret uncontrolled hazards literally as something that workers had no control over, for example: *uncontrolled hazard means something that you can't put a box around to protect yourself from it* … and *uncontrolled? …. Something that we can't control ourselves…*

Managers were asked to provide examples of uncontrolled hazards as shown in Table 17.

Table 17

Managers' perceptions of what constitutes an uncontrolled hazard (Site B)

Manager	Uncontrolled hazard
1	*… an example might be that despite all of our best intentions with mowing if we hit a rock that is hidden that is capable of coming out from underneath our deck or out from our shoot where we have extra protection it's an uncontrolled hazard. So the question "are there any uncontrolled hazards" stop make sure you get your thinking of things that aren't visually obvious so you might have to do a walk-through of an area to identify if there is something extra because just because you turn up every day something might have changed.*
2	*… it's you know things like if you are felling trees there could be a dislodged branch that you haven't seen or a caught up branch that you haven't seen. Somebody, an irate customer walking into the workplace and ranting and raving and diverting your attention from the job all those sorts of things…*
3	*… uncontrolled hazards could be … the cars going past that we can't stop unless we block the road off when we cut a main road like ****** highway so I would put that as an uncontrolled hazard um*

When asked what they expect workers to do about uncontrolled hazards the general view was that workers should attempt to control the hazard by minimising the impact of the hazard or stop work:

> *Basically try and do everything possible to control them and if you can't control them do everything possible that the impact is the least it can be. So for example, when we are mowing we know that there may be things hidden in the grass that we can't find because they are either the same colour as the grass or they are half buried or whatever, but we face our chutes away from the road so even despite the fact that we have got lowering devices on the chutes to make sure they are as low as possible we still make them so that the actual rotation of the blades will shoot things away from the road so in that most cases it will go to where there is no injury possible.*

In some cases it may be more appropriate to stop work:

Um … well, often it just needs to be an immediate reaction so somebody needs to basically stop and break what they're doing and deal with the situation almost as a reflex action and that happens sometimes when they yell out STOP! Get out of the way! You know?

With the exception of the contract manager, managers like employees do not make a link between the notion of uncontrolled hazards and the reporting system. Nevertheless, managers see themselves as leading a reporting culture.

5.7.6.2 Leading a reporting culture

This manager emphasises the importance of a reporting culture for preventing injuries:

The same with close calls, if there is a little incident, or if someone observes something that could possibly be hazardous if they report it first then we can track some similarities in those close calls. We can determine whether we are actually exposed to risk that people haven't thought about and if we can identify them early enough we can put processes in place so that we don't actually have the incident, and that's the whole theory behind it, it's trying to prevent the incident from happening by doing some preplanning and getting some information in advance

One manager perceives that the contract has been so good at developing a reporting culture that it has received *flak* from higher up the organisation. This manager said:

Yes we have been very good at reporting incidents we have received some flak over time personally for the amount of incidents that we report per month people: 'are gee you have got a lot of incidents out there'.

The success of the reporting culture was told by one manager through the same success story told by one of the workers:

Yeah the guys say hey … I'm just trying to think of something … for example … it has been documented because there is a proper way to do it but our dual cab truck which our infrastructure guys use it has just had a new towbar put on it because continually taking the trailer off in underneath the tray of the track you hit your head hit your hand and I guess that's that came into me and a good thing with the mechanism was that we had some way of reporting it and action could then happen.

The significance of this excerpt rests as much in the idea of storying telling as it does in revealing how the reporting process and reporting culture works. Stories are one way in which culturally accepted practices can be taught to novices entering a community of practice (Gherardi, 2006) . In this case, I as a new-comer to the community and the culture learnt that the practice of reporting is worthwhile because it makes the workplace safer.

5.7.7 Site B anecdotes from the field

There was only one opportunity to observe the reporting process in practice and that was in the case where the young apprentice arborist dropped a tree limb onto a fence.

5.7.7.1 Dropping a tree limb onto a fence

There is not a lot that I can say about the reporting side of this anecdote except to say that the young arborist reported the incident using the formal reporting system. I am not aware of how the organisation responded in terms of learning from this incident apart from saying they quickly repaired the fence.

For the young worker, however, it may represent a first step away from being a novice and toward being an expert. The incident will most likely be stored in the worker's long term memory and may serve his situation awareness well in the future.

For the organisation, it represents another story to tell about the practice of safety on the job and perhaps the next young arborist joining the community of practice will have the opportunity to avoid a similar incident by learning that the ropes should be used to lower a limb to avoid ‘dropping a limb onto another fence’.

5.7.8 Site B within-site comparison of findings

Both workers and managers believed that there were some hazards that cannot be controlled. When faced with an uncontrolled hazard, workers felt empowered to stop work and this view was shared by managers. With the exception of the contract manager, both workers and managers did not see a link between being aware of uncontrolled hazards as part of the risk-awareness process and the possibility of reporting those hazards using the reporting system.

5.7.9 Between-site comparison of findings

The main difference between the two sites is that at Site A, both workers and managers believed that all hazards could be controlled whereas at Site B, both workers and managers believed that that there will always be uncontrolled hazards.

A further difference was with respect to the reporting culture of both sites. Workers at site Site B appeared more prepared to report hazards, near misses, incidents and errors than Site A.

Both sites were similar, however, when it came to risk-awareness and reporting practices. There was no evidence at either site that the risk-awareness process increased the practice of reporting.

5.8 The Texture of Workplace Learning About Safety

By this point in the narrative it becomes apparent that issues of workplace learning cannot be neatly isolated for examination now; rather they are already embedded within and run like a ribbon through the preceding themes. For example, a learning process is implicit in the organisation's efforts to bring about a change in safety culture by developing a more risk-aware workforce. However, the organisation's efforts to bring about that change, through what Schein (1999, p. 160) might refer to as "a situation of coercive persuasion", may be deflected by the workers' own learning processes based on their situated knowledge and experience; or what the workers refer to as "common sense". Common sense may be a form of social tacit knowledge that is then transmitted by workers within a community of practice through the use of narrative or story-telling (Linde, 2001). Linde (2001, p. 163) argues that stories "provide a bridge between the tacit and the explicit, allowing tacit social knowledge to be demonstrated and learned".

Safety, and workplace learning about safety, therefore, may be an emergent property of a cultural system and that safety, as a competence, may be realised within communities of practice (Gherardi, 2006). However, the common sense that is transmitted within communities of practice may be flawed. For example, if, for the workers, common sense is an expression of existing mental models learnt on the job, then poor learning processes may lead to "imperfect" (Chapman & Ferfolja, 2001) mental models which may inhibit workers from achieving situation awareness. But none the less it is these mental models, or common sense, that informs the practices of the community.

At the heart of this discussion of learning are issues of power. Managers are able to exert power in their attempt to coerce workers to learn and practice risk-awareness, but the workers also have the power to deflect that coercion if they see fit (Latour, 1986). Even the situated nature of the learning of safety within communities of practice implies a power relationship. Contu and Willmott (2003, p. 283) contend that what has been over-looked in Lave and Wenger's (1991) original conception of social learning theory, and the resulting rise in popularity in the notion of communities of practice, is "the

embeddedness of learning practices in power relations". Therefore, workers exercise power over other workers entering a community of practice in terms of what practices new workers are expected to learn. This then is culture and culture has as much to do with learning and power as it has with leadership and organisational practices. This view is exemplified in Schein's (2004) definition of culture which bears repeating here:

> … a pattern of shared basic assumptions that was learned be a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 17)

If the group (perhaps community of practice) has learnt that common sense has worked well enough to solve safety problems, then the group will use its power to teach new members that safety is about using your common sense. Therefore, the culture of the group developed on the basis of situated learning may be at odds with the culture, built on the practice of risk-awareness, which the wider organisation wants the group to learn. This situation arises because organisations can only create the conditions that may influence learning but it is "individuals acting as agents of organizations who produce the behavior that leads to learning" (Argyris, 1999, p. 8).

The purpose of this discussion has been to emphasise that issues of learning are already embedded within and are not necessarily separate from other themes within this narrative. Workplace learning about safety is situated in social practice as much as it is a cognitive process situated in the heads of individual workers. This understanding of workplace learning about safety has implications for how organisations think about and design safety training programs. Organisations typically rely upon cognitive approaches to training through programs designed to transmit knowledge from the head of a trainer to the head of a worker (Machles, 2003). However, Machles (2003) argues that the knowledge may not transmit all that readily from the trainer to the worker in the workplace. Workers, on the other hand, may prefer to rely on common sense and tacit knowledge that is transmitted within communities of practice and reproduced through story-telling (Gherardi, 2006; Linde, 2001; Somerville & Abrahamsson, 2003).

It is against this backdrop to the texture of workplace learning (Gherardi, 2006) that I will present the findings from the field.

5.8.1 Site A workers' perceptions of learning about safety

The workers were asked how they learnt about the risk-awareness program and how new workers would learn about the program. Workers who could remember learning about the program said they learnt about it at toolbox meetings but that new workers would learn about it on the job.

5.8.1.1 Learning about safety at toolbox meetings

There was a widespread expectation among workers that they would learn about a range of safety matters at toolbox meetings with workers saying things like it was introduced *at the toolbox* and *it was introduced at a toolbox*. This worker went on to elaborate on the importance of tool box meetings, not just for learning about the risk-awareness program, but for more general communication reasons. The worker said:

> *Well he handed me the cards and he has had a talk at the toolbox meetings that's the sort of thing we do here you know we all work all over the district we only get together as a group in a toolbox meeting that's management's opportunity to communicate systems, work practices and so forth and that's generally when it rolled out …*

This excerpt is significant because toolbox meetings are perceived by this worker and the workers in general as a key social structure where workers come together with managers to talk about safety. This worker remembers the risk-awareness program being *rolled out* at a toolbox meeting and reflects a model of training consistent with a transmission model (Machles, 2003) of learning where learning is conceived of as a cognitive process of transmitting knowledge from the head of the manager to the heads of the workers. However, there is some evidence that the transmission model of learning may not be effective. For example, neither workers nor managers understand the key terms and

concepts that underpin the risk-awareness program. Furthermore, the risk-awareness program has fallen short of enabling workers to achieve situation awareness. Other workers could not remember receiving any formal training in the risk-awareness program at all. For example this worker said: *it's obviously been around for a little while but never really introduced to us*, a viewed shared by another worker who said: *nobody has gone through it with us.*

Nevertheless, the toolbox meetings seem to serve an important social purpose of bringing the group together and could serve as a forum for making tacit knowledge explicit, in other words an occasion for storytelling (Linde, 2001). Toolbox meeting could be used to expose common sense knowledge and even flawed mental models (Chapman & Ferfolja, 2001). However, toolbox meetings are still not the place where workers work and as such the learning still would be one level out from being situated in practice.

5.8.1.2 Learning the practice of safety on the job

Apart from learning about safety at toolbox meetings there was a widespread and valued belief among the workers that learning the practice of safety takes place on the job, or as one worker said: … *the only way to learn is to do* … In reflecting on the risk-awareness program, this worker believed that an awareness of risk is something that is learnt as part of the trade:

> *That's probably outside of the card so as I say the three questions I may not be doing them word for … remembering them word for word but it's something I think you pick up in the trade of just working around the areas you get to recognise the things you should be looking at and it's just an instant reaction it's like once you've learnt to ride a bike you know you can always ride a bike …*

This workers view of learning is generally consistent with that found by Gherardi and Nicolini (2002, p. 216) during their ethnographic study of an Italian building site that learning takes place in a “local culture of practice” – or *the trade* as this workers calls it. This worker refers to learning what is safe as *working around the areas you get to*

recognise the things you should be looking at and it's just an instant reaction. This is similar to Gherardi and Nicolini's (2002, p. 216) finding that workers do not simply acquire a set of safety competencies, rather through participation in a field of practices ("the trade"), workers develop a "sense of what is safe" which is very similar to the workers comment in relation to safety that you learn to *recognise the things you should be looking at*.

The workers perceived that new workers would learn about safety in general and about the risk-awareness program in particular through a formal induction process, for example: *…they should know about it already they should be inducted … part of their induction*. The workers shared a view, however, that they would teach new workers about safety on the job or as this worker says: *they tend to learn on-the-job … probably spend a bit of time with an experienced fella straight away; they would pick it up as they go along.*

According to this worker, learning on the job is important because it teaches new workers the *right way* of working safely:

> *Yeah, it's an opportunity to teach him the right way first-off before he develops any bad habits … just get him used to working this way… it's a little bit daunting for him initially at least. I can guarantee when I've been teaching him the ropes of the job that if he follows these I've got a pretty good chance that he's going to come home bloody safe at the end of the day if he follows these…*

The significance of this excerpt is that learning about safety is situated as much in practice as it is in the training room or toolbox meeting. This worker's comments are therefore consistent with the view of learning proposed by Lave and Wenger (1991):

> … learners inevitably participate in communities of practitioners and that the mastery of knowledge and skill requires newcomers to move toward full participation in the sociocultural practices of a community. (p. 29)

But there may be a down side to learning the practice of safety within a community of practitioners, and that is that the wrong practices might be learnt as this worker points out when asked how new workers learn about the risk-awareness program:

> *I don't know. I don't think they go through any training or nothing, they just go out on the job with blokes and are supposed to learn off the blokes so if particular blokes aren't doing their *** ***** for every job, well they will just get into that habit of not doing them for every job…*

The point clearly made by this worker is that the "sociocultural practices of a community" (Lave & Wenger, 1991) may not always be conducive to safety. This is a similar situation to that described by Hopkins (2005a) in relation to organisational culture and safety. Hopkins (2005a) suggests that a safety culture may not be the same as a culture of safety. For example, this excerpt points to a safety culture of not complying with the risk-awareness program, and from the standpoint of the organisation at least, this may constitute a negative safety culture, but a safety culture none the less. However, given that the workers value common sense, not complying with the risk-awareness program might be a non-issue because from the workers standpoint, safety is not derived from a piece of paper, but from their common sense. Therefore, the workers may believe that they do have a culture that is focused on safety – just expressed differently. But given the potential limitations of common sense knowledge in the context of achieving situation awareness, it is possible to envisage that a community of practice within an organisation may end up with a safety culture that is naively not focused on safety in much the same way as might an organisation – but for different reasons. For example, in the former case, the community of practice, the illusion of a safety culture may be due to naivety, whereas in the latter case, the organisation, it may be a case of convenience or risk denial (Hopkins, 2005a). However one decides to frame the debate and make sense of this, it seems as if safety culture or a culture of safety remains an ambiguous and contested concept.

5.8.2 Site A managers' perceptions of learning about safety

Managers, like the workers, acknowledged the importance of toolbox meetings as a forum for communicating with and teaching workers about safety. However, there was concern that the risk-awareness program had not been "rolled-out" effectively and this could lead to the development of bad habits on the job.

5.8.2.1 Toolbox meetings as a forum for communicating and learning

Managers have recognised that toolbox meetings provide them with an opportunity to talk to their workers about risk. Traditionally, toolbox meetings have been used to review safety rules, but this manager recognised that the process was not working:

> *…we started out when I first came back in reading these and the guys, you're watching them, they were half asleep you know… no value in it whatsoever. You can say corporately we have read our chlorine handling procedure, tick it off, no value whatsoever. The guys walked out of that room and didn't listen to a word that we said to make them physically do something, get their brain thinking about it…*

To *get their brain thinking* managers now use toolbox meetings to discuss risk scenarios in the workplace. This manager provided an example of how a scenario in relation to the use of cranes might be played out in a toolbox meeting:

> *These are the procedures that we toolbox each month (referring to a list on a pin board behind the desk). Say we are going to do cranes. We would say to the guys, alright you are going to use a crane; you have got a crane on site. What can go wrong? Start thinking about what processes you have got in place to stop that from happening. Has the crane driver got a certified licence? How are we going to rig the load? Have we got proper slings? Have they slung the load properly? How am I going to lift it? And they are things that we say to the guys, you tell us and we push the guys into little groups of say three or four, here is the procedure we want you to follow this process; stop and think about what could go wrong and what have we got in place out on site. This is what we have put in place and then we go*

around the room and say: what did you find? And it's a general discussion it works really, really well instead of just sitting there - right when you get a crane guys make sure the guy's got a licence make sure you can see his service records…

These excerpts are significant for two reasons. First they illustrate the importance of toolbox meetings as a structure for learning. For example, re-designing the toolbox meetings to cause workers to reflect on risk scenarios is an example of an organisation creating the conditions "that may significantly influence what individuals frame as the problem" (Argyris, 1999, p. 8) and provide workers with "occasions for storytelling" (Linde, 2001, p. 170). Second they illustrate how learning about safety within a toolbox meeting has shifted away from a mindless review of safety rules to a more situated view of learning through the use of risk scenarios designed to challenge workers' thinking. Although toolbox meetings are not situated learning in its pure form, they could still be used by managers to encourage workers to make their tacit knowledge about safety explicit and to share that knowledge with their co-workers and managers. It also provides an opportunity for workers to surface their mental models, or what workers refer to as their common sense, to reflect on the appropriateness of those mental models, and where necessary, refine those mental models based upon new insights. The effectiveness of this approach to learning and the extent to which it is able to bring about cultural change will depend upon the extent to which workers translate their new insights into practice. This view of learning is consistent with double-loop learning because it calls into question underlying assumptions, that is, values and beliefs not as espoused, but as inferred from observations of practice (Argyris, 1999). Learning is said to occur when an organisation achieves a match between the intended and actual outcomes (Argyris, 1999). Against this test then it could be said that with the best intent, learning still has not occurred because there is ample evidence that the workers' practices do not follow managers' intentions.

According to one manager, the reason why workers' practices do not match managers' intentions is that the risk-awareness program *was never rolled out …there is no training material* and as a consequence new workers only learn short cuts. This manager said:

…the scary part about the level that you see application of these processes is in the field is that a new person coming on board only learns shortcuts. Now shortcuts are fine, I use shortcuts all the time, but you have got to risk assess them and you have got to know if you are going forward if it turns to shit how far back do I have to go to make it safe, I might have to take one step or I might have to go all the way. Now you need to know where to go now a person who learns shortcuts doesn't know that…

This excerpt illustrates the power of situated learning in that new workers learn short cuts *in the field* in the absence of the organisation creating the conditions within which individuals can learn, that is, the risk-awareness program was never "rolled-out" and there are no supporting training materials.

5.8.3 Site A anecdotes from the field

I have no specific anecdotes to share here in relation to workplace learning about safety, except to say that workplace learning about safety already runs like a ribbon through previous themes. For example, the tale of the 'ditch-witch accident' which appeared in the theme 'risk-awareness and the practice of safety', is a powerful reminder of how story-telling transfers knowledge about safety within a community.

5.8.4 Site A within-site comparison of findings

Both workers and managers perceive that toolbox meetings are an important organisational structure for communication and learning about safety. Workers, however, have a more passive view of the role of toolbox meetings; it is where they expect to be told things. By comparison, managers have a more active view of toolbox meetings; it is where they involve workers in thinking about risk.

Workers perceived the importance of learning on the job differently to managers. For example, workers valued learning on the job as an opportunity to teach new workers the

right way of working. By comparison, managers perceived that learning on the job meant that new workers learnt *bad habits*.

5.8.5 Site B workers' perceptions of learning about safety

The workers were asked how they learnt about the risk-awareness program and how new workers would learn about the program. Workers who could remember learning about the program said they learnt about it at toolbox meetings but that new workers would learn about it on the job, or more particularly, from the "crew".

5.8.5.1 Learning about safety at toolbox meetings

Not all workers remembered how they learnt about the risk-awareness program but for those who did, it was through a toolbox meeting as reflected in comments such as: *in a toolbox they tell you what you have got to do* and similarly:

> *Through one of our toolbox meetings … it came up at a toolbox meeting that this is what ****** wanted us to do and that sort of thing … everybody said oh oh oh more paperwork which it is it is more paperwork …*

One worker remembers more clearly the training that took place at the toolbox meeting. The worker said:

> *Um … it was just a toolbox situation where we had one I think it was a projector on the board um showing what points were there and how you to had to assess that with your job when you turned up and take a step back and have a look and go through the point and relate what you thought risks were and the safety procedures you needed to go through them but yeah it was a toolbox situation with it …*

These excerpts again illustrate that toolbox meetings are an important organisational structure for communicating with workers and for creating the conditions under which individuals might learn (Argyris, 1999). The type of training the workers received at the toolbox, however, is again consistent with a transmission model (Machles, 2003) of learning, for example: … *it was a projector on the board um showing what points were there and how you to had to assess that with your job.* As with Site A, the training will

only be effective if the workers translate what they learnt in the toolbox into practice in the field. In the field, the structure for learning is the work crew.

5.8.5.2 Learning the practice of safety on the job

The workers also perceived that they learnt about the risk-awareness program on the job and in particular from team leaders and the work crew. For example, both these workers comment on how they learnt about the program from their team leaders:

> *Um just through my old team leader …yeah he used to do it and then after a while I was doing it in the cars sort of I was filling out …*

> *Um I probably learnt from um first two weeks I probably just went out with different teams just getting to know the work and all the different locations I was … I was introduced that way in leaders doing them …*

Both excerpts illustrate the importance of leaders in the field in influencing worker practices. The work crews are also influential in teaching new workers the practice of risk-awareness as the following comments from two different workers illustrate:

> *Um … it was probably my second week, my first week, something like that, um and I was going slashing and one the guys just said: 'we have got to fill these out every day' so he handed it to me and said: 'think of any risks you can think of and write them in there' so I thought of some and he added a few that I hadn't thought of which I thought was good, because it actually opened my eyes to other things so in that sense it was really useful, but the risks are there …*

> *I guess not long after, within the first couple of weeks, I was asked to fill one out so I had to be sat down and shown what to do … this was in a crew out in the field … I had to be shown basically what to look for on that particular job and how to … what the best way is to fill it out and how to write it and that sort of stuff*

Learning the practice of risk-awareness then is very much situated within a community of practice – the work crew and workers often referred to the "culture of the crews", for example, this worker said:

> *… we will take them around and then we will put them in with the crew and it's just like the culture within the crew they all know that they have got to fill it in first so it is filled in and they would see it happen …*

This excerpt is significant because it locates the notion of "culture" very much within a community of practice and the community (crew) accepts responsibility for teaching new workers the safety practices that make up the culture of the crew, or as this worker said: *you have got to teach them and tell them the best way to do things*. Not only do workers learn about the risk-awareness program within a crew, they learn the practice of safety more generally in the crew as this next comment illustrates:

> *… a lot of your safety training comes from the guys around you especially working with chippers like I was for the first few months and brush cutters. You are doing something unsafe it makes everyone else unsafe and your actions can very easily injure somebody else so they tell you how to … that was the best part of learning safety …*

At one level the preceding excerpts, when taken together, suggest that the practice of safety is learnt within communities of practice referred to by the workers as *the culture within the crew*. This assessment would be consistent with that of Gherardi et al. (1998, p. 202) who argue that safety is socially constructed and that "there are as many safety cultures as there are communities of practice inside an organization". But the excerpts need to be interpreted cautiously for two reasons. First is that the espoused beliefs and values of the workers have been shown to differ from the workers' underlying assumptions inferred from observation of action (Argyris, 1999; Schein, 2004). Although the workers talk positively about safety, a reflection of their espoused beliefs and values, field observations have revealed that workers regularly break safety rules. Further still,

many workers do not value and believe in the risk-awareness program and do not comply with the program – a reflection of their basic underlying assumptions. To put it bluntly, workers are espousing one thing and doing another. Managers too, may be espousing one thing, and tolerating another.

This is not to deny that safety culture may reside within communities of practice; it is to say that maybe these cultures are not always focused on safety in the way they say they are (Hopkins, 2005a). More than anything, this assessment underscores the difficultly of making sense of and interpreting organisational culture and safety culture beyond saying that culture is an ambiguous and contested concept. It is ambiguous because cultures, for example a work crew, can simultaneously espouse safety as a value while breaking safety rules. Contested by virtue of the different interpretations of safety culture within and between different communities of practice including the academic community, for example see Guldenmund's (2000) review of the literature on safety culture, and the community of workers and the community of managers, reported in Gherardi et al. (1998).

5.8.6 Site B managers' perceptions of learning about safety

Managers, like the workers, acknowledged the importance of toolbox meetings as a forum for communicating with and teaching workers about safety.

5.8.6.1 Toolbox meetings as a forum for communication and learning

Managers, like the workers, learnt about the risk-awareness program at a toolbox meeting, or in the words of this manager: *we got toolboxed! … like everyone else, all the crews, we get toolboxed on such things as risk-awareness programs…* The nature of the toolbox training is further explained by this manager:

> *When it was first rolled out corporately, so when someone at first said we are going to have a ***** *****, basically there was a process of a PowerPoint presentation running through risk, consequence, likelihood and those type of issues and explaining how you can lower the risk, lower the risk outcome through consequence and likelihood so that everyone's going to go home in a better condition than if you didn't pay attention to that - that was basically through a toolbox presentation – PowerPoint.*

The version of the program released from the corporate level of the organisaiton was modified by the site and was again presented to the workers in a toolbox meeting as explained by this manager:

> *… we actually took our new focused, if you want a call it that *** ***** and gave it to a couple of teams to trial and to hone and to cut off all the sharp edges, and then we presented it in another toolbox but in a less formal way, no PowerPoint type of presentation …*

According to one manager, new workers also learn about the risk-awareness program at toolbox meetings:

Um … well they are tool boxed all the blokes are tool boxed with these um when they came out um we have changed this a lot from when they first came out when they first came out we tool boxed them and new people that come on they're tool boxed with them when they have their induction so if we induct someone they are told about the risk-awareness forms and the importance of signing them and the risk-awareness cards…

New managers learn about the risk-awareness program by spending time in the field with workers. As this manager said:

A new supervisor or manager would learn about this process initially through the induction, but then during their initial few months of starting I work very closely with the supervisors going out onto site and getting the team leaders to explain to the supervisors what they actually do. So it is a bit of a reverse that the team leaders are actually educating the supervisor and what that assists in doing is showing the supervisor that it is something that is real and tangible and is happening on site and is not something that just sits on the shelf and just gets dragged out for audits …

These excerpts are an overwhelming illustration of the faith that is placed in toolbox meetings for training workers and managers alike, and for communicating with the workers. The exception to this reliance on toolbox meetings is that new managers learn about the risk-awareness program and safety by spending time in the field. The distinction between the cognitive and social aspects of learning has already been laboured in this narrative and is in evidence again here. What is different about these excerpts is the language that managers use when talking about learning and toolbox meetings. Managers describe toolbox meetings in the language of something that is done to you, for example, *all the blokes are toolboxed* and *we got toolboxed!* In this sense, "toolbox" is a verb rather than adjective. As an adjective, "toolbox" would describe a place where learning takes place, as a verb "toolbox" is that learning, hence, *we got toolboxed!* The point being that the notion of "toolbox" is such an integral part of the organisational

culture that the intent of a toolbox is spoken of in cultural short-hand. But even cultural-shorthand can mask issues of power. This point will be expanded upon in the anecdote from the field referred to as ‘the power of toolbox meetings’ which, it is argued, adds support to the theory that culture is ambiguous and contested.

5.8.7 Site B anecdotes from the field

I have elected to include two anecdotes from my time spent in the field. Each anecdote highlights a different aspect of the texture of workplace learning about safety. The first 'the power of toolbox meetings', illustrates the relationship between power and learning. The second, 'run over by a chipper', is a return to more familiar ground and illustrates how stories are used as a vehicle for reproducing safety knowledge.

5.8.7.1 The power of toolbox meetings

Toolbox meetings are a regular part of the operation of the site and are used by managers to communicate with workers on a variety of topics including safety. For example, there is an annual schedule for the review of a different safety rule at each meeting. Meetings are also used to train workers in new corporate initiatives such as the risk-awareness program. Each of the three sections on site holds a toolbox meeting at least once a month. The meetings are held in the training room at the depot and are attended by the contract manager, supervisor for the relevant section, health, safety and environment coordinator and of course the workers. On this occasion, I also attended the meeting. But it was not so much what was said at the meeting that was of interest but the silence of the workers in response to what was said. Here is how the events unfolded.

> *The most interesting part of the toolbox meeting to me was when Laurie, the contract manager, joined the meeting about two thirds of the way through. Laurie wanted to talk about the risk-awareness forms and prefaced his comments by saying "there has been a lot of talk from the ****** crew about the new forms which require you to tick a box. What I have heard is that the tick a box approach is not working, it isn't getting you to think". Laurie then reiterated the reasons why they had moved to a tick a box form which was mainly because it was not reasonable for workers to remember everything that is now on the form. He also made the point that they should be writing down the specifics of what they are doing on the job on their risk-awareness forms. He said that "if you are going to have your signs out just adjacent to your job rather than say at the entrance to the park or reserve, then you should write that down on your form so that you can*

cover yourself if someone comes back and questions what you were doing". Laurie acknowledged that the risk-awareness program was covering both the organisation and the individual in terms of liability for what they were doing and encouraged everyone to do complete their risk-awareness forms and to write more things on them. Laurie asked the group "what do you think of the risk-awareness programs? Do you have any views on the risk-awareness programs?" His questions were met with silence from the workers. This surprised me because having spent the week in the field with these guys I was well aware of their views and in particular their concerns in relation to the risk-awareness program.

When the meeting was over I returned to the workshop to prepare for the day's work. In the process of helping the crew I was riding with for the day load equipment onto the truck, I struck up a conversation with Mal about the toolbox meeting. I wanted to explore the reason for the silence of the workers and I felt that I had developed enough trust from working with Mal to ask him why the silence. As we stood there, both of us with one leg up and resting on the A frame of the trailer, Mal's response was at first guarded. He then said he needed to explain to me what had just occurred. Mal said to me: "I have seen it all before. Laurie will ask you for your opinion and when you do give your opinion, and when you do speak up, well, then you get into trouble, so we don't speak up". This then, was the reason for the silence of the workers.

This excerpt is significant because it is an illustration of the relationship between power, learning and culture and how power may actually negate opportunities for learning and the development of a culture of safety. These three issues, power, learning and culture are revised here so that they may be used as a frame to interpret the 'silence of the workers'.

It has already been argued in this narrative that under a translation model of power (Gherardi, 2006; Latour, 1986) leaders do not have power they can only exert power. In fact Latour (1986) argues that power is actually a paradox:

> … when you simply *have* power – *in potentia* – nothing happens and you are powerless; when you *exert* power – *in actu* – others are performing the action and not you. (pp. 264-265)

Furthermore, Argyris argues (1999, p. 8) that learning occurs when individuals "acting as agents of organizations produce the behavior that leads to learning" . Therefore, and based on these views of power and learning, both are implicit in Schein's (2004, p. 17) definition of culture which relies upon groups learning basic assumptions that work and are taught to new members of the group "as the correct way to perceive, think, and feel". Bringing these three strands together then, it is argued that "shared basic assumptions" (Schein, 2004), the basis of culture, is subject to individuals acting together to agree on ways to behave. Agreeing on ways to behave is an issue of power; what is agreed to is a matter of learning. Culture, therefore, is influenced as much by local work groups as it is by the actions of leaders because culture is able to be contested and on the surface appears ambiguous. I will now use this argument as a frame to the 'silence of the workers'.

The 'silence of the workers' therefore, is an example of a situation where a person, in this case the contract manager, who, although they may have legitimate power (Baron, 1986) by virtue of position in the organisation, are actually powerless and are made so by the actions of the workers, that is, by their silence. The workers have learnt that their opinion does not matter anyway and have also learnt that the best way to deal with this is to remain silent. I too, as a new member of the group, have learnt that at toolbox meeting you do not say anything; I too have joined the culture of the work group symbolised by 'the silence of the workers'. Ironically then, the toolbox meeting is a battleground of power where the losers are learning and safety and culture remains ambiguous and contested.

5.8.7.2 Run over by a chipper

The story of a worker being 'run over by a chipper' was told to me by at least four different work crews. It was a story that was told during a break for lunch as much as it was told while working. I have included it here because it is an example of how the workers use story-telling to share and reproduce safety knowledge, in this instance with me as a new member of the group. Like the ditch-witch story in a previous theme, I

developed a new sense of respect for ‘chippers’ and their potential for injury. A chipper is much like an ordinary garden mulcher – but much bigger! It can handle anything from twigs and branches up to sizeable logs. The chipper is on wheels and is towed behind a truck, into which the chipper ‘spits’ the results of its mulching efforts. The chipper is very noisy and workers wear hearing protection, in part to guard against the noise of the chipper, in part to guard against the noise of their chain saws.

Here is my rather feeble attempt to summarise the story of being ‘run over by a chipper’ as it was told to me by one of the work crews:

> *Interestingly a few years ago one of the guys on the crew was actually run over by the chipper. Hence how easily awareness can be lost when there is a combination of noise, cars, hearing protectors and the like. The worker was sharpening a saw in a vice on the mud guard of the chipper. The chipper, of course, was attached to the truck. Without the worker knowing, another worker jumped in the truck to move the truck forward, a regular practice when cutting back trees and shrubs along a road. Likewise, the worker in the truck was not aware of the worker sharpening the saw blade on the mud guard of the chipper. When the truck towing the chipper moved, it knocked the worker who was sharpening his saw over and ran over his leg, for reasons that I don’t fully understand, the truck then backed up and ran over the workers leg for a second time. The worker still has problems with his leg to this day. It does demonstrate the seriousness of the risks that these guys face.*

As I have said this story is still very much at the forefront of workers minds such that they feel compelled to tell new workers, like me, about it. The story possibly illustrates how situation awareness can be lost, for both the worker sharpening the saw and the driver of the truck. The story also illustrates that common sense alone is not enough to prevent incidents like this from occurring. As a result of this incident, the workers instituted a system where as a community they became more aware of each others position on the road and now use hand signals to communicate what is safe and what is not safe. Stories such as these carry powerful messages about safety that have a lasting

influence, remember the story was a couple of years old. This is an example of risk-awareness based on situated practice and situated learning and as such, storytelling seems to me to be a powerful means for reproducing safety knowledge.

5.8.8 Site B within-site comparison of findings

Both workers and managers perceive that toolbox meetings are an important organisational structure for formally communicating and learning about safety. Workers, however, perceive that much of their informal learning takes place either through team leaders or the crew. For managers, learning on the job is a formal part of the induction process for a new manager. However, the potential of toolbox meetings as a forum for learning is undermined by issues of power. Workers seem to value story-telling as a means for reproducing safety knowledge informally in the field. Therefore, there is a gap between the formal and informal mechanism for workplace learning about safety.

5.8.9 Between-site comparison of findings

The stand-out similarity between Site A and Site B is the use of toolbox meetings as the forum for communication and learning about safety. There are differences, however, in how both sites use toolbox meetings. Site A uses toolbox meetings to generate thinking and discussion among workers around a workplace scenario. Site B, by comparison, uses toolbox meetings to, it seems, “do things” to workers and managers, hence the comment “we get toolboxed”. Although, toolbox meetings are the formal structure for learning, workers perceive that much of their learning about safety is informal and takes place on the job.

5.9 Risk-awareness and a Safer Workplace

Hopkins (2005a, p. ix) argues that "every organisation has a culture and that culture can be expected to impact on safety". Risk-awareness, Hopkins (2005a, p. ix) goes on to argue, is a cultural phenomenon that today is advocated as a way of "enhancing safety". These issues are at the heart of this research; therefore, this final theme is a return to the main research question that was designed to explore Hopkins' arguments. That question is repeated here:

What impact, from the perspectives of the on-site workers and managers, does an organisation's risk-awareness program have upon the culture of safety and the resultant level of risk?

The story so far has explored this question from a number of angles and in the process has surfaced a number of sub-plots that influence the answer. The "illusion of safety" has emerged as an intriguing sub-plot with sub-plots of its own. Take for instance the faith workers place in their common sense; compare that with the faith managers' place in paperwork. There is also the power sub-plot, not just the power of leaders but the power of workers and groups of workers. To add to the intrigue is the workers' defiance of both the risk-awareness program and the safety rules resulting in a gap between paperwork and practice. Taken together, it is tempting to want to speculate on the answer to the research question, but that must wait for the next chapter. For now, let us explicitly seek out the workers and managers views on the extent to which the risk-awareness program has resulted in a safer workplace.

The question: "In what ways do you think that the risk-awareness program makes your workplace safer?" serves as the final backdrop against which I will present my findings from the field.

5.9.1 Site A workers' perceptions of risk-awareness and a safer workplace

The workers' responses to the question varied with some workers perceiving that the risk-awareness program had had no impact upon safety, whereas others workers perceived that it had made a positive impact. Comments representing both views are shown in Table 18.

Table 18

Site A - Workers' perceptions of the impact of the risk-awareness program on workplace safety

No impact	Positive impact
I don't see that it has made much difference myself.	*I think it's a good prompt to encourage you to think about certain things that you may not think about under pressure.*
I don't think on the whole it has made any difference … I'm not sure that it does … (make the workplace safer.) No it probably doesn't … probably doesn't … just more paperwork.	*Not seeing the hose black hose on a walkway and I must have stood on it incorrect or stood on it in a funny way and rolled my ankle. So that's the only real injury I've had here …back then we did not have *** ******…and we did not have ***** ****** so look, possibly they could have contributed to a safer workplace.*
No, No, it's just paperwork to me.	*I think it's extremely good tool for anyone new that starts to get them on the right way of thinking about what they are doing.*
*Well, my workplace was safe before they came in because, like I said, it's all the same sort of stuff you're thinking about the same … the stuff that they have got written down on the *** ***** and that ***** ***** card is what you were doing before they came in.*	*It's probably handy sometimes. It does make you think of a couple of little extra things you possibly may not have thought of. I think it is especially good for someone that has just started and is new to the industry.*
Well none. I just go about it the way I always gone about it before they came in. As I said, it's just common sense that you go through the process that you normally would about thinking about what you have got to do with a job, what hazards there are and try and eliminate as many hazards as you can.	*It has made he workplace safer by identifying hazards and putting in measures to control hazards or eliminate the hazards.*

The themes that emerge from the workers responses in Table 18 echo those that have emerged throughout this narrative. For workers who perceived that the risk-awareness program had had little impact there were two recurring themes. Firstly, that the program

creates more paperwork and secondly, that workers were already thinking about the risks on the job before the program was introduced. For those workers who perceived that the program had had a positive impact, the main themes to emerge were that program may be of more benefit to new workers and that for existing workers, it helps them think about risk.

5.9.2 Site A managers' perceptions of risk-awareness and a safer workplace

Interestingly, none of the three managers interviewed gave a direct answer to the question 'how has the risk-awareness program made the work place safer'. The closest one manager came to answering the question was with a question: *have they?*

5.9.3 Site A within-site comparison of findings

It is not possible to make any within-site comparison because managers did not respond to the question.

Site B workers' perceptions of risk-awareness and a safer workplace

The workers' responses to the question varied with some workers perceiving that the risk-awareness program had had no impact upon safety, whereas others workers perceived that it had made a positive impact. Comments representing both views are shown in Table 19.

Table 19

Site B – Workers' perceptions of the impact of the risk-awareness program on workplace safety

No impact	Positive impact
I don't personally. I don't think this sheet is helping at all.	*I suppose it makes us think more about the safety aspects like in the depot or on the job site. It makes us just look around the job better for any hazards.*
Not very much at all because um, take that away and what are you going to do? So take it away and you are still going to be thinking about it regardless.	*Aware of the hazards on the job. Just a reminder of things that can go wrong.*
I don't know if it has. I'm just trying to think of an example where it might have made it safer for me and I can't think of one.	*It has made the workplace safer. It is a method of engaging my attention before I start on a job when in the past, for many years I would have just gone ahead and done it.*
They might be good for a different line of work, different type of work, but for what I do, I feel that they are not helping. They are not making it a safer place. What piece of paper can really?	*Oh definitely in informing people, myself, my team. It just makes you more aware at each job site because each job site changes. It just keeps you aware of different hazards at different jobs and jogs your memory really.*
If after four years if you don't know what you're doing, you probably shouldn't be here really.	*A lot safer because the last *** ***** that we had before had nothing like this, that's why these have been all changed. I find this is a lot easier to fill out and not only that, I reckon it's a better idea.*
None. I don't think it has had any impact. I would like to think that I am safer than what the piece of paper tells me to be anyway.	*What impact did they have? Well I think it's more about a reminder. It's a reminder that not every job site is the same.*
	Oh personally it makes just makes you aware of your surroundings. It just jogs the memory all the time. It definitely makes me concentrate more,

	especially when you get to different areas. It just makes you more aware of your surroundings.

The themes that emerge from the workers' responses in Table 19 again echo those that have emerged throughout this narrative. For workers who perceived that the risk-awareness program had had little impact, the same themes that emerged for Site A were also present at Site B. That is, the program creates more paperwork and secondly, that workers were already thinking about the risks on the job before the program was introduced. For those workers who perceived that the program had had a positive impact, the main themes to emerge were that program helps workers to think about risk and makes them more aware of risks.

5.9.4 Site B managers' perceptions of risk-awareness and a safer workplace

The managers' responses to the question also varied with some managers perceiving that the risk-awareness program had had no impact upon safety, whereas other managers perceived that it had made a positive impact. Comments representing both views are shown in Table 20.

Table 20

Site B - Managers' perceptions of the impact of the risk-awareness program on workplace safety

No impact	Positive impact
**** ***** (the card) *might have made it a bit safer but I don't know whether the* *** ***** (the form) *has made it any safer all. All it has done is give some documentation behind the process.*	*It is a communication tool that has helped me and saved me from having to be out there and trying to rush around to every single job to make sure they are alright. It's just saying okay, we have people out there who have been inducted in this process, educated to know how it works, and I feel comfortable that they have a process that enables them to have a safe worksite.*
	I feel confident that I can pick up their *** ****** (the forms) *and see the sorts of stuff that they are actually working too, and see that they are filling it in on a regular basis, and that gives*

	me a degree of satisfaction knowing that they are thinking about the job.
	Oh well it gives me a record of when the tasks were done.

While one manager said that the paperwork associated with the risk-awareness program had not made the workplace safer, other managers said that the program, including the paperwork, gave them confidence and a record that workers had a safe workplace.

5.9.5 Site B within-site comparison of findings

There were conflicting views, both within and between the two groups of respondents as to whether or not the risk-awareness program made the workplace safer. However, the paperwork associated with the program is viewed negatively by some workers and managers. Some workers thought that they were already thinking about risk before the program was introduced, whereas some managers thought that the program gave them a level of confidence that the workers had a safe workplace.

5.9.6 Between-site comparison of findings

Both Site A and Site B were similar in that there were conflicting views within both groups of respondents as to whether or not the risk-awareness program had made the workplace safer. A further similarity was that workers voiced concern over the paperwork associated with the program and said that they were thinking about risk on the job before the program was introduced.

5.10 Summary of the main findings

The results of this study have been presented as a thematic narrative in an attempt to capture what the risk-awareness program means to workers and managers at two sites within the one organisation. The main findings that emerged for each theme are summarised in Table 21. In Chapter 6, Conclusion, the themes will be used to respond to the research questions.

Table 21

Summary of the main findings for each theme in the narrative

Theme	Main findings
1. The role of leadership	Managers drive the risk-awareness program and are able, to an extent, to influence workers to comply with the requirement to complete the paperwork associated with the program.
2. Risk-awareness and the culture of safety	There are cultural differences between workers and managers and between sites. At both sites, most managers valued the paperwork associated with the risk-awareness program whereas workers, and some managers, do not place the same value on the paperwork. At Site A, the risk-awareness program was at odds with a culture of "getting the job done". By comparison, at Site B, workers were encouraged to take the time to apply the program and to say "no" to unsafe work. Therefore, there is some evidence of different safety cultures within the one organisation as well as within the one site.
3. Common sense and the practice of safety	The belief that safety, including the risk-awareness program, is common sense was confined to workers and was more prevalent at Site A. However, there was some evidence that common sense may be context specific.
4. The practice of risk-awareness on the job	Many workers believed that they were already thinking about risk before the risk-awareness program was introduced. However, there is some evidence that neither the paperwork associated with the program or the workers' common sense is sufficient for the workers to achieve situation awareness. Therefore, the paperwork associated with the program may be creating and illusion of safety for managers as much as common sense is for the workers.
5. Decision-making and rule-breaking on the job	There was evidence of rule-breaking at both sites. Therefore, although workers may comply with the requirements of the risk-awareness program, and even when workers are aware of the risks, their decisions in relation to risk control result, in some circumstances, in practices that are at odds with the formal safety rules.
6. Reporting practices and risk-awareness	Workers and managers at Site A believed that all hazards could be controlled and were not likely to report matters of concern. In contrast, workers and managers at Site B believed that there would always be uncontrolled hazards and workers at Site B were more likely to report matters of concern. However, there was no evidence that the risk-awareness program increased the number of reports at either site.
7. The texture of workplace learning about safety	Toolbox meetings are a key structure for formal learning about safety including the risk-awareness program. However, workers value the informal learning about safety that takes place on the job and which is sometimes reproduced within communities of practice through storytelling.
8. Risk-awareness and a safer workplace	Managers and workers were divided on the extent to which the risk-awareness program had made the workplace safer.

Chapter 6 Conclusion

Safety culture has risen to prominence over the past two decades as a means by which organisations may enhance their safety performance (Hopkins, 2005a). However, the literature review conducted for this study revealed that there is a lack of consensus in relation to how safety culture is to be defined, conceptualised and studied (Guldenmund, 2000; Hale, 2000). Conceptually, safety culture may be viewed from either a functionalist perspective or an interpretive perspective. Where the former emphasises the role leaders play in shaping and influencing safety culture, the latter emphasises that safety culture is created by social groups who construct their own systems of meaning in relation to work and safety (Pidgeon & O'Leary, 1994). This study has taken the view that both perspectives may be present in organisations simultaneously. Therefore, this study explored how local workplace cultures interpret and mediate leaders' attempts to influence, shape and change safety culture (Hopfl, 1994).

From the functionalist perspective, this study adopted the view that leaders play a vital role in influencing safety culture through the shaping of collective practices within their organisation (Hopkins, 2005a; Reason, 1997). This study explored a set of collective practices that a number of organisations have adopted and which are designed to construct a culture of safety that is risk-aware. Risk-awareness has emerged as a cultural approach to safety that is said to be interchangeable with collective mindfulness and an informed safety culture (Hopkins, 2005a). Front line workers are encouraged to become risk-aware through programs designed to prompt workers to undertake mental or informal risk assessments before commencing work. This study explored, from the interpretive perspective, how the local workplace cultures, or communities of practice (Gherardi & Nicolini, 2000a), interpreted the risk-awareness program, and to what extent the program was able to permeate and change these communities underlying assumptions (Schein, 2004) and collective practices in relation work and safety. To explore the nature of these relationships, this study posed the following research questions:

The main research question:

What impact, from the perspectives of the on-site workers and managers, does an organisation's risk-awareness program have upon the culture of safety and the resultant level of risk?

The research sub-questions:

1. What impact does on-site leadership have upon the risk-awareness program?
2. What is the perceived impact, from the perspectives of the workers and managers, of the risk-awareness program on the culture of safety?
3. What role do organisational structures and processes play in supporting risk-awareness?
4. What impact does the risk-awareness program have on the individual and collective practices of workers and managers and their awareness of risk?
5. How do workers and managers, individually and collectively, learn of the risk-awareness program?
6. What impact does the risk-awareness program have on the texture of workplace learning and knowing as expressed through the practices of workers and managers?
7. Is the risk-awareness program perceived by workers and managers to be making the workplace safer?

Ethnography was chosen as the methodology for this project because it provides researchers with a set of methods for representing and describing a culture (Fetterman, 1989; Hammersley & Atkinson, 1995; Van Maanen, 1988). The methods used in this study were participant observation and semi-structured interviews. These methods enabled the researcher to explore the extent to which the risk-awareness program had taken-on meaning in the context of the day-to-day working lives of the local communities of practice, and the extent to which the program had shaped the underlying assumptions and collective practices of those communities.

6.1 Findings

The findings of this study will be discussed in the context of the research sub-questions with the major findings being discussed in the context of the main research question.

6.1.1 Findings related to the research sub-questions

6.1.1.1 The impact of leadership on the risk-awareness program

Leaders play a vital role in shaping organisational culture, and subsequently the culture of safety, through the structures and processes together with the collective practices to which they pay attention (Hofstede, 1991; Hopkins, 2005a; Reason, 1997; Schein, 2004). In particular, leaders may be able to change the culture of safety by shaping collective practices around risk-awareness (Hopkins, 2005a), a view that was explored through the research sub-question:

What impact does on-site leadership have upon the risk-awareness program?

This research found that leaders (on-site managers and supervisors) focused on collecting and filing the documentation that accompanied the risk-awareness program because it provided them with evidence, and a sense of comfort, that workers had thought about risk before commencing work. As a result, leaders had been successful, to an extent, in encouraging workers to complete the paperwork associated with the program. However, the ability of leaders to have an impact upon workers' practices may be confined to the practice of completing the paperwork at the expense of any real increase in the workers' awareness of risk. The reason for this is that workers did not see the same value in the paperwork as did their leaders, believing instead that completing the paperwork was 'arse-covering' for managers and therefore a waste of time. Therefore, in cultural terms it may be said that the impact of leadership on the risk-awareness program was restricted to the first two levels of culture in Schein's (2004) model: 'artifacts' and 'espoused beliefs and values' (as shown in Table 2, p. 42). Workers outwardly acknowledged the need to complete the paperwork, although

in practice, their compliance with the program did not always match what they espoused, believing instead that the paperwork was a waste of time. Consequently, leaders have not been able to influence the workers at the level of 'underlying assumptions', the level at which culture change is said to occur (Schein, 2004).

6.1.1.2 The impact of the risk-awareness program on the culture of safety

Risk-awareness is said to be a cultural approach to safety (Hopkins, 2005a) and furthermore, that culture change occurs in organisations when leaders focus on changing collective practices as opposed to changing individual values and attitudes (Hopkins, 2005a; Reason, 1997). Therefore, the extent to which the risk-awareness program was changing collective practices, and hence the culture of safety, was explored through the research sub-questions:

> *What is the perceived impact, from the perspectives of the workers and managers, of the risk-awareness program on the culture of safety?*
>
> *What role do organisational structures and processes play in supporting risk-awareness?*

This study found that there were differences in organisational culture between the two sites, even though both sites belonged to the same organisation. These differences had ramifications for the impact of the risk-awareness program on the culture of safety. For example, a culture of "getting the job done" at one site was considered to be less conducive to safety and the adoption of the risk-awareness program, than was the contrasting culture of saying "no" to unsafe work at the other site. This finding suggests that organisational culture, at a site level, also impacts upon the culture of safety.

The major barrier to changing collective practices around risk-awareness was, however, the dominant view among workers that safety is common sense. Common sense knowledge, as a cultural system (Geertz, 2000), was valued by the workers and

was embedded in their underlying assumptions and practices. The risk-awareness program, with its focus on what was perceived to be time-consuming paperwork, was not valued by the workers as a means for making their work life safer. Therefore, the impact of the risk-awareness program on the culture of safety was to create a culture of paperwork and, in effect, reinforce the workers' underlying assumption that safety is common sense.

6.1.1.3 The impact of the risk-awareness program on the awareness of risk

A culture of safety that is risk-aware can be encouraged by leaders through the construction of collective practices built around programs that are designed to heighten workers' awareness of risk (Hopkins, 2005a). These programs require front line workers to engage in the practice of stopping before commencing work for the purposes of undertaking an informal or mental risk assessment and in some cases, documenting their findings including their proposed risk control actions. The mental or cognitive processes that complement the practice of becoming risk-aware are similar to those that are associated with achieving what is referred to as situation awareness (Endsley, 1995b). Therefore organisational practices, that is, the practices of leaders and managers, must support and encourage both the mental processes and practices required of workers. As a matter of practice, workers who are risk-aware are also more likely to report hazards, errors, near-misses and incidents (Hopkins, 2005a). Risk-aware workers it is posited will also be more mindful of the limitations of safety rules and will engage in risk control practices that are commensurate with their awareness of risk. This relationship between the risk-awareness program, collective practices and heightened awareness of risk were explored through the research sub-question:

> *What impact does the risk-awareness program have on the individual and collective practices of workers and managers and their awareness of risk?*

It was found that the key practice that leaders reinforced with the workers was the need for them to document that they had assessed the risks before commencing work.

However, in practice, workers completed the paperwork more as an administrative or "tick and flick" exercise. Sometimes the paperwork was completed after the job, sometimes on the way to the job, whilst at other times it was not completed at all. In other cases, crews would meet before commencing work to discuss the risks and to complete the paperwork. However, the practice of completing the paperwork and the associated practice of stopping to assess the risks was found to be variable. For example, a crew might stop to discuss the risks on one job, and complete the paperwork, whilst on another job ignore the process completely. The same held true for individual workers, even those who openly expressed support for the risk-awareness program.

Overall, the risk-awareness program did not appear to heighten workers' awareness of risk. Instead, workers preferred to rely upon their common sense to keep them safe and argued that as a matter of practice, they always thought about risk as part of their work. However, observations of workers' practices found that workers may over-estimate their common sense and furthermore, that their common sense may be context specific. A typology of risk-awareness outcomes was developed (see Figure 11, p. 216) and suggested that the risk-awareness program, in combination with workers exercising common sense, was only achieving variable to low risk-awareness outcomes. This finding, in combination with the finding that workers routinely and knowingly broke the safety rules, suggests that the risk-awareness program and the risk control practices that ensued, had a negligible impact on the level of risk.

Finally, the risk-awareness program did not appear to contribute to an increase in the practice of reporting hazards, errors, incidents and near-misses. Instead, and as a matter of practice, workers would risk-assess what they deemed was worthy of reporting. For example, workers were more likely to report injuries that they assessed as serious, or could be incurred by other workers, whilst not reporting injuries that they assessed as being trivial.

6.1.1.4 The impact of the risk-awareness program on learning about safety

Although leaders play a vital role in changing organisational culture through the shaping of collectives practices, culture change is also contingent upon a group learning that the new practices are valid, and worthy of being integrated into the group's underlying assumptions and therefore suitable for teaching to new members of the group (Schein, 2004). In safety terms, it may not be safety that the group or community of practice learns, instead it may be safe work practices that are reproduced within the communities of practice (Gherardi & Nicolini, 2000a). Therefore, the impact of the risk-awareness program on learning about safety and safe work practices was explored through the research sub-questions:

> *How do workers and managers, individually and collectively, learn of the risk-awareness program?*
>
> *What impact does the risk-awareness program have on the texture of workplace learning and knowing as expressed through the practices of workers and managers?*

This study found that both workers and managers learnt about the risk-awareness program at toolbox meetings, although recollection of the content of the training was vague on both accounts. It was found, however, that workers expect to learn what constitutes safe practice on the job from fellow workers. It was at this level, the level of communities of practice, that common sense knowledge in relation to what constitutes safe working practices were shared and reproduced. Therefore, it could be argued that communities of practice have the ability to influence culture and are structures that may be resistant to change, unless that change is viewed by the community as being worthwhile. This was not the case in relation to the risk-awareness program and, consequently, the risk-awareness program appeared to have limited impact on the texture of workplace learning and knowing.

A further finding, however, was that knowledge about what constitutes safe work practices was sometimes reproduced within and between communities of practice through storytelling on the job. On other occasions it was found that knowledge about safety and safe working practices remained locked in workers' heads unless explicitly asked for.

6.1.1.5 Impact of the risk-awareness program on safety in the workplace

The conceptual framework (see Figure 7, p. 82) that informed this study reflected a view that leaders influence safety culture through the shaping of collective practices built around risk-awareness; practices that will result in a reduced level of risk. This view was explored through the research sub-question:

> *Is the risk-awareness program perceived by workers and managers to be making the workplace safer?*

Overall this research found that there was a mixed response to this question. In some cases workers perceived that the program had made the workplace safer because they were more aware of risk whilst in other cases it was perceived to have made no difference. Managers were more optimistic. They perceived that the risk-awareness program had made the workplace safer and relied heavily on the workers' documentation of the risk-awareness process as evidence that this was the case.

6.1.2 Findings related to the main research question

The responses to the research sub-questions will be synthesised to provide a response to the main research question which is:

> *What impact, from the perspectives of the on-site workers and managers, does an organisation's risk-awareness program have upon the culture of safety and the resultant level of risk?*

The impact of the risk-awareness program on the culture of safety and the resultant level of risk is qualitatively measurable by the impact that the program had upon collective practices. It was found that, to some extent, the main impact of the risk-awareness program was to create a culture of completing paperwork and, consequently, develop an illusion of safety. Leaders were are able to influence workers' practices only to the extent that the workers would complete the paperwork, but completing the paperwork did not necessarily translate into increased risk-awareness for workers or a culture of safety that was risk-aware for the organisation. Moreover, through their communities of practice, workers were able to deflect the risk-awareness program on the basis that it was perceived to be an "arse-covering" exercise and therefore a waste of time. As a result, the risk-awareness program had little impact on the underlying assumptions of the communities of practices that safety is common sense. As a consequence, safety practices that were learnt and reproduced within communities of practice were more likely to be resistant to change. Consequently, practices such as non-compliance with the risk-awareness program, the breaking of safety rules and risk-assessing what should be reported prevailed among the workers.

However, common sense also did not necessarily translate into increased risk-awareness. Common sense was found to be context specific with the result being that workers may become blind to risk even when the risk is the same but the context changes. Therefore, one of the main findings of this study is that common sense was creating an illusion of safety for workers as much as the paperwork associated with the risk-awareness program was for managers.

These findings support the view that safety culture is an interpretive device that mediates between the organisational rhetoric and the risk-awareness program on the one hand, and the local workplace culture, dominated by an underlying assumption that safety is common sense, on the other. Furthermore, the risk-awareness program was interpreted differently at different levels of the organisation. These differences were found between the corporate level of the organisation and the two sites, with aspects of the program being interpreted differently between the two sites. Furthermore, within each site,

differences in interpretation were evident between managers and workers, as well as between individual workers and between groups of workers. These findings suggest that organisations are comprised of many, rather than one culture of safety.

Finally, given that the risk-awareness program had little meaningful impact on the collective practices of workers, the impact of the program on the resultant level of risk was judged to be negligible.

6.1.2.1 Revised conceptual framework for risk-awareness

This study was informed by a conceptual framework for risk-awareness (see Figure 7, p. 82) that drew together ideas from the safety culture literature. These ideas suggested that there was an influential relationship between leadership, safety culture and the resultant level of risk. Within safety culture, there is an influential relationship between the organisational structures and processes for risk-awareness, collective practices, situation awareness, risk control practices, reporting practices and workplace learning about safety. However, the results of this study have revealed a different set of relationships resulting in a revised conceptual framework for risk-awareness as shown in Figure 12.

In the revised framework that is based upon the findings of this research, there are two key sets of relationships. Firstly, there is an influential relationship between leadership and safety culture and, subsequently, the organisational structures and processes for risk-awareness, collective practices and paperwork. Secondly, there is an influential relationship between collective practices, safety culture, common sense and learning. In effect, there are two safety cultures, one representing work as imagined (Dekker, 2006) by leaders and managers and reflected in one set of collective practices, and another representing work as actually performed (Dekker, 2006) by the workers and reflected in a different set of collective practices. This division in safety cultures reflects Hopfl's (1994) view that safety culture is an interpretive device that mediates between the organisation's espoused values, in this case about risk-awareness (work as imagined in Figure 12) and the underlying assumptions of the workplace that safety is common sense (work as actually performed in Figure 12). Therefore, the practice of completing the

paperwork creates a feedback loop into “work as imagined” that reinforces an illusion of safety. This is because workers will only comply with the paperwork associated with the risk-awareness program when they are forced. Instead, workers value common sense to keep them safe and it is common sense that will impact upon their risk control practices. Therefore, common sense creates a feedback loop through learning and collective practices into “work as actually performed” that also reinforces an illusion of safety. Therefore, even though there are two sets of collective practices operating, both result in an illusion of safety.

The revised conceptual framework for risk-awareness has implications for organisations wishing to make risk-awareness programs more real and more meaningful to the workers and therefore more effective. Some of these implications and subsequent recommendations are discussed in Section 6.2 and 6.3.

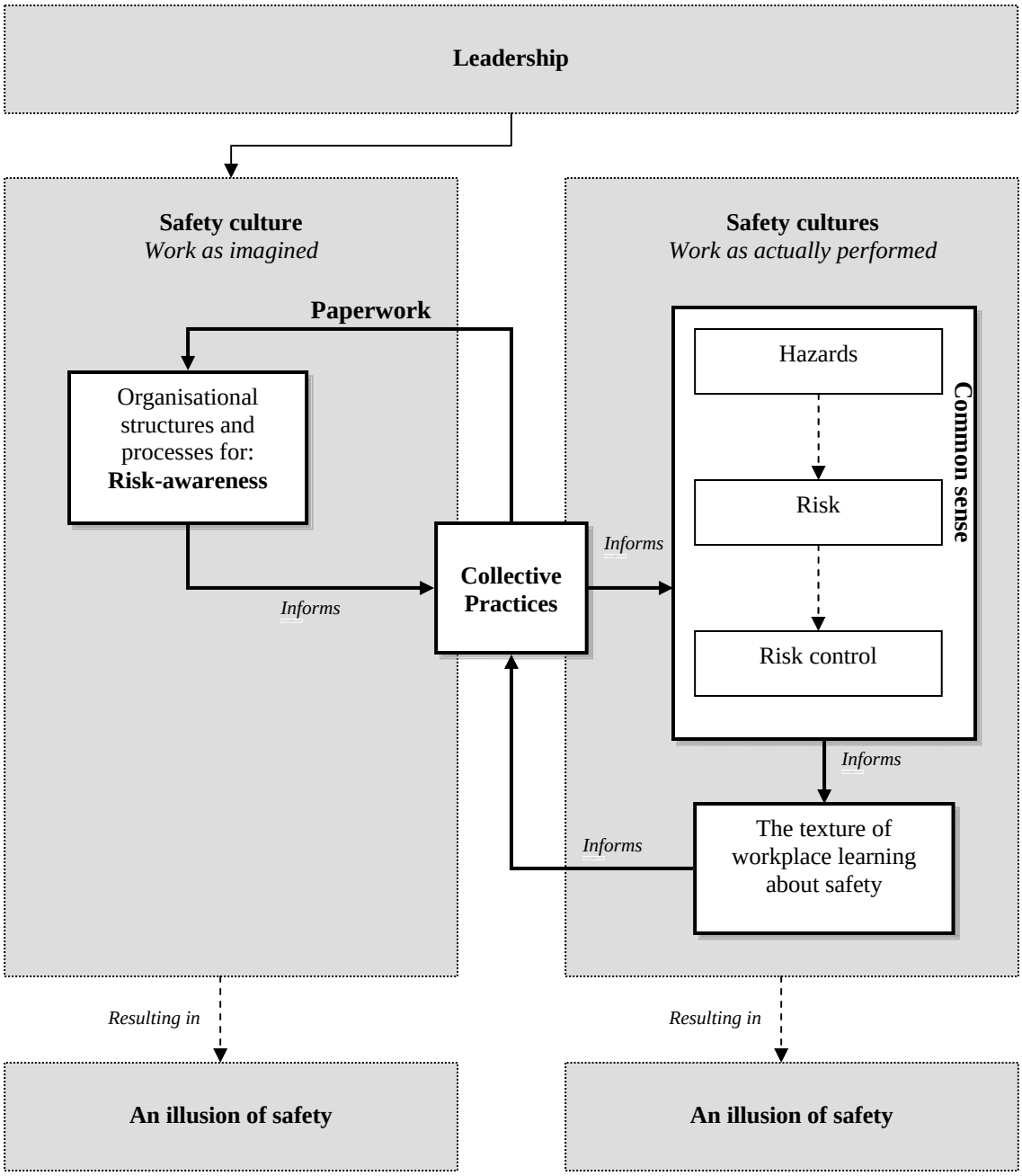


Figure 12 A revised conceptual framework for risk-awareness

6.2 Implications

The findings of this exploratory research, which draws on the experience of workers and managers in local workplaces who are required to apply the organisation's risk-awareness program, has several key implications for safety culture in the workplace, risk-awareness by front line workers and learning in work groups.

6.2.1 Implications for safety culture in the workplace

The findings of this study suggest that a culture of safety does not emerge solely from organisational structures and processes, like the risk-awareness program, designed by leaders to shape collective practices. Rather, it seems that a culture of safety also emerges locally from within communities of practice who will interpret and modify the program and its associated rhetoric, in light of their own underlying assumptions about safety. This has implications for how organisations, and, in particular how leaders, approach safety culture. In the first instance, this requires leaders to acknowledge that there may be a distinction between "work as imagined" by the leaders and the "work as actually performed" by the workers. Consequently, there may be different sets of collective practices operating in different parts and at different levels of the organisation. Therefore, leaders may not be able to change workers' collective practices until they have: invested time and effort into understanding what the collective practices are; the underlying assumptions those practices represent and why they have meaning to the workers and their communities of practice in the first place. Therefore, any change processes must be seen by the workers as adding value to their world of work and to their safety before they will be absorbed. In the second instance, this requires leaders to carefully consider the type of organisational structures and processes and the associated practices that they themselves pay attention to when encouraging risk-awareness among workers. Therefore, leaders' practices should be more focused on eliciting a shared understanding of how workers go about dealing with risk on the job rather than compliance with paperwork. If leaders have a better understanding of work as it is actually performed, then they will be in a more informed position to engage in practices that support risk-awareness that have meaning for workers.

6.2.2 Implications for risk-awareness by front line workers

The findings of this study suggest that there may be gaps between the risk-awareness program and the workers' risk-awareness practices and their awareness of risks. Each of the four gaps listed below has implications for the effectiveness of risk-awareness programs. The four gaps are between:

1. The risk-awareness paperwork and the workers' risk-awareness practices;
2. The risk-awareness paperwork and the workers' awareness of risk;
3. The workers' common sense and the workers' awareness of risk;
4. The workers' awareness of risk and the workers' risk control practices.

The first gap represents a 'values' gap and refers to the organisational requirement that, for certain jobs, workers must document, on the prescribed form, that they have stopped to think about risk before commencing work. In practice, workers' compliance with this requirement varies between workers and can also vary from day-to-day and from job-to-job for an individual worker or work crew. One explanation for this is that whilst managers appear to value the paperwork associated with the risk-awareness program because it provides them with proof that workers have thought about risk, workers do not value the paperwork. Instead, workers prefer to rely on their common sense to keep them safe. Therefore, the organisation's espoused values in relation to the risk-awareness program, exemplified by managers constantly reminding workers to complete the paperwork, are inconsistent with the workers' basic underlying assumptions that safety is common sense. Therefore this 'values' gap has implications for the effectiveness of the risk-awareness program and relates back to the first implication that leaders must take time to understand the real collective practices in which workers engage.

An 'illusion of safety' is reflected in gap two and refers to those circumstances when managers are successful in encouraging the workers to complete the paperwork. It was found that there is no guarantee that the paperwork enables the workers to foresee all the risks on a job. One explanation for this gap is that workers become fixated on completing the paperwork to please their supervisor or their manager, as opposed to actively thinking

about and becoming aware of risks. Furthermore, simplifying the paperwork to make it easier to complete has resulted in a potentially more mindless 'tick and flick' exercise that may not prompt workers to think about risk. A further explanation could be that because there is a requirement to complete the paperwork at the start of the job, then workers are only thinking about risk at one point in time. Consequently, this may dull the workers' awareness of changing circumstances and risk and lull them into a false sense of security that, because the paperwork has been completed, the job must be safe. Therefore, the paperwork may be creating an 'illusion of safety' in the minds of both workers and managers. Once again, these findings have implications for the effectiveness of the risk-awareness program and suggest that an over-emphasis on the paperwork may be detracting from the intent and effectiveness of the program.

A further 'illusion of safety' is reflected in gap three but for different reasons to gap two. This third gap reflects an underlying assumption among some workers that safety is common sense. However, common sense, like the paperwork associated with the risk-awareness program, does not guarantee that workers will be able to foresee all risks. One explanation for this gap is that common sense knowledge for an individual worker may be limited by their prior training and experience. As a result, common sense knowledge may be highly context specific. Therefore, the belief that safety is common sense may be creating an 'illusion of safety' in the minds of the workers. This finding has implications for the effectiveness of the risk-awareness program and suggests that an over-reliance on common sense may be detrimental to workers' safety and has implications for how workers learn about risk.

The fourth and final gap is between the workers' awareness of risks on the one hand and their decisions and actions in relation to risk control on the other. This 'rule-breaking' gap assumes that even though workers may be aware of the risks on the job, their risk control practices deviate from the formal safety rules. One explanation for this 'rule-breaking' gap is that workers prefer to rely upon their common sense to keep them safe in preference to following the rules. Furthermore, some workers believed that the safety rules did not match the practicalities of their day-to-day work, a situation which further

reinforced their need to rely upon common sense. This gap may also be perpetuated by the organisation because the organisation may be unaware that the workers are breaking the rules and also for their reasons for breaking the rules. In effect, this finding deepens the illusion of safety because, not only is it possible that the risk-awareness program may not be making the workers more risk aware, but because workers are making their own decisions in relation to risk control practices unbeknown to the organisation. This gap has implications for the effectiveness of the risk-awareness program and for the rule-management program. With respect to the former, it has implications for how organisations balance achieving risk-awareness with decision-making and action. The latter has implications for the quality of rule management systems as well as for leaders and their appreciation of "work as actually performed".

6.2.3 Implications for learning in work groups

The results of this study suggest that workers learn about safety in a variety of ways which has implications for learning in work groups. Formal learning about safety in general, and the risk-awareness program in particular, occurs at toolbox meetings. Informal learning about what it means to work safely and to be risk-aware occurs in the workplace within communities of practice and through storytelling. As a result, workers build up a repository of common sense knowledge which they value highly. In some cases, common sense knowledge is so obvious to an individual worker that it is not shared and remains locked in the worker's head as tacit knowledge. However, this tacit knowledge may vary from worker to worker, and from situation to situation. These findings have implications for how organisations design safety training programs and how training may be turned into learning that is more situated in the workplace, so as to maximise the effectiveness of risk-awareness programs and to overcome the limitations of common sense.

6.3 Recommendations

The implications of this exploratory research make it possible to put forward some tentative recommendations for organisations wishing to make their risk-awareness programs more effective on the basis of them being more meaningful to workers. To improve the effectiveness of risk-awareness programs, it is recommended that organisations:

1. Focus less on the paperwork associated with the program and more on encouraging workers to talk about and share their experiences in dealing with risk on the job;
2. Move beyond encouraging risk-awareness at the start of a job to encouraging the principle of "life of job" risk-awareness;
3. Extend the risk-awareness program beyond awareness to the quality of decision-making and risk control practices;
4. Move learning about safety beyond toolbox meetings and take it out into the workplace and where possible, use communities of practice as the site for learning;
5. Grow workers' "base-line of common sense" by encouraging storytelling about safety;
6. Utilise communities of practice as the site for culture change and learning;
7. Link reporting systems to the risk-awareness program;
8. Monitor the gap between safety rules and workers' practices by investing in an understanding of how work is actually performed and the reasons why workers break safety rules.

6.4 Limitations of the study

This study has a number of limitations which, it is argued, are compensated for by its benefits. This study was limited to one organisation's risk-awareness program and was further limited to two sites within that organisation. Therefore, the results should be treated with caution when considering how they may apply to other organisations and

other risk-awareness programs. Furthermore, the results reflect one person's interpretation which means that they are, according to Gallie (cited in Geertz, 1975, p. 29), "essentially contestable". However, the intent of this study was never to generalise across cases or to achieve consensus (Geertz, 1975). Rather, the purpose of this ethnography was to provide one person's written interpretation (Van Maanen, 1988) of the impact of a risk-awareness program on the culture of safety. As such, the benefits of this work do not reside in generalisations or consensus, but in a refinement of the debate (Geertz, 1975) that informs risk-awareness programs at a time when both knowledge and debate are lacking.

6.5 Concluding reflections

The incidence of fatalities, injuries and disease is regarded as still being too high in Australia and overseas. Improving safety culture is viewed as one means by which the incidence of fatalities injuries and disease may be reduced. This research has attempted to contribute to the debate on safety culture in a practical and developmental way by exploring the impact risk-awareness programs have on safety culture. This research has made a positive contribution to worker safety by highlighting the importance of understanding work from the perspective of the workers, because culture change is more likely to occur if organisational practices, including those that support risk-awareness, are in tune with the reality of the work as it is actually performed.

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