

national research centre for

OHS regulation



Working Paper 83

‘Culture Eats Systems for Breakfast’: On the Limitations of Management-Based Regulation

**Neil Gunningham, The Australian National University
Darren Sinclair, The Australian National University
(Contact: Neil.Gunningham@anu.edu.au)**

November 2011



About the Centre

The National Research Centre for OHS Regulation (NRCOHSR) is funded by WorkCover New South Wales, WorkSafe Victoria and Workplace Health and Safety Queensland to work to achieve excellence in work health and safety research and regulation development. The NRCOHSR is a research centre within the Regulatory Institutions Network (RegNet) at The Australian National University (Canberra), and operates in association with Griffith University (Brisbane).

The NRCOHSR conducts and facilitates high quality empirical and policy-focused research into work health and safety regulation, and facilitates the integration of research into regulation with research findings in other areas of regulation. We encourage and support collaborating researchers to conduct empirical and policy-focused research into work health and safety regulation. The NRCOHSR also monitors, documents and analyses Australian and international developments in work health and safety regulation and research, as well as related areas of regulation, and produces a web-based series of working papers reporting on research into OHS regulation.

Address for correspondence

National Research Centre for OHS Regulation
Regulatory Institutions Network
Coombs Extension
Cnr Fellows and Garran Road
The Australian National University
Canberra, ACT, 0200
Email: nrcohsr@anu.edu.au.

Disclaimer

The views expressed in this paper are the authors' alone and do not reflect any formal opinion of the National Research Centre for OHS Regulation, the Regulatory Institutions Network or the Australian National University. They are provided for the purposes of general discussion. Before relying on the material in this paper, readers should carefully make their own assessment and check with other sources as to its accuracy, currency, completeness and relevance for their purposes.

Abstract

This paper discusses research examining the relationship between safety performance and safety culture (including trust) in five mine sites within a single Australian coal mining company. Although operating under the same corporate OHS strategy and management tools, there was considerable variation in OHS outcomes achieved at each site. The paper examines the causes of this variation in performance, including the potential influence of site specific cultural variables, focusing on *the relationship between safety culture and safety management initiatives*. Also discussed are the the particular characteristics of the coal mining industry that shape both culture and safety outcomes, and concludes with some insights of more general application.

1. Introduction

Over the last decade the Australian mining sector has achieved impressive improvements in occupational health and safety (OHS) performance. During this period, there has been heavy reliance on OHS management tools in general and on safety management systems in particular, as the principal means of achieving improved OHS performance within large corporate enterprises. Indeed, the latter are a regulatory requirement in two of the three Australian mining jurisdictions (Gunningham 2007, Ch 2). Many large mining companies have in any event introduced such systems as the principal vehicle through which to improve their internal OHS performance, often with the intention of going 'beyond compliance' with OHS regulation.

However, recent statistics suggest a plateauing of OHS performance and an inability to maintain the momentum of earlier gains (NSW Minerals Council, 2009).¹ And even within the same company, it seems that some mines substantially outperform others in terms of OHS outcomes, raising questions as to why there might be such substantial internal variation and why it is so hard, notwithstanding the introduction of sophisticated management tools, to achieve *consistently* high performance.

These challenges have led some policy makers and analysts to pay increasing attention to matters of 'safety culture' or 'safety climate'. Increasingly it is believed that while 'hard' safety management variables (the traditional emphasis on technology and equipment and the more recent focus on management tools and systems) have achieved a great deal, further improvement and greater consistency across corporations, is only likely to be achieved by paying increasing attention to 'soft' issues such as trust and culture.

In this study we examine the relationship between safety performance and safety culture (including trust) through the experiences of a series of mine sites within a single Australian coal mining company.² This company provides an excellent basis for a case study, having imposed a uniform OHS management system across the entire organisation. As such, each of the five mine sites that are the subject of the study had been exposed to the same corporate OHS strategy and subjected to the same management tools. For example, they had all been required to comply with the same corporate standards and system, audit program, management system templates, statistical and qualitative reporting, behavioural-based safety initiatives and interactive safety databases (what are collectively known as 'process based' safety initiatives since they require a particular process to be undertaken rather than – at least directly – particular outcomes to be achieved). And yet, as we will see, there was a very considerable variation in terms of the OHS outcomes they had achieved.

The main objective of the study was to understand the causes of this variation in safety performance. In particular we wanted to identify the factors that had most contributed to OHS outcomes, including the potential influence of site specific cultural variables, and

¹ For example, in New South Wales coal mining Lost Time Injuries Frequency Rates fell quite dramatically from 48.2 in 1997/98 to 21.4 in 2004/05, but in the four subsequent years have stabilised at 17.7, 15.2, 16.3 and 16.3 respectively.

² We are grateful to the coal mining company for providing us with access to five of its mine sites in order to interview managers and workers, as well as corporate management, and to detailed internal safety statistics and audit data. We also acknowledge the Australian Research Council for funding the research through a 'linkage' grant.

whether, to what extent or in what circumstances, *these undermined the effectiveness of the company's overall OHS strategy*. We are of course, hardly the first to examine safety culture, a subject with regard to which there are numerous empirical and theoretical writings. (For reviews see Gadd and Collins, 2002; Guldenmund, 2000). Our concern however, is not with safety culture per se, but rather with *the relationship between safety culture and 'process based' initiatives* among which the safety management system is the most important. Not least, we wanted to test the claim that "culture eats systems for breakfast": that cultural variables often mediate (or even neutralise) the impact of OHS management systems and other process based management tools. Finally, recognizing that the coal industry may be in some ways atypical, we sought to identify the particular characteristics of that industry that shaped both culture and safety outcomes, concluding with some insights of more general application.

2. Methodology

The research was conducted with the cooperation of the company in question, and with the support of an Australian Research Council grant. Consistent with the norms of social science research and of our ethics clearance, we do not identify the company or any of the individuals who participated in the research. The five mines we studied included one open cut and four underground. Mine sites were selected in consultation with the participating coalmining company, with the intention of including both leading and laggard mine sites so as to provide a broad range of experiences. Each mine site visit occurred over a two-day period in which a representative sample of both staff and workers participated in semi-structured interviews (62 in total). A typical sample of twelve interviewees from each mine included the general or operation manager, mine manager, shift or process supervisors, under manager, safety officer, engineering (mechanical and/or electrical) managers, crew leaders (deputy under managers, team supervisors), and mine workers (the 'crew') and tradesmen (including local check inspectors/site safety representatives). In most cases the balance of managers to employees was split approximately evenly. Each interview lasted approximately 40-60 minutes.

Each interview was conducted in private, with interviewees informed in advance that all material arising out of the interviews would be treated confidentially, and used anonymously in any subsequent publications. In addition to the mine site interviews, representatives from corporate management, including chief executives, safety managers and operational managers, were interviewed. A total of six corporate interviews were conducted. Questions took the form of a series of prompts, with only those questions that elicited a substantive response, being explored in greater detail. This approach ensured that a diversity of perspectives were explored and that respondents were not constrained to address only particular preconceived issues. Qualitative material generated by the interviews was supplemented by reviews of both the domestic and international literature, including the organisational and safety culture, mine safety, and OHS literatures. The mining company involved in the project also provided internal policy background and safety statistical information (on a confidential basis), in particular, lost time injury frequency rates (LTIFRs) and total recordable incident frequency rates (TRIFRs), and comprehensive internal OHS audit data obtained by Australian corporate management and data from a series of international OHS audits.

3. Internal Variation in Safety Performance

In addressing the impact of corporate safety management systems on OHS outcomes at the mine-site level it was necessary to obtain a credible ranking of safety performance across the five mine sites included in our study. In order to do this, internal safety statistics and audit data were collated over a five-year period.³ In particular, annual information was aggregated and weighted (with the highest weighting given to the most recent statistics/data⁴). This process yielded a single percentage score for each mine, with a lower score reflecting a better OHS performance. As can be seen in the table below, this quantitative ranking produced a very wide range of safety performance indeed, with an approximate 100% difference between the best and worst performers. Further, individual mine-sites fall into relatively distinct groupings – Mines A and B are clear leaders, Mine C has a middle ranking, and there is a large gap to the worst safety performers, Mines D and E.

Table1: Aggregated and weighted safety statistical and audit rankings

Mine A	Mine B	Mine C	Mine D	Mine E
51%	62%	77%	96%	98%

In addition to this quantitative ranking, five corporate managers were asked (individually and confidentially) to rank the same five mines according to their subjective views of safety performance. This qualitative ranking produced very similar results both amongst the corporate managers, and as compared to the quantitative results: Mines A and B were ranked by senior managers as the undisputed safety leaders, and Mines C and E were ranked as near unanimous poor performers. Only the ranking of Mine D produced some dissension from the statistical rankings in that it was placed somewhere above the bottom group of Mines C and E, but still well short of the top ranking Mines A and B.

Finally, and after our research fieldwork was completed, the mining company itself conducted an additional round of detailed audits of the five mine sites in question using a comprehensive set of OHS and environmental standards recently established by its international head quarters. Encouragingly, these international audits produced remarkably similar results to the earlier quantitative and qualitative rankings, again placing Mines A and B as the clear leaders, with Mines D, C and E at a substantial lower level (in that order).

The extensive overlap between the quantitative and qualitative rankings provides a considerable degree of reassurance as to their validity. This is despite legitimate criticism that has been raised about the susceptibility of some safety statistics, in particular LTIFRs (see Hopkins 2005), to manipulation. In this regard, it is noted that the safety statistics employed in the quantitative ranking gave equal weighting to TRIFRs

³ The five-year period was chosen because it corresponded to the period in which corporate management had imposed uniform OHS standards and systems across the five mine sites, and it also minimises the chance of annual aberrations in OHS performance outcomes.

⁴ The most recent year's data was given a weighting of five, the next most recent data was given a weighting of four and so until the five-year old data was given a weighting of one. This was done to reflect the greater likelihood that more recent data would accurately reflect current circumstances, but at the same time attempting to smooth our results over a longer time frame so as to minimise annual anomalies.

that, arguably, are far more difficult to manipulate. In addition, the fact that the international audits were completed *after* the ranking process had been undertaken, and therefore were unable to influence the views of corporate managers, and yet yielded remarkably consistent results, provides additional credibility.

4. Explaining Variation

How do we explain the striking difference in safety performance across a group of mine-sites within the same company? The possible explanations may be grouped into three broad categories. First, there may be differences in the physical environment and/or technologies employed. Second, there may be differences in the management tools and systems utilised. And third, there may be differences in mine site culture. We examine each of these categories below.

In terms of the first category, it was clear that the mines had different physical environments, and that these had the potential to impact on safety issues. In the case of one mine, for example, water infiltration is a distinctive impediment, with workers often forced to wade through knee deep, opaque water. Further, there was variation in technology types, and the age of equipment. For example, one mine utilised open cut mining techniques, which are arguably inherently safer than underground mining, whilst other mines had more recently been refurbished with new equipment, again with the potential to deliver safety advantages. And yet none of these attributes can adequately explain the dramatic variation in safety performance, for at least two reasons. First, the differences in physical environments and/or mining techniques *within* each of the top and bottom ranked groupings of mines are just as great as the differences *between* the two groups, with no obvious pattern emerging. Second, prior to the introduction of corporate management's OHS standards and systems, the two highly ranked Mines A and B were reportedly amongst the worst performing mines in the company. One would expect that if the physical and/or technical factors were a significant determinant of rank, then their influence would persist to some degree over time, and such profound changes in ranking order would be unlikely. Again, no such pattern emerged.

In terms of the second category, as noted earlier, corporate management has increasingly sought to impose ambitious and uniform OHS management standards across all the company's mines, against which they are regularly and comprehensively audited. In order to comply with these standards, detailed and uniform safety management systems have been introduced at each mine. Mines must also conform to a further set of OHS standards issued by the international headquarters, including, again, regular audits, conducted by an international audit team. Monthly and quarterly meetings are held where individual mine managers are required to report on OHS processes and performance, including not only conventional safety statistics, such as LTIFRs and TRIFRs, but also positive OHS performance indicators (which are intended to anticipate future safety performance). In addition, the company has introduced a blanket behavioural-based safety program across all mines under which all senior and middle managers are required to conduct a minimum number of 'safety observations' per month. Finally, all OHS systems, reporting and actions at each mine are included on a single interactive database that is accessible across all mines and corporate management. Clearly, the company has gone to very considerable lengths to minimise differences in OHS systems and processes and it appears implausible that differences in management systems and processes are the primary source of variation in mine site

safety performance. One may also discount the influence of different regulatory requirements, as all five mines exist within the same regulatory jurisdiction.

It would appear, then, that the striking variation in OHS performance that we identified cannot be explained by either of the first two categories (physical environment/technology and systems/processes). Whether a more plausible explanation can be found in terms of mine site safety culture is a matter that will be explored in more detail in the following sections. But before doing so, it is appropriate to make clear what we mean by the term 'culture', and, in particular, 'safety culture', as we apply it in our discussion of variation in OHS performance.

5. Defining Safety Culture

Safety culture derives from the broader concept of organisational culture that refers to a system of shared meaning held by members that distinguishes the organisation from other organisations. Schein (1992) provides the most widely quoted and recognised definition of organisational culture:

A pattern of shared basic assumptions that the group learned 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 a correct way to perceive, think and feel in relation to those problems.

According to this definition, organisational culture is a consequence of learned attitudes on the part of a group with common experiences.

Over time, the examination of culture extended from the general (organisational) to the specific (safety). Although not the sole source of this development, it is widely acknowledged that the International Atomic Energy Agency (IAEA) through its 1991 report "Safety Culture" attracted widespread attention to this concept. Subsequently, the term 'safety culture' entered mainstream policy discussion with bodies such as the United Kingdom's Health and Safety Executive (UK HSE, 1993) employing it in their policies and reports, and defining it as follows:

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 preventative measures.

Unfortunately, safety culture is a much-used (and abused) term, often leading to disputes about its application. Hopkins (2002) notes, for example, that while corporate managers are likely to emphasise the safety culture of individuals, especially in terms of values and attitudes, social scientists view safety culture in the context of groups, or at least sub-groups, and their associated norms of behaviour. The waters are further muddied by the fact that, while some authors refer to safety culture, others refer to 'safety climate'. While some regard the latter as a discrete category, others use the terms culture and climate interchangeably (Gadd and Collins, 2002).

What, then, constitutes a favourable safety culture? Unsurprisingly, there is no single consensus view. Particularly influential however, has been the IAEA (1996), which

suggests that “a good safety culture does not mean that mistakes are not made at all, rather it means that mistakes are responded to openly; they are considered to be learning opportunities”. Also influential has been Reiman and Oedewald’s (2004) compilation of positive safety culture descriptors, which include “a safety policy”, “visible commitment of management to safety”, “clear definition of responsibilities and obligations”, “balance between safety and production”, “good training”, “fairness and trust”, “quality ... rules and regulations”, “reporting of events and accidents”, “flow of information between the different levels”, “continuous improvement”, “sufficient resources” and “working relationships with authorities”. Finally, Reason’s (1997) seminal contribution describes building a safety culture by bringing about a *reporting culture*, a *just culture*, a *flexible culture* and a *learning culture*.

In much of the literature, however, there is little attempt to locate safety culture in the context of specific industries, nor to consider the possibility that such sectors may have particular characteristics that do not conform to generic constructs. An exception is Cooper’s (1998 and 2000) work, which resonates with the circumstances of coal mining. In particular, Cooper (2000) describes three main components of safety culture as being *psychological*, *situational* and *behavioural*. The psychological component includes peoples’ norms, values, attitudes and perceptions of safety. The situational component involves the structure of the organisation, its policies, working procedures and management systems. And the behavioural component addresses practices adopted by employees that can be observed. These categories readily accommodate the circumstances of coal mining, with a broad corporate OHS management strategy overseeing a portfolio of disparate mines, each of which has a unique worker cultural history and circumstances. Accordingly, in exploring the particular (safety) cultural characteristics of the five mines sites, and their relationships to safety performance, then, we are guided by Cooper’s categorization.

6. Safety Culture and Safety Performance

To what extent can safety culture influence safety performance? Certainly, there is much in the literature to suggest that this influence can be substantial. Reason (2000), for example, argues that safety systems may operate far more effectively if they exist in the presence of a “robust safety culture”. More generally, Deal and Kennedy (1982) highlight culture as *the* most important factor in determining company outcomes, while the IAEA (1991, 1996, 2006) similarly identify safety culture as central to the delivery of safety outcomes. Clearly, while the precise meaning and scope of safety culture might remain a contested subject, there is little disagreement on its overall impact on safety outcomes.

Generally underplayed in the safety literature however, is the issue of whether culture can play an important role not only at the level of the corporation *but of individual sites within it*. Do companies, for example, possess one readily identifiable homogenous culture or rather a number of distinct mine-site sub-cultures (Lesley and Millet, 2000)? Support for the integrated culture position is provided by the advent of large, multinational companies with sites located in numerous international jurisdictions. Some of these companies, despite substantial logistical hurdles, are apparently able to impose a uniform culture across their sites. For example, the Toyota Motor Company is a prominent example of this phenomenon (Vaghefi *et al*, 2000). An alternative view suggests that notwithstanding attempts to achieve uniformity, often a number of distinct sub-cultures exist within a single organisation, often in the form of ‘silos’, which in turn

may act to preserve their own interests, sometimes at the expense of wider company goals (Willcoxson and Millet, 2000), including OHS.

Since there was evidence of considerable variation in OHS outcomes across the five sites in this study, we are inclined to lean towards and delve more deeply into, the second view, with a focus on differences in safety culture between mines within the same company. But we are also interested in similarities in safety culture between mines that share a similar level of safety performance. We therefore describe below the cultural characteristics of the five mines included in our fieldwork according to two key groupings, those mines ranked as high OHS performers (Mines A and B), and those mines ranked as low ranked OHS performers (Mines C, D and E). These groupings are based on the rankings described at Section 3 above. In exploring differences in safety culture across the two groupings, we also draw on Cooper's (2000) categorisation of safety culture as comprising psychological, situational and behavioural elements.

6.1 High ranked mines (Mines A and B)

Mines A and B shared considerable historical and cultural similarities, despite their different mine site technologies and physical environments (being underground and open cut coal mines respectively). Both mines had, until the last five years or so, been among the lowest ranked OHS performers in the company. In particular, it was claimed that there were serious and ongoing disputes between workers and management, poor housekeeping standards, and a 'bad' culture, the only answer to which, according to management, was radical change. For example, one mine manager told us:

Bad culture goes with old mines. It produces a 'them and us' approach, and mistrust of management. Lots of people say the only way to change is a forced closure - to put the mine in care and maintenance for a minimum of six months and a maximum of twelve, and then cherry-pick a new workforce.

This was precisely what management elected to do. Following brutal worker-management conflicts, and the equally brutal closure of the old mines and the compulsory redundancy of their workforces, both were reopened as 'new' mines (Gunningham, 2008). As such, they were able to recruit new employees (including the *selective* hiring of some of the previous workforce), with a clear bias towards those seen as more sympathetic to management attitudes and likely to be acquiescent in new production and safety initiatives.

For present purposes,⁵ the important question is how such a new culture was inculcated and how the two mines became (according to all formal and informal rankings) the company's highest OHS performers. Drawing from our more in-depth analysis published elsewhere (Gunningham and Sinclair, forthcoming), we are able to identify a number of common patterns which, it will be argued, collectively contributed to their overall positive safety culture, and clearly distinguished them from the middle and lower ranked mines. These were as follows.

⁵ This is not to suggest that the fire and hire strategy was a desirable one (on which see Gunningham, 2008), but simply that it had consequences that impacted directly on safety culture.

6.1.1 High norms of safety

Following their closure and re-opening, senior management claimed that there was a concerted effort at the each of the mines on setting and maintaining high OHS standards (in fact, this process began prior to re-opening through the selective recruitment of those viewed as sympathetic to corporate OHS policy). The mine managers articulated this in the form of a clear goal to 'be the best' coal mines in their jurisdiction in terms of both safety *and* production (a particularly ambitious target given the mines had previously been industry laggards in both these respects). In particular, the mines aimed to have the best safety statistics in the state (a goal, according to the internal statistical data, they achieved). One of the ways of inculcating high OHS expectations throughout the management hierarchy was to integrate OHS with mainstream decision-making (see below). Our interviews suggested that the joint aspiration of a productive *and* a safe mine was one which workers and middle management 'bought into' at a relatively early stage in the reopened mines' evolution. Reportedly, they came to 'own' this vision in large part because senior management had engaged them in the formation of mine site goals closely following the mines' inception.

Three key ways in which high OHS standards were promulgated throughout the mines were communication, devolution and accountability. Communication is discussed in detail below. Devolution and accountability are 'two sides of the same coin' and entail middle and line managers being given greater authority to make decisions about OHS issues, and being confident of receiving senior management support, at the same time as putting in place mechanisms to ensure that they are held accountable (see, for example, 'action items' and 'safety observations' below). In terms of daily operations, good 'housekeeping' ("a tidy pit is a safe pit") was targeted as a key area for instituting high OHS standards. In contrast to other mines, workers, line and middle managers highlighted what they considered to be very good housekeeping at Mines C and B. This was put down to line managers, in particular, having the authority and foresight to insist upon housekeeping: "if the guys know that you are *fair dinkum* well then they adopt that standard".

6.1.2 Safety was placed above production

Arguably one of the most significant actions by management at these mines was a demonstrable willingness to place safety above production. Mine managers at both mines were able to point to specific examples where they had halted the production process to address safety concerns. Given the large sums of money involved, halting production is an issue where leadership must come from the top. Middle and line management may be reluctant to halt production if they are not confident they will have the support of senior management.

At Mines A and B, the mine managers themselves took the initiative in halting production to address safety. This gave a clear message down the management hierarchy about the importance of safety. Consequently, mine managers were seen to 'walk the talk', and middle and line management became confident that if they in turn halted production for legitimate safety reasons they would be supported by senior management. Middle and line managers at these mines did not hesitate in articulating a willingness to halt production if circumstances warranted it, and in several cases were able to point to specific examples where this had occurred. Workers in turn reported a belief that management had a genuine commitment to safety. In this respect, a willingness to halt

production served to build trust between management and workforce (on which see more below).

6.1.3 Integration of OHS standards and systems

One of the striking features of the two high ranked mines was the strong commitment to corporate OHS standards and systems, in particular, their integration into mainstream decision-making processes. For example all weekly management meetings have safety as their first agenda item – and senior managers are expected to provide a detailed account of safety performance and actions across their areas of responsibility. More important, (and in stark contrast to the other mines) the company's interactive OHS database has become an essential management tool at all levels of the management hierarchy. In particular, managers used the database to allocate OHS actions to each other – these cannot be removed from the system until the actions have been addressed. Senior management receives regular updates on any outstanding actions. This system provides a high degree of accountability, but is dependent on management treating the action items seriously. Although this interactive system has been implemented across the entire company, it is only at Mines A and B that senior management has insisted up on its application – any outstanding items are viewed with concern and require justification and explanation at management meetings. Internal audits revealed that Mines A and B had far fewer outstanding action items than that other mines, and managers throughout the hierarchy expressed strong support for the system (even when acknowledging that it could mean additional work for them personally) – it is now accepted as an essential safety and general management tool.

Another example where Mines A and B appeared to be far more diligent in implementing corporate OHS initiatives is in respect of monthly safety observation obligations under the company's behavioural-based safety program. Again, internal audit data and mine-site interviews supported a much stronger commitment to this program as compared to other mines – as one manager noted, “it can be a pain to do them, but it is worth the effort”. In summary, although these mines did not embrace all corporate management's OHS initiatives with equal levels of enthusiasm, overall they were welcomed as an opportunity to improve safety practices and outcomes.

6.1.4 Communication, consultation, reporting and feedback

At both mines, mine managers reportedly commanded widespread respect amongst the workforce, and claimed that this was because they placed great emphasis on open communication and consultation. As one worker, reflecting a common view, put it: “the mine manager does lots of things to be seen around the workforce – and chases up all the complaints”. An important aspect of this was senior management, in particular mine managers, regularly leaving their offices to engage directly with the workforce, and getting personally involved in their safety and welfare. At both mines middle management and workers confirmed the high visibility and approachability of senior management. The mine managers at both these mines claimed they placed a very high priority on maintaining open communication with the entire workforce, and were able to detail numerous examples where this occurred on a regular basis – including, maintaining an open door policy, regularly conducting ‘rounds’ of the crews as they are working, holding regular shift meetings, and monthly rostered-on mine meetings.

Another crucial issue, from the workers' perspective, was that management responded promptly to OHS issues raised by workers, and provided individual workers (that were the source of the original report) with timely feedback detailing what action has been taken to address their concerns. Workers reported that this occurred even in cases where no action was taken, with an explanation provided as to why no action was deemed to be necessary. Overall, managers and workers at these mines reported a strong emphasis on reporting incidents, even where this might potentially cast the worker in a poor light – the emphasis was on getting comprehensive data, not apportioning blame. Internal audit data confirmed that these two mines had substantially higher rates of incident reporting, particularly near misses, over the other mines. This suggests that the high-ranking mines had to some extent successfully introduced a 'blame free' culture (Reason, 1997) in regards to incident reporting.

6.1.5 A reduction in 'us and them'

Respondents reported a notable reduction in the traditional adversarial relationship between workers and management that is prevalent across much of the industry. Although 'us and them' attitudes were not entirely absent, workers by and large described a strong identification with the mine as a collective entity, including management, and having a 'stake' in the future prosperity of the mine. In this regard, many workers considered that they were working with management towards a common goal – and that safety was a key contributor to, and outcome of, this collective vision and responsibility. A key contributing factor in this regard was the placement of management and workers into discrete team-based processes, namely, 'development', 'production' and 'out-bye'. This facilitated the reciprocal identification between workers and management within each process area as being part of the same 'team', and to this extent, undermined traditional 'us and them' attitudes. An important related factor was a 'flattening' of the management structure in each process team as a consequence of line managers (often viewed by workers as being 'one of them') being elevated to overall shift based management responsibility (at the expense of the traditionally middle management derived 'shift undermangers'). From a worker's perspective, "one of their own has been put in charge of day-to-day operations".

A critical aspect of breaking down the barriers between workers and management was the capacity to build 'trust' between workers and management (this issue is dealt with in detail in Gunningham and Sinclair 2009). Respondents at both Mines A and B claimed that there had been a conscious effort to foster trust, with management in particular citing a number of interlocking approaches, including an emphasis on direct communication between workers and senior management, social gatherings where workers and management can mingle informally, seeking workers' views and acting upon them promptly, and an emphasis on the long term benefits of a safe and productive mine (including a commitment to putting safety first, even at the expense of short term production). It was claimed that as a consequence, workers are far more willing to approach management if they had an issue, concern or suggestion, because they had confidence they would be given a genuine hearing. Clearly, some of these trust-related issues overlap with the other cultural factors raised above. One, however, is not only distinctive but strikes at the heart of 'us and them' attitudes: the issue of worker 'ownership'. A distinctive feature of Mines A and B is that worker input and engagement (in short, ownership) was actively sought in the implementation of new safety systems and initiatives. Again, although not all responded positively to these overtures, it was claimed by workers and managers alike that many workers had. From workers'

perspective, this invitation is a tangible demonstration of trust from management. It is much harder, then, to maintain 'us and them' attitudes when both workers and management have ownership of the same safety management initiatives.

6.1.6 Cooper's categories

The characteristics of Mines A and B align to a substantial extent with Cooper's (2000) typology of safety culture as follows.

Psychological (norms, values, attitudes and perceptions of safety):

- There is an emphasis on the maintenance of high safety-standards.
- Management are prepared to halt production if safety is compromised – sending a strong safety message to the workers.
- There are lower levels of mistrust between workers and management.

Situational (policies, working procedures and management systems):

- Corporate management OHS standards and systems have been integrated into mainstream decision making processes.
- Middle and line managers are held accountable for OHS actions items and monthly safety observations.

Behavioural (observed employee practices):

- There is a high level of communication between workers and management, on a number of levels, including informal gatherings and regular meetings.
- There is an emphasis on good housekeeping and pit-top tidiness.
- Safety observations are conducted regularly and treated seriously.
- Workers are willing to report safety incidents, including near misses.

The net result of these characteristics at Mines A and B was the creation of a virtuous safety cycle whereby workers gained confidence in the system (and in management) because they were taken seriously (and seen to be taken seriously), and as a result, were more likely to report incidents/issues and *less* likely to include trivial or frivolous reports in the first place (or to use the reporting system as a malicious tool to undermine management). They were also more likely to respond favourably to new management safety initiatives having been involved in their development and implementation. In turn, they were more likely to act in a manner that reflects high professional and personal OHS standards of behaviour. In short, ownership and involvement has led to accountability and responsibility.

Despite the considerable similarities between Mines A and B, one area where they have differed is in respect to the roles of and relationships with the unions. In the case of Mine B, management has adopted a confrontationist approach making a conscious decision when selecting the new workforce to exclude those who had been employed at the old mine who, in the view of management, were "union troublemakers and hardliners". It is claimed that this provided an opportunity to create a new, more production and safety orientated culture (with minimal cultural baggage from the old mine), and that the much

weaker union presence facilitated this outcome. Mine B also went through a similar process some three to four years ago in which a substantial proportion of the workforce was “let go” and “the heavily unionised industrial culture of the past has been largely removed”. In contrast, however, management at Mine B has pursued a more conciliatory approach with unions since, by engaging them in regular meetings with senior mine management, by working directly with them rather than by passing them and informing them of key management decisions. From this we may tentatively conclude that what is important to the successful nurturing of a new safety culture was not the exclusion of trade unions but rather direct engagement with the workforce, whether mediated via a trade union or not. In passing, we concur with the considerable volume of literature that suggests that a powerful trade union committed to OHS issues, is a strong determinant of improved OHS outcomes (Gunningham 2007, Ch 9).

6.2 Middle and low ranked mines (Mines C, D and E)

Turning to the middle and low ranked mines, there was a range of distinctive characteristics that helped shape their respective safety cultures. In the case of Mine C, geographical remoteness from both other mines and corporate management, it was claimed, has led to the formation of a more independent, autonomous culture, despite the advent of comprehensive corporate controls. Several respondents at this mine referred to a perceived ‘isolation’ of management and workforce, noting with concern that management had largely been left to their own devices, and that this had made them less receptive to corporate management OHS initiatives. This isolation was compounded by a relatively high turnover of management staff. The cultural dynamic at Mine C was also influenced by the fact that its workforce was drawn predominantly from the local farming district, with the consequence that few workers had a mining background. Moreover, respondents told us such workers were not only less experienced in mine work, but inclined to greater independence and self-reliance and accordingly less receptive to the observance of rules based OHS practices and procedures than workers at other mines.

In the case of Mine D, there was a strong undercurrent of antagonism between workers and management, dating back to a particular incident during a pay dispute, approximately four years previously. In response to strike action by the workers, mine management had taken over production and continued to cut coal during the dispute, thereby weakening the impact of the strike and workers’ negotiating power. This action generated worker resentment that was so deep that it continued to permeate management and worker relations some considerable years later, and even between those who had not been directly involved in the original dispute. Almost without exception, middle managers identified the consequences of the dispute as a source of unease and a significant impediment to improved worker-manager relations and to improvements in OHS management practices and outcomes. This was despite a widespread consensus that management had been putting considerable effort into OHS initiatives.

In the case of Mine E, there was a widespread perception that the mine was operating under a constant threat of closure – the fact that this had not occurred to date was viewed as the fortuitous outcome of exceptionally high coal prices. This threat of closure, so workers reported, had detrimental implications for OHS. Many workers apparently saw little point in changing work practices and/or learning new mining techniques whilst they believed that the mine did not have a long-term future. In short, they were resistant

to new safety initiatives and management overtures. This resistance was exacerbated by the presence of an aging workforce – with many looking forward to impending retirement, it is not difficult to imagine a general reluctance to embrace new corporate management OHS initiatives. Another feature of mine E was an adversarial relationship between workers and management that goes back many years and has its roots in the mine’s trade union background and history.

Although each of these mines had its own particular history that contributed in part to poor OHS outcomes, they also *shared* a number of cultural characteristics that clearly distinguished them from the high ranked mines. As we will see, there was strong reason to believe that these characteristics, in combination, also contributed substantially to their poor OHS performance. These are described below.

6.2.1 High levels of mistrust

Each of the Mines C, D and E was characterised by high levels of mistrust, in particular, between management and workers, but also between middle/line management and senior management, and between senior and corporate management. By and large, this mistrust had its roots in the long history of antagonism between workers and their unions and management, and was often preceded by, or contributed to, by a catalytic event (for example, ‘spilling’ the workforce or cutting coal during an industrial dispute) that soured relations. Such incidents thus serve as a negative prism through which all subsequent management actions are interpreted. This made it much more likely that workers at these mines would spurn management safety initiatives as a matter of course, irrespective of whether such initiatives were genuine and in the best interests of workers themselves. One respondent articulated the mistrust as follows:

I think it’s an inherent thing ... that nobody will trust anybody. It’s just ... we’ve been told things that many times and the opposite’s just happened. That it’s just the bigger the company gets the less they trust and I don’t think you’ll ever get rid of that out of the coal industry. I think it is just one of those things. It’s more inherent in the coal industry I think than any other industry in Australia.

Our interviews suggested that mistrust often resulted in an unwillingness on the part of workers to support management safety initiatives, in some cases resorting to active subversion, even where these were ostensibly genuine and worthwhile managerial attempts to improve safety practices and outcomes. For example, workers are less likely to report incidents, particularly ‘near misses’, for fear that they may “get nailed for something”, and resist the use of intrusive behaviour-based programs, such as safety observations, when they feel threatened or do not trust management motivations behind them. Or workers may choose not to follow safety procedures because they resent management telling them how to do their job, because they have little trust in management’s ability to develop appropriate procedures, or because they believe such procedures are really there to “protect management more than workers”. Finally, mistrustful workers were much more reluctant to engage with managers to discuss safety matters. Apart from workers, senior management at these mines also expressed mistrust of corporate management and viewed, in particular, corporate safety initiatives as an unwarranted and unwelcome attempt to keep ‘tabs’ on their behaviour and performance.

6.2.2 A lack of commitment to middle management ‘accountability’

Inherent in the application of safety systems is devolved decision-making. Success in this endeavour requires not only that each layer of management is confident in enjoying the support and assistance of their superiors in exercising their judgement, but that they are held accountable for making appropriate decisions. And yet, Mines C and E demonstrably failed in their commitment to two important accountability provisions directly related to safety, despite exhortations from corporate management. In both mines obligations to conduct ‘safety observations’ remained largely unmet, and safety ‘action items’ under the corporate wide interactive safety management database were left unattended (Mine D, in contrast, has made some progress on these fronts, although it still fell considerably short of the level of commitment on display at Mines A and B). Middle managers were neither sufficiently encouraged nor sufficiently penalised for them to take the programs seriously. In short, there was a distinct lack of accountability, and this deficiency in turn flowed from the attitudes and behaviour of senior mine management. One respondent described the situation as follows:

It has only been very partially implemented. It is not taken seriously by middle managers, with overdue actions allowed to accumulate unimpeded. Some have a very cynical attitude towards it, in particular that it is a malicious attempt by management to control their behaviour. Others think it is just another extra burden that makes their job harder.

The consequences of a lack of middle management accountability can be highly detrimental to mine site safety practices and performance. In addition to not responding to safety observations and action items, middle managers openly admitted to audit recommendations being ‘left on the shelf’, to not following or referring to safety management systems, and to delivering safety briefings where they are simply ‘going through the motions’. Such a ‘blockage’ at middle management level is not confined to the mining industry and seems to be a common and substantial challenge to building trust across a range of organisations (Jeffcott *et al*, 2006).

6.2.3 A widespread acceptance of poor housekeeping

Another distinctive feature of Mines C, E, and to a lesser extent, D, was their poor housekeeping standards (‘housekeeping’, apart from cleaning up the accumulation of rubbish, also involves planning ahead so that all the equipment and materials needed for a particular task are readily at hand, and stored in appropriate locations). High housekeeping standards are recognised by the mines as being closely associated with improved safety outcomes – one manager claimed that the quickest and easiest way of assessing mine standards is to “look around and see how much crap has been left around the place”. And yet at these mines workers did not view housekeeping as a priority. As one respondent noted:

They would rather walk or trip over something or walk around it than move it, because that is not my job. “I didn’t put it there, that’s your problem”. Yeah, I really do think that’s the fact. I’ve got no doubt about that.

Such attitudes not only contributed to an increased risk of accidents, through slips and trips, but also to an overall lack of safety pride in the workforce, and to worker and manager perceptions of what constituted acceptable ‘standards’ – in this context

standards does not refer to official corporate management policy, but rather to the general level of attention to safety that is readily visible on a day-to-day basis in the work environment. Thus there was the potential for housekeeping standards to impact on worker consciousness in a much more direct and tangible fashion than more corporate imposed standards. At Mines C and E, in particular, there was a perception that housekeeping would detract from production, and further, that line managers either lacked the inclination and/or authority to insist upon higher housekeeping standards. Line managers, in their defence, cited a lack of support from their supervisors.

6.2.4 A perceived (or real) reluctance on the part of mine management to follow-up and respond to worker input/suggestions/reports

Another consistent finding at Mines C, D and E was that workers reported, rightly or wrongly, being ignored or 'taken for granted' by management. Consequently, they claimed that they did not see value in the process of reporting accidents, incidents and near misses, since they had no confidence that any action would be taken if they did so. It is possible, in some cases, that management had indeed responded to workers reports, but failed to properly and/or timely inform them of their actions. This perception/reality had the unfortunate consequence of undermining worker confidence in management more generally. Certainly these mines, according to internal auditing, experience less incident reporting than Mines A and B. Incident report forms a vital component of corporate wide safety management systems, and any tendency towards systematic underreporting has the potential to seriously undermine their effectiveness.

6.2.5 A focus on short-term production

Underlying many of the above characteristics at Mines C, D and E is a persistent focus on short-term production, both amongst workers and management. In a way this is not that surprising given that prevailing worker bonuses are predominantly geared towards production, and management at these mines, because of below par production performances over time (as compared to other mines in the company), perceive themselves to be under constant pressure to lift production. This creates a kind of 'catch 22' trap for these mines whereby they avoid implementing practices that could lead to long-term improvements in both production and safety for fear of sustaining short term reductions in production. This includes, in particular, a lack of commitment by managers and workers alike to the implementation of corporate safety initiatives. As noted above, these mines have systematically failed to address safety observations, action items, housekeeping and reporting. As one manager put it: "[we're] always playing catch-up and never taking a stand". The broader message this reluctance to take a 'stand' sends out to the workforce is that safety is not taken seriously by mine management (as it is undoubtedly the responsibility of management in the first instance to set mine safety expectations), and that therefore safety programs and initiatives are essentially about 'paying lip service' not about achieving genuine improvements.

6.2.6 Cooper's categories

A summary of the key individual and collective features of safety culture at Mines C, D and E, according to Cooper's (2000) typology, is as follows.

Psychological (norms, values, attitudes and perceptions of safety):

- Independent 'can do' attitude, lack of mine safety background, reluctance to embrace corporate management safety vision (Mine C).
- Breakdown of trust between management and workforce, resentment of management by workers (Mine D).
- Adversarial relationship between workers and management (Mine E).
- An 'us and them' attitude between workers and management.
- Reluctance on the part of senior management to recognise the importance of middle management accountability on safety management systems.

Situational (policies, working procedures and management systems):

- Isolation from corporate management oversight and failure to fully embrace corporate management standards and systems (Mine C).
- Senior and middle management did not take the interactive safety database seriously.

Behavioural (observed employee practices):

- Poor communication between workers and management.
- Poor housekeeping standards.
- Safety observations either not conducted or perfunctory.
- A general unwillingness to report safety incidents.

The net result of these characteristics at Mines C, D and E was the creation of a 'negative feedback loop' on corporate safety issues. Mine management is suspicious of corporate interventions, and workers mistrust mine management, resulting in a joint lack of commitment to safety management systems and practices, such as observations, actions, reporting and housekeeping. This is exacerbated by a focus on short-term production that precludes devoting the time and resources necessary to bring about lasting improvements in production and safety. A lack of genuine commitment from senior mine management, in particular, an unwillingness to impose accountability on middle management simply confirms worker suspicions that safety initiatives, as one worker described it, "are simply there to protect management's arses". In short, mistrust and suspicion rule, and safety management systems are not given the chance to succeed.

7. Conclusion

Over the last decade or so, large sophisticated mining companies have increasingly sought to improve OHS performance across their mine sites through the introduction of comprehensive OHS tools, standards and systems. Indeed, in this respect there has clearly been a high degree of policy convergence between major mining companies. The Australian coal mining company that is the subject of this study is a prime example of this trend. Over a five-year period, corporate management at this company has implemented an impressive array of initiatives, including company wide OHS standards, detailed safety management systems, key performance indicators, regular reporting, in-house auditing, safety observations and interactive OHS databases. These initiatives

have been allocated considerable resources, and have received the full backing of senior corporate managers.

Despite these efforts of corporate management, however, the company has been unable to achieve anything close to consistent safety performance across its various mine sites. Judging the five mines in our sample on a variety of criteria, there was a twofold difference between their best and worst safety performers over the same five-year period. This result was confirmed by the subjective assessments of corporate managers, and by a more recent international audit program conducted independently and subsequent to this study. This finding of safety performance variation strongly indicates that a sophisticated OHS management system, in conjunction with the application of corporate wide standards and other management tools, has been unable to achieve *consistently* high OHS performance at the company's mine sites. Clearly other factors are at play.

Since neither equipment/technology, nor standards and management systems provided a plausible explanation for mine site variation, attention turned to the culture or sub-culture of individual mines. Utilising Cooper's safety culture categories, a number of patterns linking safety culture to safety performance emerged between high and middle/low ranking mines. In terms of *psychological* characteristics, high ranked mines demonstrated distinctive norms and values, for example, the willingness to stop production over safety concerns and a high level of trust between mine site management and workers. In contrast, middle and low ranked mines were characterised by an 'us and them' relationship between management and workers, and an emphasis, by both management and workers, on short-term production goals. High ranked mines were seen to have benefited from the capacity to start afresh, after earlier purges of staff and workers that enabled them to engage in selective recruitment. In terms of *situational* characteristics, key differences between the ranking groups were observed in terms of their embrace of safety management systems and their utilisation of interactive databases to achieve middle management accountability. In terms of *behavioural* characteristics, major differences were even more apparent. These included standards of housekeeping, the reporting of incidents, the conducting of safety observations, and communication between workers and management.

Finally, and crucially, while corporate safety management standards and systems remain popular, and generally useful tools through which large multinational mining companies may improve their OHS performance, at the very least, a receptive workplace safety culture would seem to be a necessary, albeit not a sufficient condition, for their success. The variation in safety performance witnessed in the five mine sites of a single coal mining company in this study demonstrates the vulnerability of such corporate management initiatives, even with the best will in the world, to the impact (both positive and negative) of localised mine sites' safety cultures.

It may well be that the coal mining industry, with its distinctive history of conflict and polarisation, and geographically isolated mines sites, is more susceptible than other industry sectors to the influence of individual site cultures on the success or otherwise of corporate wide OHS management standards, systems and procedures. However, it is not difficult to imagine that other industries, for example, commercial shipping and offshore petroleum, might be just as susceptible to sub-cultural and site specific influences on safety systems and other process based management tools. And although we cannot be confident of this, it is also plausible that these findings resonate for other

industries, particularly those struggling to achieve consistency in the safety performances and outcomes of different sites. At the very least, the present study clearly demonstrates that corporate safety standards and systems are often dependent on the culture into which they are received, and that culture does indeed “eat systems for breakfast”.

References

- Cooper, D., 1998. Improving safety culture. Wiley, Chichester.
- Cooper, M.D., 2000. Towards a Model of Safety Culture. *Safety Science* 36, 111-136.
- Deal, T.E. and Kennedy, A.A., 1982. *Corporate Cultures: The Rites and Rituals of Corporate Life*. Perseus Publishing, Cambridge, MA.
- Gunningham, N., 2007. *Mine Safety: Law, Regulation, Policy*. The Federation Press, Sydney.
- 2008. Occupational Health and Safety, the Mining Industry and the Changing World of Work. *Economic and Industrial Democracy* 29, 336-361.
- Gunningham, N. and Sinclair, D., 2009. Organizational Trust and the Limits of Management-Based Regulation. *Law and Society Review* 43(4), 865 -900.
- Gadd, S. and Collins, A.M., 2002. Safety Culture: A Review of the Literature. Health & Safety Laboratory HSL/2002/25.
- Galvin, J.M., 2005. Occupational Health and Safety Acts: Performance and Prosecution in the Australian Minerals Industry. *Mining Technology* 114, 251-256.
- Guldenmund, F., 2000. The Nature of Safety and Culture: A Review of Theory and Research. *Safety Science* 34, 215-57.
- Hopkins, A., 2002. Safety Culture, Mindfulness and Safe Behaviour: Converging ideas? NRCOHSR Working Paper No. 7, Australian National University, Canberra.
- Hopkins, A 2005, "New Strategies for Safety Regulators" National Research Centre for Occupational Health and Safety Regulation, Working Paper 32, <http://ohs.anu.edu.au/publications/pdf/wp%2032%20-%20Hopkins.pdf> accessed 30 Oct 2011.
- IAEA (International Atomic Energy Agency), 1991. Safety Culture. Safety Series No. 75-INSAG-4, IAEA, Vienna.
- 1996. Quality Assurance for Safety in Nuclear Power Plants and Other Nuclear Installations, Code and Safety Guides Q1–Q14. Safety Series No. 50-C/SGQ, IAEA, Vienna.
- 2006. Application of The Management System for Facilities and Activities. Safety Standards Series No. Gs-G-3.1. IAEA, Vienna.
- NSW Minerals Council, 2009. OHS Performance Statistics. <http://www.nswmin.com.au/Policy-and-Advocacy/Health-and-Safety/OHS-Performance-A-Look-at-the-Record/default.aspx> (Oct. 21, 2010).
- Reason, J., 1997. *Managing the Risks of Organisational Accidents*. Ashgate, England.

—— 2000. Beyond the Limitations of Safety Systems. Australian Safety News April.

Reiman, T. and Oedewald, P., 2004. Measuring Maintenance Culture and Maintenance Core Task with Culture Questionnaire - A Case Study in the Power Industry. *Safety Science* 42(9), 859-889.

Schein, E., 1992. *Organisational Culture and Leadership* (2nd ed.). Jossey-Bass, San Francisco.

UK HSC (Health and Safety Commission), 1993. *Third Report: Organizing for Safety*. ACSNI Study Group on Human Factors. Her Majesty's Stationery Office, London.

Vaghefi, M.R., Woods, L.A. and Huellmantel, A., 2000. Toyota Story 2: Still Winning the Productivity Game. *Business Strategy Review* 11(1), 65.

Willcoxson, L. and Millet, B., 2000. The Management of Organisational Culture. *Australian Journal of Management & Organisational Behaviour* 3(2), 91-99.