DIGGING DEEPER

Wran Consultancy Project **Vol** 1

Independent Consultant Report by **Shaw Idea**
Commissioned by NSW Mine Safety Advisory Council

NSW DEPARTMENT OF
PRIMARY INDUSTRIES

NSW MINE
SAFETY
ADVISORY COUNCIL

Preface

The entire NSW mining industry's commitment to achieving and sustaining world-class performance in OHS is demonstrated by the commissioning in 2007 by the NSW Mine Safety Advisory Council (MSAC) of research into: production bonuses and safety incentives; working time and fatigue management; and OHS management systems and consultation.

These three, interrelated, topics were priorities identified by the Wran Mine Safety Review in 2005. In 2006, the newly-formed and revitalised MSAC moved quickly to develop a comprehensive research project and then selected a consulting consortium lead by Shaw Idea to carry it out within a relatively short time frame.

'Digging Deeper' is an apt name for this project. Never before has so much detailed and credible information been obtained from all sections of the NSW mining industry. Never before have so many sites been visited, people interviewed, questionnaires completed and follow-up workshops held. The extensive knowledge gathered from this process has provided a clear picture of how work is structured and how systems are implemented in the NSW mining industry. This knowledge also provides an insight into how relationships can be built that improve management and performance in the industry.

The process, the information, the analysis, the outcomes and the recommendations are contained in this two volume report of the project.

All sectors of the industry – coal, metals and extractives, large, small, local and multinational – have been willing participants throughout. The result is a veritable mine of cross-checked information, opinion and data that form a statistically sound foundation for the conclusions and recommendations.

The commitment of the groups represented on MSAC (NSW Minerals Council; Cement, Concrete and Aggregates Association of Australia, NSW; Construction, Forestry, Mining and Energy Union, Mining and Energy Division; Australian Workers Union and the NSW Department of Primary Industries) to encourage their members to play a full role in the project is laudable and contributed markedly to the validity of the information obtained. This commitment demonstrates MSAC's resolve to make a positive difference in OHS in the NSW mining industry.

The report demonstrates that the industry has made major steps in managing the significant mining-related OHS risks over the years. The industry and those who work in it are to be congratulated. The report, however, did identify a number of areas where improvements are required. Importantly, MSAC has accepted the report, considered the recommendations and developed a program of action to address them. MSAC has informed the Minister for Primary Industries of its program and has recommended the Minister supports the program and promotes the report and its findings in NSW and beyond.

MSAC's first priority is to oversee the development and implementation of an industry-wide fatigue risk management education and improvement strategy that is supported by NSW DPI, employer groups and unions. High priority will also be given to developing a consultation, education and improvement strategy that covers all sectors of the NSW mining industry, then overseeing its subsequent implementation. In a similar vein, MSAC will oversee the implementation of an OHS management system education and improvement strategy that is agreed to by all the stakeholders. On the matter of production bonuses and safety incentive schemes, MSAC will oversee the implementation of a review of safety incentive schemes and the use of production bonuses by industry at company and site level.

Each of these programs will be undertaken with the full involvement of MSAC's membership. Moreover, their implementation will be followed up and progress reported to MSAC at regular intervals.

To accompany each of the four programs, MSAC will develop and implement an information and communication strategy to inform the NSW mining industry of the 'Digging Deeper' project outcomes and of the educational and OHS improvement strategies that are being developed and implemented.

The efforts of all who contributed to this important and impressive report are acknowledged with thanks. These efforts will, however, only be worthwhile if the momentum is maintained, through the concerted programs of action outlined above that seek to focus activity to improve OHS performance in the NSW mining industry. Addressing the issues that have been identified in this report is crucial. Not to do so would be cynical in the extreme. It is with this in mind that MSAC has prioritised its activities so that tangible improvements will soon be achieved.

MSAC will work co-operatively with all stakeholders across sectors, companies and regions to reinforce the need for action to implement more effective approaches to OHS in NSW mines, and thereby achieve the goal of world-class OHS performance and zero harm to the mining workforce.

Norman Jennings
Chairman
NSW Mine Safety Advisory Council

Volume 1

ISBN 978 0 7347 1883 9

Disclaimer

Digging Deeper

Wran Consultancy Project

Final Report Volume 1

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5 November 2007

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Abbreviations

ABS	Australian Bureau of Statistics
AIFR	All Injury Frequency Rate
ANOVA	Analysis of Variance
AS	Australian Standards
BAC	Blood Alcohol Content
CEO	Chief Executive Officer
DIDO	Drive In Drive Out
DPI	Department of Primary Industries
EBA	Enterprise Bargaining Agreement
EMS	Environmental Management Systems
FIFO	Fly In Fly Out
GM	General Manager
HSR	Health and Safety Representative
ILO	International Labour Organization
IR	Industrial Relations
ISO	International Standards Organisation
JSA	Job Safety Analysis
LTI	Lost Time Injury
LTIFR	Lost Time Injury Frequency Rate
MSAC	Mine Safety Advisory Council
MSMP	Mine Safety Management Plan
MTIFR	Medical Treatment Injury Frequency Rate
NSW	New South Wales
NZS	New Zealand Standards
OHS	Occupational Health and Safety
OHSC	Occupational Health and Safety Committee
OHSMS	Occupational Health and Safety Management Systems
OSHA (USA)	Occupational Safety and Health Agency (USA)
PPE	Personal Protective Equipment
PSG	Project Steering Group
RTW	Return To Work
SMS	Safety Management System
SOP	Safe Operating Procedure
SWMS	Safe Work Method Statement
SWP	Safe Work Procedure
WA	Western Australia

Acknowledgments

We have been greatly privileged to be able to conduct this research and we have many people to thank.

Our heartfelt thanks goes firstly to the 53 sites we visited, the 585 people whom we interviewed and the 1,667 individuals who completed questionnaires. Their preparedness to be involved in the project and to put forward their candid views, concerns, criticisms and praise about their experiences with the various topics confirms our view that the NSW mining industry is committed to improve OHS. The owners and senior management in those firms which participated were very generous and often went to extraordinary lengths to ensure we had enough of the right category of people to interview. Given we were broaching sensitive topics, we were delighted with the manner in which this was done. Sincere thanks to the managers and owners of these firms.

To MSAC and the Project Steering Group we owe a special thanks for commissioning us in the first instance, and then for believing in us and supporting us throughout the research period. As representatives of all facets of the mining industry they have been valuable as sounding boards, and have also given us practical assistance. John Flint, Project Manager, has a profound concern for OHS in the NSW mining industry and he has been the quiet force behind the logistics of this project. He has been gentle with us when things have been tough, and his sense of humour and his pragmatism have carried us through on more than one occasion. We also thank his team, especially Kate Maddison who managed the *Future Inquiry* workshops perfectly.

Undertaking a work of this magnitude requires an extraordinary team. And we have been lucky to have been part of one. Each member of our team has been challenged by the complexity of the work, excited by the findings, and driven to excel in analysing and applying what we have found. If the size and complexity of the work were not enough, we had the added challenge of limited time in which to conduct it. To say we were stretched for time is a grave understatement. At least, in working the consistently long hours we have needed to get the work done, we have had great empathy for our subjects. Thanks to each of you for your collegiality and friendship. In addition we thank Professor Neil Gunningham for his help in the early part of the project. We owe special thanks to our administrative and research assistants, Jean Harben, Lily Hirsch and Glenys Shaw. For many in the industry, their first contact with the project was through phone calls from one of these three and

their skill, good humour and courtesy in conducting the census has been the foundation for the rest of the project.

The last thanks goes to our long-suffering families from whom we have been absent for a considerable part of this year. Even when we were in our home towns we managed to be absent while analysing data and writing. It's hard having a pre-occupied family member, but our families have been more than forgiving, they have been encouraging.

Executive Summary

Introduction

This report details the findings of the *Digging Deeper* Project, commissioned by the New South Wales (NSW) Mine Safety Advisory Council (MSAC). This project was undertaken by a team of researchers:

- Andrea Shaw (Shaw Idea Pty Ltd) as project leader;
- Dr Verna Blewett (New Horizon Consulting Pty Ltd);
- Laurie Stiller (Beyond Words);
- Christine Aickin (Workability Pty Ltd);
- Prof Drew Dawson (Centre for Sleep Research, University of SA);
- Dr Sally Ferguson (Centre for Sleep Research, University of SA);
- Dr Stephen Cox (Stephen Cox Consulting); and
- Professor Kaj Frick (Malardalen University, Vasteras, Sweden).

The project gives an accurate and reliable picture of the state of play in the NSW Mining Industry with respect to the topic areas of:

1. Production bonus and safety incentive schemes;
2. Hours of work and fatigue management; and
3. OHS management systems disconnect and consultation.

During the project we have worked with all sections of the industry to develop practical and effective strategies to strengthen OHS management in the areas covered by the topics.

Method

We undertook the project in an 11-stage research process:

1. Write a literature review
2. Prepare and distribute an issues paper
3. Conduct a census of mines and interview key stakeholders
4. Refine the sampling and data collection strategy
5. Produce an interim report
6. Data collection
7. Data analysis
8. Write interim report
9. Conduct three *Future Inquiry* workshops
10. Write draft report
11. Write final report.

The findings that resulted from this process for each of the project topics are summarised below.

Production bonus and safety incentive schemes

Schemes used in the industry

Production bonus and safety incentive schemes were most commonly found in the coal sector and most extractive sites had no schemes of any type. There were two types of safety incentive schemes – those that involved a financial payment in exchange for achievement of outcome targets and those that involved reward or recognition for contributions to the OHS management process. Production bonus schemes in place included schemes that did not include safety components and some that combined safety with production criteria. Most schemes applied to operational employees only, with only 11 schemes including staff and managers. Only two schemes included subcontractors.

A surprising number of interviewees on sites with these schemes were not aware of the nature or even existence of them. This may be because most schemes had been in place for some time and were historic or part of a broader industry or corporate framework. As a result there had often been limited or no consultation in determining the OHS measures that were included.

For the schemes that involved payments or tangible rewards for achievement of outcomes, the measures or targets used to determine eligibility covered the whole site. Thus, if there was a lost time incident in one part of the site, the payment for everyone on site was affected. While subcontractors were usually not directly involved in these schemes, injuries or incidents that involved subcontractors were often taken into account in determining eligibility for payments. Thus, if a subcontractor experienced a lost time incident, direct employees on the site would have their bonus or incentive payment affected. In contrast, the safety incentive schemes that involved recognition for contributions to OHS management were often on the basis of team performance or contribution.

Impact on OHS

Production bonus and safety incentive schemes that involve payment in exchange for achieving particular outcome targets have not proved themselves to consistently or reliably improve safety outcomes. The confusion about the presence of such schemes evident in our interviews and in questionnaire responses suggests that any positive effects are likely to be limited at best.

The most commonly cited benefit was that the schemes encourage effective injury management. Rather than a benefit, this could well be seen as a cost of the schemes, since responding promptly to injuries is a fundamental building block of effective OHS

management. If such action is only undertaken when there is a financial benefit available, the basics of OHS management may not be in place. As the *Future Inquiry* Workshop participants identified, in a world class OHS system, people contribute to OHS management, not because of extra money, but because it is 'the right thing to do'.

Generally, sites reported that safety incentive schemes making payments as a result of achievement of outcome targets either made no difference at all or had negative effects on incident reporting. The questionnaire responses suggest that this is more likely where large payments are involved, which further reinforces the negative consequences that may have been realised.

A small number of sites had safety incentive schemes that recognised contribution and effort towards OHS. More positive outcomes for organisational factors associated with effective OHS management were evident at these sites, suggesting that an approach involving recognition of contribution rather than payment for outcome targets may have more positive results. *Future Inquiry* workshop participants reinforced the value of such an approach and recommended that the ideal safety incentive scheme provides recognition for high achievement and contribution, not payment in exchange for low levels of reported injuries, however defined.

Better reward and recognition schemes

As a result, we recommend that NSW mining enterprises should review their existing safety incentive schemes and shift them from a focus on outcome data to a focus on improvement and contribution. A guide to undertaking such a review is provided as Attachment 10 in Volume 2 of this report.

Given the potential for under-reporting and the other negative effects associated with payment schemes based on outcome measures and the lack of evidence of value from them, we recommend that such schemes should not be used in the industry.

We did not find that there was necessarily a direct link between production bonus schemes and breaches of work procedures such as 'short cuts', although we did receive some reports of such problems. However, the link between roster risk and high production bonus payments needs more careful examination at those sites that make such payments to ensure that payment systems are not creating disincentives for addressing working arrangements with negative OHS consequences.

Hours of work and fatigue management

Hours of work

Hours of work in the NSW mining industry are high (average 49.8 per week) and far in excess of the hours worked in the mining industry on average around Australia (average 44.7 per week). The following factors affect the hours of work:

- *Occupation*. Those in management and professional positions work longer hours than those in blue collar and administrative positions.
- *Sector*. Those working in the metalliferous sector work significantly longer hours (54.33) than in the extractive (50.33) and coal (48.10) sectors.
- *Employment status*. Contractors work longer hours (51.86) than direct employees (50.12) across the industry. The difference between contractors and direct employees is largest in the metalliferous sector (65.85 compared with 52.40).
- *Size*. Those employed at large sites work longer hours than those at small and medium sites. In particular, those employed at large sites in the coal and metalliferous sectors work significantly longer hours (52.24) than those employed at small and medium sites (48.39).
- *Location*. Those employed at sites in the far west of the state work significantly longer each week (55.75) than every other region.

Monitoring hours of work

The census of the industry showed that the overwhelming majority of sites use timesheets to record and monitor hours of work and that the use of swipe cards, while limited, is spread across large sites in all three sectors. Many sites reported that the data collected about working hours are monitored to ensure agreed maxima are not exceeded. However, even where swipe cards are used to record hours of work, information about hours on site is not always used to track hours so that those on site approaching or exceeding a specified limit can be identified and alerted.

As this suggests, the main control measure over hours on site is not the monitoring system. For blue collar employees, the main control is the existing industrial arrangements over hours of work that specify when overtime is worked. For white collar employees, there are few, if any, controls. Management and professional

employees all reported that their hours were not formally monitored or reviewed.

Given the long working hours identified in the NSW industry, more rigorous and interventionist monitoring of hours would be useful. Given that hours of work information is collected at almost all sites, this would not require the introduction of new systems. Rather, existing systems should be extended to staff positions and the full functionality of existing systems should be used. This does not necessarily mean that staff should clock on and clock off, but sites should be tracking and, where necessary, controlling the hours worked by all workers on site.

On the whole, a smart card system has strong support, but we are concerned that this is because sites may see this as an easy solution, and not undertake the risk management action needed to effectively manage hours of work and fatigue. A smart card system would not address the problems we observed with monitoring and assessing hours of work in the NSW mining industry. For existing smart card systems to have maximum functionality, the systems established by different providers must be able to interconnect to read records of hours worked stored on cards provided by other companies.

Shift arrangements and fatigue

Many people interviewed reported that they were fatigued as a result of their hours of work and shift arrangements. Respondents reported statistically significant differences between fatigue according to shift. Night shift was reported to cause significantly worse effects on work performance and fatigue levels than either afternoon or day shift. Afternoon shift was significantly worse than day shift. The finding that night and afternoon shift have such effects on key parameters such as work performance, alertness and ability to concentrate suggests that current shift arrangements are not adequately managing the risks associated with shift work.

Our data show that fatigue and other problems arise primarily from the time of day that work is being done, not the number of hours involved.

Each site was assigned a risk rating based purely on the roster arrangements using criteria that are well established to contribute to increased fatigue-related risk. On the basis of these factors, 24 rosters were low risk, 16 were medium and 11 were high risk.

We found that:

- Roster arrangements on most sites with extended shift rosters (both high and medium risk) are not designed to accommodate circadian rhythms.

- Some high risk shift rosters do not allow for long enough breaks so that workers can get sufficient rest between shifts.
- Many high and medium risk rosters do not provide adequate breaks within shifts. This accounts for nearly half of all of the rosters we identified.
- Some high and medium risk rosters work so many consecutive shifts and/or involve such extensive on-call work for at least some groups of workers that a cumulative sleep debt is likely to be accrued and was reported to us.

Roster arrangements therefore do not effectively control the risks associated with extended hours and shiftwork in all cases.

Fatigue risk management

The NSW mining industry recognises the importance of effective control of OHS risks arising from fatigue and hours of work. Despite this, few sites provided evidence of systematic risk assessments of fatigue. We found limited evidence that sites had a thorough understanding of the causes of fatigue, with most attitudes to fatigue focussed around non-work causes, rather than the contributions made by working arrangements. The importance of addressing the inter-related personal and organisational factors was not widely recognised.

The industry has had significant opportunity to voluntarily adopt effective, preventive approaches to fatigue risk management and a number of sites in our sample demonstrated both the benefits and the barriers faced by such approaches. However, the limited adoption of such an approach suggests that voluntarism in this area has limitations. As a result, we have found that DPI should intervene more directly in this area.

A key underpinning of effective risk management of fatigue and hours of work is accurate and reliable information about fatigue-related incidents. Existing “no blame” approaches to incident reporting and investigation must extend to fatigue as well.

In summary, the industry’s approach to fatigue risk management must recognise that working long hours and at night will necessarily result in fatigue. A risk management approach that seeks to shift responsibility for this to individuals is bound to fail and may result in serious negative consequences. More effective approaches to fatigue management that recognise the responsibilities of employers, as well as employees, have benefits broader than just OHS. The potential of more family-friendly working arrangements to aid the recruitment and retention of skilled workers at a time of serious labour shortages was well recognised by participants at the *Future Inquiry* Workshop.

OHS management systems and consultation

There is room for improvement

The industry's commitment to this project is clear evidence of its preparedness to embrace continuous improvement and we have been able to identify clear opportunities for this. Areas that need to be addressed across the industry are:

- focussing on a systematic approach to OHS management, rather than adherence to a specific OHSMS;
- improvements in consultation and participation by the workforce;
- controlling risks at source;
- applying resources to OHS;
- seeking good advice; and
- monitoring performance through auditing, feedback and review.

Successful strategies for dealing with these must be built on the features of organisational culture we identified as closely linked with effective implementation.

OHSMS

An effective OHSMS is built on the principles of mindfulness, work group cohesion, trust in management, organisational justice, supervisor support and role clarity. This does not require the development of detailed specifications and standards. The *Future Inquiry* workshop participants agreed that defining the "perfect" OHS system was both unnecessary and diversionary. Instead, the industry should be encouraged to develop a systematic approach to managing OHS, not complex, paper-based OHS management systems. Such an approach must be built upon clear goals and participative strategies to achieve them. The OHSMS can then be a tool that supports achievement of agreed goals and effective risk control, rather than act as an end in itself.

Consultation

Consultation is the cornerstone of effective OHSMS. Given the importance of effective consultation for sound OHSMS, it is disappointing that we did not find any examples of world class consultation. However, many sites - particularly proactive sites - have the essential building blocks in place. Consultation and communication were identified as a key strategy for immediate action by the industry at the *Future Inquiry* Workshop.

Controlling risks at source

While we found excellent examples of engineering risk controls, we also saw some reluctance on the part of the industry to manage risks at source. This was coupled with an increasing take up of strategies that focus on worker behaviour as the primary means of risk control. The industry should strengthen its focus on controlling risks at the source, as the law requires. DPI has a significant role to play in enforcing such an approach. Industry bodies also have a role to play in promoting changes at enterprise level that make the workplace healthy and safe and advising against strategies that focus on worker behaviour as the primary source of risk control.

Applying resources

Both the industry and DPI have critical roles to play in ensuring that appropriate competence, time and money are applied to making the workplace healthy and safe. This will not always require more resources, but simply more strategic application of current resources, for example, through a carefully constructed and fully resourced OHS strategic plan.

A disturbing finding of this research is the lack of good advice on OHS, both external and internal, that is accessed by organisations. To be able to identify, obtain and use competent advice, senior managers need to know enough about OHS to make the most informed choices.

Monitoring performance

Closing the continuous improvement loop of plan, do, check, act, relies on sound processes of monitoring and evaluation. Despite the widespread use of auditing in the industry, we did not find effective evaluation processes. Our research shows the need for greater clarity in goals as the essential underpinning of evaluation.

On many site visits and during the *Future Inquiry* Workshops, people told us how much they valued the opportunity to mix with others in the industry. They expressed a desire for process benchmarking through small workshops where they could share ideas and work through issues of relevance to them.

If you think you are good, you can't improve

The NSW mining industry is well-placed to build on its substantial achievements in OHS management to reach its goal of world class OHS. The barriers we identified through this research are not associated with lack of ambition or lack of information. Rather, we have observed a need to get the basics of OHS management right.

The message to the industry is clear, if uncomfortable. Implementing effective OHS systems and making the workplace healthy and safe is the legal and moral responsibility of management. It requires resources and time. It may be a business expense, but it is an operational requirement for business. It is

appropriate for senior management to declare a high priority for OHS, but in doing so it must be prepared to follow the stated intent with consistent and continuous action at each level of the business.

The problem of improving OHSMS and consultation is not really lack of guidance – we found numerous examples where existing guidance was not applied to key issues. Rather, a strategy that builds effective local action is needed, supported by clear and accessible information.

Conclusion

Our findings across the three research topics set out above reinforce the commitment of the NSW mining industry to world class OHS. The very act of commissioning this research demonstrates the industry's recognition that this commitment requires preparedness to thoroughly review actions in key areas.

We have identified an underlying theme across all three topics: the need to get the basics of OHS management right. *The Platinum Rules* we have prepared codify the fundamental steps the industry should take to more effectively manage OHS. Following these rules would substantially fill the gaps we have identified in OHS management in the NSW mining industry.

The Platinum Rules

1. Remember you are working with people—

- Don't exhaust them;
- People aren't machines;
- Treat them with dignity and respect.

2. ***Listen* to and *talk* with your people—**

- Be inclusive;
- Do it frequently;
- Value and develop people skills in supervisors and managers.

3. Fix things promptly—

- Don't let issues fester;
- Keep people informed of progress.

4. Make sure your paperwork is worth having—

- Keep it current;
- Make sure it's meaningful.

5. Improve competence in OHS—

- Particularly at management levels.

6. **Encourage people to give you bad news—**

   - Canaries are the most important workers in a mine.

7. **Fix your workplace first—**

   - Before even thinking about the bells and whistles.

8. **Measure and monitor risks that people are exposed to—**

   - Don't just react to incidents: fix things before incidents happen;
   - Control risks at their source.

9. **Keep checking that what you are doing is working effectively—**

   - Are you achieving what you think you are?

10. **Apply adequate resources in time and money**

Making it happen

To apply these rules, the industry needs to work cooperatively with all stakeholders, across sectors, companies and regions, reinforcing the need for local action. An industry development approach is more likely to support the actions this research has identified as necessary in order to get the basics right. And by getting the basics right, the NSW mining industry can achieve world class OHS.

Recommendations

Recommendation 1

Recognition and reward schemes should be reviewed and developed in line with good practice principles, namely, they should:

- reward and encourage contributions to effective OHS management, not outcomes;
- promote all aspects of a safe and healthy workplace;
- have significant management commitment, which necessarily involves resource allocation;
- be designed, implemented and reviewed in a consultative process;
- be reviewed and evaluated regularly to ensure that the scheme is targeting the desired result and not producing perverse incentives;
- be integrated within broader organisational improvement strategies; and
- encourage effective OHS culture through recognising contributions by teams as well as individuals.

Recommendation 2

The NSW mining industry should no longer pay workers in the industry money or equivalent benefits as a result of achievement of particular targets for outcome data, eg LTIFR, MTIFR.

Recommendation 3

Sites with production bonus schemes should carefully review them to ensure that the payment is not creating a disincentive to address adverse OHS consequences of current working arrangements.

Recommendation 4

DPI should develop an intervention strategy on fatigue management and hours of work. The 'how to' guide provided as Attachment 11 in Volume 2 of this report that is based on guidance promulgated by the NSW Minerals Council should be used as the standard for this strategy.

Recommendation 5

Prescriptive hours of service rules should not be imposed, but sites should use risk management approaches to monitor and address the excessive hours of work at some sites and for some occupations. This requires support from all stakeholders and intervention by the regulator where necessary.

Recommendation 6

Sites should actively monitor and address excessive hours of work for all who work on sites. In particular, contracting companies should monitor and control working hours of their employees who work across and travel to a variety of sites. DPI should not actively fund or promote a smart card system, but encourage employers to use appropriate techniques to monitor hours of work.

Recommendation 7

Existing providers of smart card systems should provide systems that can interconnect so that the hours of work stored on the cards provided by different systems can be downloaded by all readers.

Recommendation 8

MSAC should develop a minimum data set identifying fatigue-related information to be collected in incident investigations and provide it to the industry. This should also be incorporated in existing industry data collection protocols.

Recommendation 9

The industry should adopt a 'no blame' approach to reporting fatigue, responding to reports by addressing work-related causes not by penalising tired workers.

Recommendation 10

MSAC should develop a strategy to address the skills shortage faced by the industry, working with the industry's training advisory bodies and building on the concept developed at the *Future Inquiry* Workshop.

Recommendation 11

MSAC should develop a strategy to support all sites in the NSW mining industry to review the extent to which they have effective OHSMS in place, building on the concept developed at the *Future Inquiry* Workshop and using the findings of this research.

Recommendation 12

Sites should apply the tools currently available, and new tools as these are developed, to review and improve their consultative arrangements in consultation with their workforce.

Recommendation 13

DPI should further develop its intervention strategy on consultation to include assessment of effectiveness. This will require the development of review and evaluation guidelines that should also be made available to the industry. As part of this, DPI should also consider what further inspectorate training may be necessary to support such a strategy.

Recommendation 14

DPI should review their site visit protocols to ensure that they build effective consultation, in particular that they include the imperative to meet with workers and their representatives each time they come on site. Enforcement activity about compliance with legal consultation requirements should increase and sites should be actively encouraged to improve the time and resources expended on this critical area.

Recommendation 15

MSAC should develop a strategy to identify and promote good consultation practices building on the concept developed at the *Future Inquiry* Workshop and using the guidance that has been prepared previously for the industry. This strategy should identify and acknowledge best practice consultation in each sector and in SME as well as large enterprises. Case studies about these examples should be prepared and disseminated widely. Companies that demonstrate best practice consultation should be encouraged to share their experiences with other firms.

Recommendation 16

MSAC should revise and update the guidance for consultation provided as Attachment 12 in Volume 2 of this report to include recent legislative changes to create a *Guideline on Employee Consultation*. This guideline should then be actively and widely disseminated throughout the industry, including via the internet, as a guide to effective consultation.

Recommendation 17

MSAC should derive a set of self-audit tools and self-review tools from the *Guideline on Employee Consultation* for use by the industry.

Recommendation 18

Industry bodies and unions should offer training on consultation based on the industry guideline.

Recommendation 19

DPI should continue to require sites to use risk control strategies that focus on control at source and advise against using strategies focussing on worker behaviour as the primary means of risk control.

Recommendation 20

MSAC should identify where lack of information is inhibiting the ability of sites to develop effective risk controls and address this by improving information provision on such risks.

Recommendation 21

The importance of adequate resourcing should be emphasized in any industry guidance prepared by MSAC to implement the recommendations of this report.

Recommendation 22

MSAC should develop guidance materials to assist enterprises to choose appropriate internal and external advice based on the findings of this research. This should include advice to senior managers on what they need to know in order to select and use the best specialist advice.

Recommendation 23

MSAC should review and revise the performance measurement guidance materials prepared for the NSW Minerals Council to develop a guide to monitoring and evaluating OHS management. MSAC should then actively promote the use of such an approach throughout the industry.

Recommendation 24

As well as conducting audits in its own right, DPI should establish inspection protocols that check whether sites have effective internal and external auditing processes and specify appropriate remedial actions where necessary.

Recommendation 25

MSAC should provide opportunities for benchmarking and sharing industry data and knowledge and establish opportunities for the exchange of ideas, problems and solutions (eg through internet sites, regional meetings and *Future Inquiry* type initiatives).

Chapter 1 Introduction

This report details the findings of the *Digging Deeper* Project, commissioned by the New South Wales (NSW) Mine Safety Advisory Council (MSAC).

1.1 Background

The three topics of this project result from a series of reviews and investigations of OHS in the NSW mining industry. In particular, the 2005 Wran Mine Safety Review identified key issues that needed further investigation. Three of these formed the *Digging Deeper* project, which investigated how the following issues impact on OHS performance:

1. Production bonus and safety incentive schemes;
2. Hours of work and fatigue management;
3. OHS management systems disconnect and consultation.

The purpose of this study was to identify how these issues were affecting OHS performance in the NSW mining industry.

1.2 Research Team

A consortium of independent consultants and researchers, led by Shaw Idea Pty Ltd, undertook the research. The consortium members were:

- Andrea Shaw (Shaw Idea Pty Ltd) as project leader;
- Dr Verna Blewett (New Horizon Consulting Pty Ltd);
- Laurie Stiller (Beyond Words);
- Christine Aickin (Workability Pty Ltd);
- Prof Drew Dawson (Centre for Sleep Research, University of SA);
- Dr Sally Ferguson (Centre for Sleep Research, University of SA);

- Dr Stephen Cox (Stephen Cox Consulting); and
- Professor Kaj Frick (Malardalen University, Vasteras, Sweden).

1.3 Project Steering Group

A Project Steering Group (PSG) was established to oversee the project, to provide feedback on the progress of the research and to make decisions at critical stages of the research. The members of the PSG and the DPI support staff provided us with considerable and enthusiastic assistance during the project, for which we thank them. The members are:

PSG members

- Norman Jennings Chairman MSAC (Convenor);
- Dr Graeme Peel (Independent MSAC member);
- Rod Morrison (NSW DPI);
- Tara McCarthy (NSW Minerals Council MSAC employer member nominated representative) to May 2007;
- Dave Mellows (NSW Minerals Council alternate for Tara McCarthy since May 2007);
- Mark Levey (NSW Minerals Council alternate for Dave Mellows 30/08/07 only);
- Wayne Evans (CCAA MSAC employer member nominated representative);
- Andrew Vickers (CFMEU Mining and Energy Division, MSAC employee member nominated representative).

Project manager (not a member)

- John Flint (project manager and secretariat to PSG, NSW DPI).

Policy and research support

- Tim Crakanthorp (NSW DPI).

Admistrative support

- Kate Maddison (NSW DPI).

1.4 Industry support

This research has been supported by extraordinary dedication, cooperation and involvement by all industry stakeholders. Almost without exception, sites and their employees provided unprecedented access for interviews and were generous with their views and ideas. It has been a privilege to undertake this project. The people who work in the NSW mining industry have enormous pride in their work and are committed to the goal of world class OHS. The concerns expressed about current approaches were provided entirely on the basis of seeking to strengthen and improve both the quality and quantity of the efforts all are making to improve OHS performance.

1.5 The need for action

Addressing the issues identified in this report is critical. Perhaps on the basis of history, a number of interviewees expressed some cynicism about whether the topics covered by the project would be addressed with the necessary attention. Unless the issues that have been identified through this research are addressed effectively, there is the further risk that this cynicism will be strengthened, itself adding to any disconnect that might exist. Each chapter of this report makes recommendations that are directed to engaging all stakeholders in a process of renewed attention to the basics of OHS management.

1.6 Report outline

The report is in six chapters:

Chapter 1	Introduction, which provides a context to the report.
Chapter 2	Method and context, setting out how the research was undertaken and the industry context revealed by early stages of our research.
Chapter 3	Production bonus and safety incentive schemes, detailing our findings in relation to this project topic.
Chapter 4	Hours of work and fatigue management, detailing our findings in relation to this project topic.
Chapter 5	OHS management systems and consultation, detailing our findings in relation to this project topic.
Chapter 6	Conclusion, setting out our overarching findings.

A second volume to this report contains a complete set of attachments that provide supporting information referred to in this report.

Chapter 2 Method and Context

This chapter sets the context for this research project and describes the research method. It provides in some detail the steps, the resources and the analysis undertaken to address the project topics.

2.1 Approach

The approach we applied to the project was evidence-informed. That is, we used an approach based on sound principles and applied methods and tools with demonstrated effectiveness in relevant contexts.

For the project to have maximum impact on improving OHS management in the NSW mining industry, the approach to the project needed to be coherent, comprehensive and consistent with the values and strategies that are known to be associated with superior OHS performance. For this reason, we undertook the project as a single effort. While each topic constituted a research area in its own right, we collected data in one process. This also reduced disruption to the industry and allowed more effective data collection and analysis.

2.1.1 Outline of project steps

We used an 11-stage research process:

1. Write a literature review.
2. Prepare and distribute an issues paper.
3. Conduct a census of mines and interview key stakeholders.
4. Refine the sampling and data collection strategy.
5. Produce an interim report.

6. Collect data.
7. Analyse data.
8. Write an interim report.
9. Conduct three *Future Inquiry* workshops.
10. Write a draft report.
11. Write a final report.

2.1.2 Research objectives

The project aimed to achieve objectives set for the three topics of research:

Topic 1 – production bonus and safety incentive schemes

Research under this topic aimed to:

- Identify the range of existing production bonus and safety incentive schemes in existence across the NSW mining industry.
- Assess the impacts these schemes have on OHS performance and management, particularly the accuracy and reliability of OHS data.
- Identify approaches to rewarding and recognising efforts supporting effective OHS management.

Topic 2 – hours of work and fatigue management

This research aimed to:

- Create a statistically significant profile of working hours across the industry (including contractors), capturing the variability of hours across occupational levels and employment arrangements and comparing this profile with relevant standards.
- Review the range of methods used to record and monitor hours of work for employees and contractors and determine their effectiveness in supporting control of related risks.
- Identify options for recording and monitoring systems, including use of a ‘smart card’ or alternative Information and Communications Technology based system.
- Review the effectiveness of existing approaches to managing fatigue risks.
- Recommend approaches, based on the data, that would more effectively manage fatigue in the industry.

Topic 3 – OHS management systems (OHSMS) and consultation

This research aimed to:

- Identify the various instruments, strategies and practices (including formal consultation processes) which corporations use to ensure that individual sites and their managers, supervisors and workers work towards common goals and priorities determined at corporate level.
- Assess the strengths, weaknesses and relative effectiveness of the various internal management mechanisms described above in overcoming any potential 'disconnect' between corporate aspirations and site performance and in achieving effective consultation.
- Identify the range of consultative arrangements across the industry and how these can be most effective.
- Identify the importance of various corporate characteristics (centralised/devolved, corporate culture, information flow, etc.) which influence OHS outcomes and avoid the potential for 'disconnect' at site level.

2.1.3 Project outcomes

The research has achieved the following outcomes:

- Clear recommendations on how to structure and apply production bonus schemes and safety incentive schemes to support effective OHS management in the NSW mining industry.
- An accurate picture of the true hours worked by employees and contractors and of the existing work-life balance in the NSW mining industry.
- A clear path forward for the NSW mining industry on how best to record and manage work hours.
- Comprehensive, better practice methods on how to manage fatigue within the mining industry in NSW.
- These outcomes could lead to a recommendation proposing a standard (which could be in the form of a code of practice or guideline) on work hours and fatigue management to the Minister by the MSAC.
- A clear path forward for the NSW mining industry on how to address any disconnects between management systems and their implementation at sites.

- Comprehensive, better practice examples on how to implement and manage consultation within the NSW mining industry and means for obtaining feedback and input from the workforce for consideration.

2.1.4 Confidentiality

Confidentiality was a key consideration in this project. We took a number of steps to ensure that the identity of individuals and enterprises that provided information to us would be kept absolutely private.

The census results have been reported in aggregate form and the completed forms will be destroyed at the end of the project, as set out on the census form (see Volume 2 of this report). In particular, the identity of the sites we visited has been kept confidential and we have written all our reports to ensure that identities are not able to be deduced from them.

During site visits, all participants were assured of the confidentiality of the information collected. The site visits were undertaken on the ethical basis that participants gave informed consent to participate in surveys, interviews and focus groups and that they gave information on the basis that they will not be identified, and that no harm will come to them arising from the project (Kellehear 1989: 63).

In reporting our quantitative and qualitative data we have only reported on groups that contained more than 15 members (individuals or enterprises) to make identification more difficult. This means that sometimes we have not reported on some sectorial differences or individual differences in the data rather than risk the confidentiality of participants.

2.1.5 A note on terminology

Our public information, such as in reports, has been expressed so that it is not possible for anyone to work out who gave the information, unless that person or enterprise has given their consent. Thus in this report, where people have been quoted, we have sometimes altered the information so as not to lose meaning, but to prevent identification. Similarly, we have sometimes identified the sector, size and organisational category from which participants came and at other times we have not. Where there was any risk of identification and/or where the sector, size or oganisational category was not critical to the discussion we have not included that information. For similar reasons, to prevent location in any particular sector, we have used the following terms generically:

- ‘mine manager’ to also include ‘quarry manager’;
- ‘HSR’ to mean employee representatives, including check inspectors;

- ‘OHSC’ or ‘OHS Committee’ to mean consultative committees for OHS. These had a wide variety of names and to use the site names risks identification; and

- ‘OHS manager’ to describe employer appointed people with responsibility for OHS. Again, the variety of actual terms in use could result in identification of sites or individuals.

2.2 Research questions

The research method detailed in this chapter was designed to answer the following research questions in relation to each of the three topics of the project:

2.2.1 Topic 1 – production bonus and safety incentive schemes

Key research questions for this topic were:

1.1 What types of schemes are in operation and in what types of mines?

1.2 What are their formal and informal objectives? What are their defined "success" criteria?

1.3 What organisational levels are involved in the schemes and how (from executive management to mineworkers and contractors)?

1.4 How have the schemes been developed and implemented?

1.5 What impact have the different schemes had on:

- Information flows?
- Internal communication?
- Reporting of incidents and injuries?
- Decision-making about OHS?
- Management and worker behaviour?
- Safety performance?

1.6 What types of schemes are more likely to have a positive impact on OHS and what are their critical features?

2.2.2 Topic 2 – hours of work and fatigue management

Key research questions for this topic were:

2.1 What are the actual hours of work in the industry and how do these vary by individual, occupation, level, employment status, type of mine, etc?

2.2 How are hours of work recorded and monitored across the industry and how do these methods vary?

2.3 What is the impact of these hours on fatigue?

2.4 How are issues associated with long commute times managed?

2.5 How does the industry currently manage fatigue and how do these methods vary?

2.6 What has worked (and why) and what has not worked so well (and why)?

2.7 What are the formal policies of organisations and how are these policies reflected in practice?

2.8 How are individual risk factors considered and addressed?

2.9 How is the effectiveness of these methods measured and how effectively do these methods control the risks associated with fatigue?

2.10 To what extent are sites identifying the impact of fatigue on incidents and how are they responding to such incidents?

2.11 What could the industry, companies, employees and contractors do to improve current hours of work and fatigue management approaches?

2.12 What role should DPI play in dealing with hours of work and fatigue?

2.2.3 Topic 3 – OHS management systems (OHSMS) and consultation

Key research questions for this topic were:

3.1 What is the relationship between various "hard" instruments/policy tools (systems, monitoring, audits, etc) and soft variables (culture, leadership, trust, etc.) at corporate and individual sites and to what extent does this explain any disconnect between systems and outcomes?

3.2 To what extent and in what circumstances are formal systems/audits/monitoring, etc. a necessary component of effective OHS management?

3.3 To what extent must they be supported by informal processes (enhancing cohesion, initiative, morale, safety climate, etc.) before they can be fully effective?

3.4 What marks out effective strategies for implementing formal systems and procedures, eg for consultation, that support alignment at a site level?

3.5 How does OHS become institutionalised, how does it get into the "bloodstream" of the organization at site level? What are the significant drivers and barriers for this?

3.6 What are the most effective approaches to consultation in the industry and how might they be promoted throughout NSW?

3.8 What actions at the corporate or site level have worked (and why) and what has not worked so well (and why)?

3.7 How might the effectiveness of OHS management and consultation be monitored and assessed?

3.8 What role should DPI play in supporting effective OHSMS and consultation?

2.3 Literature review

We monitored the scientific literature, and professional and industry publications for information about the project topics. Our final summary of the 'state of play' in the literature on each of the topics is provided in this report in each of the topic chapters.

The literature review aimed to answer the critical question of effectiveness: What can the literature tell us about what works in relation to the three project topics? This allowed us to compare current industry practice that we determined through the census and site visits with the published evidence. The gaps identified through this comparison were then discussed with the industry at the *Future Inquiry* Workshops and this final report sets out our recommendations for closing these gaps.

The research team is familiar with the topics for the project and we have drawn on our previous work in relevant areas for this review. In addition, the following databases were searched:

- Ebsco
- Emerald
- Informit
- Google Scholar

Key words for the searches were:

- Mining and "OHS management systems"
- Mining and "safety management systems"
- Mining and incentives
- Mining and bonus
- Mining and "bonus payment"
- Mining and fatigue
- Mining and "working hours"
- Mining and consultation
- Mining and "employee consultation"
- Mining and participation

- Mining and “employee participation”
- Mining and trust.

These searches were restricted to publications between 2002 and 2007. In the first part of the literature search 88 articles were identified through these searches and were considered in preparing the issues paper and our interim reports. Earlier and other literature that was known to the researchers has also been considered. We have continued to search the literature as we have progressed the data collection and data analysis. These additional papers have been included in the literature review that is incorporated into the chapters on the research topics which follow.

2.4 Issues paper and stakeholder consultation

At an early stage of the project, we prepared and distributed an issues paper, interviewed key stakeholders and established an internet-based Project Forum

2.4.1 Issues paper

An issues paper that set out the research questions and asked for industry comments and input was prepared and distributed. It is included in Volume 2 of this report.

This issues paper was widely circulated by the consultants, DPI and PSG members to key stakeholder organisations, individuals, sites and contractors to the industry. It was also available for download from the DPI and the project website.

Submissions were invited in response to the issues paper and a small number of written responses was received. These were reviewed and used as background to the site level data collection.

2.4.2 Stakeholder consultation

Meetings and interviews were also conducted with key stakeholders. The following interviews and meetings were held:

- Executive Committee, NSW Minerals Council;
- OHS managers of NSW Minerals Council member companies;
- Australian Workers Union officials;
- Institute of Quarrying, Hunter Sub Branch;
- Director OHS, NSW Minerals Council;
- Rio Tinto Coal Australia OHS management;
- Construction, Forestry, Mining and Energy Union, Mining and Energy Division officials;
- Institute of Quarrying, NSW Branch;
- DPI officers; and
- Mining industry contractors, with Australian Industry Group assistance and support.

These meetings were most productive and had positive impacts on the project, particularly in supporting responses to the mines

census. This suggests that the key messages about confidentiality and the action-orientation of the project was conveyed effectively.

Andrea Shaw also made a presentation to the NSW Minerals Council OHS Conference to inform delegates about the project and to encourage them to cooperate with ongoing data collection activities.

2.4.3 Project forum

The Project Forum website was established as a means of encouraging discussion on the topics within the industry. Access to the site was anonymous and mediated by the researchers. We expected that industry players might use the forum as a means of fielding questions about the research topics, but traffic was slower than we anticipated. Nevertheless, the potential of internet-based forums is worth exploring in future MSAC projects.

2.5 Mines census

A census of the industry was conducted in order to develop a taxonomy of mine sites in order to choose a random stratified sample for in depth qualitative and quantitative data collection in the subsequent stage of the research.

2.5.1 Establishing the population

DPI's COMET database was used as the population of mines. All open mines, as listed in the database, were included in the population. This provided contact details for 91 coal, 53 metalliferous mines, and 481 extractive mines.

All coal and metalliferous mines were included in the census. Due to the very large number, extractive mines were sampled. Sampling of extractive mines was performed on the basis of the operator of the mine site. All operators who operated two or more mine sites were included in the sample. Single operators were sampled. Approximately 72% of single site operators were contacted. This sampling allowed an error of margin of +/- 3.3% on the basis of operators from the sector, as a worst case. (A worst case is where a sample probability equals 0.5). A total of 243 extractive mine operators were contacted, which accounted for 401 mines sites, an overall error rate of +/- 3%.

2.5.2 The census questionnaire

We sent census questionnaires by mail to all coal and metalliferous mine sites and the identified sample of extractive sites in NSW. Each site that had not responded by 22 March 2007 was followed up by telephone. The census questionnaire can be found in Volume 2 of this report.

The personal contact with sites had several advantages:

- The data were collected in a timely fashion once contact was established.
- Personnel at the sites were able to experience the project at first hand and responses indicated that they found it non-threatening, indeed respondents by phone were often enthusiastic about the project and wanted to elaborate on their answers to the questions or give us much more information than we had asked for.
- We were often asked why we had not asked specific questions about safety incentives and people took the opportunity to tell us their views in any case.

- The vast majority of respondents were surprised at how quickly the data were collected and learned that we were truthful about the demands on their time.

We found a high level of cooperation, enthusiasm and speedy responses from the extractives sector, even though the greater population meant that the response rate was not quite so high. Both metals and coal were more difficult. Some multi-site organisations in these sectors required that we forward the questionnaires to their corporate offices and we were not able to talk directly to their sites for some time. This resulted in slow or no responses from some of these organisations and required considerable persistence to address.

2.5.3 Census responses

Just under 550 (549) questionnaires were distributed by post to coal, metalliferous and extractive sites throughout NSW. The following table represents the final breakdown of responses.

Response	Total	Coal	Metal	Extract
Complete response	257	61	19	177
Refused	24	6	3	15
Included in another	28	12	3	13
Shut down	21	6	3	12
Intermittent	46	0	3	43
Not operational	68	5	22	41
No response	105	1	4	100
Total:	**549**	**91**	**57**	**401**

Table 2.1: Questionnaire responses

Phoning the sites was difficult in some instances because of changes in operation and ownership of some sites and subsequent changes in contact details. In fact, 135 or 24.6% of the sites in the database were excluded from the statistics because they were non-operational, intermittent, or had shut down. Twenty-eight sites did not provide data independently but in combination with other sites where they were part of a single operation. A very small number of sites (24, about 4.4%) refused to answer the questionnaire. Of the 105 sites which did not respond at all, most did not appear to be operational, eg the phone numbers we rang did not seem to be current because the call did not go through to an answering machine or messaging service. For others, despite a number of direct contacts and commitments from the site to complete the questionnaires, no final response was received by 1 May. Some others may have chosen not to express a refusal directly to us but

were actively choosing not to participate by not responding to phone messages. The number of refusals combined with the number of no responses represents 129 or 23.5% of our sample, giving an overall response rate of 66.6%.

The response rates in specific sectors are set out in Table 2.2 below.

Sector	Total number of sites contacted	Number of sites excluded from population	Final Population	Number of usable responses	Response rate
Coal	91	23	68	61	89.7%
Metalliferous	57	31	26	19	73. 61%
Extractives	401	109	292	177	60.6%
Total	**549**	**163**	**386**	**257**	**66.6%**

Table 2.2: Questionnaire response rate by sector

A graphical summary of the overall responses to the mines census is found in Figure 2.1 and responses by industry sector are found in Figure 2.2 below.

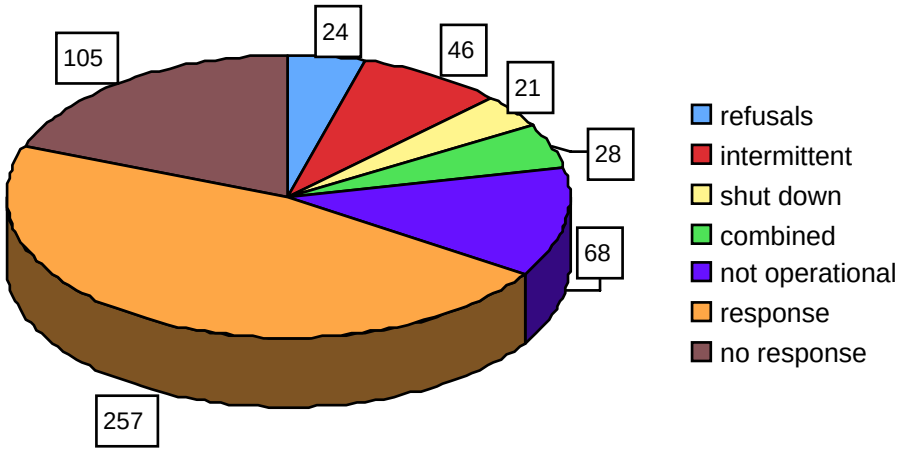

Figure 2.1: Overall responses to the mines census

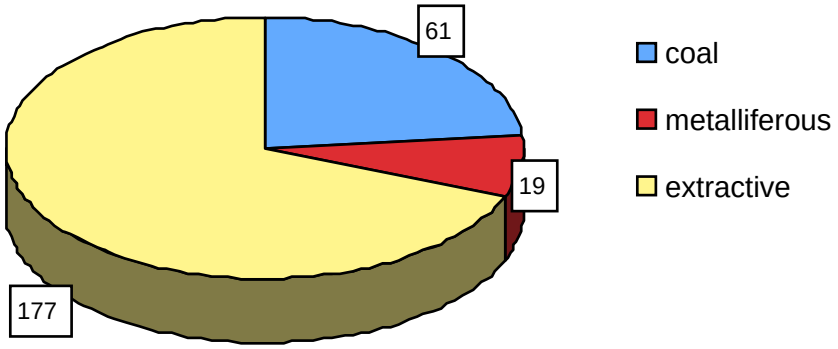

Figure 2.2: Responses by industry sector

2.5.4 Census Data

The data frequency tables from the census, with the margins of error, can be found in Volume 2 of this report.

We divided the respondent organisations into categories by size of mine using employee numbers and use of contractors. This was different for the different sectors. The divisions were defined to provide enough sites in each category for comparison purposes.

Sector	Small		Medium		Large	
	Employees	Contractors	Employees	Contractors	Employees	Contractors
Coal	0 - 35	0 – 24	36 - 200	25 - 90	201 - highest	91 - highest
Metal	0 - 9	0 – 12	10 - 96	20 - 90	97 - highest	91 - highest
Extractive	0 - 4	0 – 6	5 - 15	10 - 41	16 - highest	42 - highest

Table 2.3: Definition of small, medium and large categories by sector

The margin of error for the total sample proportions of each category of response was calculated. These ranged from a low of +/- 0.4% to a high of +/- 3.6%. This means that we can be confident that, at the worst, the difference between the proportions determined from our census are different to the complete population by only 3.6%.

These margins of error were calculated using the COMET data as the basis for the total populations for each sector, adjusted for the sites we knew to be non-operational, intermittent, or to have been included in the data for multiple sites. A margin of 5% is a statistically acceptable margin of error and lower margins are considered excellent. A higher response rate, while decreasing the margin of error even further, would have been highly unlikely to alter the results *per se*. It would require mines not sampled to be extremely different in nature to those captured in the sample. Based on the consultants' knowledge of the industry, there did not appear to be any mine sites or operators not included who would have made such a substantial difference to these results. Our findings from the census were therefore statistically robust and allowed selection of a sample for in-depth data collection.

2.6 Site visits

2.6.1 Site visit sampling strategy

The mine sampling strategy had two aims: the first was to have a sample of mines that was representative of the population of mines in NSW. The second was that this sample was large enough to allow sufficient precision of estimates and to test the findings of the census.

We used a stratified random sampling strategy, based on the profile established by the census. All mine sites were categorised according to the number of direct employees and number of contractors used at the mine site. The specific size categories used varied according to the sector, as discussed in the last section. The mines in the sample varied by sector, size, nature, location, and the other variables of interest, as identified in the census.

Access to sites was varied: in some sectors and for some sites, there were no problems at all. In others, we faced considerable difficulties. This was a particular problem in the coal sector.

Of the 50 sites initially approached, we received 11 refusals, four in coal, two in metals and five in extractives. Five refusals were stated to be because involvement in the project would disrupt production too much, two were because the site was no longer operational, two were because the sites were very small and the manager would not be able to spare their own time for participation, one was because the site was not operating due to flooding and the final site did not want the topics of the project canvassed with their employees. Each refusal was replaced with an equivalent site, according to sector, type of mine and size. To reduce the risk of observer bias, our statistician, Dr Stephen Cox, who was not familiar with the industry in NSW, performed these allocations.

The final sample covered the industry as per our census, although one major corporate declined the opportunity to participate. Given the broad cross-section we were able to obtain from the rest of the industry, we believe that this was unlikely to affect the validity of our data.

All of the site visits were arranged and conducted by four of the researchers, each of whom is a skilled interviewer with considerable experience in organisational review using qualitative methods. Site visit data collectors were Andrea Shaw, Verna Blewett, Laurie Stiller and Christine Aickin.

2.6.2 Site visit protocol

The site visit protocol was:

- Make initial contact by phone to identify a suitable liaison person and to gauge the degree of engagement from the site.
- Send a letter or email detailing what would be involved in the site visit and requesting copies of relevant documents prior to the visit.
- Follow up the letter and arrange the site visit (eg the date) establishing a sample of employees and contractors if necessary, coordinating visits to other sites in the vicinity.
- Conduct the site visit, including a short debrief to the site OHS manager upon completion if desired.

Within each mine, we collected qualitative and quantitative data from individuals. Site visits were undertaken in June and July 2007.

2.6.3 Quantitative data

Individual data were collected using a survey instrument based on standard questionnaires validated as reliable tools to collect data on the variables of interest. This *Site Visit Questionnaire* can be found in Volume 2 of this report. The questionnaire was refined following on-site piloting at one of the sites. It covered:

- demographic data, such as age, gender, occupation, type of employment, non-work risk factors for fatigue;
- hours of work;
- OHS culture variables such as perception of management commitment, confidence that OHS issues are addressed effectively (using our previously validated assessment tool); and
- features of the psychosocial work environment (using the Copenhagen Psychosocial Questionnaire).

We collected completed questionnaires from 53 sites:

- 17 coal
- 25 extractives
- 11 metalliferous

The breakdown of the 53 sites by size is:

- 18 large

- 18 medium
- 17 small

We received 1,667 completed questionnaires, which was more than we needed in terms of the total population, and provided sufficient numbers in particular categories of employees and from each industry sector.

The questionnaire instrument and the frequency tables for the questionnaire responses can be found in Volume 2 of this report.

Sector	Number of responses required	Number of responses received
Coal	766	858
Metalliferous	550	567
Extractive	220	242

Table 2.4: Questionnaire responses by sector

2.6.4 Qualitative data

Effective research of this nature cannot be done exclusively using quantitative data, although they provide critical background support. Face-to-face individual and focus group interviews are required to collect the detailed information needed to answer the research questions and to identify the key factors associated with the research topics.

Because the research topic rather than the person is the focus of analysis (Mitchell 1983: 192), qualitative data are necessary to detail the underlying, complex issues that cause changes in workplace health and safety (Rimmer and Watts 1994: 66). Qualitative data, as both Cook and Reichardt (1979) and Yin (1984) suggest, help to untangle the processes and causes involved in complex social situations when the prior isolation of key variables is difficult. They help to explain how or why particular events or actions occurred (Cook and Reichardt 1979; Yin 1984). As Shannon et al (1999) suggest, the researcher is

> …interested in the opinions and reactions of those directly involved with the site of a workplace intervention, such as managers, workers or program delivery staff, and also those not directly involved, since their attitudes or actions could indirectly affect a program (Shannon, et al. 1999).

This in turn allows the development of effective strategies for assisting industry to improve its performance.

Qualitative data were collected through focus groups where possible and individual interviews where appropriate, for example higher levels of management. We developed an interview schedule with questions and prompts designed to cover the three topics. The interview schedule was refined following a pilot test at one of the sites. It can be found in Volume 2 of this report.

Focus groups consisted of individuals selected on the basis of a stratified random sampling strategy, wherever possible. At some sites, we interviewed everyone who was on site on the day. On other sites, we were restricted to those who could be released for the interview. In summary, qualitative data were collected on site in the following manner:

- Individual interviews with senior site managers and relevant OHS personnel.
- Focus group interviews of employees in specific categories, defined according to site characteristics, with 6 – 10 participants in each interview. In many small and some medium sites (particularly in the extractives sector) all employees participated in focus group interviews. A representative sample was established on larger sites.
- Focus group interviews of contractors on site, with 6 – 10 participants in each interview. Where the number of contractors on a site was low, we sought to interview all contractors. Otherwise, a representative sample was drawn.

Each focus group interview commenced with participants completing the questionnaire before the interview. The interviews took between 1 – 1.5 hours. We collected qualitative data from 52 sites. We interviewed 585 people from across the industry, in 221 individual and group interviews.

2.6.5 Site level data

We collected the following site level quantitative data:

- Workers' compensation data,
- Injury and incident statistics,
- Audit results,
- Data relating to inspections, regulatory breaches and prosecutions, and
- Any other site-specific quantitative data.

We also collected documentary data from the sample sites. This included:

- Industrial instruments and other records of production bonuses and safety incentives
- Incident records and analyses
- Hours of work records
- Fatigue management plan and related policies
- Any documents about fatigue management (eg risk assessments)
- OHSMS documents setting out the formal system
- Terms of reference and other records of OHS consultative arrangements (eg recent minutes of OHS committees)
- Any evaluations of any of these systems/processes

These documents have allowed us to confirm or challenge the information provided by individuals about matters such as rosters, hours of work, incident reporting and OHS consultative arrangements.

2.6.6 Triangulation

The multi-method approach, described by Brewer and Hunter (1989), is designed to "attack a research problem with an arsenal of methods that have non-overlapping weaknesses in addition to their complementary strengths" (Brewer and Hunter 1989:17). Each new set of data serves to increase our confidence in the research data as a reflection of reality rather than methodological error. This is particularly so when the findings are the result of different methodologies. Divergent results are also valuable: they make us question the validity of both sets of data, they signal the need to analyse the question further, and to be cautious of interpreting the significance of any one set of data (Brewer and Hunter 1989:19). For example, differences between the rostered hours of work and the hours of work claimed by individuals signals issues associated with record keeping and/or recall.

The multi-method approach we have used has allowed us to be confident that the features identified from the data are a reflection of reality rather than methodological error.

2.7 *Future Inquiry* workshops

In July 2007 three one-day *Future Inquiry* Workshops were conducted for industry and industry stakeholders to discuss the findings of the data analysis and to identify future directions for the industry in NSW.

2.7.1 Background

Strategies to improve OHS performance in the mining industry are likely to be much more effective if they are developed and implemented in a way that embodies the values and norms that are associated with high OHS performance, particularly participation. *Future Inquiry*, a method developed and tested by Verna Blewett and Andrea Shaw, has enabled us to achieve this participation efficiently and effectively. It adapts existing participative planning techniques, building on appreciative inquiry and future search methodologies.

Appreciative Inquiry (Whitney and Cooperrider 1998) aims to examine new directions for action by looking at what works well now, rather than problem solving. Problem solving tends to be slow, is backward looking in the search for problem causes, is about closing gaps rather than looking for fresh ideas, and tends to generate defensiveness (your fault, not mine) that reinforce power and control agendas. A focus on positive stories and ideas generates a respect for what has been done well, identifies the part that individuals play in their organisation, reinforces accepted values and invites an affirmation and expansion of ideas.

Future Search (Weisbord and Janoff 2000) is a collaborative process aimed at hearing and considering the voices of the "whole system" in the room so that many perspectives are brought together to work on a specific and task-focused agenda (Weisbord and Janoff 2000). It is a collaborative process that encourages creativity, commitment to actions that are grounded in reality, the formation of new working relationships and voluntary cooperation. The process gives participants the opportunity to share leadership and to engage as peers in robust discussion, in an environment focused on the future.

The *Future Inquiry* Workshop that we have developed from these methodologies engages people in thinking past 'problems' to thinking about the future. The method has the added benefit that it embodies the principles of participation and respect that underpin effective consultative processes, ensuring that these are built in from the beginning. The workshop engages a large group of people who are representative of the "whole system" of the industry and the particular focus of inquiry. We actively seek common ground

as a basis for action knowing that people are more likely to take action where they have shared commitment. Having taken action on common ground, other areas can be tackled.

2.7.2 Three workshops

Three one-day workshops, each with a focus on one of the research topics, were held for this project. The aim of the workshops was to use the input of the stakeholders to determine what future directions could possibly be implemented in the industry to address the project topics. Relevant stakeholders were invited and encouraged to attend. We identified stakeholders in collaboration with the Project Steering Group and DPI, with each stakeholder group taking the responsibility of nominating eight representatives for each workshop. Participants were provided with a background paper, summarising the findings of the project to this point. A copy of this background paper is provided in Volume 2 of this report.

The workshops were held as follows:

1. 24 July 2007: Production bonuses and safety incentive schemes

2. 25 July 2007: Occupational health and safety management systems and consultation

3. 31 July 2007: Hours of work and fatigue management.

We were encouraged by the representation at each workshop, and at the high level of participation during the workshops. For ease of identification, each of the seven (7) stakeholder groups was allocated a colour. Attendees were as follows:

Stakeholder group and colour	WS1	WS2	WS3	All
Coal employers	6	9	10	25
Metalliferous and Extractive Employers	6	6	9	21
Contractors and services to the mining industry	4	6	6	16
Coal employees	8	8	8	24
Metalliferous and Extractive employees	8	7	7	22
Other employees and representative groups	4	4	4	12
Regulator	8	6	12	26
Total	**44**	**46**	**56**	**146**

Table 2.5: *Future Inquiry* Workshop attendances

2.7.3 Workshop format

Each of the workshops used a similar format in which participants moved from an examination of the past (through a presentation of the literature review), the present and the future with respect to the topic. Participants worked in stakeholder groups for some exercises and in mixed groups for others. Thus at times they were testing ideas with their peers and at other times representing their stakeholder voice with representatives from other stakeholder groups. Some exercises were done as a plenary group so that the whole room was able to hear the different views that were expressed.

2.7.3 The past

At the beginning of each workshop we provided a short overview of the project and the literature that we had read and analysed to that point, as set out in the background paper. We were also able to share some insights from the preliminary analysis of our site visit data and identify where the gaps in the NSW industry existed, or were most likely to exist. We were able to field questions from participants at this point. We found this a useful 'reality check' for the group given the extent of our literature reviews and the significance of our census and site visit data.

2.7.4 The present

Working in stakeholder groups, participants identified what works now and what doesn't work now in relation to the topic of the workshop. The ideas were collected on flip charts and stuck on one wall for everyone to review. Common themes could be readily seen by this stage and these were collected in a plenary session.

The whole group looked for trends that influence the capacity for the industry to do well in each of the topic areas. This took the form of a large, group mind map. The centre of the mind map contained the topic area expressed as the ideal:

- effective production bonus and safety incentive schemes;
- effective OHS management systems and consultation;
- ideal hours of work and effective fatigue management.

The trends collected on the mind map had different priority for different people and different groups of stakeholders. Each participant was given five (5) sticky dots in their stakeholder colour and invited to 'vote' for the trends that they considered most important or significant. They could spread their dots across the mind map as they chose as illustrated below.

Figure 2.3: A completed mind map and Voting on the mind map

Stakeholder groups then re-convened to examine the voting on the mind map and select a few that were considered significant by their group. They were asked to identify what they (as individuals or as a stakeholder group) are doing now in response to those trends, and what they (not others) could, should or would like to do now in response to those trends. Some expressed this pictorially:

Figure 2.4: "What we are doing now in response to trends" and "What we'd like to do now in response to trends"

By the end of this session the participants had identified what works and what doesn't in the present, the trends that exist now that impact on achieving the ideal, and what particular stakeholders are doing and would like to do in response to those trends. Thus they created a clear picture of the present that was shared by those in the room.

2.7.5 The future

Having heard and discussed the past and examined the present as stakeholders and as a plenary group, we turned the participants' attention to the future. The next exercise was set 10 years in the future when all problems concerning the topic under consideration were solved and the situation was ideal. Thus, for example, we

have ideal hours of work and effective fatigue management. Mixed groups, consisting of at least one member from each stakeholder group (where numbers allowed this), assembled to create an ideal future and write the front page of the *Mining News Update* for 2017 to reflect on the work that had been done since 2007 that enabled us to reach that future. They were asked to consider the following questions:

- What contributions is the ideal future making to OHS outcomes?
- What barriers did you overcome back in 2007 to get to today? How did you do it?
- What is being delivered for the industry? For your organisation? For people who work in the industry? For families and the community? For the economy? For the nation?

They were asked to include in their description: a headline, an image (a picture or a description of a picture), a list of key milestones along the way, and a quote from each group member telling how they feel about the changes over the last 10 years. What they described needed to be feasible (people could do it if they wish), desirable (the whole community would benefit), and motivating (you would work to make it happen).

Figure 2.5: Mixed groups designed the ideal future and described it as the front page of the *Mining News Update 2017*

All of the newsletters were hung on the wall and participants spent some time examining them and looking for similarities and differences.

2.7.6 Getting to the future

The whole group gathered to discuss the areas of 'common ground' from the newsletters – what was commonly wanted and what would people be prepared to work for? These were recorded on

flip charts. In plenary discussion these were worded to form strategies for action that would enable movement towards the desired future. The strategies were divided up amongst the plenary group with self-selected groups working on specific strategies that the whole group identified as having priority.

2.7.7 Workshop outcomes

The records of the workshops outcomes have been provided to participants with an invitation to provide further feedback within a few days. A copy of these records is provided in Volume 2 of this report.

Each of the workshops identified a remarkable degree of common ground and in each workshop it was clear that there is a strong desire to improve – at least amongst those who attended and the organisations they represented. Given the broad representation, this must be considered to be wide-spread in the industry. That there is commitment for improvement is evident in the strong attendance figures. Some people came to all three workshops – a considerable commitment by these individuals and the organisations they represent.

The format of the workshops worked. Participants were not only exposed to a wide range of people with very different opinions, but were also required to determine an agreed future with them. The environment was relatively 'safe' – it gave the opportunity to test ideas together with no punitive consequences and we found that people generally engaged in the discussions wholeheartedly. We know that some people were surprised to learn that those on the opposite side of the industrial fence shared similar views on some of the topics. We know also that some people found this challenging. Some people suggested that this type of workshop would be a beneficial annual event in the industry; they appreciated the process, the topics, and the opportunity to network with others in the industry.

DPI staff most ably handled the mechanics of the workshops.

2.8 Quantitative data analysis

2.8.1 Statistical analysis

Quantitative data from the questionnaires were analysed using standard statistical processes. In particular, we used the quantitative data to provide a profile of the industry with respect to the project topics and to triangulate our qualitative data.

Throughout the report, the means of groups of cases are compared on the factors, usually using Analysis of Variance (ANOVA). The significance of group differences are provided throughout the report, along with the absolute means. All reported significance levels are two-sided. Where correlations are provided throughout the report, Pearson correlations are used. Again, two-sided significance levels are reported.

2.8.2 Factor analysis

Factor analysis is a statistical method that uses correlations to identify the interrelationships between variables in a data set, such as the answers to our site questionnaire. It is most useful when there are a large number of variables (the number of different questions) and a large number of respondents; greater than 1,000 is excellent. The method helped us to identify the underlying correlations that are the features of organisational culture that might have impact on OHS (called 'factors'). We expected some items on the questionnaire to be correlated because they were designed for that purpose; but factor analysis allowed us to confirm that they were *really* correlated in our data, allowed us to remove outliers and tighten our organisational culture definitions[1]. From this process the factors set out below were identified.

2.8.3 Factors from the questionnaire responses

These factors provide us with statistically significant data about aspects of organisational culture. Organisations that scored well for mindfulness are those that fit some of the characteristics that make them capable of dealing with unexpected events (Weick and

[1] Items expected to load together were factor analysed, allowing factors to form that had eigenvalues greater than 1.0. Items that exhibited unduly large cross-loadings (> 0.3) and/or low loadings (< 0.5) were dropped from factors as outliers. The analyses were then rerun with the reduced item set.

Respondents' scores on each factor were calculated by using their mean score across the items associated with that factor. This allowed factors to be produced on a common scale: simply adding across the items for each factor would have lead to factors with greatly varying ranges due to differing numbers of items in each factor. Using a mean of the items produces factors, all of which range from 1 to 5. This facilitates comparability among factors. A potential interpretational issue is that absolute differences between responses on a factor can look small (compared to use of a summed scale), although differences are statistically significant.

Sutcliffe 2001). Other factors describe aspects of the organisational culture that together define the psychosocial environment: work group cohesion, trust in management, organisational justice, supervisor support, role clarity and work life balance (Kristensen and Borg 2001).

The factors and the questions that form them are as follows:

Mindfulness	Q38	If you make a mistake, it is not held against you.
	Q39	People report near misses that might have serious consequences, even if no one else sees them.
	Q40.	Managers seek out and encourage news about what could go wrong.
	Q41.	People are appreciated if they spot problems, mistakes, errors or failures.
	Q42.	People are not shot down for reporting information that might stop operations.
Workgroup cohesion	Q23	Health and safety has priority even when we are busy.
	Q26	It is easy to ask others for help.
	Q27	People are able to rely on others.
	Q33	Everybody works safely here.
	Q34	People rarely cut corners under pressure or otherwise.
	Q35	The people I work with take health and safety seriously.
Trust in management	Q24	Management is competent when it comes to health and safety matters on this site.
	Q30	Management takes health and safety into account when they make decisions.
	Q32	Management makes sure that equipment and procedures meet health and safety requirements.
	Q44	Managers are as concerned about people's health and safety as they are for other requirements.
Organisational justice	Q25	People are treated with respect here.
	Q36	If someone gets hurt at work, they are not blamed for the injury.
	Q52.	Are you treated fairly at work?

Supervisor support	Q50.	Do you get sufficient information from your immediate supervisor/manager?
	Q54	How often do you get help and support from your immediate supervisor/manager?
	Q56	Do you get consistent information from your immediate supervisor/manager?
	Q57	How often is your immediate supervisor/manager willing to listen to your work related problems?
	Q58	Do you get adequate support in difficult situations?
Role clarity	Q66	Do you receive all the information you need in order to do your work well?
	Q67	Do you know exactly what is expected of you at work?
	Q68	Are you informed well in advance about important decisions, changes, or plans for the future?
Work life balance	Q51	Do you have enough time for social activities?
	Q61	Do you have enough time for leisure?
	Q63	Do you have enough time for family?
Fatigue night shift	How often does working **night shift** cause you problems with:	
	Q73.1	Sleep
	Q73.4	Work performance
	Q73.5	Fatigue
	Q73.6	Alertness while working
	Q73.7	Ability to maintain concentration across the shift
Night shift a problem	How often does working **night shift** cause you problems with:	
	Q73.2	Family life
	Q73.3	Social life
Fatigue afternoon shift	How often does working **afternoon shift** cause you problems with:	
	Q72.1	Sleep
	Q72.4	Work performance

Q72.5 Fatigue

Q72.6 Alertness while working

Q72.7 Ability to maintain concentration across the shift

Afternoon shift a problem

How often does working **afternoon shift** cause you problems with:

Q72.2 Family life

Q72.3 Social life

Fatigue day shift

How often does working **day shift** cause you problems with:

Q71.1 Sleep

Q71.4 Work performance

Q71.5 Fatigue

Q71.6 Alertness while working

Q71.7 Ability to maintain concentration across the shift

Day shift a problem

How often does working **day shift** cause you problems with:

Q71.2 Family life

Q71.3 Social life

The outcomes of the statistical analyses from these factors are reported in the chapters that follow.

2.9 Qualitative data analysis

Preliminary analysis of the qualitative data was conducted by the four data collectors over a two-day meeting in which we were able to discuss our findings and refine our thinking. We then reviewed all of our interview notes and site documents to identify key comments and features that were relevant to our research questions. We prepared summaries of the key features of each site with respect to the project topics to allow comparison of basic features.

Relevant comments from each interview were transcribed and grouped around the three project topics. These groupings were further analysed by Andrea Shaw and Verna Blewett to identify key themes and conceptual groupings related to the three topics (Huberman and Miles, 1994; Strauss, 1987). This was a time-consuming and labour intensive process given the very big volume of data we had collected. The result is that our findings are grounded in the data and we have been able to make observations sure of the robust nature of our analysis.

From our analysis of the qualitative data (interviews, focus groups and examination of documentation), we were able to produce a rough 'league table' of the sites we visited on the basis of their systems and consultative processes. With closer examination of our data we were able to divide the sites into three categories; they were similar to those we described in earlier work (Blewett and Shaw 2001) so we have used the same terminology.

2.9.1 Proactive sites

The first category is called **proactive**. These sites typically had:

- A risk management system that anticipates risks and seeks to control them at source;
- Systems that are well-developed, known and used; and
- Well-developed and effective consultative processes.

Six coal, seven extractive and three metalliferous sites were found to fit this category.

2.9.2 Reactive sites

The second category is called **reactive**. These sites typically had:

- Nothing in place, or they reacted in response to incidents, with a focus on controls that dealt with the consequences of the incident (such as claims and injury management);
- Systems may exist but are token, or systems non-existent; and

- Consultation non-existent or at most token

Three coal, six extractive and three metalliferous sites were found to fit this category.

2.9.3 Transitional sites

The last category is called **transitional**. These sites ranged between the proactive and reactive categories. Some were nearly proactive, and some were nearly reactive. These sites typically had:

- Rudimentary and or patchy risk management, not always focussed on control at source;
- Systems may exist but application is patchy; and
- Variable consultative processes.

Eight coal, 13 extractive and two metalliferous sites were found to fit this category.

The spread of organisational categories across the three sectors, coal, extractive and metalliferous, is shown in Figure 2.6 below.

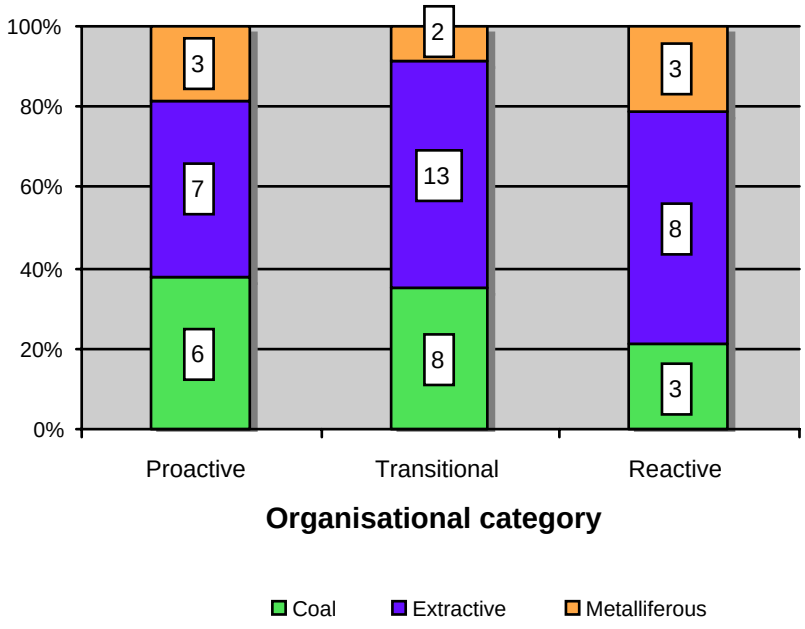

Figure 2.6: Organisational Categories by Sector

As will be seen in later chapters, our choice of categories and the range of firms that fell within them were validated by statistical analysis. Indeed, we have been able to differentiate on the basis of organisational category and organisational factor with a very high degree of statistical power.

2.10 Reporting

Through the course of the project we produced two progress reports and two interim reports for the PSG that updated members on progress and preliminary findings. This document is our final report and sets out the project's findings.

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Chapter 3 Production Bonus and Safety Incentive Schemes

3.1 Introduction

The use of production bonus and safety incentive schemes in the NSW mining industry has been debated for many years. The 1997 review of mine safety in NSW (Johnston 1997) criticised safety incentive schemes in use in the NSW mining industry at that time, finding a number of potentially serious adverse outcomes from schemes based on accident outcomes and production results. The review recommended that the industry make a more detailed study of this area (Johnston 1997, p. 21).

While investigations had been undertaken, the Wran Mine Safety Review concluded that production bonus and safety incentive schemes had not been adequately addressed at that time. In-depth data about how bonus payments and safety incentive schemes operated in the industry were not publicly available and evidence of their effects on key outcomes had not been reported.

This chapter reports on the findings of the project that provide the detailed empirical data that will underpin the industry's efforts to determine how to use such schemes to achieve world class OHS performance. The *Future Inquiry* Workshop outcomes reinforced the industry's commitment to this result and demonstrated the industry's preparedness to move beyond current arrangements.

This topic is linked to the other two research topics. Production bonus and safety incentive schemes may impact on hours of work and the effectiveness of OHS management systems (OHSMS) to have even greater effect on OHS outcomes than the schemes alone. For example, production bonus schemes may indirectly encourage excessive hours of work to achieve targeted production levels. Safety incentive schemes may undermine the effectiveness of incident reporting procedures. Equally, a well-designed system for recognising and rewarding OHS management initiatives (eg using valid key performance indicators) may support more effective OHSMS.

This chapter sets out:

- the findings of our literature review;
- the use and impacts of production bonus and safety incentive schemes in the NSW mining industry;
- the outcomes of the *Future Inquiry* Workshop that considered production bonus and safety incentive schemes; and
- our conclusions and recommendations on this issue.

3.2 What do we know about what works?

There has been vigorous criticism of OHS incentive schemes based on outcome data and there is some literature detailing the potential negative consequences of such an approach. Equally, there is good evidence that recognising and rewarding effective OHS management initiatives can have positive consequences. However, as Weyman (1999) has pointed out:

> The majority of the literature in this area lacks scientific rigour, with much of the debate being at the level of opinion rather than established research findings (Weyman, 1999: 13).

3.2.1 Definitions

As well as lack of rigorous analysis, the literature is marked by ambiguity in terminology. For this reason, we only asked about the presence of production bonus schemes in the industry census. We did not ask about the presence of safety incentive schemes because we could not have been confident that sites were identifying schemes on a consistent basis.

For the purposes of this project, we have used the following definitions:

- *Safety incentive schemes.*

  This term covers two distinct but related programs:

  - Reward schemes that offer financial or other tangible rewards (such as donations to charity or consumer items) as a result of achieving specific targets of OHS performance. Usually, these targets relate at least in part to outcome measures such as lost time incidents (LTIs), but they can also result from achieving targets related to process or behaviour indicators.

  - Celebration schemes that provide recognition of achievements in OHS management, such as awards for safety innovations, eg the NSW Minerals Council Innovations Awards, or celebrations of key events, eg a dinner for an OHS committee.

- *Production bonus schemes.*

  Payment of a component of wages dependent upon achievement of a certain level of production or productivity.

3.2.2 Previous reports of extent of use

Safety incentive schemes of the first type (ie reward schemes) are reportedly very common in the NSW mining industry (NSW Minerals Council, 2004), although details of the nature of these schemes are not usually publicly available. Terrey (undated) found that the vast majority of coal sites had production and/or safety incentive schemes and that these were detailed in industrial agreements. In 1997, the NSW Minerals Council found that most production bonuses were tied to production and not productivity.

In general, incentive schemes based on celebration (ie celebration schemes) did not seem to be so common at an enterprise level, even though they were acknowledged to be unlikely to have adverse consequences (NSW Minerals Council, 2004: 21).

3.2.3 Benefits of the schemes

The NSW Minerals Council submission to the Wran Review (NSW Minerals Council, 2004) points out that reward schemes can have the positive effect of "focussing behaviour to improve safe work practices" (p. 20). However, as Sundstrom-Frisk argues, it is important to make sure that the behaviour of everyone at work is considered, including managers whose decisions can critically affect safety outcomes (Sundstrom-Frisk, 1997: 31). Whether these schemes are realising the benefits of improved behaviour at any level has not been the subject of detailed empirical study until now, although their popularity suggests that the schemes are meeting enterprises' needs. Terrey (undated) concludes on the basis of a literature review that:

> Safety and production incentives can have a significant benefit in improving safety as well as production if handled well (Terrey, 2005: 5).

He suggests that incentives and bonuses can have more impact on long-term outcomes such as OHS culture than on day-to-day decisions (Terrey, undated: 12).

3.2.4 Problems with the schemes

The NSW Minerals Council acknowledges that

> Any scheme which provided financial or other incentive to encourage people to work harder or faster might have the unintended consequence of supporting risk taking or short cutting safe work procedures (NSW Minerals Council 2004: 24).

These "perverse motivations" (Marlow, 2005: 8) undermine the effectiveness of such schemes. For schemes based on targets for accident or incident rates, Daniels and Marlow (2005) report that the literature suggests:

> Individuals may be subject to peer pressure that suppresses the motivation to report incidents in instances where incentives are ascribed to individual groups or work teams…. Accident reports may decline (possibly due to underreporting) yet underlying safety problems within the system will remain (Daniels and Marlow, 2005: 13).

Under-reporting is most likely, according to Marlow (2005: iv), when the scheme has the following features:

- financial rewards;
- achievement of targets is not progressive, but "all or nothing"; and
- there are sanctions for failure.

OSHA in the USA was reported (by Daniels and Marlow, 2005: 13) to have significant concerns that under-reporting of accident rates was a consequence particularly of schemes with high financial rewards and was reported to be scrutinising such schemes with some rigour. However, we were unable to locate any public report or paper detailing the outcomes of this scrutiny.

Even if safety incentive schemes do not actually result in under-reporting, Weyman (1999) suggests that they can be perceived by the workforce to have such an effect and this can lead to cynicism about safety performance and management OHS commitment in any case (Weyman, 1999: 8).

Kohn (1999) argues that rewards and incentives do not work to achieve long-term outcomes:

> If your objective is to get long-term quality in the workplace…then rewards, like punishments, are absolutely useless (Kohn, 1999: 41–2).

He cites evidence that shows that:

> People who are trying to earn a reward end up doing a poorer job on many tasks than people who are not (Kohn, 1999: 49).

He argues that reliance on an incentive scheme "does not require any attention to the reasons that the trouble developed in the first place" (Kohn, 1999: 59), which suggests that safety incentive schemes risk shifting the focus from the underlying causes of risk to the immediate antecedents of incidents in worker behaviour. The focus is also more likely to be on those aspects of worker behaviour that deal with physical risk, potentially neglecting occupational health issues that do not cause acute ill-health.

3.2.5 Evaluations of such schemes

Hopkinson and Gervais (2004) reviewed the effectiveness of celebration schemes at a national, industry and enterprise level and found that they were not unequivocally successful and that they were not always seen as relevant at all these levels. Particular success factors were identified to be:

- the scheme being seen as an attractive 'brand';
- evaluation of the scheme;
- strong focus on "health promotion and good practices";
- transparent processes;
- commitment to continuous improvement;
- holistic approach;
- worker involvement; and
- collection and use of data (Hopkinson and Gervais, 2004: 36).

Reviews and evaluations of reward schemes have not been common. McAfee and Winn (1989) reviewed 24 studies of the effectiveness of reward schemes and found that they all focussed on one or more of five aspects of behaviour: PPE, material handling (eg bending knees when lifting), housekeeping, general safety (eg using tools properly) and other (eg climbing stairs properly) (McAfee and Winn, 1989: 17). In these 24 studies, less than half (10) recorded that a reduction in injury or accident rates accompanied the intervention.

Similarly, Aitken and O'Driscoll (1998) found that the goal setting and feedback intervention they tested in a New Zealand construction company did not result in a statistically significant reduction in injury or accident rates. However, neither McAfee and Winn nor Aitken and O'Driscoll concluded that the failure of the interventions to reduce outcome data provided a challenge to their underlying assumption that such reward schemes would reduce accident rates. This is a common feature of reviews of reward schemes.

For example, Geller et al found in 1989 that programs to encourage seat belt use which were not based on rewards:

> were significantly more effective that those that did use behaviourist incentives. The superior effects (both short and long term) of the no-reward, awareness/commitment programs were not predicted

> and are inconsistent with basic reinforcement theory (Geller et al, 1989: 14).

However, despite this finding, Geller argued that a safety belt program was a good start for a reward-based safety program in an article published a year later (Geller, 1990).

The reviews and evaluations do not appear to control for confounding variables, such as other workplace changes that may be occurring. Weyman (1999) suggests that the improvements in safety performance that are claimed in some reviews may be due at least in part to underlying factors, such as greater management commitment to OHS and so the improvement may be coincidental rather than causally linked. Indeed, Weyman concludes that:

> Overwhelmingly, the available evidence suggests that effects of safety incentive schemes tend to be short-lived, with few authors appearing able to make substantial claims regarding the longevity of initiatives (Weyman, 1999: 13).

Marlow (2005) suggests that the short-lived nature of the positive effect may be that incentives and rewards do not necessarily lead to internalising "the attitudes that lead to long-term improvements" (Marlow, 2005: 27). Thus, Weyman (1999) concluded that the evidence from the literature was sufficient to determine that reward schemes can be negative for OHS and that therefore they should not be used (Weyman, 1999: 20).

3.2.6 What marks unsuccessful incentive schemes?

Hopkinson and Gervais, in their review of celebration schemes, found that the less successful of such schemes were marked by the following characteristics:

- no clear purpose;
- narrow focus;
- large fees for involvement;
- not enough resourcing; and
- no strategic direction.

Building on this and other reviews, Terrey (undated) advises that poor reward schemes are marked by:

- targets using only a single indicator;
- generic targets that are not defined by individual work groups or teams;
- high value of rewards;

- ‘all or nothing’ achievements;
- sanctions for failure; and
- poor feedback.

3.2.7 What marks successful incentive schemes?

In 1997, Shaw recommended to the NSW Minerals Council (Shaw, 1997) that an effective reward system:

- Reinforces the values and principles of OHS best practice through promoting alignment with the attitudes and behaviour required of all parties.
- Recognises the two-way relationship between OHS best practice and reward systems, ensuring that the positive effects OHS best practice can have in broader areas such as process improvement are reinforced.
- Creates incentives (financial and other) for OHS best practice by reinforcing actions which promote the principles and values of best practice, such as participation and commitment.
- Assesses all proposed IR arrangements for OHS consequences as part of the negotiation process. Those with potentially negative OHS consequences would be rejected or modified to ensure that such consequences did not result (Shaw, 1997: 32).

To a large extent, these recommendations still hold.

Weyman (1999) is less supportive of a rewards scheme but suggests that, if such a scheme is to be used, then it should:

- not be based only on lost time incident data;
- reward safe behaviour;
- only constitute a minor part of the overall OHS management system;
- be based on management commitment; and
- be applied to small groups (Weyman, 1999: 20).

Building on this review, Marlow (2005) argues that goals work best when they are:

- specific;
- challenging;

- accepted;
- well-defined; and
- within an appropriate timeframe (Marlow, 2005: iii).

Setting targets for these goals are most effective when:

- Senior management is committed to the targets.
- The workforce has participated in setting them.
- The targets are related to small not large group achievements (Marlow, 2005: iv).

Overall, Marlow recommends that an effective reward scheme would have the following features:

- target setting consistent with other organisational objectives;
- balanced set of indicators;
- not 'all or nothing' achievement;
- feedback;
- participation; and
- small groups (Marlow, 2005: 35).

3.2.8 What does the literature tell us?

Schemes that reward people for achieving particular levels of outcome data, such as periods during which there were no lost time accidents, are based on two fundamental assumptions:

1. Occupational injuries are primarily due to worker behaviour; and
2. Worker behaviour will only change in response to an incentive.

Both of these assumptions are erroneous. Worker behaviour is just one of the multiple causes of occupational injuries and is dependent on, rather than independent of, the other causes. Behaviour change in the workplace is, as elsewhere, much more complex and difficult to manage than simply providing financial or other tangible rewards. Relying on a simplistic model of behaviour change creates the likelihood of creating "perverse motivations" that result in undesired behaviours, such as under-reporting, that adversely impact on risk control.

As a result, there are significant potential pitfalls in production bonus and safety incentive schemes, as a result of:

- the risk of under-reporting;
- an inappropriate focus on worker behaviour, rather than the behaviour of everyone who influences OHS outcomes and on the underlying causes of risk;
- neglect of occupational health issues;
- workforce cynicism; and
- making the schemes a prime focus of OHS management, instead of a focus on risk control.

Successful schemes are marked by:

- not relying on outcome data to set targets;
- management commitment;
- workforce participation in their development;
- a clear connection between a controllable behaviour that is encouraged and the rewards or incentives that are available;
- targets that are linked to broader organisational objectives, including occupational *health* as well as safety, and that are linked to continuous improvement; and
- recognising and rewarding the performance of small groups.

3.3 What schemes are in place and how do they operate?

3.3.1 What schemes are in place?

The census data show that production bonus schemes are overwhelmingly a feature of the coal industry. Only 8% of the extractive sector and 21% of the metalliferous sector reported paying a production bonus, while 82% of coal sites reported such a payment system.

The site data we collected showed that safety incentive schemes are more widely spread. In general, we found that there are four main categories of scheme:

1. no scheme at all;
2. production bonus scheme only;
3. safety incentive scheme only; and
4. combined production bonus and safety incentive scheme.

There were significant internal differences in the nature of the incentive available within some categories, as set out in the table below. For example, some safety incentive payments involve substantial amounts of money, over $100 per week in eleven cases. For confidentiality reasons, we have not differentiated every category by sector.

Sector	Nothing	Production bonus only	Safety incentive only		Combined production bonus and safety incentive	
			process only	outcome mostly	$100 + per week	< $100 per week
Coal	0	5 (3 pay $100 + per week)	1	0	9	3
Metalliferous	2	7				
Extractive	19	8				
Total	21	7	5	5	11	5

Table 3.1: Types of production bonus and safety incentive schemes

There is an obvious sector effect, with all coal sites except one paying a production bonus. Most extractive sites do not have a scheme at all.

Sites that paid a production bonus or had a combined production bonus and safety incentive scheme were mostly able to provide documentation that set out the scheme, usually in the form of an enterprise agreement or equivalent. However, not all sites were able to provide us with documentation that clearly set out the scheme that existed at their site. Particularly for those sites that had a safety incentive scheme that was not linked to a production bonus, the scheme was often not documented in a policy or procedure.

3.3.2 Safety incentive schemes - process

There were two types of safety incentive schemes – those that involved a financial payment in exchange for achievement of outcome targets and those that involved reward or recognition for contributions to the OHS management process. Those that focussed on OHS management provided both tangible rewards and intangible recognition. For example, one site provided vouchers for gifts in exchange for nominations from team members of colleagues who had made a particular contribution to safety. Two other examples demonstrate the value these schemes have had on the sites.

Case 1

At one small mine, workers and staff make anonymous reports on each other's safety performance. Each report earns that person a demerit point. At the end of each month the person with the fewest demerit points wins a prize. Although workers and management agree that the reports are mainly about nominal breaches, such as not wearing the right protective gear, "everyone's involved in it, staff and miners, and it's got people thinking; we're on the same page about safety". People talk about it as though it's a bit of fun, but one spin-off is that it has helped to identify some areas of work at the mine that needed job safety analyses (JSAs) and standard operating procedures (SOPs).

Case 2

At another site, each work unit identifies the best safety improvement that's been made in their area over the last two months and puts this to the OHS Committee (OHSC). The OHSC considers each entrant and selects a winner. The work team gets a barbecue and a certificate to acknowledge their contribution to workplace health and safety. "It's important to recognise people's efforts to improve safety in our mine", says the mine manager. One of the supervisors said, "It gets the guys thinking about improvements and encourages them to put them forward".

3.3.3 Safety incentive schemes - outcomes

In common with most combined schemes, some safety incentive schemes provide financial rewards for achievement of particular outcome standards. For example, many of these schemes provide a voucher or amount of money for achieving a year without a lost time accident. As a result, the measures on which rewards are provided are related to post-incident behaviour, eg reporting, not to activities that control risks.

3.3.4 Production bonus schemes

Surprisingly few schemes paid a production bonus in isolation from safety incentives. Only seven sites provided a production bonus payment that was not linked to any safety achievements. Five of these were coal sites and, of these, three paid production bonuses in excess of $100 per week.

3.3.5 Combined schemes

The majority of sites that had such schemes operated a combined production bonus and safety incentive scheme. The majority of combined schemes involve payments of more than $100 per week through the scheme. These were mostly in the coal industry, although two metalliferous sites pay over $100 a week in exchange for achieving both production and safety outcomes, such as no LTIs in the specified period.

Of the sites that have combined schemes, five include measures of safety management as well as outcome data in their calculations of bonus payments. These process measures include targets for review of JSAs, conduct of safety inspections, and achievement of housekeeping standards.

3.3.6 How were they developed?

A surprising number of interviewees on sites with these schemes were not aware of the nature or even existence of them:

> Award scheme? I've never heard of it – I can't remember anyone getting an award. We had a BBQ a couple of weeks ago – I didn't know what it was for (metalliferous, employee).

As a result, interviewees were often unable to articulate how or why the scheme was established. Most schemes had been in place for some time and were historic or part of a broader industry or corporate framework. At some sites, the origins of the schemes are so historic that they are "lost in the mists of time" (extractive, manager). As a result, the process by which they were developed was not known by those on site. In particular, schemes in the coal sector are clearly based on tradition and have evolved from historic piece rate payment systems.

We were able to collect information about the development of a number of schemes, but there was often limited or no consultation in determining the OHS measures that were included. On one

extractive site, the measures were developed by corporate management and then provided to the site "for approval". In other cases, primarily in the coal sector, the measures were negotiated in a formal industrial relations arena as part of enterprise bargaining negotiations. The traditions of this arena can make change to the schemes more difficult:

> During the last negotiation, I wanted to get some personal performance in there and positive things that will prevent the accident, eg, reporting incidents or hazards, but the guys said no, it's too big a transition (coal, manager).

Cynicism about the establishment of the schemes was evident at some sites:

> I don't see that as a fair system, it was forced upon us. Came in as part of an EBA, forced in. It's a package – if you knock it back, you lose other bits too (coal, employee).

Perhaps as a result of the historic nature of many schemes, the payments do not always function as an 'at risk' component of wages. Many managers told us that bonus payments are expected – they're seen as a right:

> The workforce *expects* them. We'd have to pay the make up amount anyway (coal, OHS manager).

> The guys see it as a penalty – 'we are entitled to a certain amount of money' and managers take it off them when they have an incident (coal, manager).

> We even get it if we miss the target - if it is a problem with machinery or we have really tried to reach the target. It encourages a good attitude (extractive, employee).

> The workforce at this mine are fined $100 for each lost time injury (coal, employee).

3.3.6 Who is involved?

Most schemes applied to operational employees only, with only 11 schemes including staff and managers. Only two schemes included subcontractors. For the schemes that involved payments or tangible rewards, the measures or targets used to determine eligibility covered the whole site. Thus, if there was a lost time incident in one part of the site, the payment for everyone on site was affected. In contrast, the safety incentive schemes that involved recognition for contributions to OHS management were often on the basis of team performance or contribution. These schemes were also more likely to be inclusive in determining eligibility for the recognition:

> Safety committee and safety representatives are involved in nominating and selecting recipients of awards (metalliferous, manager).

While subcontractors were usually not directly involved in these schemes, injuries or incidents that involved subcontractors were often taken into account in determining eligibility for payments. Thus, if a subcontractor experienced a lost time incident, direct employees on the site would have their bonus or incentive payment affected.

3.3.7 How is the effectiveness of the schemes measured?

We found that very few sites had evaluated their schemes at all. One coal company has reviewed the impact of the different combined schemes in place across its sites, including tracking outcome data. While the LTIFR for this company has decreased substantially over the period covered by the review, the company does not believe that this is a result of under-reporting encouraged by the schemes. For example, for one site, total recordable incidents have increased while LTIs have decreased, suggesting that injuries are being addressed before they become disabling. OHS and mine managers at the different sites reported that they do not have evidence that the schemes have lead to under-reporting. However, it is not possible to determine the extent to which the improvement of the measures is due to more effective OHS management and how much is related to the schemes in place.

3.4 What impact have the schemes had?

Given the range of influences on OHS management and OHS outcomes, teasing out the impact of production bonus and safety incentive schemes in isolation from other factors can be difficult. This was exacerbated in this project by the confusion that is apparent on sites about the schemes in place. As the previous section reports, respondents were often not aware of the schemes in place on their sites. Others may have been aware that the scheme existed but did not understand how it operated. Despite these difficulties, we received evidence of both negative and positive effects.

We asked two questions on the site visit questionnaire about the consequences of production bonus and safety incentive schemes and the quantitative data from these questionnaires is provided below. However, these data must be considered in the context that many respondents from sites with relevant schemes responded that they did not have such a system, further evidence of the confusion on sites.

3.4.1 Identified benefits of the schemes

Many sites have found that the schemes involving payment as a result of achieving certain outcome targets encourage active management of injuries:

> [Our safety incentive scheme] helps early intervention – we've been able to deal with injuries early and get them back to work, it encourages them not to have time off for petty injuries, not to take time off when it's not warranted (extractive, manager).

> [Safety incentive schemes are] traditionally aimed at rorts of the workers' compensation system with minor injuries used to top up annual leave. Now if you have a minor injury, you're more focussed on being at work and supported by RTW procedures (coal, manager).

While such an outcome is clearly of benefit, it suggests that the schemes may be falling into one of the pitfalls identified in the literature. Rather than identifying and addressing the underlying causes of poor injury management, the schemes may be simply masking these problems. Given that active treatment and rehabilitation of work-related injuries is a legal requirement and a basic foundation for good OHS practice, it is concerning that employees and their managers report a need to have financial incentives before the necessary commitment is applied to the system.

Sites asserted that paying a safety incentive would lead to changed behaviour, by encouraging peer pressure to challenge dangerous behaviour:

> We pay money to get them used to the situation of others challenging you about it (behaviour). If someone challenges me I should think 'thank you'. If fifty people do it, it becomes normal (coal, OHS manager).

On sites with safety incentive schemes that recognise and reward particular OHS activities, sites were able to provide examples of long term benefits, for example decreased exposure to risks and more rapid review of JSAs and SWPs.

3.4.2 Consequences for reporting incidents and injuries

The quantitative data from the questionnaire responses suggest that neither production bonus nor safety incentive schemes are having significant effects on incident reporting. The two questions we asked about the consequences of the schemes were:

> How often does the production bonus system lead to problems with:
>
> - Incident reporting?
> - Information flows?
> - Internal communication?
> - Decision-making about OHS?
> - Management and worker behaviour?
>
> How often does the safety incentive system lead to problems with:
>
> - Incident reporting?
> - Information flows?
> - Internal communication?
> - Decision-making about OHS?
> - Management and worker behaviour?

In both cases, respondents were given the option to nominate that they did not have such a system. Respondents were asked to score their answers on a scale of one to five, where one meant never or hardly ever and five meant always.

The average score for the extent to which production bonus systems cause problems with incident reporting was 2.37, where a score of two represents seldom and three represents sometimes. The equivalent score for safety incentive systems was slightly higher at 2.53. This suggests that production bonus schemes may

have less impact on incident reporting than safety incentive schemes.

As the graph below suggests, however, schemes that involved larger sums of money may be more likely to have negative effects. The difference between the scores for incident reporting problems as a result of production bonus schemes were statistically significant (to 0.002) – combined production bonus and safety incentive schemes that involve large payments were more likely to cause problems than those that involve smaller payments and those that do not include safety incentives at all.

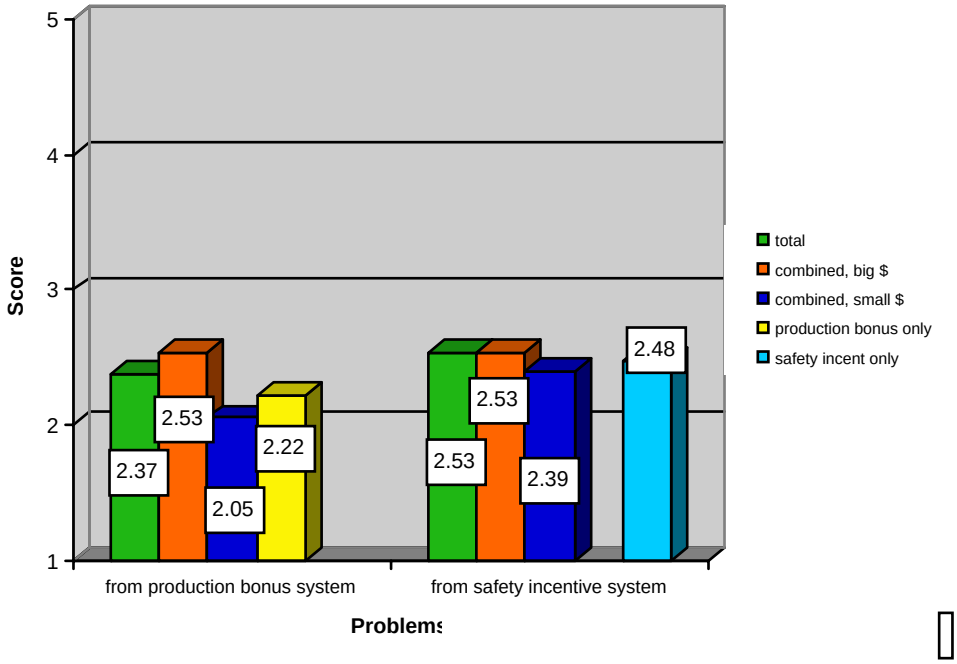

Figure 3.1: Problems with incident reporting as a result of different production bonus and safety incentive schemes

In contrast, qualitative data from our research suggest more strongly that disincentives to report do exist as a result of the schemes. Interviewees across a range of sites provided numerous examples of peer pressure that was exerted not to report injuries and, in one focus group, the interviewer even observed one participant exhorting his colleagues not to report any injuries in order to ensure that they received the benefit of a forthcoming payment.

> What the bonus does do is get the blokes to hide injuries. They take a $100 off you if you have an LTI…. If a contractor gets injured he gets put off. They hounded me about having time off. You feel like a victim. The intent of the bonus is for us to put pressure on blokes not to go off (coal, employee).

A number of interviewees reported that these pressures exist even when the reward is not particularly valuable:

> The safety incentive scheme is 'half baked'. It stops people from reporting and people do care if they don't get a T-shirt (coal, employee).

> Everyone wants to kill you if it's getting close to getting a voucher and you get hurt (extractive, employee).

This is a particular problem for contractors – we were told consistently by contractors and by direct employees and managers across the industry that contractors and their employees believed that reporting of LTIs would have negative consequences for their work, even where they were not formally part of the incentive or bonus scheme:

> We have a lot of contractors on site. They will not report near-misses for fear of loss of jobs (coal, employee).

> Contractors are under the pump. They are pressurised more (coal, employee).

> This is particularly for labour hire. You wouldn't report, you feel pressured for your job. If you did report it, you'd be gone. And we don't want to blow their bonus either (coal, labour hire employee).

In particular, contractors reported that they are penalised by reduced payments or withdrawal of access to contracting work as a result of reporting incidents or injuries. We were consistently told by contractors that, as a result, they do not report such events, even when they occur. These views were expressed to us on site and in the consultations undertaken by the project with contracting companies. The consistency and strength of these reports demonstrates the impact that such views have on reporting behaviour. Whether in fact mining companies do actually withdraw access to work or reduce payments as a result of reporting incidents or injuries is to some extent less important than the strongly held belief by all contractors involved in the project that this would be the result of reporting. This belief drives the reported behaviour of under-reporting.

On some sites, the risk that reward can be linked inappropriately to other behaviours had been recognised. For example, on one site the All Injury Frequency Rate (AIFR) is included in the calculation of incentive payments and this can mean that payments can be reduced or withdrawn as a result of campaigns to encourage reporting:

> AIFR is a bit problematic since we are wanting people to report all incidents so this can increase because people are reporting cut fingers that they would not have previously reported. You have to understand the underlying factors when interpreting this data (metalliferous, manager).

Participants in the *Future Inquiry* Workshop recognised the potential for reliance on outcome or lag indicators to drive under-reporting, with all stakeholder groups at the workshop identifying this as a negative feature of current arrangements.

3.4.3 Consequences for risk management

The quantitative data from the questionnaire responses suggest that neither production bonus nor safety incentive schemes are having significant effects on risk management. The scores for the extent to which production bonus systems cause problems with information flows, internal communication, decision making about OHS and management and worker behaviour ranged from 2.32 to 2.58, where a score of two represents seldom and three represents sometimes. The equivalent scores for safety incentive systems ranged from 2.40 to 2.53.

As the graphs below suggest, however, schemes that involved larger sums of money may be more likely to have negative effects. The difference between the scores for problems with management and worker behaviour as a result of production bonus schemes were statistically significant (to 0.001) – combined production bonus and safety incentive schemes that involve large payments were more likely to cause problems than those that involve smaller payments and those that do not include safety incentives at all. This trend is fairly consistent across the range of issues.

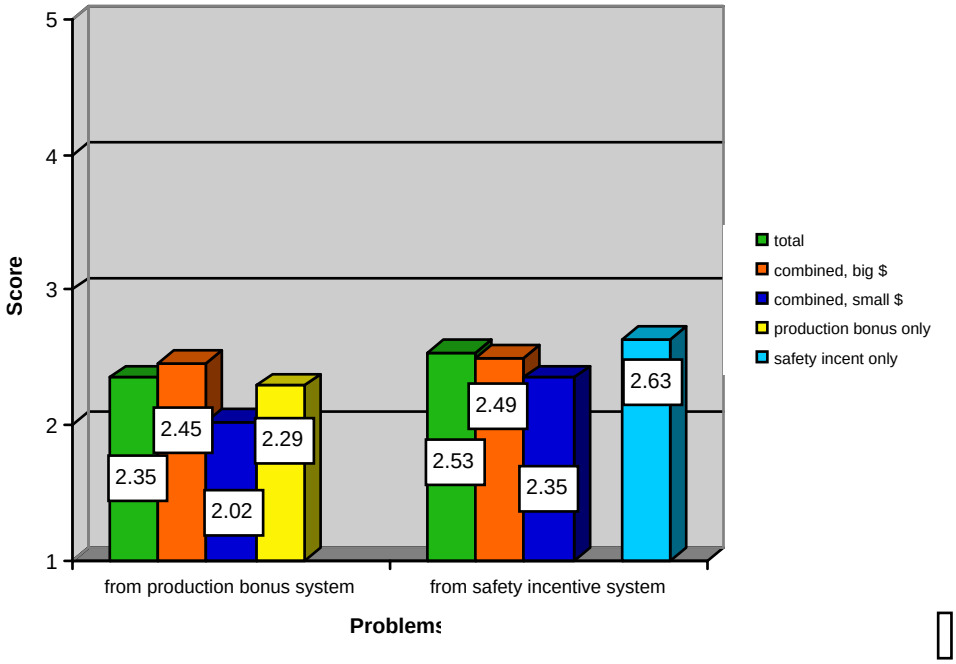

Figure 3.2: Problems with information flows as a result of different production bonus and safety incentive schemes

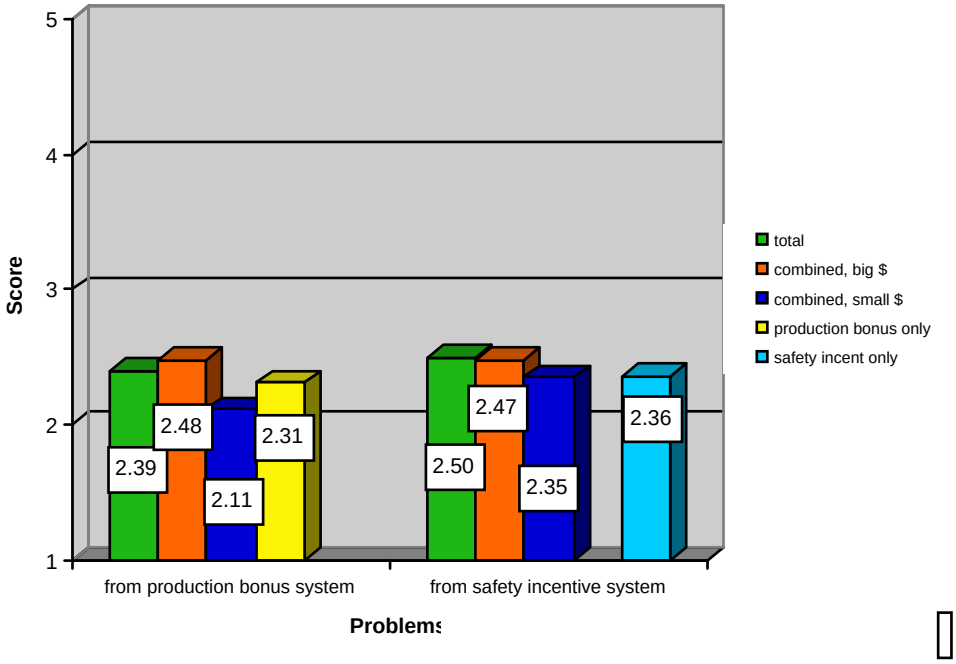

Figure 3.3: Problems with internal communication as a result of different production bonus and safety incentive schemes

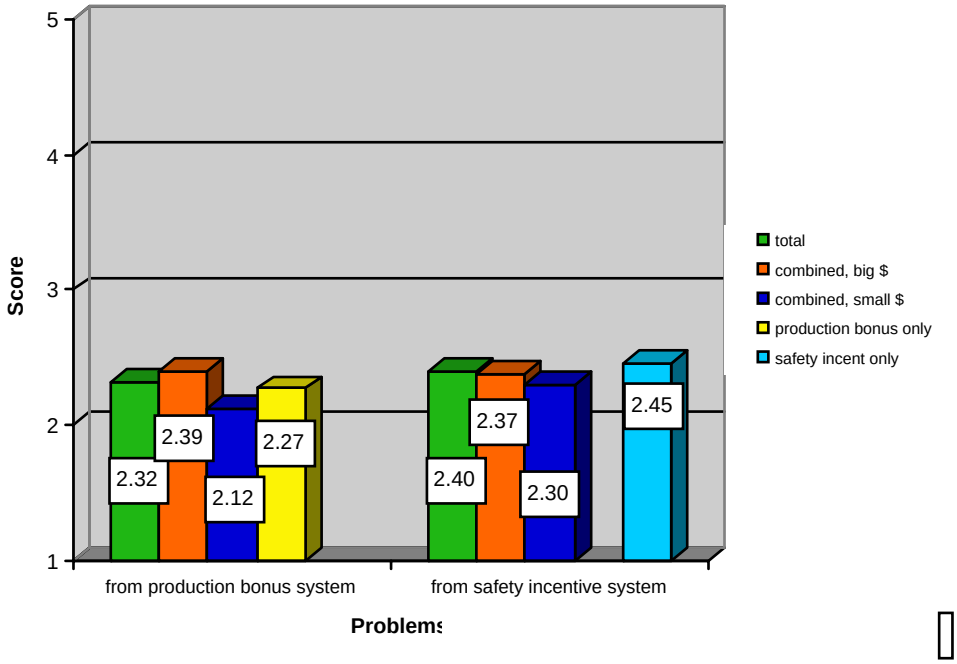

Figure 3.4: Problems with decision-making about OHS as a result of different production bonus and safety incentive schemes

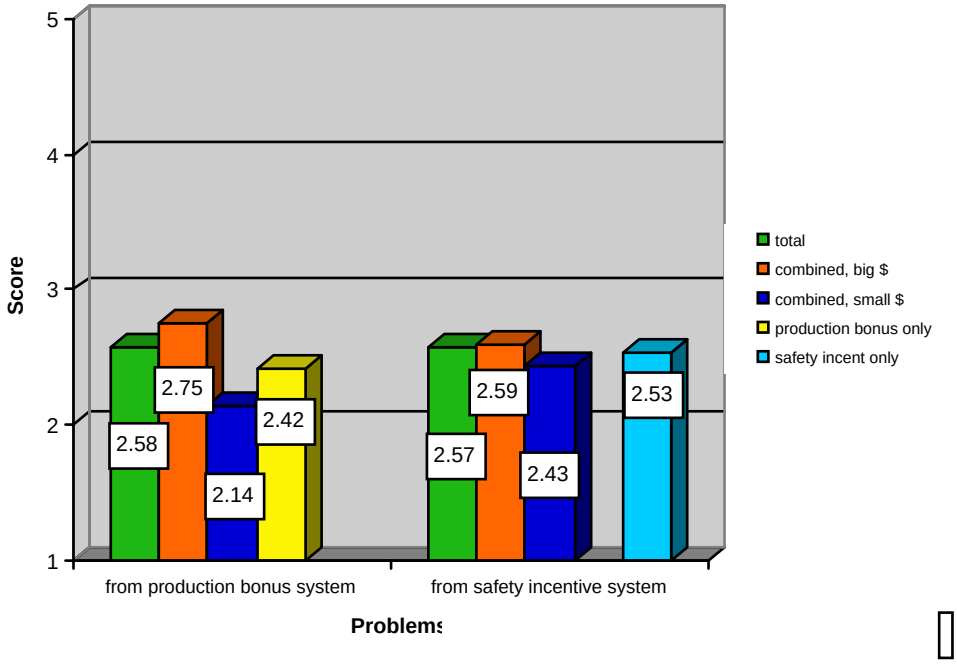

Figure 3.5: Problems with management and worker behaviour as a result of different production bonus and safety incentive schemes

On one coal site, the OHS manager suggested that the production bonus scheme actually supported effective risk management:

> The bonus encourages our guys to have good systems and planning. Shortcuts don't get good production. Being well set up gets good production. (It's) fostering team work that gets a bonus. You can only sustain those achievements if you have a systematic approach (coal, OHS manager).

Again, however, qualitative data collected on other sites suggested that there were some issues with risk management. We were told on a few sites that production bonuses had negative consequences for risk control, resulting in less stringent adherence to safety requirements in an effort to achieve the required production targets:

> Does the production bonus affect safety? Yes - there wouldn't be anywhere where it wouldn't (coal, manager).

> Yes it can impact on safety. When the shit hits the fan and you are losing the money, it can have the potential for you to do something silly (coal, employee).

> It'll always happen when there are dollars involved. We don't cut corners, but it does encourage us to bend the rules. For example, we cut and bolt with no trunk in the tubes. The dust may be too high but you keep working (coal, employee).

> Staff (salary workers) seem to push boundaries to meet production targets. As there are bonuses paid directly as a result of meeting them, and cut as a result of not meeting targets (coal, employee).

As these quotations from three different sites suggest, there is a potential for the current schemes that involve payment to reinforce existing working arrangements that may be detrimental to good OHS outcomes. Almost all of the sites that pay over $100 per week in their production bonus scheme have high or medium risk rosters – only one has a low risk roster. This is not to say that there is a causal link between the two features, however, when bonus payments are considerable (up to $1,000 per week on some sites), anything that may adversely affect payments is likely to be strongly resisted. Thus, there may be a disincentive to address the fatigue consequences of current shift arrangements because of the perceived disruption to production that may result.

3.4.4 Control over size or nature of benefit

A key feature of best practice schemes identified from the literature is a clear link between the behaviour that is sought and the outcome of the incentive or bonus scheme. Those involved in an effective scheme know what they need to do to receive the incentive and are able to do it. This was not always evident on sites, not only in relation to under-reporting. Some of the production bonus schemes in particular were quite complex. For such schemes, interviewees

could not explain how their actions could contribute to maximising the benefit they would receive. As a result, the scheme did not result in an incentive to behave in the way intended; indeed, many did not believe that the scheme affected behaviour at all.

> There is not enough control over the outcomes (by employees). I have tried to change it but most people want to keep it in. I don't think its affecting safety either way (extractive, manager).

> There are few people on site who can influence the production bonus. I feel the pressure to keep the mill going so that people get their bonus. It gets used as a stick. It wears a bit thin (metalliferous, manager).

> We don't have a lot of control over production tonnes so it's not an issue, we don't take short cuts to get our payment, we don't worry about it (extractive, employee).

In other cases, the scheme directly rewarded specific actions such as reporting hazards or reviewing JSAs. As a result, the tasks were completed, but interviewees reported that the quality of the activities was not adequate. The incentive rewarded quantity but not quality of activity, another form of 'perverse motivation'.

> Supervisors get paid a bonus for reporting hazards, so they report hazards that aren't real (coal, employee).

> They'll find the easy defects, not a real hazard. I don't see being paid a bonus for just identifying defects should get the culture right to recognise the real issues, not quick and easy 'let's just get the numbers up' (coal, supervisor).

Others perceived that the way the schemes are determined can be unfair, because they do not have control over the outcomes that determine the amount of the payment:

> I don't feel I have control. I get judged on the open cut's performance that I have no control over as well as the prep plant – it's a site wide thing. I have impact on these guys but not over there. I liaise with open cut but can only suggest to them. There are more incidents in open cut, so that reduces my capacity also to affect the outcome (coal, manager).

Indeed, the way in which the measure can be controlled can result in negative outcomes:

> Once, the guys were having a blue at the quarry, so someone engineered an injury so they'd all lose their bonus (extractive, manager).

3.4.5 Recognition schemes are linked to positive organisational factors

Respondents from sites with safety incentive schemes consistently made more positive ratings of organisational factors associated with effective management in their responses to the questionnaire than those with production bonus schemes. Most commonly, more positive responses were made by respondents from sites that provided for recognition of OHS contributions, not payment for outcome targets. The better scores for this group were statistically significant in a number of cases. These results suggest that effective OHS management is associated with safety recognition schemes that do not involve tangible rewards.

The following graphs compare the scores given by respondents from sites with different types of schemes, where a higher score represents more positive or more frequent ratings for the different organisational factors investigated by the questionnaire. The scales range from one, representing strong disagreement or never, to five, representing strong agreement or always.

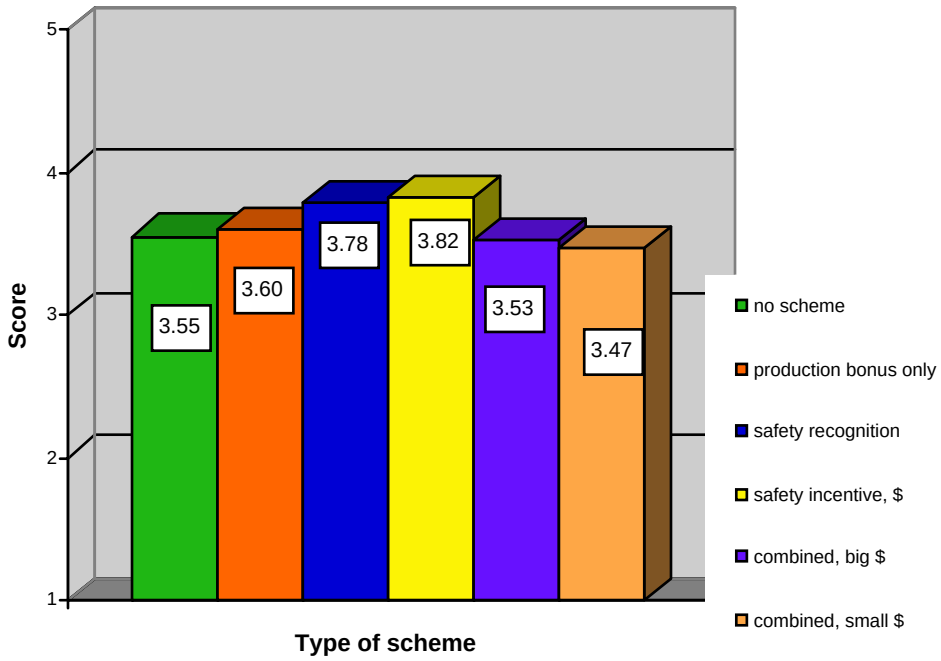

Figure 3.6: Mindfulness and production bonus and safety incentive schemes

This graph shows that respondents from sites with safety incentive schemes only rate the mindfulness of their site more positively than all other schemes. The difference between these scores and the other categories was statistically significant to 0.001.

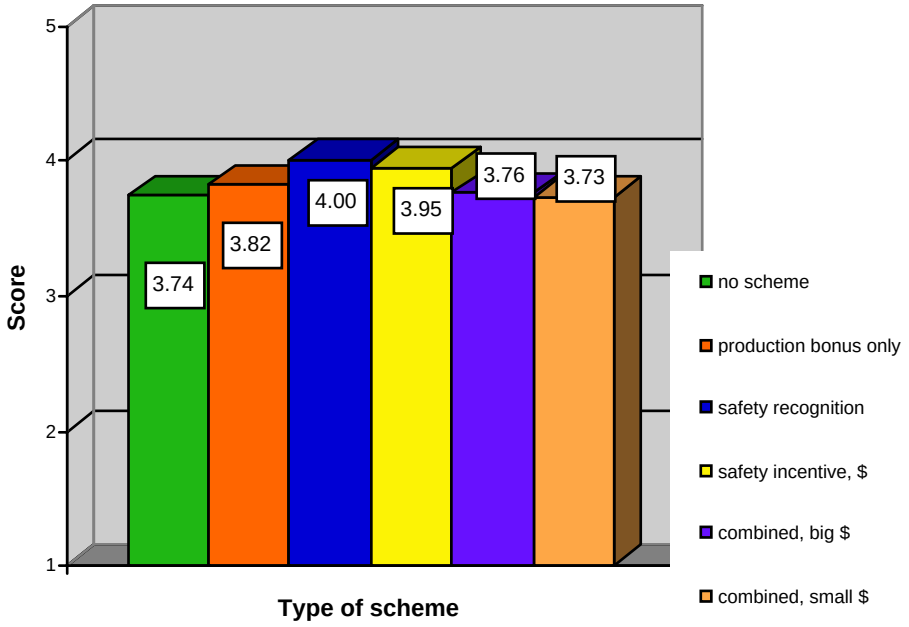

Figure 3.7: Work group cohesion and production bonus and safety incentive schemes

Similarly, the score for work group cohesion from sites with safety recognition only schemes was more positive than the others to a statistically significant extent (to 0.001, apart from safety incentive only schemes that involved payment).

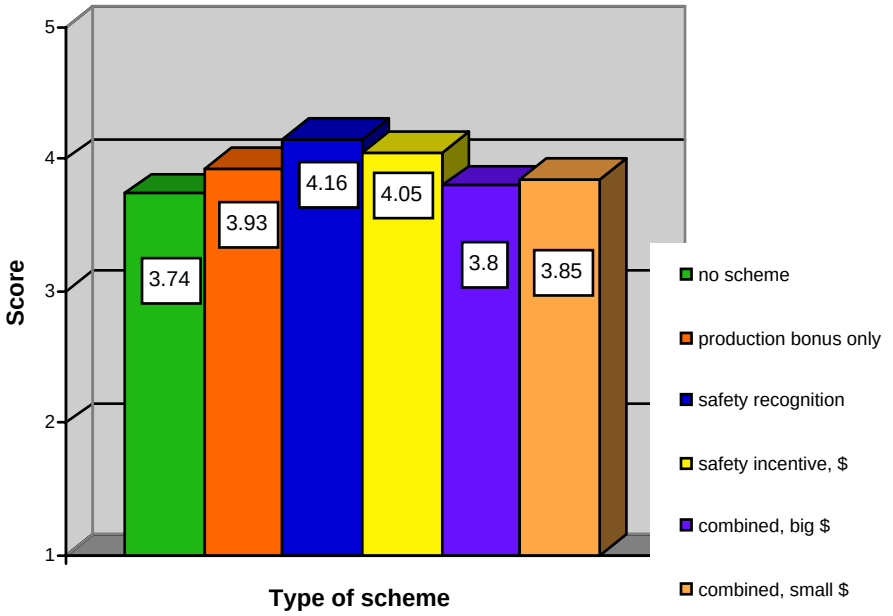

Figure 3.8: Trust in management and production bonus and safety incentive schemes

Trust in management is scored more positively at sites with a safety recognition only scheme than at all other sites, to a statistically significant extent (to 0.001, apart from safety incentive only schemes that involved payment).

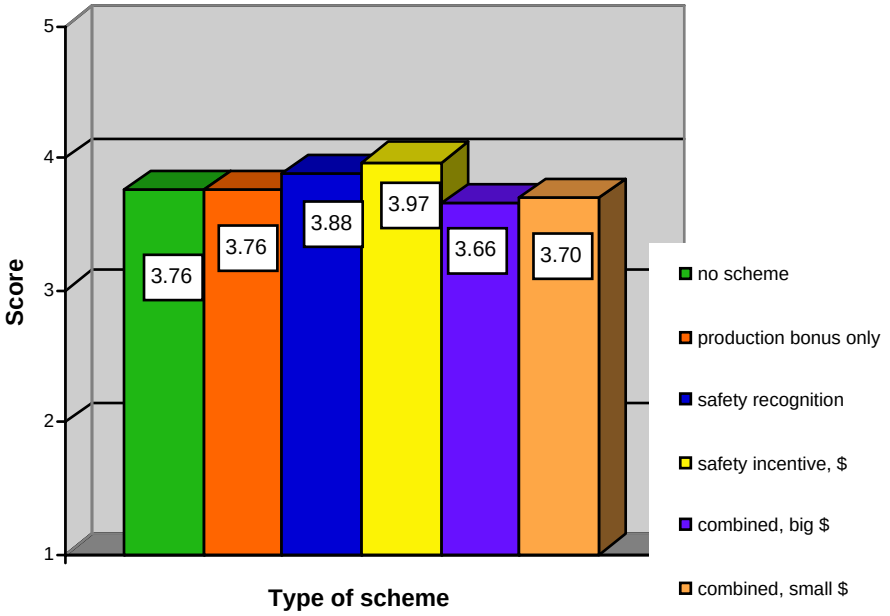

Figure 3.9: Organisational justice and production bonus and safety incentive schemes

The trend of better ratings from safety incentive only sites is consistent on this factor as well, although the differences are not all statistically significant. The difference between safety recognition only sites and sites with combined schemes with larger payments was statistically significant (to 0.005). This is because the larger numbers of respondents in these two categories mean that a smaller difference can be statistically significant.

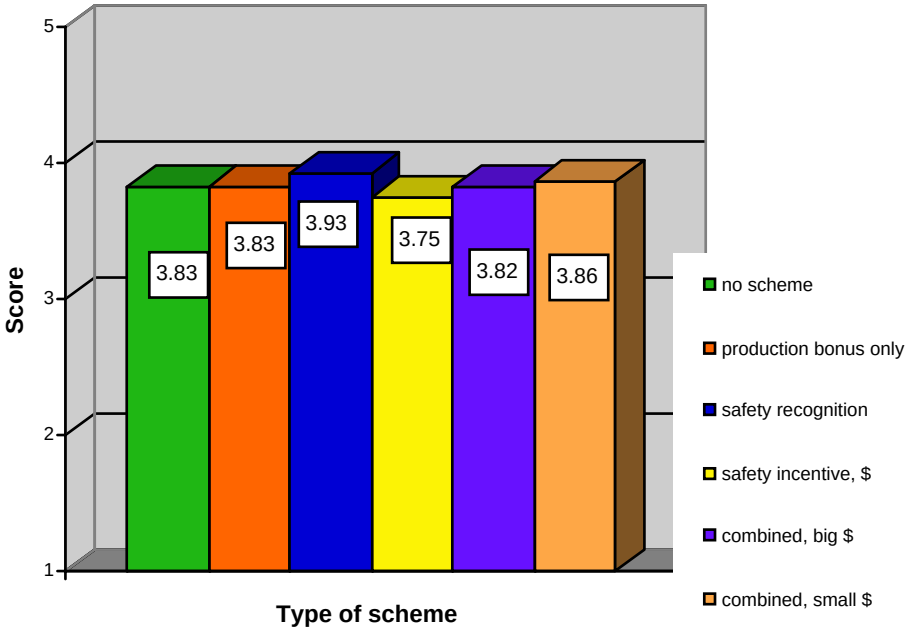

Figure 3.10: Supervisor support and production bonus and safety incentive schemes

None of the differences on this factor are statistically significant.

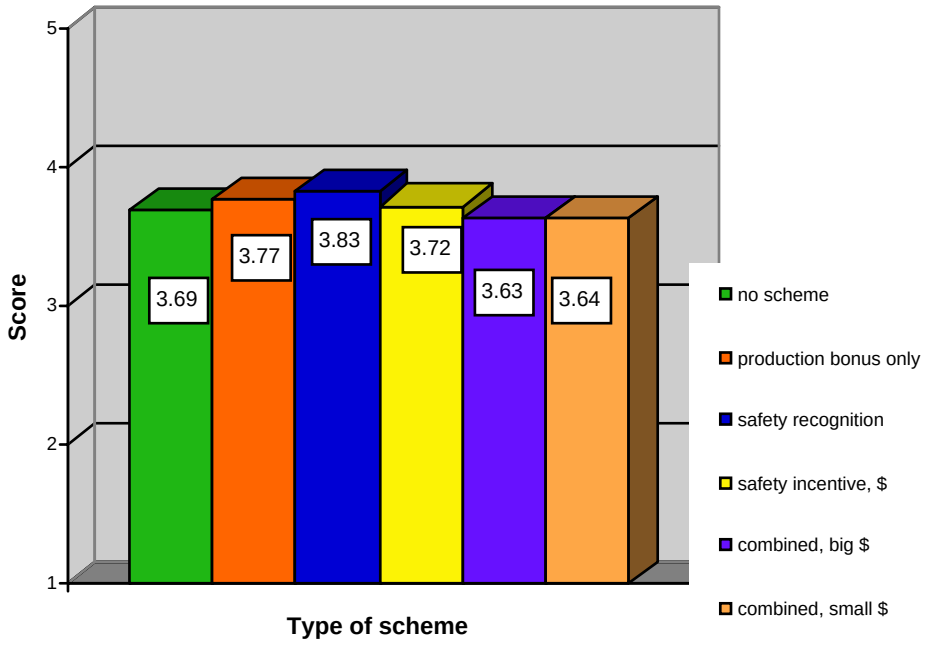

Figure 3.11: Work role clarity and production bonus and safety incentive schemes

The trend of better ratings from safety incentive only sites is consistent on this factor as well. The difference between safety recognition only sites and sites with combined schemes with larger payments was statistically significant (to 0.05).

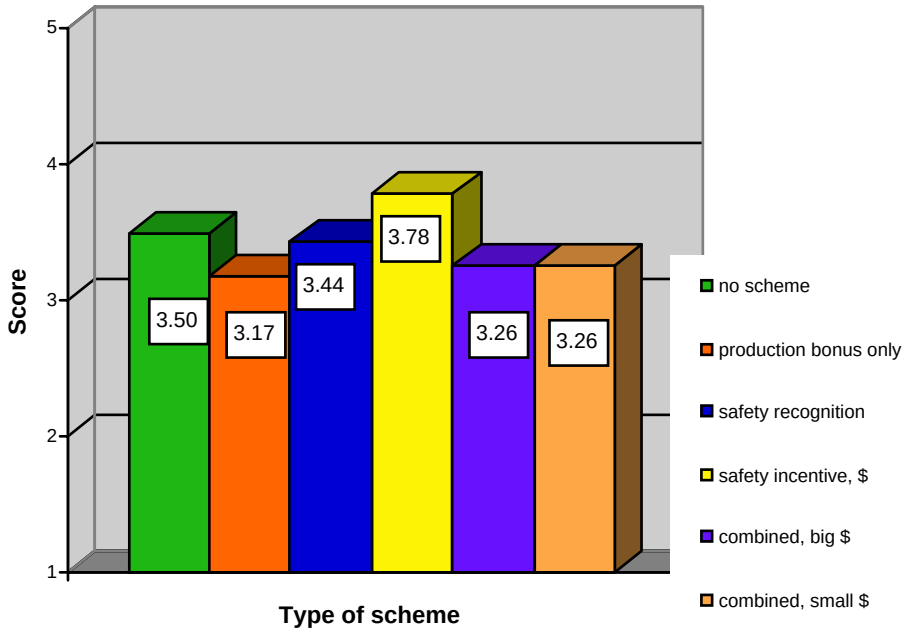

Figure 3.12: Work life balance and production bonus and safety incentive schemes

The differences between the scores from safety incentives only sites and production bonus only sites were statistically significant (to 0.001). Both types of combined schemes scored significantly worse than safety incentive schemes that involved tangible rewards (to 0.001).

3.5 Conclusion and recommendations

Production bonus and safety incentive schemes that involve payment in exchange for achieving particular outcome targets have not proved themselves to consistently or reliably improve safety outcomes. The confusion about the presence of such schemes evident in our interviews and in questionnaire responses suggests that any positive effects are likely to be limited at best.

The most commonly cited benefit was that the schemes encourage effective injury management. Rather than a benefit, this could well be seen as a cost of the schemes, since responding promptly to injuries is a fundamental building block of effective OHS management. If such action is only undertaken when there is a financial benefit available, the basics of OHS management may not be in place. As the *Future Inquiry* Workshop participants identified, in a world class OHS system, people contribute to OHS management, not because of extra money, but because it is 'the right thing to do'. Production bonus and safety incentive schemes that imply that basic OHS management processes such as treating minor injuries should only be used if there is an added financial benefit may actually make it harder to achieve world class OHS.

3.5.1 Safety incentive schemes

Generally, sites reported that safety incentive schemes that made payments as a result of achieving outcome targets either made no difference at all or had negative effects on incident reporting. The questionnaire responses suggest that this is more likely where large payments are involved, which further reinforces the negative consequences that may have been realised.

A small number of sites had safety incentive schemes that did not involve payment for achieving targets and did not have accompanying production bonus schemes. More positive outcomes for organisational factors associated with effective OHS management were evident at these sites, suggesting that an approach that involved recognition of contribution rather than payment for outcome targets may have more positive results. *Future Inquiry* workshop participants reinforced the value of such an approach and recommended that the ideal safety incentive scheme provides recognition for high achievement and contribution, not payment in exchange for low levels of reported injuries, however defined.

As a result, we recommend that NSW mining enterprises should review their existing safety incentive schemes and shift them from a focus on outcome data to a focus on improvement and

contribution. A guide to undertaking such a review is provided as Attachment 10 in Volume 2 of this report.

Recommendation 1

Recognition and reward schemes should be reviewed and developed in line with good practice principles, namely, they should:

- reward and encourage contributions to effective OHS management, not outcomes;
- promote all aspects of a safe and healthy workplace;
- have significant management commitment, which necessarily involves resource allocation;
- be designed, implemented and reviewed in a consultative process;
- be reviewed and evaluated regularly to ensure that the scheme is targeting the desired result and not producing perverse incentives;
- be integrated within broader organisational improvement strategies; and
- encourage effective OHS culture through recognising contributions by teams as well as individuals.

Given the potential for under-reporting and the other negative effects associated with payment schemes based on outcome measures and the lack of evidence of value from them, we recommend that such schemes should not be used in the industry.

Recommendation 2

The NSW mining industry should no longer pay workers in the industry money or equivalent benefits as a result of achievement of particular targets for outcome data, eg LTIFR, MTIFR.

3.5.2 Production bonus schemes

Production bonus schemes have their genesis in industrial relations arrangements outside the scope of this investigation. We did not find that there was necessarily a direct link between such schemes and breaches of work procedures such as 'short cuts', although we did receive some reports of such problems. However, the link between roster risk and high production bonus payments needs more careful examination at those sites that make such payments to ensure that payment systems are not creating disincentives for

addressing working arrangements with negative OHS consequences.

Recommendation 3

Sites with production bonus schemes should carefully review them to ensure that the payment is not creating a disincentive to address adverse OHS consequences of current working arrangements.

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Chapter 4
Hours of work and fatigue management

4.1 Introduction

All mining industry parties agree that hours of work and fatigue management remain priority OHS issues for the industry. The *Future Inquiry* Workshop held as part of the *Digging Deeper* project reinforced the commitment of the industry to achieving sound management of fatigue risks and providing work-life balance for all who work in the industry. There have been numerous projects across the mining industry nationally and in NSW to address the issue, but a coordinated and agreed response has not yet been developed. Previous empirical work undertaken for DPI has indicated that long hours of work may be common in the industry but data on the range, variability, determinants and impacts of hours of work in the NSW mining industry have not been obtained. Difficulties monitoring hours of work in a multi-employer work system have hampered previous efforts to develop a sound database for decision-making. For example, contractors may move from site to site as jobs finish with consequences for cumulative hours.

This chapter reports on the findings of the project that provide the detailed empirical data that will underpin the industry's efforts to implement comprehensive control strategies. The *Future Inquiry* Workshop outcomes represent the first steps towards developing an agreed framework for intervention that would underpin these strategies. While divergent views on how to deal with the issue may still exist, the findings of this project strongly demonstrate that everyone is committed to achieving effective control of the risks associated with hours of work and fatigue.

This chapter sets out:

- the findings of our literature review;
- the current circumstances in the NSW mining industry in relation to hours of work and fatigue management;
- the outcomes of the *Future Inquiry* Workshop that considered hours of work and fatigue management; and
- our conclusions and recommendations on this issue.

4.2 What do we know about what works?

Both the duration of work (working hours) and the time of day that work is done (shift arrangements) have significant consequences for health and safety.

4.2.1 Working hours and health

Long working hours are associated with adverse health outcomes. The most commonly studied outcome has been heart disease, but other health issues such as gastrointestinal disorders, sleep disorders, psychological illness and fertility problems have all been identified (see Sparks et al, 1997; Dawson et al, 2001; and Caruso et al, 2004 for reviews).

A case-control study of Japanese men found a dose-response relationship between hours of work and the risk of non-fatal acute myocardial infarction (heart attacks), ie the longer the hours of work, the higher the risk of heart attack. Working more than 60 hours per week nearly doubled the risk of heart attack. An even stronger dose-response relationship was found between the number of days off per month and heart attack risk. Less than two days off per month tripled the risk of heart attack. The highest risk was found between the number of days per week with less than five hours sleep – two or more days per week with less than five hour sleep increased the risk of heart attack over 3.5 times (Liu and Tanaka, 2002).

Researchers such as Newcombe have commented that such data may even underestimate the risk of extended working hours because the statistical analysis has controlled for factors such as body mass index, hypertension and lipid levels (cholesterol). These factors may not be independent of the hours of work – excessive working hours may also be a cause of such health factors (Newcombe, 2006).

Not surprisingly, some studies have suggested that long working hours exacerbate stress in workplaces. Maruyama and Morimoto (1996) compared managers working at similar organisational levels and found that those who worked more than ten hours per day were more than 2.5 times more likely to experience high job stress than those who worked less than nine hours per day.

4.2.2 Fatigue and work performance

Fatigue is a major hazard for organizations that operate outside of the standard nine to five, Monday to Friday work week. Shiftwork, which encompasses a wide variety of working time arrangements, is associated with increased risk of fatigue-related errors and incidents compared to day work. Fatigue can be described as “a state of impaired physical and/or mental performance and lowered

alertness arising as a result of inadequate restorative sleep. Other mediators of fatigue are time of day and length of time awake" (p. 5, Baker and Ferguson, 2004; see also Brown, 1994; ATSB, 2001).

The consequences of fatigue and sleep deprivation are extensive and impact a range of performance and mood variables. Some examples include: reduced concentration, impaired attention, poor judgement of own performance, inability to assess problems and determine solutions, impaired decision-making, slower reaction times, poor hand-eye co-ordination, poor communication skills, impaired short-term memory, mood swings, loss of situational awareness and increased lethargy (eg Lamond and Dawson, 1999; Dinges et al, 1997; Harrison and Horne, 2000; ATSB, 2001). These impairments have clear consequences for the standard of work performance, affecting the quality of work but, more significantly, the risk of incidents that may lead to serious injury.

4.2.3 Sleep and work performance

As this suggests, a minimum amount of sleep is required to maintain baseline waking function. Recent research indicates that individuals who obtain less than six hours of sleep a night for a series of consecutive nights will exhibit cognitive and physical performance impairment (Belenky et al, 2003; van Dongen et al, 2003). Previous research has shown that the effects of remaining awake for 24 hours are similar to having a blood alcohol concentration (BAC) of 0.1% (twice the legal limit for driving in most of Australia) (Dawson and Reid, 1997; Lamond et al, 1999; Williamson and Feyer, 2000). Importantly, total sleep loss (one or two nights without any sleep) and cumulative sleep loss (reduced sleep on consecutive nights) are equally detrimental to performance and alertness (Pilcher and Huffcutt, 1996).

Work in the Centre for Sleep Research laboratory in the last couple of years has focussed on the recovery from sleep loss when recovery opportunities are restricted. Following a night of sleep loss, six hour opportunities were insufficient for full recovery of objective performance measures. It took a number of nights of six hours of sleep before performance could be recovered (Jay et al, 2007; Lamond et al, 2006). This is highly significant for operations where the roster provides for restricted sleep opportunities.

Work in the health care sector examining the impact of work hours on patient safety outcomes has demonstrated recently that the total number of hours is not the significant factor, but rather the opportunity the hours provide for sleep. The study showed that a change in the roster that provided for more sleep during the night hours directly improved patient safety outcome measures (Landrigan et al, 2004; Lockely et al, 2004).

4.2.4 Circadian rhythms

The body's endogenous clock controls the timing of various bodily functions such as the sleep/wake cycle, core body temperature, melatonin and other hormones, alertness and performance (Zee and Turek, 1999). The natural tendency for humans is to be asleep during the night hours and awake during the day. Thus, individuals required to work during the night are exposed to two circadian-related influences that increase fatigue. Firstly, alertness levels are lower during the night hours, typically lowest around 0300-0600 when body temperature is at its nadir. Secondly, working at night requires sleep to be obtained during the daytime. Sleep is generally more disturbed, lighter and shorter during the day than at night (Escriba et al, 1992; Gillberg, 1995; Fischer et al, 1997).

4.2.5 Prior wake

Prior wake, sometimes referred to as time on task, is the other major contributor to fatigue. A landmark study by van Dongen et al (2003) recently determined that the critical time awake for maintenance of performance is 15.8 hours, or approximately 16 hours. This maps very closely onto the findings of Dawson and Reid (1997) and Lamond and colleagues (1999) described earlier, that 16-17 hours of prior wakefulness results in performance changes comparable to 0.05% BAC. With increasing time awake, the pressure for sleep builds up according to the three-process model proposed by Akerstedt and Folkard (1997). Fatigue increases with increasing time awake and dissipates only with sleep. The circadian factor mediates the fatigue levels within these parameters.

4.2.6 Shift patterns that induce fatigue

Following is a brief synopsis of the specific characteristics of shift patterns that are known to influence fatigue.

- *Sleep opportunity:* The sleep opportunity provided by a working time arrangement does not equate to the actual amount of sleep obtained. It refers to the time available for sleep (that is the time away from work). As an example, if an individual is working 12-hour shifts and the commute time is 30 minutes each way then their sleep opportunity will be approximately 11 hours. Within this opportunity, time will be spent engaging in personal, family, social and leisure activities.

- *Consecutive night shifts:* people generally accrue a sleep debt over a period of consecutive night shifts due to the reduced quality and quantity of sleep during the daytime hours. Accident risk increases with each consecutive night shift worked. Compared to the first night shift, risk is increased by 17% on the third night shift and 36% on the fourth (Folkard and Tucker, 2003).

- *Start times:* early start times (e.g. prior to 0600) require people to truncate their sleep period in the early morning hours. Due to the 'forbidden zone' for sleep in the early evening hours (Lavie, 1986) it is very difficult to go to sleep earlier than normal to compensate for early starts. Early starts can also result in 'clock-watching' due to concern over waking to an alarm and getting to work on time. Early starts may also require people to work (or to drive to work) in the lowest point in their body's alertness rhythms, in the early hours of the morning.

- *Shift length:* long shifts reduce the time available for sleep. As sleep is often sacrificed in favour of other non-work activities in order to maintain some normality for shiftworkers, the shorter the sleep opportunity, the less sleep naturally will be obtained. Further, composite data indicate that the risk of accidents occurring increases significantly from the 9th hour of work (Folkard and Tucker, 2003; Tucker et al, 1996). Prior wake, as described above, impacts on alertness and performance. A shift length of 12 hours or more will be associated with prior wake of at least 13 hours and possibly longer depending on the travel time and therefore time of arising from sleep.

- *Direction of rotation:* forward rotating shifts (morning-afternoon-night) match the body's natural rhythms and result in less disturbance to sleep (Knauth, 1997).

4.2.7 Measuring fatigue

A number of devices and techniques for measuring and monitoring fatigue have been proposed and some of these are currently being tested or used in the mining industry (see Baker and Ferguson, 2004, for a review). By definition, these devices do not prevent fatigue and so cannot be treated as a preventive strategy. They have potential as a technique for testing whether particular shift arrangements have better outcomes than others with respect to fatigue, but there have been few, if any, quality evaluations of their effectiveness for this purpose.

Reliance on such fatigue alert devices in a fatigue risk management strategy may result in negative outcomes. There is some evidence that they may provide a false sense of security leading to operators ignoring the precursor symptoms in the false belief that the machine will 'look after them'. The devices do not discriminate between types or causes of impairment and therefore do not support more effective risk control. Their value may be more as a 'last line of defence' in a comprehensive fatigue management strategy.

Reliance on self-reports to measure and monitor fatigue is also unlikely to be effective. Individuals are clearly able to identify fatigue states, but their ability to judge impairment becomes

impaired as they become more fatigued (Dorrian et al, 2003). Studies of driver fatigue suggest that drivers might be able to identify that they are drowsy but do not always act on that identification to discontinue driving. The reasons for this are obviously complex, but are likely to include external incentives to continue such as employment requirements (Williamson, 2007, Dawson and McCulloch, 2005).

4.2.8 Effective approaches to fatigue management

As this suggests, focussing entirely on the lower end of the incident causation chain, the experience of fatigue, is not an effective approach to fatigue management. Measures that address the causes of fatigue are also necessary. Traditional approaches to fatigue management have focussed primarily on hours of service rule-sets. These generally cover variables such as maximum shift length, minimum break between shifts, maximum number of shifts in a row and total hours in a week/month. The basis for such rule sets is in the knowledge about the manner in which recovery from physical fatigue (or exhaustion) occurs. Recent research and changes in legislation and policy however, have refocussed fatigue management strategies onto the role played by sleep and wake (Jones et al, 2003; Neville Inquiry, 2000; Dawson and Zee, 2005). For a comprehensive recent review of approaches to fatigue management see Dawson and McCulloch (2005).

Effective approaches to the risk management of fatigue are analagous to risk management of manual handling, another multi-factorial risk. Ineffective approaches to manual handling focus on treating the consequent musculoskeletal disorders and developing prescriptive rules about weight limits for manual handling. Contemporary and more effective approaches encourage attention to the range of factors that create manual handling risk, including weight. Similarly, effective approaches to fatigue management look at the interconnected range of factors that contribute to fatigue risk. As well as the length of the work period, this requires attention to shift design, work design and non-work related factors.

Evidence shows very clearly that the amount of sleep obtained in a break between work shifts is dependent not only on the length of the break period but the timing of the break in the 24-hour day. A break at night will result in a longer sleep of higher quality than the same length break during the day (Roach et al, 2003; Kecklund and Akerstedt, 1995). Thus rosters should be reviewed in light of scientific evidence regarding the role of sleep, wake and circadian timing on alertness and performance (Fletcher and Dawson, 2001; Dawson and Fletcher, 2001; Dawson, 1997; Fletcher et al, 2000; Roach et al, 2004).

Further, where hours of service rule-sets are used as the only fatigue management strategy there is an inherent assumption that adequate sleep will be always obtained in a given sleep

opportunity. This may not be the case for various reasons both within and outside the control of the individual employee. This reinforces the importance of joint accountability for fatigue management between employer and employee.

As the Australian mining industry has moved to new shift arrangements, fatigue management policies have been developed and awareness programs aimed at educating individuals about fatigue risks and controls have been introduced. Fatigue management is increasingly being seen as an occupational health and safety issue as opposed to an industrial issue and thus fatigue management programs are being integrated into safety management systems, with the aim of managing fatigue risks in a similar way to other hazards. The grouping of fatigue, alcohol and other drugs within a Fitness to Work program has also been common and has been proposed as an effective way of communicating the risks and responsibilities associated with fatigue (Cliff, 2001), although this may lead to an approach that over-emphasises individual responsibility and does not adequately address work-related causes of fatigue.

A more systematic approach to fatigue risk management expands on the use of policy and training to also include the identification and analysis of fatigue-related errors and incidents, fatigue-related behaviours, instances of inadequate sleep and excessive wake. Recording and analysis of this type of information provides opportunities for increasing the number of control strategies in place to manage fatigue-related risk. The extent to which this opportunity has been taken up was examined in the data collection.

4.2.9 What does the literature tell us?

Fatigue is a hazard that should be managed like other hazards in the workplace – a risk management model using the hierarchy of control is just as applicable to fatigue as any other OHS risk on a mine site. Fatigue should therefore be part of the risk management strategy on mine sites.

As the hierarchy of control requires, controls that act on the causes of fatigue are the essential basis to effective control. Controlling the causes of fatigue is not just a question of working hours, but about the opportunity those hours provide for recovery sleep. Definitive thresholds for hours of sleep are not useful, but in general:

- People should aim for between seven and eight hours of sleep each night.
- Less than six hours sleep over a few nights will result in impairment.

- More than 16 hours of being awake will, in most circumstances, result in impaired performance.
- The length of wake in any 24-hour period should not exceed the total amount of sleep in the last 48 hours.
- Loss of one night's sleep requires more than one nine-hour sleep to recover.

Where operations use night work or extended shifts, then more levels in the hierarchy of control are necessary. The further controls that are necessary must be based on an assessment of fatigue-related risk in the operation. The inter-related organisational and personal factors that cause fatigue risk must be considered in achieving fatigue risk control, namely:

- the time of day that work takes place (shift design);
- the length of time spent at work and in work related duties (working hours);
- the type and duration of a work task and the environment in which it is performed (work design);
- the quantity and quality of rest obtained prior to and after a work period;
- activities outside of work, such as second jobs and family commitments; and
- individual factors such as sleeping disorders.

Controls for each of these factors are necessary.

4.3 What are the actual hours of work in the industry and how do these vary?

4.3.1 Hours of work in the NSW and Australian mining industries

Weekly hours of work in the NSW mining industry are high and substantially greater than the hours of work in the Australian mining industry as a whole, as determined by the Australian Bureau of Statistics (ABS):

		NSW mining industry (Digging Deeper June/July 2007)			Australian mining industry (ABS Cat 6105.0 July 2007)
		Mean	95% confidence interval		Mean
			lower bound	upper bound	
Employed full time[1]	Males	50.2	49.5	51.0	46.0
	Females	46.6	44.1	49.1	41.6
	Persons	50.0	49.4	50.7	45.3
Total	Males	50.1	49.4	50.8	45.5
	Females	45.8	43.6	48.0	40.1
	Persons	49.8	49.0	50.4	44.7

Table 4.1: Weekly hours of work last week in the NSW and Australian mining industry

As well as longer working hours in the NSW mining industry, the substantial difference between the ABS and *Digging Deeper* data may be due to:

- Different industry definitions – the ABS data collection includes the sub-categories of *services to mining* and *oil and gas extraction* that were not included in our data collection.
- Greater representation from sectors and states that work less hours, eg extractive sector, Victoria.

[1] Data for part time employees from both the ABS and the Digging Deeper population are subject to data validity issues due to the extremely small sample size and so this comparison is not made.

ABS data reveal that no other industry works longer hours than mining when both full and part time employees are included, but full time employees in the Agriculture, Forestry and Fishing industry work 51.9 hours per week, which is 6.6 hours longer than the same figure for mining.

Aggregate data for the entire Australian workforce show that full time employees in total worked 43.6 hours per week and all employees worked 36.4 hours per week. Both of these figures are considerably lower than the corresponding figure for the NSW mining industry.

Comparing hours of work across national boundaries is not always reliable: different definitions of industry, working hours and employment categories can result in invalid benchmarks. However, the following figures provide some comparative data, as requested in our terms of reference:

- Production workers in the USA natural resources and mining industry (excluding oil and gas extraction) worked 47.3 hours per week in July 2007 (preliminary data from Bureau of Labour Statistics website, Bureau of Labour Statistics, 2007). This is 2.3 hours less than the NSW mining industry.

- In 2006, the average hours worked per week of full time employment in Europe was 41.9 hours. The highest average was 44.3 hours per week in Austria. Both of these figures are considerably lower than the NSW mining industry (Eurostat, 2007).

4.3.2 Range of working hours

The following figure sets out the range of weekly working hours across the NSW mining industry.

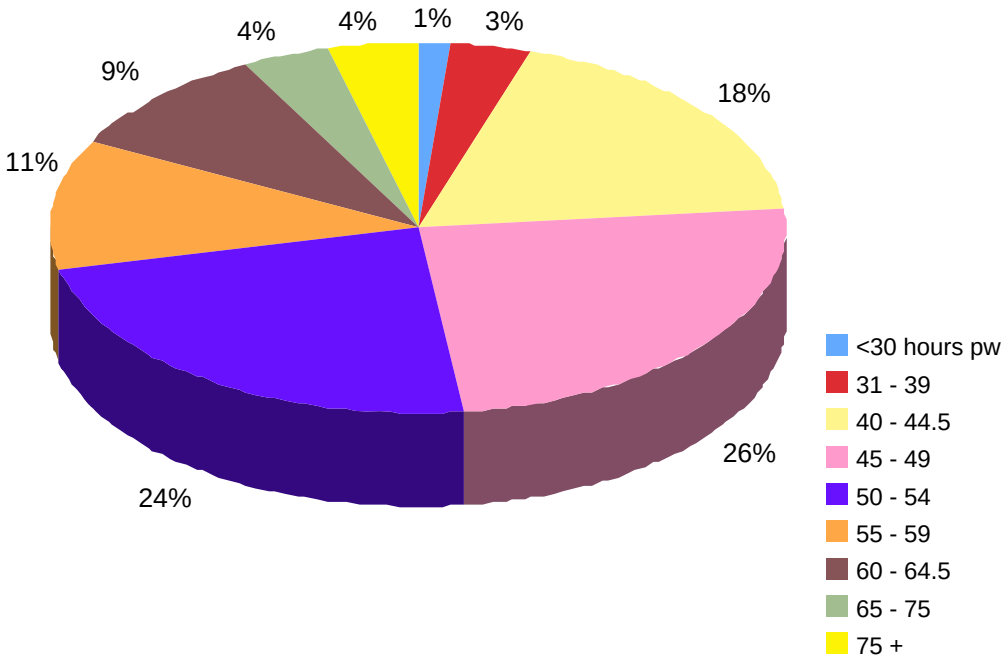

Figure 4.1: Range of usual weekly working hours in the NSW mining industry

This graph shows that over three quarters (78%) of those working in the NSW industry report that they usually work in excess of 44.7 hours each week, the ABS figure for the weekly hours worked in the industry throughout Australia. These data clearly show that people working in the NSW mining industry are working long hours compared to Australian standards.

In an effort to reduce the lack of comparability between national figures, a standard international definition for long working hours has been developed, of over 48 hours per week. On that basis, Figure 5.1 shows that more than half (over 52%) of those working in the NSW industry report that they usually work long hours. This is well in excess of comparable Australian data (22% in 2000). The ILO report, *Working Time Around the World*, gives comparative statistics for a number of countries, using data from various countries for the period 2000 – 2005. Peru had the highest percentage of employees working long working hours, with 51% of employees in Peru working more than 48 hours. The NSW mining industry is well in excess of this, with 53% working more than 48 hours each week.

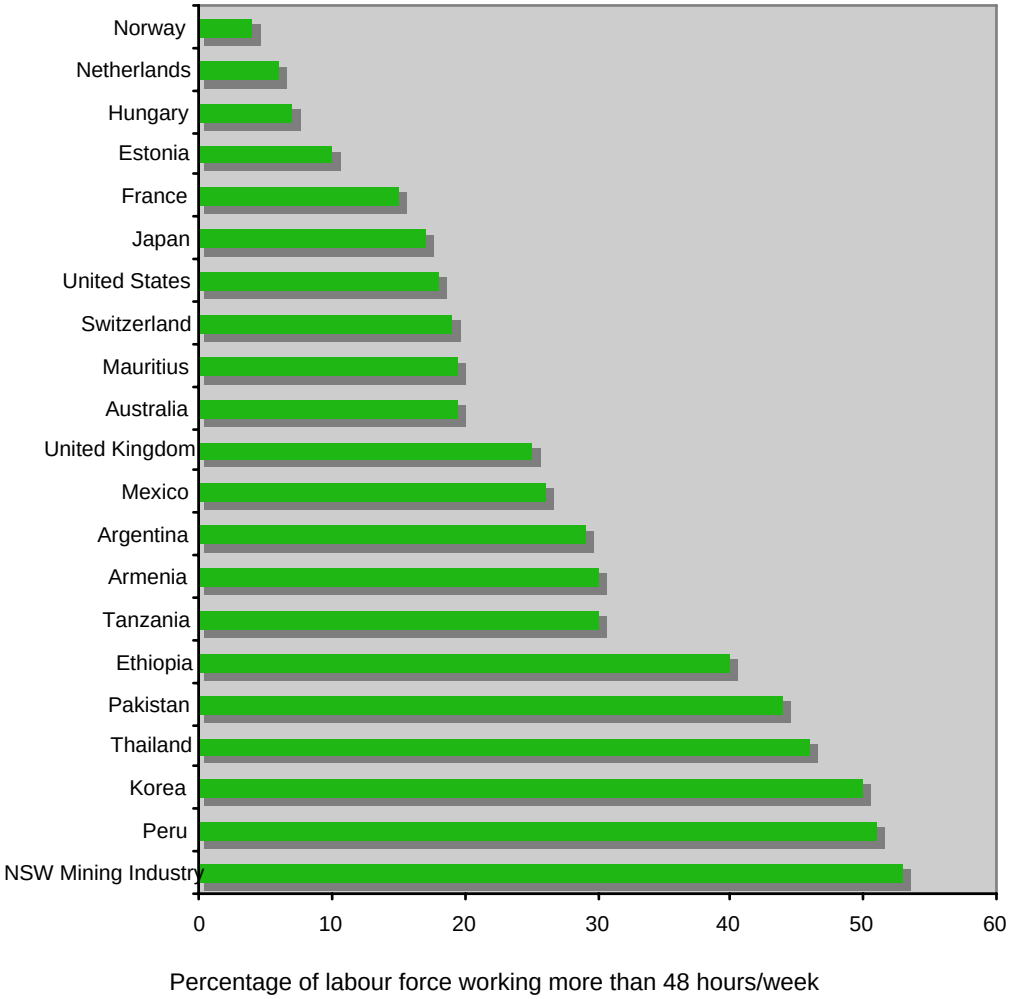

Figure 4.2: Incidence of long working hours around the world (Source: ILO, 2007 and Digging Deeper data)

4.3.3 Differences between occupations

Table 4.1 shows that there is a significant gender effect – men work many more hours than women. This is clearly a result of gender segregation. Women are much more likely to work in specific occupations in the industry and we found significant differences between the hours worked in different occupations, shown in Figure 4.3 below.

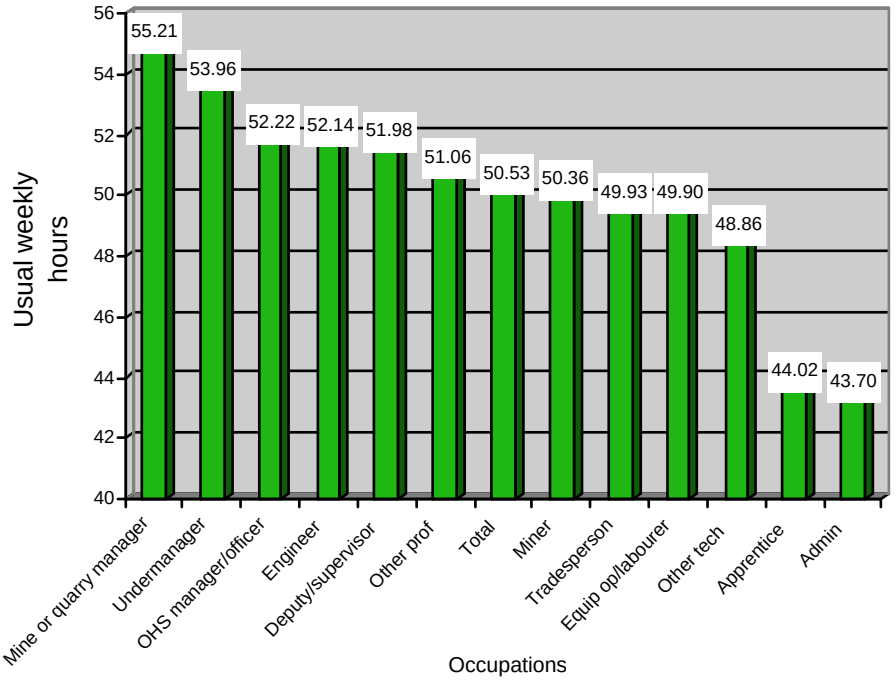

Figure 4.3: Occupations and usual weekly hours of work

Sector	N	Mean	95% confidence interval	
			lower bound	upper bound
Mine or quarry manager	60	55.21	53.19	57.22
Under manager and other managers	108	53.96	52.11	55.82
OHS manager/officer	48	52.22	49.19	55.25
Engineer	83	52.14	50.50	53.78
Deputy and other supervisors	181	51.98	50.67	53.28
Other professionals	107	51.06	48.92	53.19
Miners	256	50.36	48.81	51.91
Tradespersons	195	49.93	48.16	51.69
Equipment operators and labourers	375	49.90	48.77	51.04
Other technical employees	73	48.86	47.14	50.57
Apprentices	26	44.02	39.22	48.82
Administrative employees	73	43.70	41.47	45.93

Table 4.2: Usual weekly hours of work by occupation

The significant differences are between those who work the most hours and those who work the least, although administrative employees work significantly less hours than all other groups, apart from apprentices. These data show that staff occupations, such as managers, supervisors, engineers and other professional groups usually work longer hours than employee occupations, such as miners, tradespeople, equipment operators and labourers. This was strongly reinforced by our qualitative data from sites, where interviewees from staff groups were vocal in expressing their concerns about long hours:

> The foreman etc can work longer hours and this goes under the radar because they are not at the mine face and therefore not at immediate risk (metalliferous, supervisor).

> People in staff positions are expected to work the required hours to do their job regardless of the amount, which can be excessive (coal, supervisor).

To some extent, these long hours were seen as the unavoidable consequence of taking on a more responsible job, with little recognition of the OHS consequences. The attitudes we observed from many of those working in such positions could be described as 'professional machoism', with many claiming that such working arrangements were not a problem:

> I work 14.5 to 15 hours each day. I start at 5.30 am or pm, finish at 8 pm or am. I don't really take breaks during the shift – I have a bite to eat while I'm on the computer, I never take a proper break…. I'm finding I can get 4 hours of sleep during the day on night shift and it's not a problem. Once I've had to pull up in the jeep, but the rest of the time, I'm always busy. It's not a drama (coal, supervisor).

Other interviewees were not so sanguine:

> I'm regularly doing 14 hour days and no one's said that we have to get the GM's approval. I'm always tired, I always fall asleep driving home. I never get a full night's sleep. We don't get a break through the day. No coffee break, no lunch break. I stare at the computer screen and wonder what I'm doing. I fall asleep on the job and don't remember stuff (metalliferous, supervisor).

As the above quotation suggests, the fatigue effects of these hours for staff are considerable and not usually considered on sites, at least in part because these hours are not monitored and reviewed (see below). The evidence from interviews that the hours of staff are also often extended by being on-call is even more cause for concern, since this further reduces sleep opportunity:

> I work between 60 and 70 hours and I'm on call all week as well and a roster for weekends. I get calls on the weekend even when I'm not on call (metalliferous, staff).

One factor possibly contributing to these long hours for those in staff positions is the significant skilled labour shortage faced by the industry, emphasised by participants in the *Future Inquiry* Workshop. This shortage is reported to be particularly acute for lower and middle level managers, as well as professional positions.

4.3.4 Differences between sectors

There are significant differences in working hours between the sectors, with the metalliferous sector working significantly more hours than either the extractive or coal sectors and the extractive sector working significantly more than coal.

Sector	Mean	95% confidence interval	
		lower bound	upper bound
Metalliferous	54.33	53.17	55.48
Extractive	50.33	49.06	51.59
Coal	48.10	47.55	48.66

Table 4.3: Usual weekly hours of work by sector

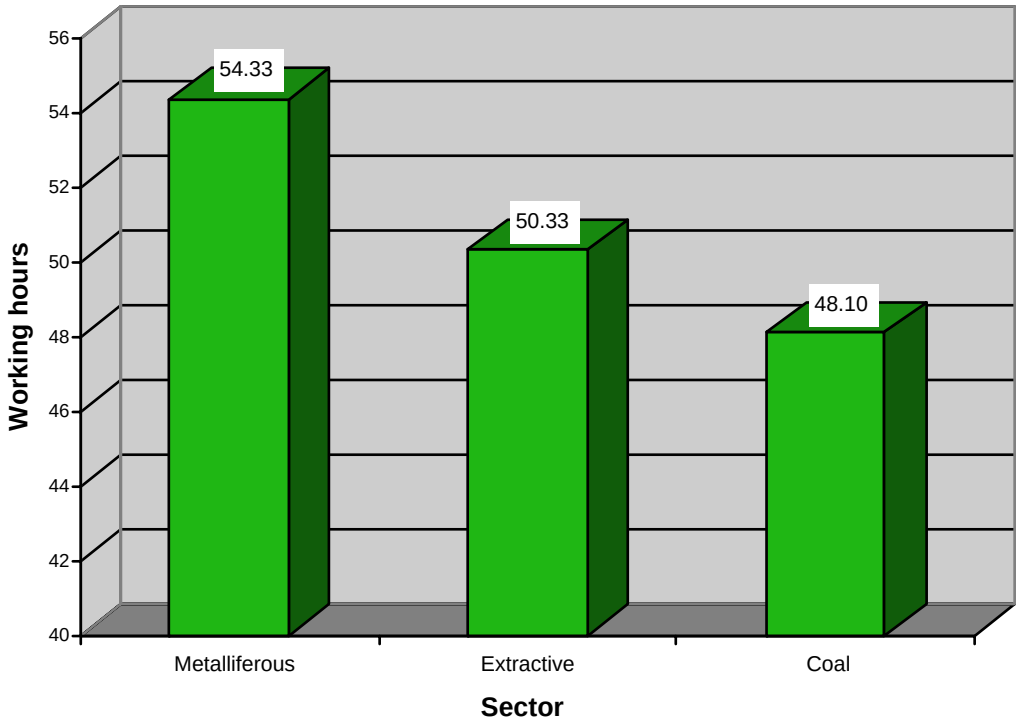

Figure 4.4: Industry sectors and usual weekly hours of work

These differences are also reflected in the hours worked by direct employees and contractors in the different sectors.

4.3.5 Differences between direct employees and contractors

Contractors reported that they usually worked longer hours than direct employees and this difference is statistically significant. The differences vary by sector, with contractors in the coal sector working less hours than permanent employees, although this difference is not statistically significant. In contrast, contractors in both the metalliferous and extractive sectors work more hours than direct employees. The difference in the metalliferous sector is statistically significant.

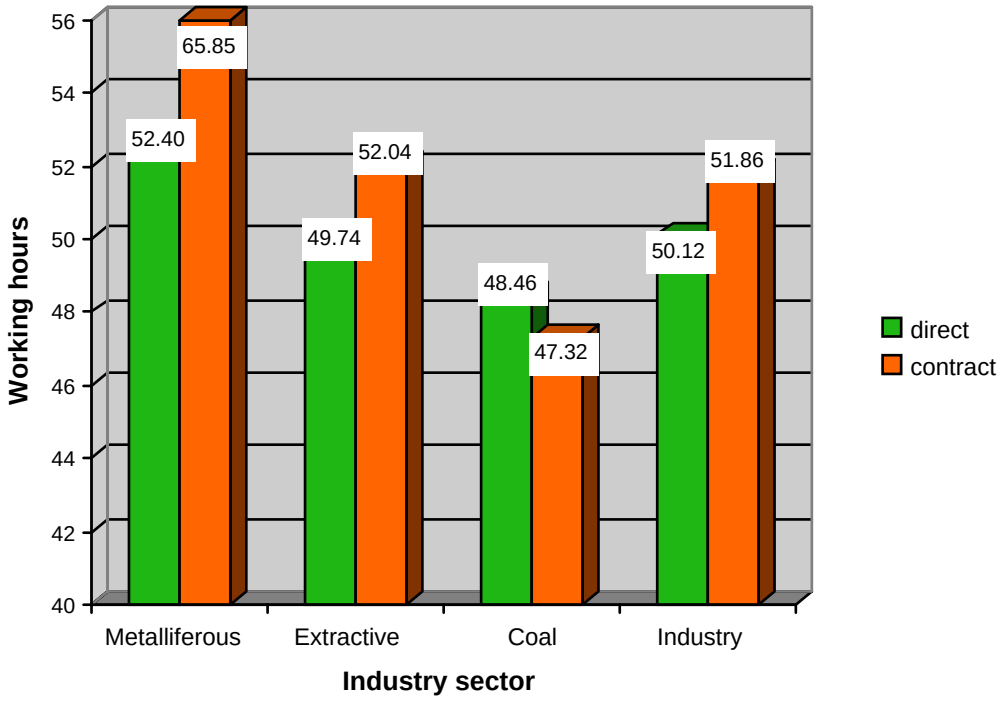

Figure 4.5: Employment status, sector and usual weekly hours of work

Sector	Employment status	N	mean	95% confidence interval	
				lower bound	upper bound
Coal	Direct employee	574	48.46	47.63	49.29
	Contractor	246	47.32	46.05	48.60
Metalliferous	Direct employee	449	52.40	51.45	53.34
	Contractor	75	65.85	63.55	68.16
Extractive	Direct employee	163	49.74	48.18	51.31
	Contractor	65	52.04	49.56	54.52
Industry	Direct employee	1193	50.12	49.56	50.67
	Contractor	389	51.86	50.47	53.24

Table 4.4: Usual weekly hours of work by sector and employment status

The issue of contractor hours was recognised across all sectors:

> Contractors? A different story, we don't know their hours of work, they drive heaps in their work; we maintain info on their hours of work here, but not elsewhere. Hours of work is a problem for contractors on site (extractive manager).

The reported usual hours of work of contractors in the metalliferous sector is very high and well in excess of hours of working hour averages that have been associated with serious health consequences in the epidemiological literature. This is even more concerning in combination with the reported roster arrangements. As described below, contractors are also more likely to work longer roster cycles, with more days of work accompanied by longer breaks.

4.3.6 Differences between sites of different sizes

The different industry sectors have quite different size profiles and consequently we defined small, medium and large sites differently in each sector. Using the census data, we derived the following categories for size according to employee numbers (Table 4.5).

Sector	small	medium	large
Coal	0 - 35	36 - 200	201 - highest
Metalliferous	0 - 9	10 - 96	200 - highest
Extractive	0 - 4	5 - 15	16 - highest

Table 4.5: Size definitions for different sectors

Across the whole industry, medium sites work less hours than both small and large sites and this difference is statistically significant. However, this appears to be due to the longer hours worked by small extractive sites.

Size	N	Mean	95% confidence interval	
			Lower bound	Upper bound
Small	105	50.52	48.86	52.183
Medium	585	48.46	47.78	49.14
Large	919	51.80	51.01	52.60

Table 4.6: Usual weekly hours of work by size

Because of confidentiality and statistical validity, we will not present the data comparing sizes and sectors for hours of work.

However, from our examination of the data, it is clear that the differences between different size categories in the extractive sector are such that the large, medium and small extractive sites operate quite differently to the large, medium and small sites in the other two sectors. Indeed, the largest extractive site we visited was smaller than the smallest coal site we visited and operated on a quite different basis. Consequently, we have also analysed size effects with the extractive sites excluded from the size comparisons, as shown in Figure 4.6 below.

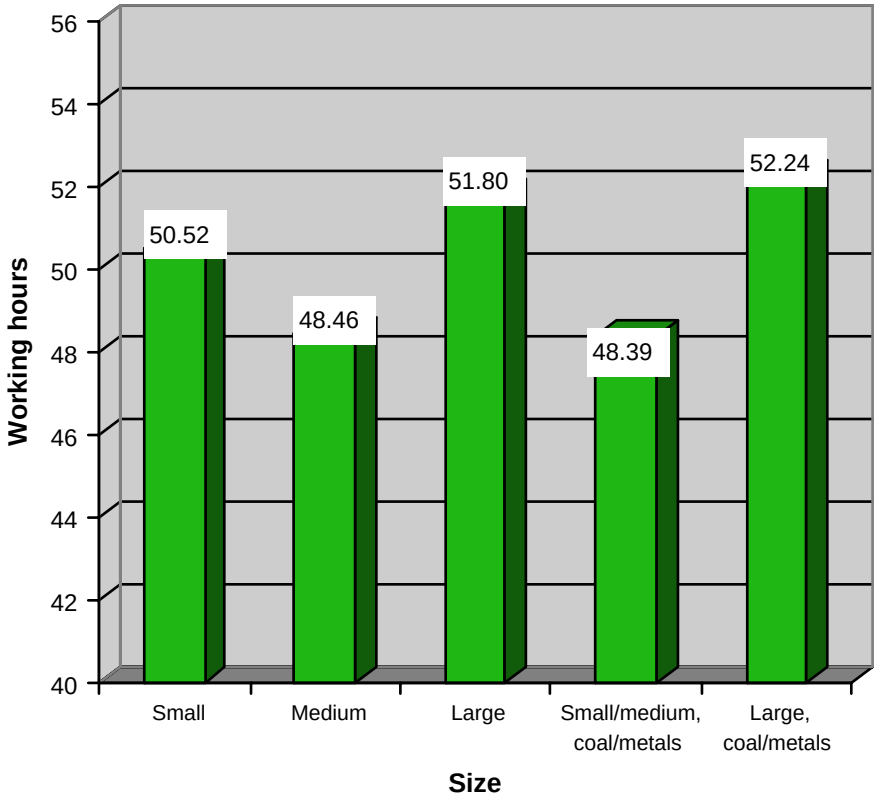

Figure 4.6: Size and usual weekly hours of work

These data show that all sizes of enterprises are working more hours than the industry as a whole in Australia and that large coal and metalliferous mines are working more hours than small and medium coal and metalliferous mines.

4.3.7 Differences between locations

Location has a statistically significant effect on usual working hours, with sites in the far west of NSW working longer hours than sites in every other region to a statistically significant extent. Indeed, the hours worked in the far west are the equivalent of five days of more than 11 hours each day. Sites in the Sydney region worked more hours than sites in the Hunter Valley to a statistically significant extent.

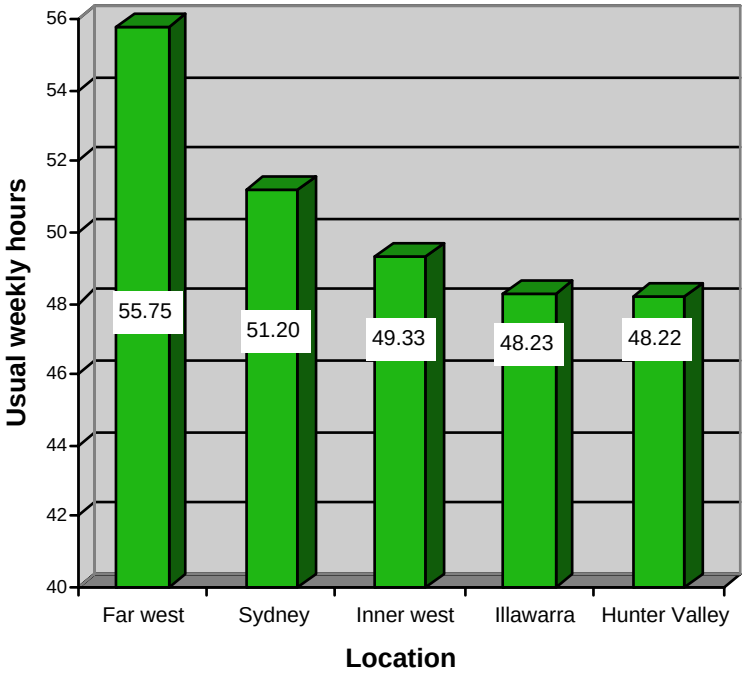

Figure 4.7: Locations and usual weekly hours of work

Location	N	Mean	95% confidence limit	
			Lower bound	Upper bound
Far west	428	55.75	54.35	57.15
Sydney	96	51.20	49.2513	53.15
Inner west	151	49.33	48.13	50.53
Illawarra	387	48.23	47.27	49.18
Hunter Valley	547	48.22	47.60	48.84

Table 4.7: Usual weekly hours of work by location

4.3.8 Summary: What affects hours of work?

Hours of work in the NSW mining industry are high and far in excess of the hours worked in the mining industry on average around Australia. The following factors affect the hours of work:

- *Occupation*. Those in management and professional positions work longer hours than those in blue collar and administrative positions.
- *Sector*. Those working in the metalliferous sector work significantly longer hours (54.33) than in the extractive (50.33) and coal (48.10) sectors.

- *Employment status*. Contractors work longer hours (51.86) than direct employees (50.12) across the industry. The difference between contractors and direct employees is largest in the metalliferous sector (65.85 compared with 52.40).

- *Size*. Those employed at large sites work longer hours than those at small and medium sites. In particular, those employed at large sites in the coal and metalliferous sectors work significantly longer hours (52.24) than those employed at small and medium sites (48.39).

- *Location*. Those employed at sites in the far west of the state work significantly longer each week (55.75) than every other region.

4.4 How are hours of work recorded and monitored across the industry?

4.4.1 Methods used to record and monitor hours of work

Many different methods are used to monitor hours of work in the industry. The census of the industry showed that the overwhelming majority of sites use timesheets to record and monitor hours of work and that the use of swipe cards, while limited, is spread across large sites in all three sectors.

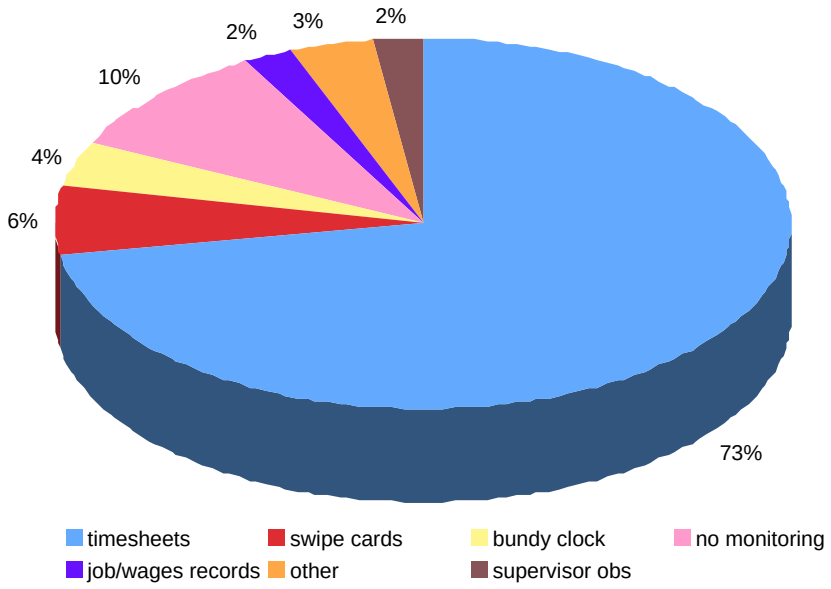

Figure 4.8: Range of methods used to monitor working hours in the NSW mining industry (census data)

The 50 sites we visited used the same sorts of monitoring approaches, although only one of the sites visited used no monitoring system at all. This last site was a single person operation and had no need to monitor hours.

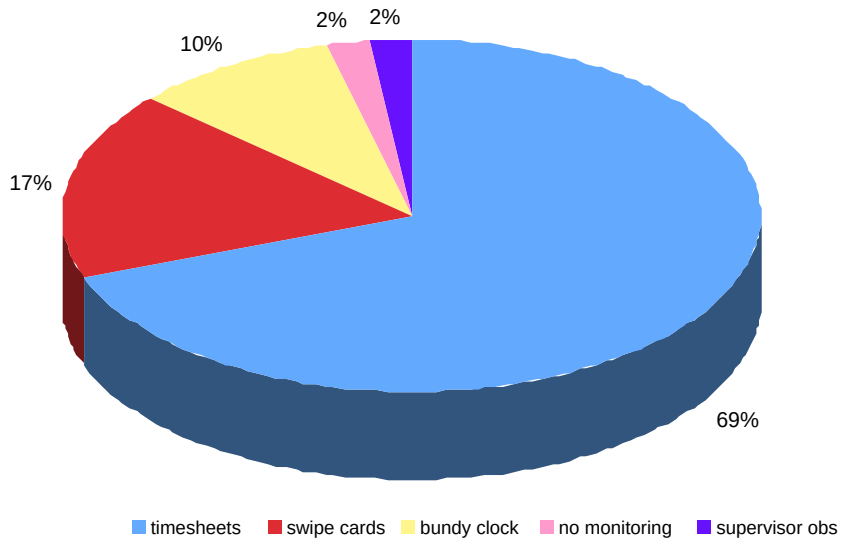

Figure 4.9: Range of methods used to monitor working hours at the sites in our site visit sample

4.4.2 Use of monitoring information

Many sites reported that the data collected about working hours are monitored to ensure that agreed maxima are not exceeded. Particularly in the extractive sector, hours of work are also monitored to ensure that overtime is equitably distributed. Where data are collected from timesheets or a bundy clock, the data are often entered into a computer spreadsheet to enable monitoring and analysis:

> We monitor hours with a bundy clock. Hours go into a spreadsheet for payroll. It comes up in a different colour for 50, 55 or 60 hours. The majority are on 50 hours per week (extractive, supervisor).

With swipe card systems, the information is available more immediately and the system on some sites is set up to give an alert when the hours worked by someone on site is approaching the pre-determined limit. This prompts action to address the excessive hours, although this is not always as effective as might be expected:

> We have a swipe card system. We get an email after someone has been working 13-14 hours to let us know that an assessment is needed. But blokes aren't at their PCs all of the time, so emails are not an immediate form of communication (coal, supervisor).

However, even where swipe cards are used to record hours of work, information about hours on site is not always used to track hours so that those on site approaching or exceeding a specified limit can be identified and alerted. Mostly, the swipe card is primarily used to determine hours of work for payment, in case of emergency to determine who is on site, and to randomly select

individuals on site for drug and alcohol tests. However, it would not be difficult to enhance existing swipe card systems to provide such a prompt.

As this suggests, the main control measure over hours on site is not the monitoring system. For blue collar employees, the main control is the existing industrial arrangements over hours of work that specify when overtime is worked. For white collar employees, there are few, if any, controls. Management and professional employees all reported that their hours were not formally monitored or reviewed. Some kept note of their hours in their diaries, but these data were not collected and analysed to allow those in such positions whose hours were approaching the predetermined maximum to be identified:

> Monitoring hours is easy for rostered people. The issue is with the staff positions such as surveyors and engineers. They are doing long hours with no formal monitoring (metalliferous, OHS manager).

> If you're working more than 14 hours, they have an official procedure, but no one's following up on that. Why is nobody looking after it? Why is there no control on how many hours people do? With the gates, you could track them (metalliferous, staff).

Sites recognised the gaps in the information collected about contractors' hours:

> The biggest risk in fatigue is contractors. They can potentially work at another site we know nothing about. We rely on their honesty. We are going through a process of training supervisors on fatigue management to recognise fatigue. We have sent a contractor home (coal, OHS manager).

> Controlling work hours of contractors is more difficult because they come and go. But if they are on site for any length of time, we can monitor their consecutive days and time on shift in the same way as permanent staff. But if they come and go, then their hours are essentially uncontrolled (metalliferous, OHS manager).

4.4.3 Views on the feasibility of a 'smart card' system

While swipe cards were not used on many sites, those using existing smart card systems were positive about their benefits. Almost all other sites we visited were positive about the feasibility of a smart card system as a way to track hours of work, particularly for those contractors who work across different sites in the industry:

> Yes it would be useful to have a smart card. It is feasible and we'd get benefits. Get the industry players to

> collaborate – to have a common data base that interfaces with providers (coal, supervisor).

This was particularly in the metalliferous and coal sectors, where contractors tend to work only within the industry:

> A smart card system would work. Contractors here are mostly mining industry related. Everyone should have one – me too (coal, manager).

One problem identified by those using existing systems is their lack of integration. The systems established by different providers cannot 'talk' to each other and so the potential benefit of tracking hours across a variety of sites cannot be realised.

The extractive sector and those using contractors from specialist trades were not quite as enthusiastic, pointing out that a mining industry smart card system would not be able to monitor hours of service for those contractors who work outside the mining industry:

> A smart card wouldn't work for electrical contractors because they work outside the mining industry too (coal, supervisor).

Contractors offering services and trades that are used in other industries (eg security systems, electricians) and those working in remote locations would be most likely to work hours that could not be captured in an industry specific system.

Some interviewees also expressed concern that the smart card might lead to contractors relying on that as a fatigue management system, rather than controlling hours themselves. One quarry manager reported:

> I don't like the idea of the smart card – having to check and send people home if they've done too many hours. He's here to service a machine. What would I do if I had to send him home? I need the machine serviced. They've (contractors) got to control it from their end. When am I going to get the machine serviced again if I have to send the guy home? It wouldn't help me, not here (extractive, manager).

This reinforces the duty of care owed by contracting companies to their employees – contracting companies should be developing internal strategies to monitor and control the hours of work, including journey time, of their employees.

Even with a smart card, sites would have to act on the information provided by the monitoring system. Given the limited use currently made of existing information, our data do not suggest that the barrier to action on contractors' hours is lack of information:

> Contractors have time sheets and a swipe on system, keeping track of hours is a function of downloading. We can do a download of the hours of contractors. We'd have to get a printout from the system. That's not been done (coal, manager).

A smart card system is not a substitute for active monitoring of the hours recorded by whatever system is in place and appropriately addressing the results provided.

4.5 How effectively do roster arrangements control the risks associated with extended hours and shiftwork?

4.5.1 Common reports of fatigue

Many people interviewed reported that they were fatigued as a result of their hours of work and shift arrangements:

> We work 12 and a half hour night shifts – you only need bad concentration for a couple of seconds for something bad to happen…. Fatigue is a really big problem. 12 and a half hours day shift are not too bad, night shift is dreadful. I don't know how truck drivers and digger drivers manage it (coal, employee).

There were also a number of comments on questionnaires about the negative impacts of hours of work:

> Work-life vs home life is very unbalanced - partly due to the 'culture' that just being at work means you are contributing/getting your work done. Long hours can often mean less effective time spent at work. Lots of discussion about work fatigue, long hours etc. Time is wasted in discussing these issues every day (metalliferous, staff).

> Excessive hours worked causes fatigue and needs to be looked at for people's safety (coal, employee).

Interviewees also reported that the potential fatigue consequences of long hours of work were not always recognised, particularly for staff:

> My hours are those required to get the job done. The fatigue consequences are not recognised (metalliferous, manager).

However, not all interviewees who reported working excessive hours identified problems with fatigue as a result:

> I'm finding I can get 4 hours of sleep during the day on night shift and it's not a problem…. I find that the least amount of sleep, the better you feel (coal, supervisor).

This quotation suggests that the problem with inaccurate self-assessment of fatigue identified in the literature can occur in the NSW mining industry.

4.5.2 Effect of shift arrangements on work fatigue

Respondents reported statistically significant differences between fatigue according to shift. Night shift was reported to cause significantly worse effects on work performance and fatigue levels

than either afternoon or day shift. Afternoon shift was significantly worse than day shift.

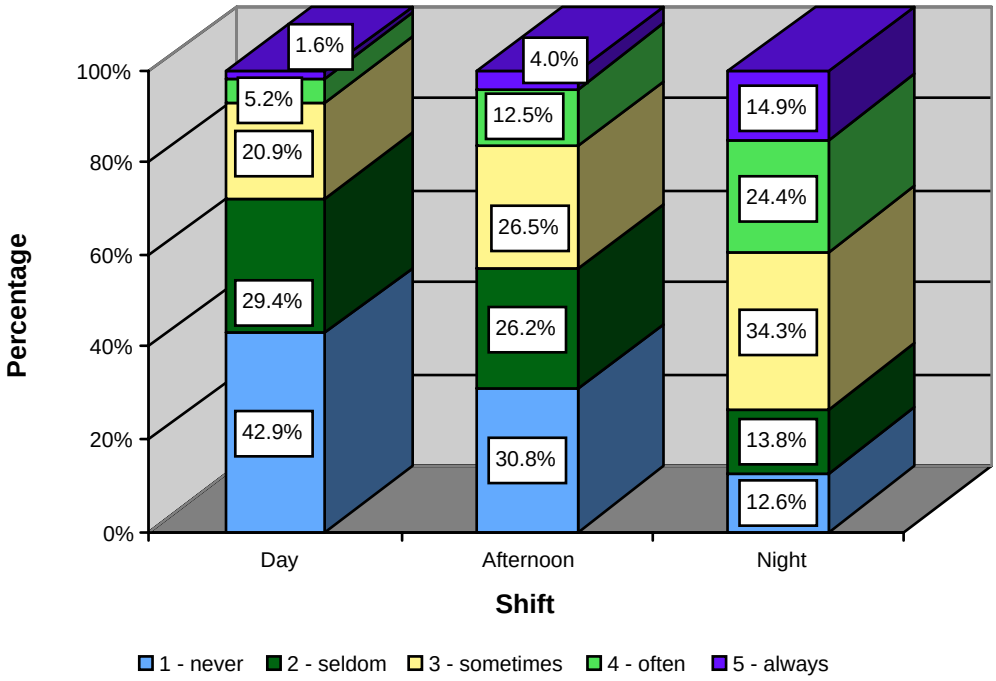

Figure 4.10: Q71 - 73 – How often does working day/afternoon/night shift cause you problems with sleep?

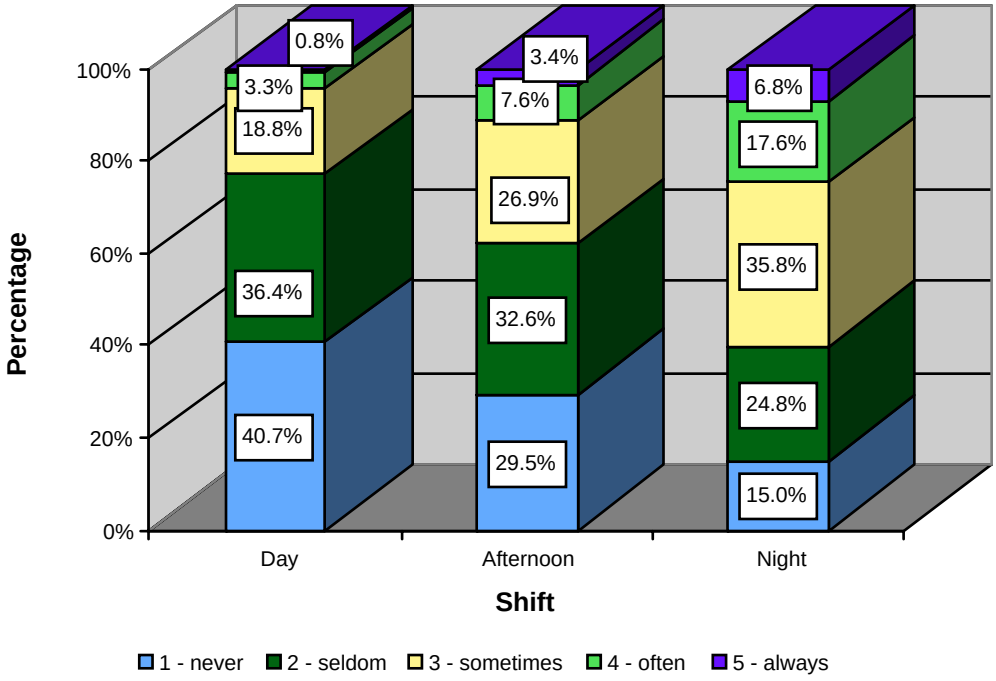

Figure 4.11 Q71 - 73 – How often does working day/afternoon/night shift cause you problems with work performance?

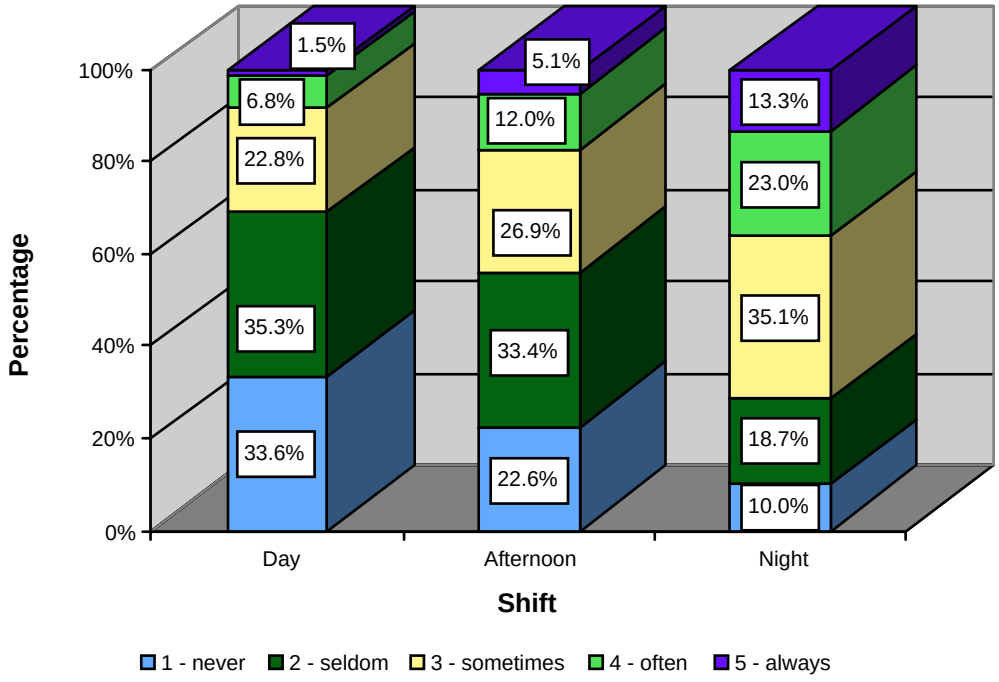

Figure 4.12: Q71 - 73 – How often does working day/afternoon/night shift cause you problems with fatigue?

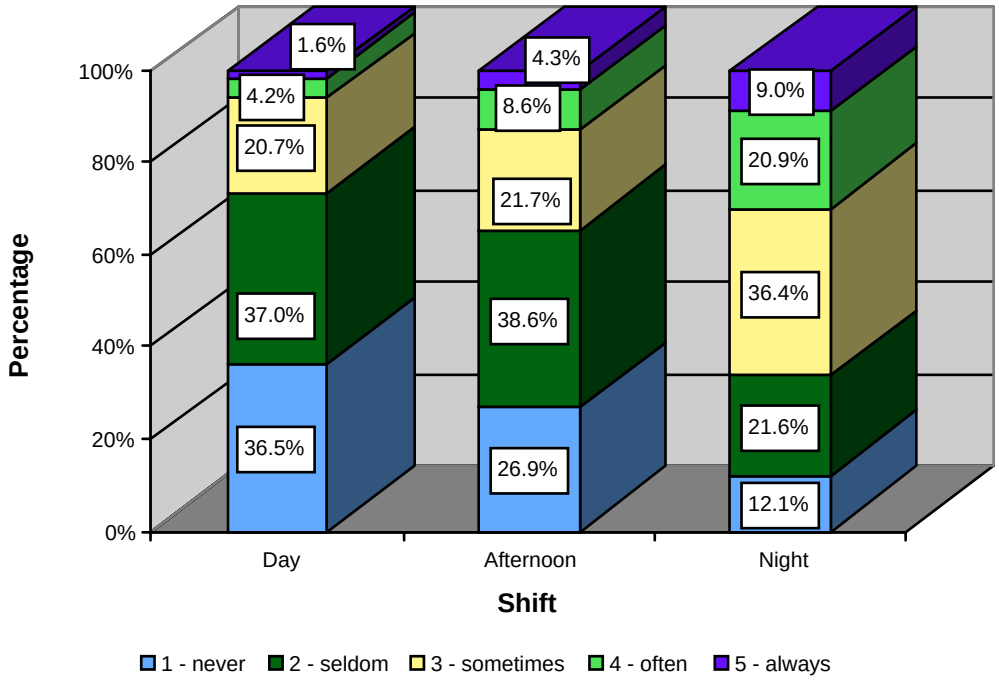

Figure 4.13: Q71 - 73 – How often does working day/afternoon/night shift cause you problems with alertness?

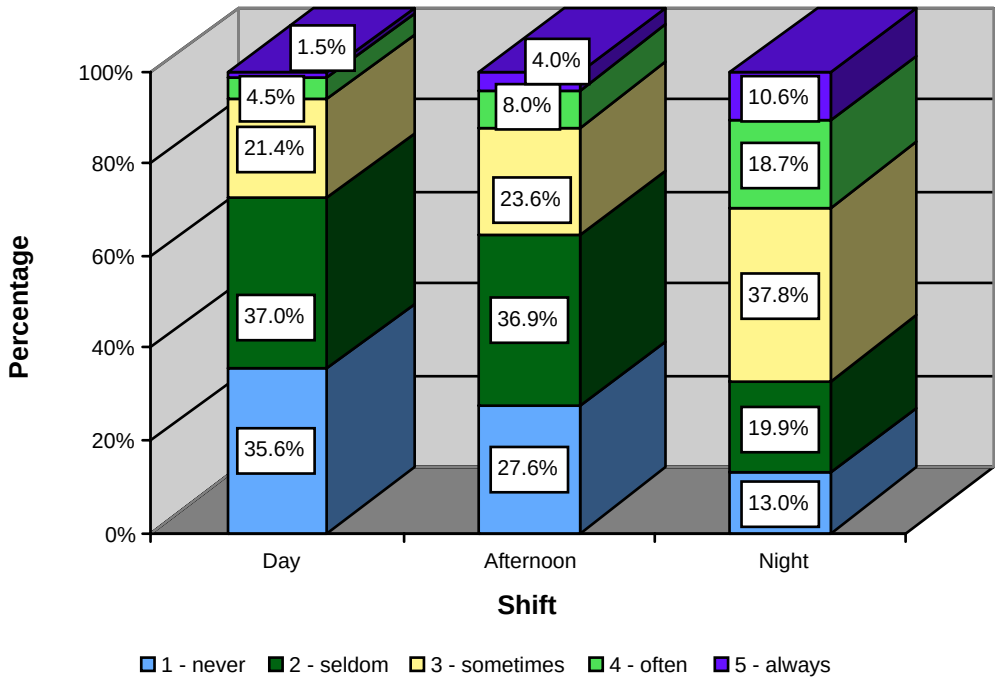

Figure 4.14: Q71 - 73 – How often does working day/afternoon/night shift cause you problems with ability to concentrate?

While this is not surprising, the finding that night and afternoon shift have such effects on key parameters such as work performance, alertness and ability to concentrate suggests that current shift arrangements are not adequately managing the risks associated with shift work. In particular, these data show that, of those who work night shift:

- Nearly one quarter (24.4%) always or often have problems with work performance;
- Over one third (36.3%) always or often have problems with fatigue;
- Nearly one third (29.9%) always or often have problems with alertness; and
- Nearly one third (29.3%) always or often have problems with their ability to concentrate.

These responses have clear consequences for the health and safety of the people working these shifts and the enterprises they work for. The answers to these questions did not vary between occupations to a statistically significant extent, suggesting that

these negative affects are experienced by all occupational groups that work night shift.

This was reinforced by interviewees who commonly reported significantly worse outcomes for fatigue from night shift than from day shift:

> Fatigue is not bad on day shift, but night shifts are a problem (metalliferous, operator).
>
> You can do day shift standing on your head, but it's from midnight to 3 am when the wheels fall off (coal, operator).

4.5.3 Size and sector effects

The responses from sites in different sectors and of different sizes to the questions on fatigue and shiftwork varied to statistically significant extents. The answers to each set of questions were aggregated to give a mean score on fatigue, where a lower number represents a more positive answer (ie fewer problems). Very few small sites worked afternoon or night shift and thus there were so few responses from small sites to the corresponding questions that these scores have not been provided.

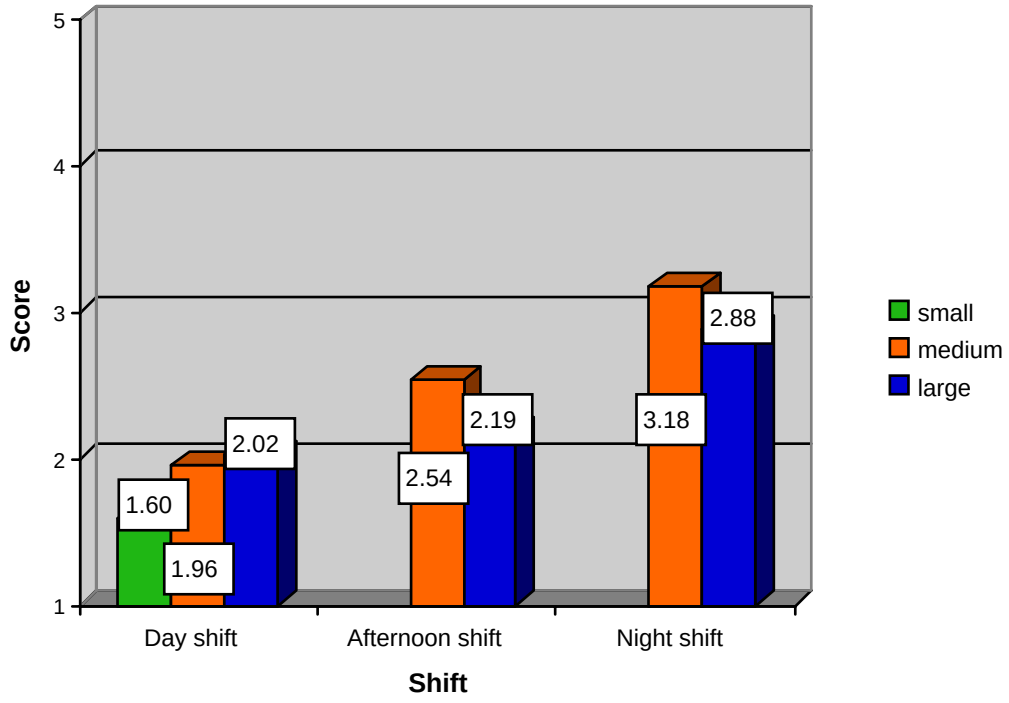

Figure 4.15: Problems with fatigue on different shifts for sites of different sizes

All of the above differences were statistically significant. With sector, the variation was not statistically significant for day shift, but coal sites reported more problems with fatigue than the other sectors for afternoon and night shift. As section 4.5.9 below reports, the roster arrangements vary considerably by sector. For

example, few extractive sites in NSW currently work night or afternoon shift. As a consequence, we have few responses from the extractive sector to the questions on night shift. As a result, we have excluded the score for night shift for extractive.

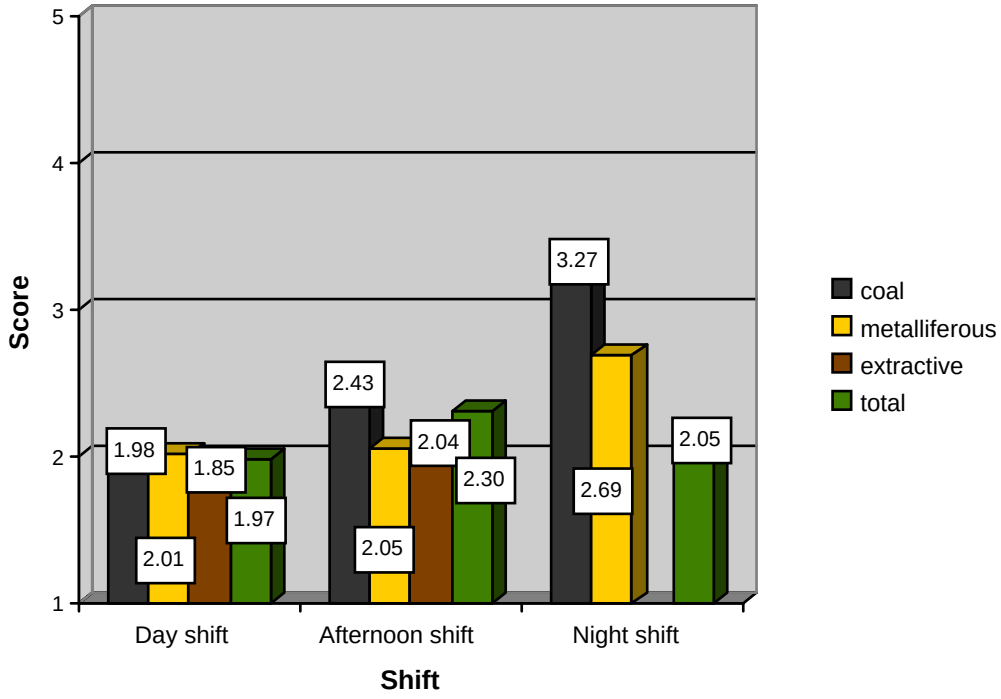

Figure 4.16: Problems with fatigue on different shifts for different sectors

4.5.4 Effect of shift arrangements on work-life balance

There were also statistically significant effects of shift arrangements on responses to work-life balance items on the questionnaire. As for fatigue items, night shift is linked to significantly worse responses than afternoon and day shift. Afternoon shift is significantly worse than day shift. Again, there was not a statistically significant difference between occupations.

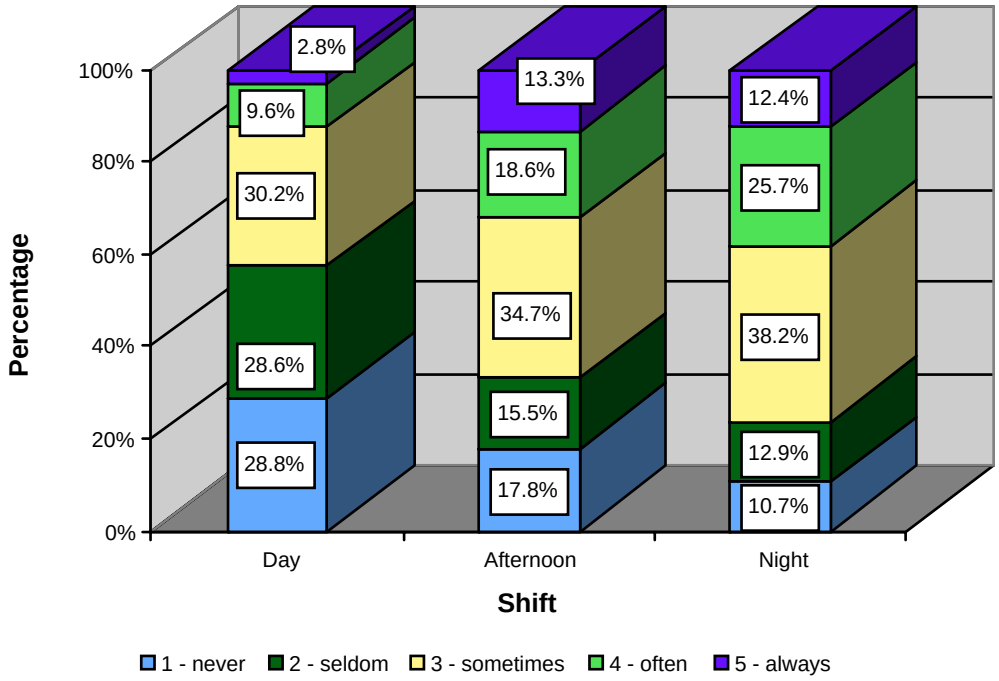

Figure 4.17: Q71 - 73 – How often does working day/afternoon/night shift cause you problems with family life?

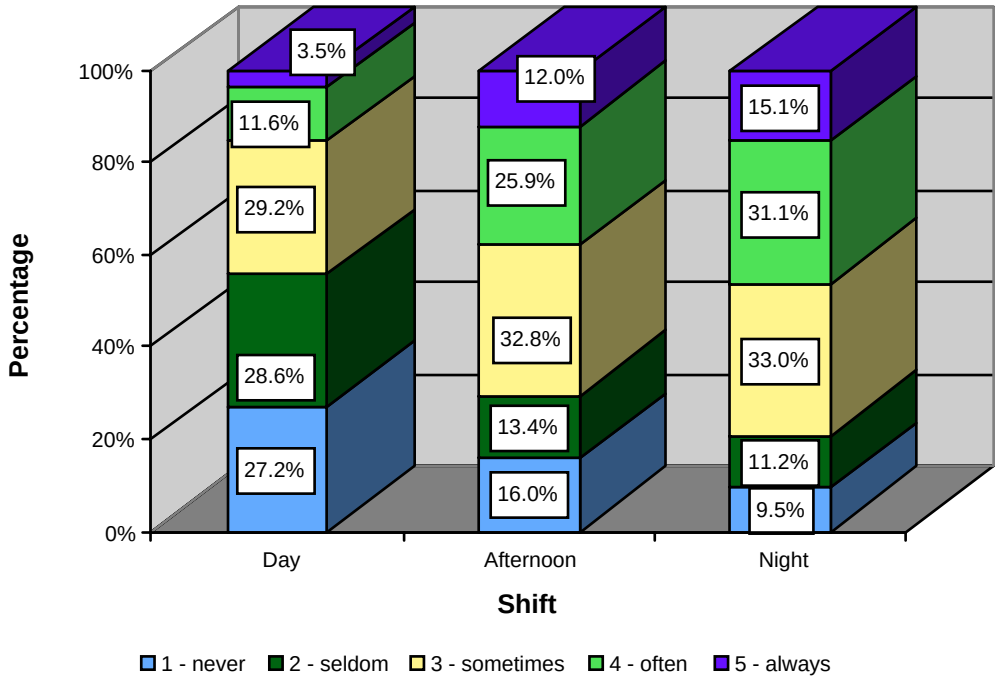

Figure 4.18: Q71 - 73 – How often does working day/afternoon/night shift cause you problems with social life?

It is worth noting that the problems with family and social life were scored substantially worse than the problems with fatigue for all three shifts, across the whole population.

4.5.5 Size and sector affects on work-life balance

The answers to work-life balance questions varied by size, with those working for small enterprises more likely to answer positively to the effect of day shift on family and social life (ie to report less problems) than those working in medium and large enterprises to a statistically significant extent. The differences for afternoon and night shift were not statistically significant.

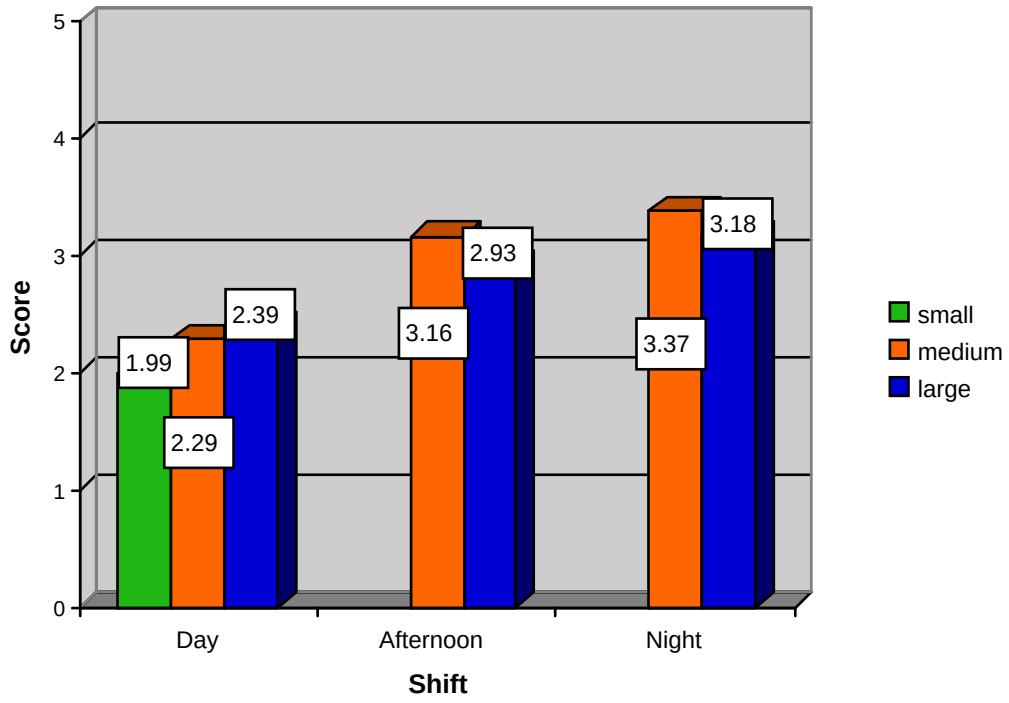

Figure 4.19: Problems with family and social life on different shifts for sites of different sizes

Only the differences for day shift were statistically significant for different size enterprises. With sector, in contrast, the variation was statistically significant for all shifts, but in different directions for different shifts. Coal sites reported more problems with family and social life than the other sectors for afternoon and night shift, but metalliferous sites reported more problems with day shift.

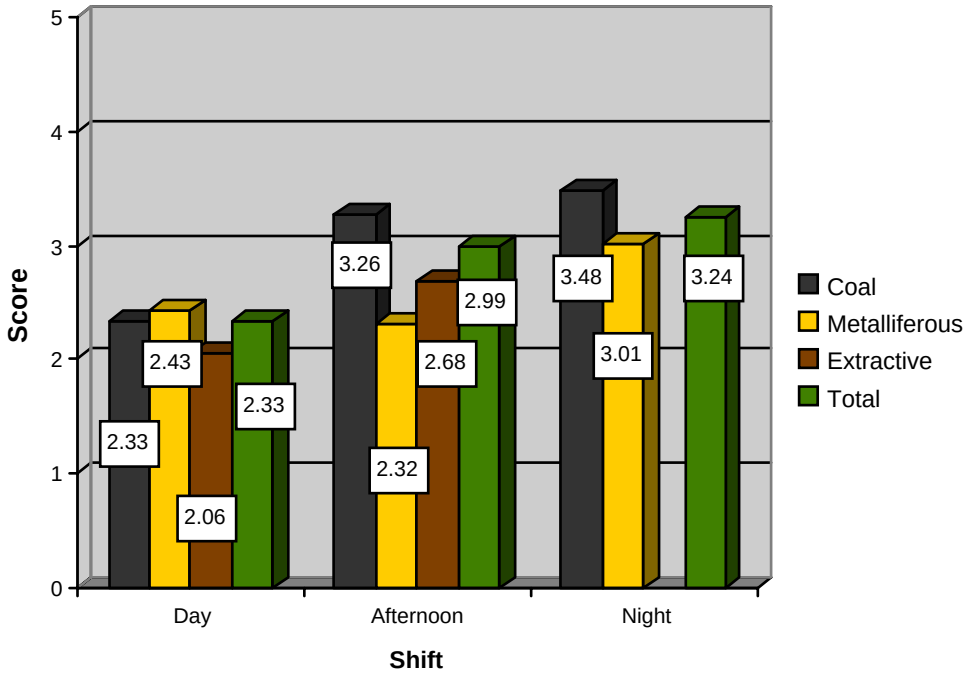

Figure 4.20: Problems with work-life balance on different shifts for different sectors

4.5.6 Work-life problems generally

There were three other questions dealing with work-life balance on the questionnaire, and answers to these questions followed a similar pattern:

Q51 Do you have enough time for social activities?

Q61 Do you have enough time for leisure?

Q63 Do you have enough time for family?

Scores for these three questions were aggregated to provide an overall score for work-life balance, where a lower score represents a more negative response. Overall, the score for this factor was 3.37, with responses for each item as set out in the graph below. Reported hours of work had a negative effect on this factor, as you would expect – the more hours of work, the less time there was for social activities, leisure and family – and this difference was statistically significant. The difference between scores for different sizes was not statistically significant. The difference between sectors was statistically significant, with coal significantly worse than metalliferous and extractive:

	Coal	Metalliferous	Extractive
score for work-life balance	3.20	3.41	3.63

Table 4.8: Sector scores for work-life balance

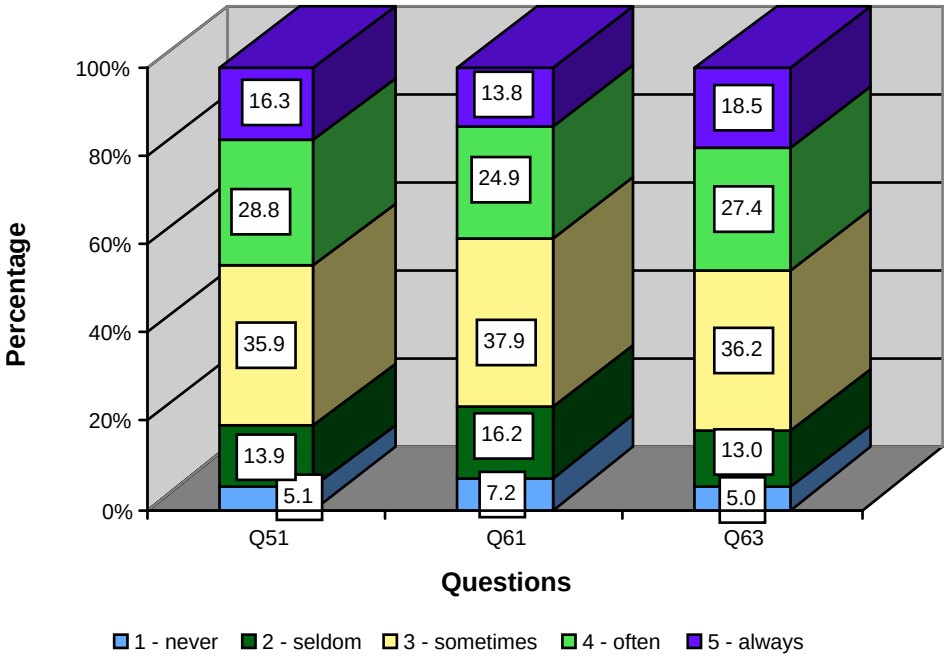

Figure 4.21: Problems with work-life balance (percentage for each rating)

Many interviewees identified work-life balance as a significant problem with their working life, particularly citing effects that shift work has had on their family life:

> Because of the early start time (6am) it means that you are up at 5 to get ready for work. The long hours are part of the reason for the breakdown of my marriage. I only have my children every 2nd weekend for three days (coal, supervisor).
>
> I work night shift and have a 5 month old daughter. I'm lucky to see her for 5 or 6 hours between Sunday and Thursday (coal, employee).
>
> There's no time for your family when you're on shift rosters (metalliferous, employee).
>
> I have a role where I am on call 24/7. This affects my sleep, social life and ability to relax out of work (metalliferous, staff).

Other interviewees and questionnaire comments addressed the consequences for their communities:

> I am involved in town community organisations and sports clubs which are suffering from primarily men unable to commit to weekend activities- many rosters in the valley require 2 out of 4 weekends to be worked (coal, staff).

> The total number of hours has a major influence on social life and exercise. There is little time for general well being (metalliferous, manager)

These problems become even more significant in the light of the consequences for fatigue management. When shift arrangements are such that the opportunity for activities outside of work are limited, shiftworkers have limited opportunities to engage in activities to maintain physical fitness, such as exercise. This, in turn, makes the consequences of the shiftwork even more physically and mentally detrimental, creating a vicious circle.

4.5.7 The combined effect of hours and shiftwork

Interestingly, the reported hours of work do not appear to make a difference to the negative reports on fatigue and work-life balance from afternoon and night shift – longer hours of work do not increase or decrease the reported affects of shift work to a statistically significant extent. In contrast, for those who work day shift, longer hours lead to more negative reports about fatigue and work-life balance issues that arise to a statistically significant extent. This suggests that, for afternoon and nightshift, the work-related problems with fatigue and work-life balance are independent of the hours worked. They arise from the time of day that work is being done, not the number of hours involved.

4.5.8 Roster arrangements

Rosters on the sites we visited varied on the basis of days of the week worked (Monday to Friday or seven days), hours in the day worked (24 hours or days only or days and afternoons), and shift length.

- 50% of sites work only on days or days/afternoon.
  - Average shift length for those sites was 9.5 hours ranging from eight to twelve hours.
- 50% of sites work 24 hours a day.
  - Only one of these was from the extractive sector.
  - Three of these sites operate five days a week (including the extractive site).
  - Of those that operated seven days per week, five reported different shift patterns during the weekdays compared to the weekends. Longer shifts are worked on the weekend (12 hours instead of eight, nine or ten hours).
  - 19 of the sites that work 24 hours a day employ shifts of ten or more hours in length.

- The majority of all sites extend shifts with overtime, some up to 16 hours without a risk assessment or assessment of fitness for duty.

4.5.9 Roster risk rating

With the information gathered from document analysis and the interviews, each site was assigned a risk rating based purely on the roster arrangements. The determination of risk category was based on criteria that are well established to contribute to increased fatigue-related risk in the scientific literature:

- sleep opportunity provided by the length of shift, number of consecutive shifts, use of night work, shift start time, and reported commute time;
- length of time required to be awake (and on shift);
- circadian factors associated with impaired performance during the night hours and difficulties with sleep during the daytime hours;
- break opportunities within a shift (number and length);
- opportunity for recovery sleep between shifts or between consecutive shifts; and
- the reported frequency of overtime and use of on-call work.

Most of these factors impact on either sleep opportunity and therefore ability to recover and prepare or prior wake, ie the time that an individual is required to be awake and alert.

Risk ratings were made based on the number and combination of factors in place at a site. For example, if a working time arrangement involves regular 12-hour shifts including only one break, with a maximum shift length of 16 hours, this would be considered high risk. Similarly, seven consecutive 12-hour night shifts (associated with circadian lows in performance and alertness during the shift *and* reduced sleep quality and quantity during the day) and a commute longer than 30 minutes each way (further reducing the sleep opportunity *and* requiring people to drive a reasonable distance following a night shift) was also categorised as high risk.

On the basis of these factors, 24 rosters were low risk, 16 were medium and 11 were high risk. These ratings are purely on the basis of the risk presented by the rosters provided to us. Section 4.6 examines the extent to which the sites' fatigue management strategies are adequately controlling the risks presented by the rosters in use.

Given the marked difference in roster arrangements between the extractive sector and the other two sectors, it is not surprising that the rosters used at most extractive sector sites are in the low risk category. Metalliferous rosters are distributed across the rankings and most coal rosters are in the medium risk category.

Sector	High risk	Medium risk	Low risk
coal	4	10	3
metalliferous	4	2	3
extractive	3	4	18

Table 4.9: Roster risk and sectors

4.5.10 Roster risk factors

A number of risk factors were evident in the rosters of the sites we visited:

- *Breaks*. The number and length of breaks within shifts is a critical factor in managing the risk of fatigue during work periods. During a 12-hour shift there should be a minimum of two breaks though a number of sites reported a single crib opportunity. Where possible the timing of breaks should be self-selected. Where that is not possible for production reasons individuals should be able to request a break when they feel impaired. Some sites did not provide formal breaks at all and at other sites interviewees reported that they did not have the opportunity to take the breaks that were set in the roster.

- *Starting time*. A number of sites reported shift start times earlier than 0600 for certain groups of employees. Early start times can significantly impact the amount of sleep individuals obtain between work periods, because it is difficult to get to sleep early in the evening to compensate for an early start. This results in shorter sleep and longer prior wake.

- *Seasonal changes***.** Seasonal changes in roster patterns to have longer hours in the summer months may result in increased fatigue-related risk if organisations do not implement supplementary risk management strategies.

- *Commute times.* Some sites reported commute times of up to and exceeding an hour each way. This extends the work day and impacts on sleep opportunity. Where sites were remote from towns this was factored into the roster risk assessments.

The effectiveness with which this risk factor is being addressed is covered in section 4.6.

- *Fly In-Fly Out and Drive In-Drive Out rosters (FIFO/DIDO).* For a number of sites, rosters for contractors differed from permanent employees and were based on FIFO or DIDO. When individuals either fly in or drive in to site for an extended stay a number of issues arise. Firstly, FIFO or DIDO rosters are often associated with an increase in the number of consecutive shifts due in part to the fact that contractors do not want to stay in the area or on the site any longer than necessary. If sleep is not adequate between work periods a sleep debt accrues and with each consecutive shift the risk increases. Further, the accommodation is a major determinant of the quality and quantity of sleep obtained in these circumstances and should also be taken into account in a risk assessment of rosters and fatigue. In this light, the reported use of 'hot-bedding', where two workers working opposite shifts share one bed in such circumstances is concerning. Such an arrangement would make it difficult to set up the sleeping quarters to meet individual needs, which is critical to maximising sleep opportunity.

- *Potential financial incentives.* Of those 11 sites in the high risk category, seven of them pay more than $100 per week as an outcome of their production bonus/safety incentive schemes. Three sites in the medium risk category and only one in the low risk category make payments of this size.

4.5.11 Roster risk ranking and reported problems with shifts

Within each roster risk category, there were significant differences in the reported problems with the effects of different shifts on fatigue and family and social life. For respondents from sites with low risk rosters, the differences were all statistically significant – day was better than afternoon shift, which was better than night shift, although few sites with low risk rosters worked night shift. For those from sites with high risk rosters, night shift was significantly worse than day and afternoon shifts for all factors. For those from sites with medium risk rosters, the differences between all of the shifts were statistically significant for fatigue, with day better than afternoon, which was in turn better than night shift. With respect to social and family life, day shift was significantly better than afternoon and night shift, but the difference between afternoon and night shift was not statistically significant.

There are also statistically significant differences between roster risk rankings and other reported problems with day, afternoon and night shifts, although these differences vary according to the shift. The biggest differences are between the rankings given for family and social life problems on afternoon shift, where, surprisingly, those from sites with high risk rosters gave the more positive scores

(ie less problems) than those from sites with medium risk rosters. This may be a result of the longer breaks between shift cycles that were common with high risk rosters.

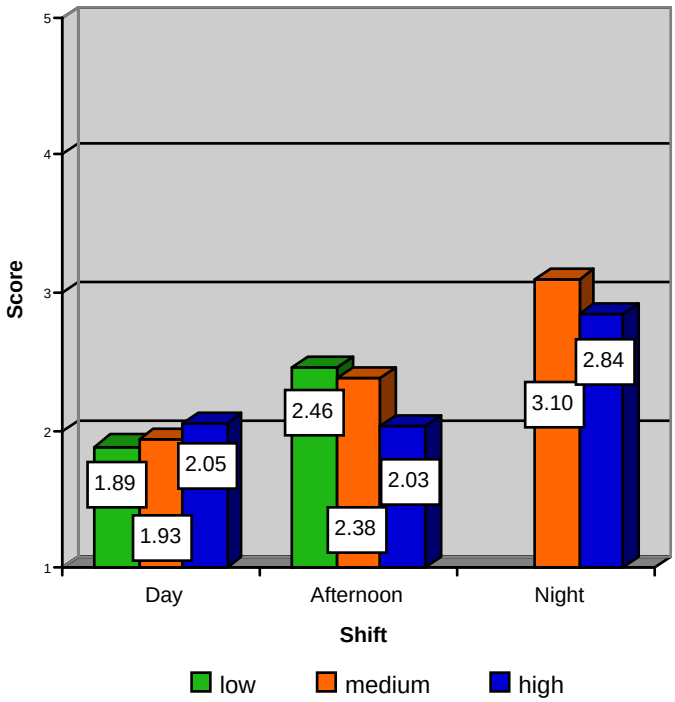

Figure 4.22: Problems with fatigue on different shifts for roster risk ranking[2]

Those respondents from sites with high risk rosters reported more positively about fatigue problems on afternoon and night shifts than those on sites with medium risk rosters to a significant extent, even though the differences were not great. In contrast, those from sites with high risk rosters were more negative about day shift fatigue than those from sites with medium risk to a significant extent. This suggests that sites with high risk rosters have measures in place to address the increased risk of night and afternoon work. It also reinforces that the problems with night and afternoon shifts are primarily because of the time of day that the work is being done.

[2] Too few respondents from sites with low risk rosters responded to the questions on night shift to be included.

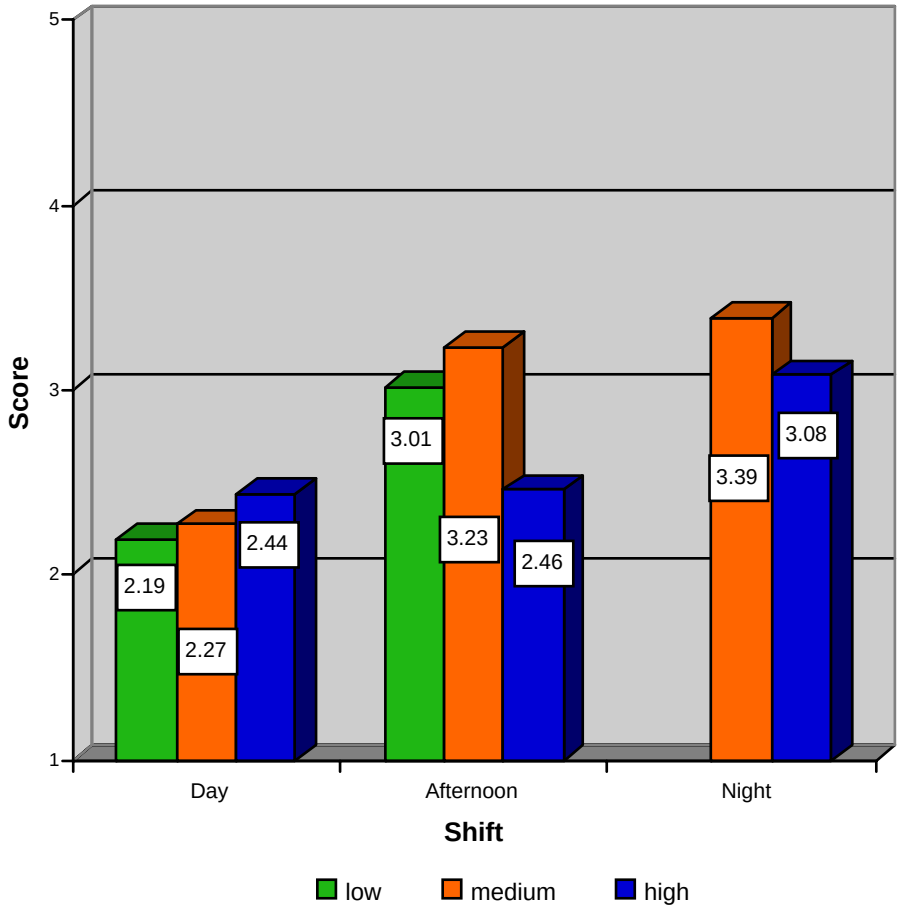

Figure 4.23: Problems with family and social life on different shifts for roster risk ranking[3]

For day shift, those working on sites with high risk rosters reported more negatively on problems with family and social life than those on sites with medium and low risk rosters to a significant extent, even though the differences were not large. The differences for afternoon and night shift were in the opposite direction and were also statistically significant. Again, this suggests that sites with high risk rosters have risk management strategies in place, described in the next section, although it also reinforces that problems with social and family life are more apparent than fatigue problems.

4.5.12 Summary

In summary:

- Roster arrangements on most sites with extended shift rosters (both high and medium risk) are not designed to accommodate circadian rhythms. They do not recognise that sleep opportunities on night shifts need to be longer to allow

[3] Too few respondents from sites with low risk rosters responded to the questions on night shift to be included.

for the poorer quality of rest that is possible in the day nor do very early starts recognise that prior sleep opportunity will necessarily be truncated.

- Some high risk shift rosters do not allow for long enough breaks so that workers can get sufficient rest between shifts. Some high risk shift rosters only allow for a sleep opportunity of six hours for both day and night shift for some categories of workers.

- Many high and medium risk rosters do not provide adequate breaks within shifts. This accounts for nearly half of all of the rosters we identified.

- Some high and medium risk rosters work so many consecutive shifts and/or involve such extensive on-call work for at least some groups of workers that a cumulative sleep debt is likely to be accrued and was reported to us.

Roster arrangements therefore do not effectively control the risks associated with extended hours and shiftwork in all cases.

4.6 How does the industry currently manage fatigue and how do these methods vary?

Given the issues we have identified with roster arrangements, the need for effective risk management of the consequent fatigue risks becomes absolutely critical. All sites we visited could articulate an understanding of fatigue as an OHS issue and most sites reported that they had addressed fatigue in some respects. However, few could provide evidence of a systematic risk management approach and even less had identified hours of work as an OHS issue that requires management in the OHS management system.

4.6.1 Recognition of the causes and problems of fatigue and extended shifts

We found limited evidence that sites had a thorough understanding of the causes of fatigue, with most attitudes to fatigue focussed around non-work causes, rather than the contributions made by working arrangements. A number of sites had instituted health and well being programs as their approach to dealing with the risks of fatigue, even though shift arrangements at these sites limited the opportunity of workers to get adequate exercise or prepare healthy meals.

Some sites that worked extended shifts did not even have fatigue management policies in place at the time of data collection:

> We have a draft fatigue policy ready to go to the OHS committee (coal, OHS manager).

This was also the case on some extractive sites with long hours:

> Fatigue isn't an issue we've tackled yet. Our guys are working up to 55 hours a week, but we don't currently have a site fatigue policy and procedure (extractive, manager)

Some sites had recognised the need to change roster arrangements but found it difficult to do so because the payment arrangements created incentives for particular shifts:

> I've tried to modify the hours, eg instead of starting at 5 am, starting at 7 am but the guys say 'that's going to cost me money' (extractive, manager).

The longer breaks created by rotating extended shifts were also a reason for commitment to existing arrangements. As one tradesperson reported:

> They tried to put us back to eight and a half hour shifts. They forced 12 and a half hour shifts on to us, but no one wants to change now. They enjoy the days off.

At another site, recent changes to shift arrangements to address OHS and other issues were not universally accepted, with a number of respondents citing the resulting shorter breaks as a negative consequence. The barriers created by existing industrial systems were also recognised by participants in the *Future Inquiry* Workshop, who identified that overcoming such industrial barriers to change was critical to addressing the issue.

We found increasing recognition of the fatigue issues for staff. On one coal site, the manager identified that staff worked between 50 and 80 hours each week:

> There is no easy answer to it. We are not setting a good example (coal, manager).

Shift supervisors experienced the dual effects of long hours and shift work. On one site, shift supervisors work 14 hours on site and then have a one hour commute to and from work. This reduces their sleep opportunity well beyond a safe limit, but this had not been addressed by the site which adopts a 'health and wellbeing' approach to fatigue risk management.

On a number of sites, interviewees reported that fatigue also had consequences for productivity:

> The shifts are longer but they don't get that much more work out of us. You don't work at the same rate as you did on the shorter shifts (coal, operator).

Other sites identified that particular shift arrangements can have negative consequences for communication on site, particularly when different groups work on different types of rosters:

> There's a big communication breakdown in maintenance. Supervisors work 5 on 5 off and if you miss them, it's a long time before you get to speak to them (staff).

Such arrangements can also have negative consequences for those who remain on site and need to maintain the functions:

> When the FIFO manager is not on site, I'm doing his job as well (operator).

4.6.2 Risk assessments of fatigue

Few sites provided evidence of systematic risk assessments of fatigue. Most sites that work extended shifts reported that they undertook risk assessments when the hours of individual workers reached particular thresholds. For example, some sites track weekly hours and as individuals approached 60 hours, they would

assess whether the workers should be sent home. On other sites, the hours worked by individuals in a single shift was monitored and, as the hours approached a particular threshold (14 or 16 hours usually), an assessment would be undertaken to determine whether the employee should be sent home. On others, the number of consecutive shifts prompted review – more than five 12 hour shifts in a row required assessment and approval.

However, as reported above, these risk assessments were only undertaken for blue collar employees, not for all on site. The quality of these risk assessments also varied greatly. Mostly, they focussed on self-assessment by the worker approaching the threshold and observation by a nominated supervisor or OHS staff person. Given the potential inaccuracies of self-assessments generally and particularly when substantial financial incentives are associated with a positive self-assessment, risk assessments of this type are unlikely to lead to appropriate risk control decisions.

We found limited evidence of fatigue risk assessments other than when hours of work are reaching their limit, for example, we found few risk assessments of the existing roster arrangements. Some sites had undertaken risk assessments for roster changes in particular circumstances. None of these revealed a particularly effective approach to fatigue risk management, focussing almost entirely on the lower end of the hierarchy of control. For example, if the risk assessment identified that there was only limited opportunity for prior sleep in the new roster, the nominated control measure was to counsel those working the roster on how to improve their sleeping pattern, rather than increasing break length or improving timing to provide a better prior sleep opportunity.

The only site that had undertaken a risk assessment of actual hours of work had changed their roster as a result. Other sites working extended shifts appeared to treat the actual hours of work as a given:

> The guys would prefer not to do 12 and a half hour shifts, but this is industry standard now. It's a bugbear (coal, manager).

4.6.3 Reporting fatigue

Given the individualised approach to fatigue risk management and the consequent reliance on self-reports evident in risk management approaches on sites, opportunities to report fatigue are an even more essential part of risk management. On a number of sites, interviewees said that reporting fatigue was encouraged:

> Yes we do report fatigue. When this happens you are swapped out and given a break (coal, contractor).

> People do put their hand up when they are tired (metalliferous, employee).

However, even where reporting fatigue was identified as something that was encouraged, these reports did not always prompt examination of any work-related causes that might exist:

> Individuals who report fatigue quite a bit are looked at in more detail. They are assessed for sleep apnoea and if necessary moved to a lower risk job (metalliferous, manager).

While it is critical to address individual factors that contribute to fatigue, when this becomes the main response to reports of fatigue, it may result in the reluctance to report fatigue that was reported to us on many sites, despite formal encouragement of reporting. When reporting fatigue has potential financial consequences, it is likely that employees will not raise fatigue as an issue. In particular, we received many reports that raising fatigue as a problem is not always positively received, particularly for those in staff positions:

> I'm really tired. If I said I couldn't keep up the hours, I wouldn't be doing this job for very long (coal, supervisor).

In other cases, reporting fatigue was not seen as positive because there was little action taken in response to fatigue:

> You can call up (if you feel tired) … but they rarely do anything. They might swap you out if there are people around … but people are not here to swap with (metalliferous, operator).

We also received concerning reports of perceptions that those reporting fatigue risked disciplinary action:

> They'll stand up here and say – if you're tired, not fit, go home, don't come in. But then they'll write you up for not coming in (coal, operator).

At this site, a recent fatigue-related incident had resulted in dismissal of the individual for failure to control non-work related risk factors. A number of interviewees at this site reported that this would make them less likely to report fatigue issues:

> One bloke on crew drove into a windrow. He doesn't work here any more. They preach to people, pull the truck over and stop, but it's noted against you in a little book. It's seen as you not managing well (coal, operator).

These barriers to reporting fatigue are often unintentional but, coupled with the evidence of unreliability of self-reported impairment, mean that reliance on self-reported fatigue to identify whether fatigue is a problem on sites is inaccurate and unreliable.

4.6.4 How are individual risk factors considered and addressed?

As described above, the focus of many sites' fatigue risk management is on individual factors.

One site had recognised that the need to allow for personal risk factors required changes to their roster arrangements. Their young workforce had a high proportion of dependent children and 12 hour shifts were causing them significant problems because of fatigue and competing family responsibilities. Through a consultative process, the shift length was reduced from 12 to nine hours and there had been no apparent change in production outputs as a result.

For most sites, though, a focus on individual factors did not mean that the family and social needs of employees were considered in establishing shift arrangements. Such an individual approach generally meant a focus on the non-work related causes of fatigue. For example, most fatigue management strategies that were provided to us consisted almost entirely of identifying the presence of individual risk factors, such as sleep disorders, the use of alcohol and drugs to aid sleep, and the presence of children at home. Clearly, these factors are influential where they are present. However, our data suggest that these factors are not of major effect in the NSW mining industry and that, even when they are present, their effects are not as negative as expected.

A very small number of respondents to our questionnaire (3.5%) identified that they often or always used sleeping pills to help sleep, and interview data suggest that this is particularly common when on nightshift. Those who reported that they took sleeping pills reported more negatively on fatigue and work-life consequences of shift work to a statistically significant extent, but the effect was not great.

More respondents reported that they often or always used alcohol to help them sleep (6.0%) and again this had a negative effect on fatigue and work-life consequences to a statistically significant extent. Alcohol had a more negative impact on day and afternoon shift fatigue problems than sleeping pills, although again, the differences were not great.

Age was identified in some of the material provided by sites as a potential risk factor. Our questionnaire data suggest that age may in fact provide protection from negative fatigue and work/life consequences of working arrangements.

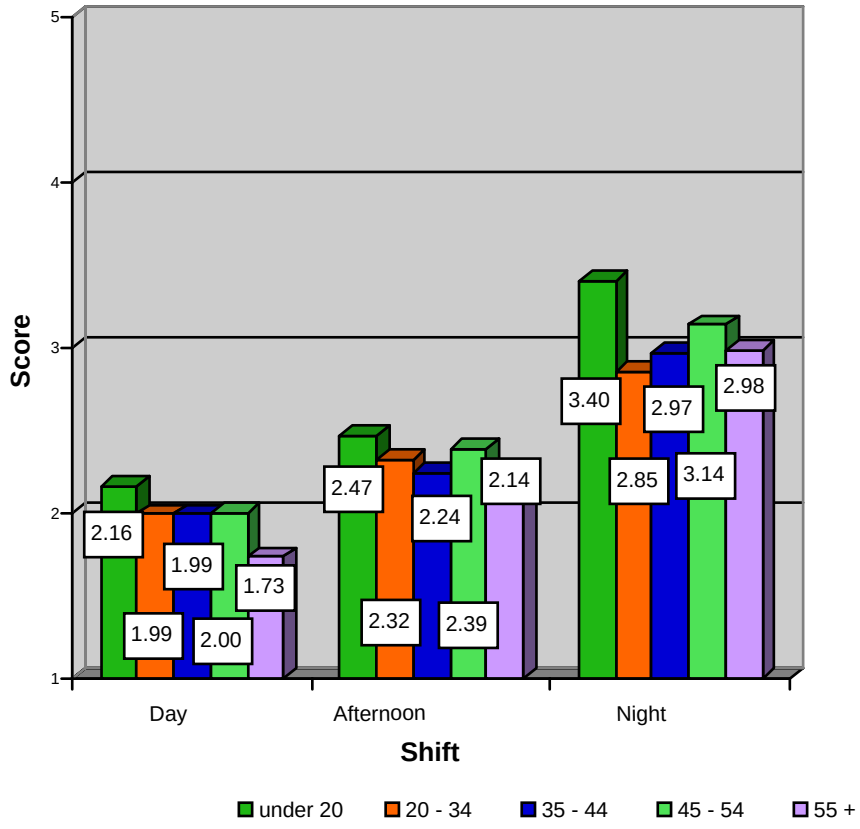

Figure 4.24 Problems with fatigue on different shifts for different age groups

Workers over 55 years old reported more positively about the fatigue problems arising from their shifts than younger age groups in almost every comparison and this difference was statistically significant for day shift fatigue problems.

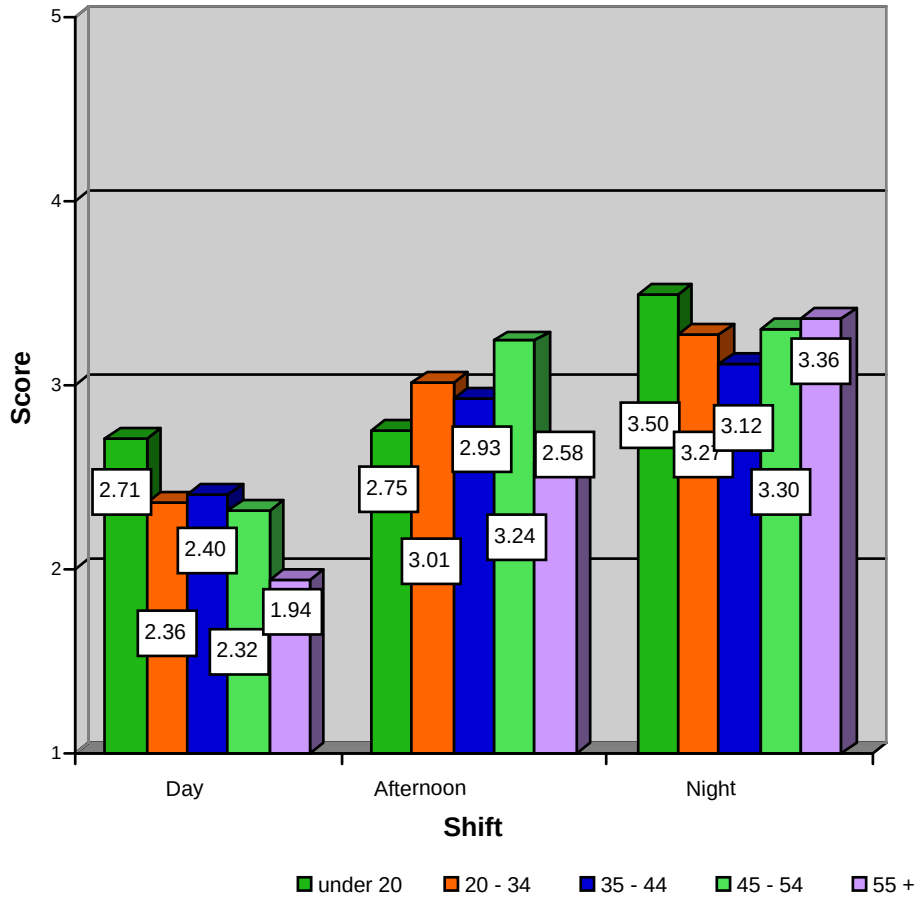

Figure 4.25: Problems with family and social life on different shifts for different age groups

Apart from night shift problems, workers over 55 years old reported more positively about the family and social problems arising from their shifts than younger age groups and this difference was statistically significant for day shift family and social problems.

Many interviewees cited the incidence of second jobs as having significant impact on fatigue and there is no doubt that those who run farms or have other paid employment while working shiftwork are likely to have worse problems with fatigue. However, only 71 respondents reported having more than one paid job and, while they reported more negatively on the fatigue and work-life balance issues than those who reported only one paid job, these differences were not statistically significant. Even if this response underestimates the incidence of second jobs by several orders of magnitude, which is most unlikely, second jobs are unlikely to have any significant effect on fatigue in the industry. This is not to say that the industry should ignore second jobs in fatigue risk management. However, there are many more significant risk factors that could be addressed to more beneficial effect than

expending resources detecting and policing those who work second jobs.

The individual factor that has the expected negative impacts on fatigue is the presence of children.

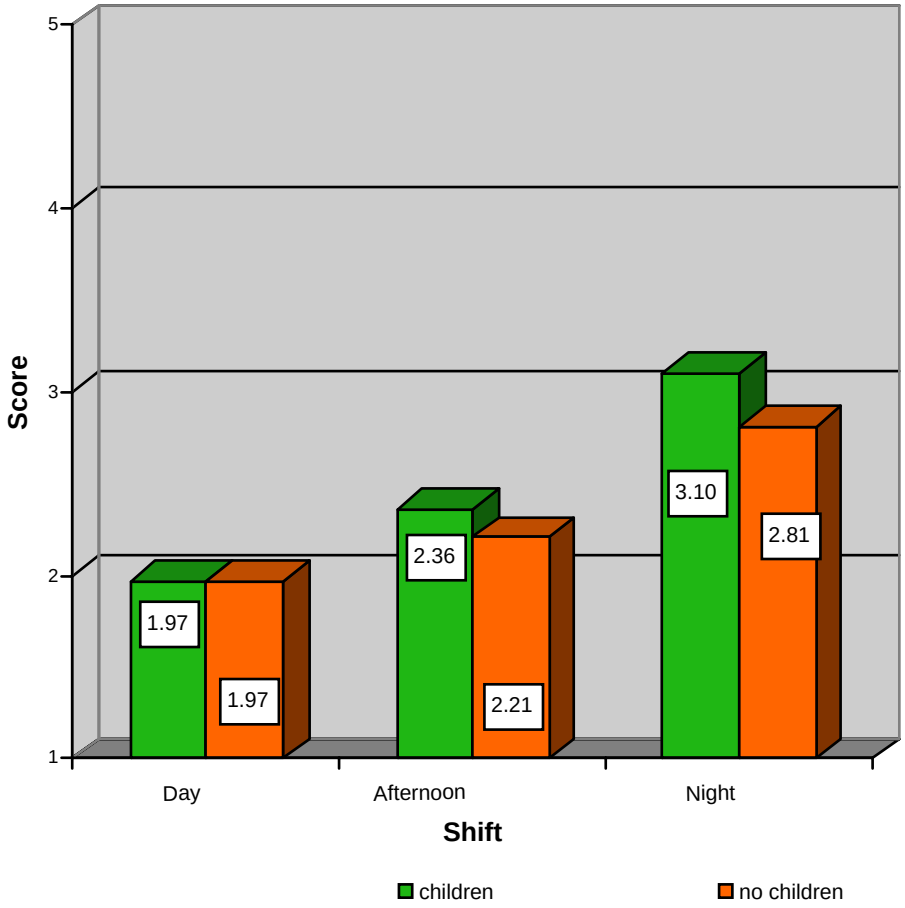

Figure 4.26: Problems with fatigue on different shifts and the presence of children in households

The presence of children makes no identifiable difference to fatigue for day shift, but makes a significant, although small, difference to fatigue problems for night shift.

The effect of children on work/life balance is consistently significantly worse across the shifts.

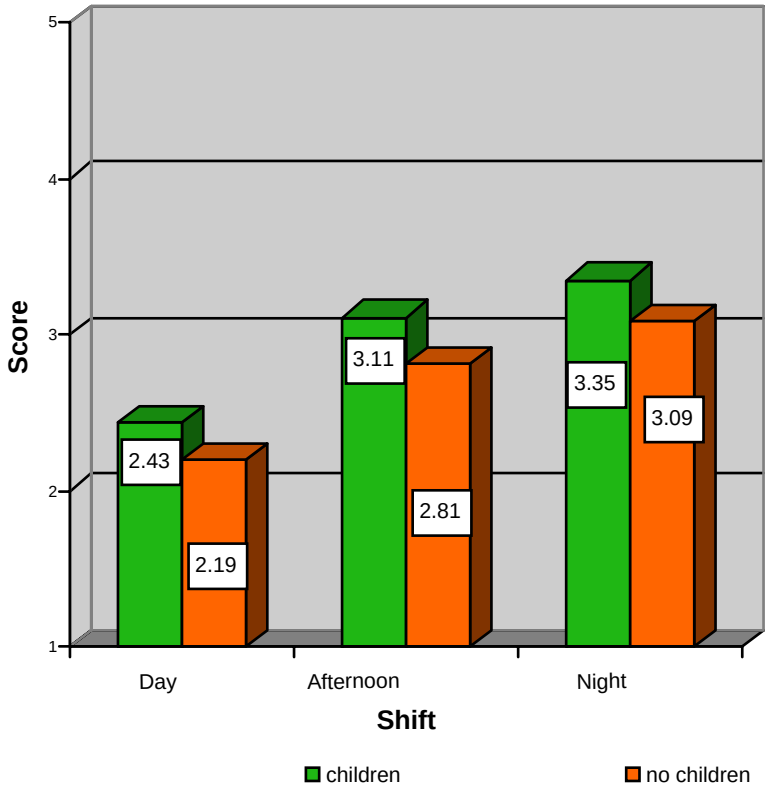

Figure 4.27: Problems with family and social life on different shifts and the presence of children in households

While the presence of children results in more negative responses to fatigue and work/life balance questions, the impact of intervention by the industry on this factor is unlikely to be significant. Instead of seeking to change the ways in which family life is structured, participants in the *Future Inquiry* Workshop advocated that the NSW mining industry should take steps to provide better work-life balance, allowing for the family needs of workers.

Given privacy considerations, it is not surprising that we received few reports of sleeping disorders. However, many sites were focussing their fatigue risk management strategy on health and well-being programs in an effort to reduce the incidence of such problems through improved general fitness and reduced bodyweight. There is no doubt that such programs have a role in a well-developed preventive strategy and a number of participants in these programs reported very positively about their outcomes. However, there is little evidence in the epidemiological literature of the long-term efficacy of such programs, particularly where they are not part of a broader preventive strategy that also addresses work-related exposures (see La Montagne et al, 2004). The failure of the programs we observed to recognise that the risk factors they address such as smoking and Body Mass Index are not independent

of work (Radi et al 2007) is also likely to limit their value in reducing the risks associated with hours of work and extended shifts.

In summary, the industry's focus on individual risk factors without also addressing work related causes of fatigue such as roster and work design is not likely to have significant impact on fatigue outcomes. We were not provided with any evidence to the contrary.

4.6.5 How are issues associated with long commute times managed?

While the NSW mining industry is usually located near residential centres (unlike WA and Queensland), commuting times are nonetheless a significant issue for many sites, extending shift length considerably and therefore limiting sleep opportunities:

> We have people who travel to Cessnock so, on top of 12 hour shifts, with shower and travel they can be away from home for 14.5 hours (coal, manager).

> Some have a 3.5 hour drive time. We do not address this (metalliferous, manager).

One metalliferous employee identified that the consequences of commuting increased their use of sleeping tablets:

> I have 14 hour days with travelling here and back. I sleep terribly - I have to take sleeping tablets (metalliferous, employee).

The issue was not as significant in the extractive sector, although one quarry manager did report that three of the site's employees lived more than an hour from the site. Because the site operated day shift only with shift length varying between nine and ten hours, this was not seen as a major issue, although the quarry manager did report that he considered commuting time when allocating overtime.

Many sites in the coal and metalliferous sectors had instituted specific strategies to address this. For example, a number had included a requirement that employees do not live more than 100 km away from the site or need to travel more than an hour to and from work as part of employment conditions. However, determining the limits for this requirement was seen as somewhat arbitrary:

> If we need to draw a line around the mine to limit travel, where do we place that line? Do we consider traffic conditions (coal, OHS manager)?

Sites with these requirements also identified difficulties with enforcing such conditions. How can the employer require

employees to move from their home or even know if this has been done? To address this problem, one mine manager reported that he preferred to:

> Recruit locally…. Having your grandmother in the local cemetery is a good reference. This reduces commute time (coal, manager).

A common control measure that some sites had implemented was car pooling. For example, one site requires all shift supervisors to car pool, because of their extended shift length. Another site had allocated people who lived in a particular location to the same shift panel to facilitate car pooling.

Commuting, whatever the length, can represent a particular risk for fatigued drivers. A number of interviewees reported that they had fallen asleep while commuting. These clear signs of fatigue had not been reported because of concerns about the personal consequences of making such reports. These incidents are also viewed as an unavoidable consequence of extended shift arrangements, rather than a signal that the risks of the arrangements are not adequately controlled.

4.6.6 How is fatigue considered in incident investigation?

On some sites, incident investigations routinely examine the impact of fatigue. For example, on some sites, fatigue is identified as a factor that must be investigated in incident investigation procedures. Time of day and hours into shift are also recorded by a number of incident reporting forms. However, in general, fatigue is rarely investigated thoroughly as a factor in incidents:

> We don't keep track of fatigue related incidents (coal, OHS manager).

Despite this, many sites that work extended shifts reported that fatigue is a significant factor in incidents:

> Eight out of ten incidents underground are fatigue related (metalliferous, supervisor).

> Every incident we've had in the last 18 months would have a fatigue component – but they don't consider it. There was a high potential incident and there was nothing about fatigue in the investigation– it could have been a catastrophic event (coal, operator).

However, as this last quotation suggests, the contribution that fatigue may have made to incidents does not appear to be well-recognised across sites. On some sites, employees identified incidents that they asserted were associated with fatigue, while managers and OHS managers at these sites reported that there had not been any fatigue-related incidents:

> There has been an accident recently due to micro-sleeps (coal, operator).
>
> We have no incidents due to fatigue (coal, OHS manager).

Where fatigue has been identified as a factor in incidents, the response was reported to focus on the individual causes, rather than work-related causes:

> We have looked at our incidents and estimate that 20 – 30% are related to fatigue. So we went back and retrained people, gave pamphlets for family members about the need for quality sleep, trained supervisors to recognise fatigue (metalliferous, OHS manager).

Another example was the response to a journey accident after night shift by requiring staff to car pool. At another site, as reported above, a driver was dismissed for failing to present himself fit for duty at the beginning of their shift. Neither site provided evidence that the potential work-related factors that may have impacted on these incidents were either investigated or addressed.

Given these types of responses and the issues associated with reporting fatigue identified above, it is not surprising that not all incidents that result from fatigue are reported:

> There are quite a lot of fatigue-related incidents. They only get reported if you can't get away with it, for example, you damage something or someone sees you (metalliferous, operator).
>
> We've had lots of incidents, a truck ran off the road, lots of incidents falling asleep. Lots of people fall asleep and don't report it. You see the marks, so you know it's happened. The consequences depend upon who notices. If there's damage to the vehicle you have to report it, but otherwise people are too scared to speak up about it (coal, operator).

The incident reporting and investigation undertaken within the NSW mining industry is therefore not robust or thorough enough to adequately collect, analyse or use information that is critical to effective control of the risks of fatigue and hours of work. In most cases, the basis for effective incident investigation is in place, but the individualised focus of fatigue risk management undermines the capacity for the existing system to deliver the necessary outcomes.

4.6.7 How effectively do the current approaches to fatigue risk management control the causes of fatigue?

An effective approach to fatigue risk management would adopt the hierarchy of control, providing a range of risk control strategies addressing the range of risk sources. A "defences in depth" model (Dawson and McCulloch, 2005) requires strategies that act on work-related and nonwork-related causes of fatigue.

In contrast to such a comprehensive approach, most approaches to fatigue risk management we found in the NSW mining industry act only at the stage where fatigue is likely to be expressed – reacting when fatigue is likely or evident. We found few examples of approaches that aimed to prevent fatigue – to stop it happening in the first place. Those that do aim to prevent fatigue focus on the nonwork-related causes associated with individuals. As described above, such an approach is unlikely to succeed.

A limited number of sites demonstrated more effective risk control strategies that addressed the work-related causes of fatigue. One extractive site reported that they had increased the staffing levels to reduce the hours of work required. This same site articulated a number of work design strategies they had implemented to reduce the risk of fatigue, eg planning shutdowns for Mondays, after crews had the weekend off. A coal site reported that they had arranged their shifts to maximise sleep opportunity in dark hours.

Only one site was able to provide evidence of an evaluation of the impacts of shift arrangements, and this resulted in a reduction of hours and significant changes to rosters, as reported above. On the whole, we found no documentary evidence of any evaluations of the impacts of current shift arrangements on most sites, particularly for supervisor and technical staff hours. Some risk assessments were provided, but they did not provide evidence of leading to higher order control measures. For example, as described above, one such risk assessment identified inadequate prior sleep opportunity arising from a roster arrangement, but did not recommend changing the roster to increase or improve the prior sleep opportunity.

Such reports reinforce that the negative consequences of shift work may not be adequately addressed by current risk management strategies.

4.6.8 How effectively do the current approaches to fatigue risk management address the symptoms of fatigue?

As well as controlling the causes of fatigue, effective risk management provides opportunities to address fatigue when it occurs. Section 4.6.4 above addresses the effectiveness with which fatigue reporting is undertaken. It is also critical that workers have the opportunity to take breaks at times when they are experiencing fatigue and to nap when necessary, particularly on nightshift. On some sites, napping is actively encouraged:

> Shift bosses allow snoozing during shift. 15 – 20 minutes makes a difference (metalliferous, operator).

> If they are tired, they can go to the crib room for a rest. We don't want them to sleep in the cab because they might wake and start the vehicle by mistake (coal, manager).

However, a number of managers reported that they actively discouraged napping:

> Napping has the ability to be abused – 'I don't need to get a good sleep at home because I can sleep at work' (coal, OHS manager).

> Some shift bosses regard napping as rorting the system (metalliferous, operator).

Generally, however, responses to the symptoms of fatigue take an individualised approach, seeking to provide those affected by fatigue with advice on how to more effectively deal with individual factors such as sleeping disorders. While these can be critical, few addressed the work-related causes of fatigue, which are far more influential on symptoms, as the data reported above demonstrate. Equally, focussing on individuals was not always part of a systematic approach that recognised that individuals will always have diverse responses to fatigue and thus that sites need to effectively respond to these needs.

Some sites reported that they were seeking an 'objective' way to measure or test for fatigue so that a response could be prompted. This approach is in contrast to standard approaches to OHS risks that seek to control exposures so that the need to treat the consequences of exposure is limited. Indeed, some of the comments by interviewees about their desire for a 'fatigue test' suggest that the possible negative consequences of reliance on fatigue testing, reported earlier in this chapter, may well be realised should such approaches be used. For example, one manager reported that he was seeking a tool to monitor alertness so that the site did not have to monitor hours in order to address fatigue. Given the existing disincentives to self-reporting that we also

found, reliance on testing devices may well increase the likelihood that fatigue goes unrecognised until serious incidents result.

Seeking to identify 'susceptible individuals', as some sites do, is also likely to create disincentives to address fatigue symptoms. One OHS manager asserted that:

> If there are people who have circadian rhythms that don't allow them to work safely, let me know and we can sack them – we need people who can work shifts.

This site is most unlikely to have a clear picture of its fatigue risks.

4.7 Conclusions and recommendations

The NSW mining industry recognises the importance of effective control of OHS risks arising from fatigue and hours of work. Despite this, the most common approach to fatigue risk management in the NSW mining industry is to make risk control the responsibility of individual workers with limited interventions to address the underlying causes of fatigue in long working hours and extended shifts. The importance of addressing the inter-related personal and organisational factors was not widely recognised. This is of particular concern, given the long working hours and high risk rosters identified in our research.

4.7.1 Access to guidance

The failure to apply a comprehensive preventive approach to risk management of fatigue is not because there is no suitable guidance. The Minerals Council of Australia provides guidance on this issue prepared by a member of the *Digging Deeper* research team, *Work Design, Fatigue and Sleep* (Baker and Ferguson, 2004). The NSW Minerals Council has recently updated their comprehensive guide that provides a detailed risk assessment pro forma focussing on work-related causes of fatigue (originally prepared by the project leader of the *Digging Deeper* project). We did not observe the widespread use of either guides across the industry. The failure of the industry to adopt this guidance perhaps reflects the common view of the industry that work-related causes of fatigue cannot be addressed and that individually focussed interventions should be adopted. The failure of such an approach to adequately control the risks of fatigue is apparent from our research.

4.7.2 Role of the regulator

The industry has had significant opportunity to voluntarily adopt effective, preventive approaches to fatigue risk management and a number of sites in our sample demonstrated both the benefits and the barriers faced by such approaches. However, the limited adoption of such an approach suggests that voluntarism in this area has limitations. A number of interviewees advocated that DPI should play a more interventionist role in this area:

> DPI should come out with a policy. If it is in the Regs, it has to be done. Guidelines are not followed (coal, operator).

> DPI needs to play a much stronger role in setting down standards, eg what are acceptable rosters (metalliferous, OHS manager)?

> I have no problem with DPI having input into shift length and ensuring that fatigue management systems are in

place and being adhered to. Also maybe more of a focus on fatigue when it comes to incidents (coal, manager).

Recommendation 4

DPI should develop an intervention strategy on fatigue management and hours of work. The 'how to' guide provided as Attachment 11 in Volume 2 of this report that is based on guidance promulgated by the NSW Minerals Council should be used as the standard for this strategy.

4.7.3 Monitoring of working hours

Given the long working hours identified in the NSW industry, more rigorous and interventionist monitoring of hours would be useful. Given that the information is collected at almost all sites, as both the census and in-depth data collection show, this would not require the introduction of new systems. Rather, existing systems should be extended to staff positions and the full functionality of existing systems should be used. This does not necessarily mean that staff should clock on and clock off, but sites should be tracking and, where necessary, controlling the hours worked by all workers on site.

Recommendation 5

Prescriptive hours of service rules should not be imposed, but sites should use risk management approaches to monitor and address the excessive hours of work at some sites and for some occupations. This requires support from all stakeholders and intervention by the regulator where necessary.

4.7.4 Smart card systems

On the whole, a smart card system has strong support, but we are concerned that this is because sites may see this as an easy solution, and not undertake the risk management action needed to effectively manage hours of work and fatigue. A smart card system would not address the problems we observed with monitoring and assessing hours of work in the NSW mining industry. This is not to say that particular regions or groups of businesses should not use such technology if they identify a need, but it can only ever be one part of a comprehensive risk control strategy.

Recommendation 6

Sites should actively monitor and address excessive hours of work for all who work on sites. In particular, contracting companies should monitor and control working hours of their employees who work across and travel to a variety of sites. DPI should not actively fund or promote a smart card system, but encourage employers to use appropriate techniques to monitor hours of work.

For existing smart card systems to have maximum functionality, the systems established by different providers must be able to interconnect to read records of hours worked stored on cards provided by other companies.

Recommendation 7

Existing providers of smart card systems should provide systems that can interconnect so that the hours of work stored on the cards provided by different systems can be downloaded by all readers.

4.7.5 Incident reporting and investigation

A key underpinning of effective risk management of fatigue and hours of work is accurate and reliable information about fatigue-related incidents. This is unlikely to be obtained if an outcome of such reports is addressing individual and non-work causes of fatigue with possible negative consequences (eg reducing access to higher paying shifts, counselling about behaviour outside of work). This is not to say that individuals do not have responsibility, but as long as there is concern that individuals will experience negative consequences as a result of reporting fatigue, it will be impossible for the industry to satisfactorily address fatigue. Existing "no blame" approaches to incident reporting and investigation must extend to fatigue as well.

Recommendation 8

MSAC should develop a minimum data set identifying fatigue-related information to be collected in incident investigations and provide it to the industry. This should also be incorporated in existing industry data collection protocols.

Recommendation 9

The industry should adopt a 'no blame' approach to reporting fatigue, responding to reports by addressing work-related causes not by penalising tired workers.

4.7.6 Labour shortage

Participants in the *Future Inquiry* Workshop identified the shortage of skilled labour confronting the industry as one of the underlying drivers of long hours. We have found that current working arrangements are in turn one of the reasons for difficulty recruiting and retaining quality workers. It is a vicious circle: because there are not enough people to fill particular positions, those currently doing these jobs work longer and harder. As a result, they are less likely to stay or recommend the industry to their professional colleagues. Dealing with this issue is a critical underpinning for achieving more effective risk control.

Recommendation 10

MSAC should develop a strategy to address the skills shortage faced by the industry, working with the industry's training advisory bodies and building on the concept developed at the *Future Inquiry* Workshop.

4.7.7 It's about work!

In summary, the industry's approach to fatigue risk management must recognise that working long hours and at night will necessarily result in fatigue. A risk management approach that seeks to shift responsibility for this to individuals is bound to fail and may result in serious negative consequences. More effective approaches to fatigue management that recognise the responsibilities of employers, as well as employees, have benefits broader than just OHS. The potential of more family-friendly working arrangements to aid the recruitment and retention of skilled workers at a time of serious labour shortages was well-recognised by participants at the *Future Inquiry* Workshop.

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Chapter 5
OHS management systems and consultation

5.1 Introduction

The *Future Inquiry* Workshop on the topic of OHS management systems (OHSMS) and consultation affirmed that stakeholders in the mining industry share the common goal of achieving healthy and safe mines and quarries through a systematic, consultative approach to managing OHS. They recognise the challenge of establishing formal, documented systems that assist organisations to provide a healthy and safe workplace without resulting in a burdensome bureaucracy that is perceived to exist only to satisfy the needs of the regulator.

The evidence is clear: OHSMS alone do not make a safe and healthy workplace. Stated commitment to OHS outcomes is also insufficient, although both commitment and a systematic approach are clearly necessary. The reported disconnect between stated corporate goals and how these goals are (or are not) translated into action at site level shows that these preconditions do not always co-exist.

A key issue is the manner in which corporate goals are operationalised at sites. The research evidence and experience demonstrate that *how* OHS strategies are developed and implemented is at least as important as *what* they involve. However, existing studies do not reveal how the cultural aspects of OHS can interact with OHSMS to create or remove the disconnect identified by the Wran Mine Safety Review.

This chapter details the approaches to OHSMS and consultation evident in the NSW mining industry and the extent to which these demonstrate a disconnect between management intentions and site outcomes. Our research has identified that OHS management and consultation in the industry exhibit many positive features. Through comparing proactive, transitional and reactive sites, we have identified a number of characteristics or organisational factors that are closely related to the effectiveness of organisational strategies for OHS management and the extent of a disconnect between intentions and site practices.

The chapter sets out:

- the findings of our literature review;
- the current circumstances in the NSW mining industry in relation to OHSMS and consultation;
- the outcomes of the *Future Inquiry* Workshop that considered OHSMS and consultation; and
- our conclusions and recommendations on this issue.

5.2 What do we know about what works?

The Wran Safety Review identified that there may be a disconnect between some company OHS management systems (OHSMS) and the translation and implementation of these systems at an operational level. It might reasonably be expected that such a disconnect could occur when management is physically separated from the workforce; when there are many layers of middle management; where the industrial relations is strained and where there is a concerted push for production. These are all characteristics of parts of the NSW mining industry. But the industry is also characterised by clearly stated company objectives for OHS. Why is it that worthy corporate goals such as 'zero harm' or 'health and safety first, production second' go astray between the offices of the board and senior management and the workplace?

There are a number of reasons evident in the literature that explain why this so-called disconnect might exist. They relate to the goals that are set in organisations, the nature and use of OHS management systems themselves, the audit processes used to ensure that the systems operate effectively, regulatory requirements for OHSMS, and the less tangible but critical aspects of organisational culture, and in particular consultation and worker participation.

5.2.1 What is the goal for OHS?

Companies may have a number of goals connected with OHS: to keep the LTIFR as low as possible, to minimise the cost of workers' compensation, to reduce exposure to the inspectorate and prosecutorial action, or to prevent industrial action. These are all legitimate goals and at first glance they may look as though they are all headed to the same high point – that of making the workplace healthy and safe. This is the ultimate goal because when a healthy and safe workplace is achieved, then these subordinate goals are also achieved. Unfortunately, the reverse is not true. The LTIFR can be reduced by legitimate means, but it can also be reduced by subtle and not so subtle means, including the use of safety incentives and production bonuses that encourage non-reporting, as discussed in Chapter 3. However, the workplace will not be any safer or healthier, indeed the contrary is likely to be true. The same goes for the other subordinate goals; there are ways to achieve them that may well subvert the main goal and not necessarily improve workplace health and safety.

In conducting this research we found that the desire to make workplaces healthy and safe was the prevailing attitude. People at all levels in the workplace sincerely wanted to make sure that they

contributed to the goal that they and others in their workplace were healthy and safe at work. We found it curious that, despite this sincere commitment, the systems that are established and the actions that occur at workplaces do not always support the goal. In fact, they may sometimes be in direct conflict with it.

5.2.2 OHSMS

Many large organisations establish complex and sophisticated systems in an effort to ensure that corporate OHS goals are realised. Typically such formal systems will be computer-based and include:

- policies, which state goals and objectives, intentions and principles, who is responsible for what: the rules that everyone is expected to abide by;
- plans, which state how the policies will be achieved;
- procedures, which put the policies into effect, including safe work methods statements (SWMS or SOPs), job safety analyses (JSAs), risk assessments, incident investigation procedures and so on;
- the organisational structure in relation to OHS; and
- the resources for developing and maintaining the system and managing OHS (NSW Minerals Council undated:4).

These elements are all aimed at systematically managing the OHS risks that the business faces.

Smaller organisations that take on such systems are often overwhelmed by their complexity. These systems can be expensive to establish and maintain and are generally subject to internal and external audit. However, the research literature that examines the effectiveness of OHSMS suggests that formal systems alone cannot achieve substantial improvements in corporate OHS performance. On the basis of comparative case study research, Gallagher concluded that, 'a conclusive link between developed health and safety management systems and a sustained reduction in injury and ill-health levels has not been established' (Gallagher 1997: 161; Gallagher, et al. 2001). Hale and Hovden claim on the basis of their systematic literature review that 'this limited structural approach [formal OHSMS] misses three-quarters of the factors that have proven links to performance' (Hale and Hovden 1998: 156).

More recently, Robson et al's systematic literature review concluded that there was still insufficient evidence in the peer-reviewed literature to conclude that OHSMS were either effective or ineffective (Robson, et al, 2007). As Bluff suggests,

> Despite the increasing emphasis on OHSM [systems] and their application [in larger organisations, in industrialised countries], the

> evidence on the impact of this strategy on OHS performance is limited. (Bluff 2003: 43).

Environmental management systems (EMS) are regarded by some as similar to OHSMS because "in encouraging organisational change…[they] are thought to have a direct impact on environmental performance" (Hertin, et al. 2004: 4), in the same manner in which OHSMS are thought to influence OHS performance. The European experience, however, derived from a very large study of EMS and firms' environmental performance, suggests that EMS have limited capacity to improve environmental outcomes (Tyteca, et al. 2002) and they are a "relatively weak driver of environmental performance" (Hertin et al 2004: 15). In this later analysis, Hertin et al further conclude that "EMS may in fact be a necessary, rather than a sufficient condition for successful efforts to reduce resource use and emissions" (15). Moomaw (2001: 137), in his analysis of North American studies, has reached similar conclusions.

As with the case of EMS, the indications from the literature are that OHSMS on their own are not sufficient to realise corporate goals. This is not a criticism of the value of the content of OHSMS standards *per se* but challenges the belief, held by many in organisations, that an OHSMS alone can provide all the necessary guidance to make any given workplace healthy and safe.

Viewing formal policies and procedures as an end in themselves is likely to result in negative outcomes because the basic reason for OHS management – creating a healthy and safe workplace – is displaced by the goal of having good paperwork and achieving a good score, or by putting emphasis on the subordinate, outcome-based goals discussed above. Formal OHSMS may lead to isolation of OHS from the real priorities of management with respect to OHS and a 'blame the victim' approach, instead of creating an environment for effective, integrated and systematic OHS management (Berger 1999; Frick and Wren 2000; Nichols and Tucker 2000; Nielsen 2000). From this perspective, the disconnect might result from the application of the wrong type of OHSMS to achieve the desired goal, or using the OHSMS to reach a subordinate, not the ultimate goal. However, this does not explain why different sites within the same company or different companies achieve quite different degrees of success when they apply similar or even the same OHSMS.

All this is not to suggest that in any specific case the implementation of a formal OHSMS might not be useful. Rather, the evidence suggests that the need for and effectiveness of a formal approach will depend upon the circumstances of the enterprise and the method used to implement the system. Indeed, as previous research undertaken by members of the *Digging*

Deeper team has found (Blewett and Shaw 2001), the mere existence of formal policies and procedures is not necessary to creating enterprises with a proactive approach to OHS. On the other hand, voluntary informal systems may not work either, but because there is nothing formal to review or audit, it may be impossible to gauge their impact (Frick 2007). Thus, it seems likely that OHSMS are a necessary support to effective OHS management, but are not the only tool that needs to be applied. Hale and Hovden (1998) conjecture that OHSMS might be "critical at the lower end of the performance scale but that they cease to discriminate once a company is at least mediocre"(Hale and Hovden, 1998: 154).

5.2.3 OHS Auditing

OHSMS are largely based on quality management systems (for example, AS/NZS 4801 is a variant of ISO 9000 and 14000) and the rise in the importance of quality management in industry has been a stimulus to the growth of formal OHSMS that are subjected to internal and external audits. Some research questions the value of internal and external audits, identifying the limits of audit methodology to assess the effectiveness of management systems (Power 1997). Power (1998: 24-6) neatly summarises the societal demand for audits in the administration of public health and these observations may also apply to OHS: external audits are intended to provide assurance of the effectiveness of self-regulated systems because they appear to assert control over those being audited and they are regarded as a means of ensuring probity and effectiveness of systems.

OHS auditing, like other forms of business auditing, can only occur because a structured management system exists, and auditing examines these structures, not the other organisational factors that influence OHS practice. External OHS audits appear to provide evidence, indeed may certify, that review of all relevant factors has occurred and may thereby give false assurance to stakeholders and observers.

Auditing is, in fact, just one form of business feedback; a market-based system in which the provider of the audit (whether internal or external) must be prepared to identify problems and the business manager (the customer) must be prepared to hear bad news. Audits that provide only good news have been implicated in major industrial disasters. Indeed, Hopkins, in his examination of the Longford disaster, points out the lessons that could have been learned there from Piper Alpha,

> Another lesson from Piper Alpha was that high quality auditing should be conveying at least some bad news to the top of the organisation. "Continuous good news — you worry", was the

> message which had been broadcast to the industry (Hopkins 2000: 143).

Audits not only appear to show organisations how well they are doing, but they may provide a false sense of security and engender a belief that auditing itself has the power to ensure that workplaces are healthy and safe. But as Parker (2003) argues, the technical efficacy of auditing is largely unproven and assumes the ability to reliably measure the performance of the compliance system. This reliability may well be illusory. Nonetheless, the OHS audit has become important as a means of determining and ensuring legislative compliance in the context of a regulatory model that promotes voluntary self-observation and control.

External auditing can be an important complement to internal processes but can never fully replace a self-critical internal check by management of how the OHSMS operates. Other forms of feedback are available to management and can be used to triangulate audit reports. In particular, feedback from employees through consultative and participative processes provides an essential 'reality check' when one is needed. As such it is an essential part of internal auditing or review.

5.2.4 Consultation

Engaging workers in developing the systems to manage OHS, to help identify, assess and control hazards, and to assist in planning to improve both the working environment and the OHSMS is a basic tenet of good OHS management. Effective consultation is the foundation on which the OHSMS is built; without it the system crumbles. Workers have a vested interest in being involved, because they are the ones most likely to be injured at work, or to be made ill because of their work. Management is unlikely to have the insight into workplace hazards that workers have, so workers' input to managing hazards is crucial (Walters, et al. 2005; Walters 2006).

Australian research suggests that essential features promoting effective worker consultation and participation include: respectful relationships between management and workers, opportunities for discussion with management on important OHS issues, adequate training and information, and opportunities to investigate and communicate with other workers (Blewett 2001). This infers a genuine opportunity for participative decision-making, what Ashmos et al refer to as 'enhancing connectivity in organizations …[to] benefit the practice of management in modern organizations' (Ashmos, et al. 2002). In the manufacturing sector, Hanna et al (2002) lauded the value of employee involvement and recommended the "widespread adoption of employee involvement" as a transforming factor in improving operational effectiveness (Hanna, et al. 2000: 151).

Christine Parker (Parker 2002) argues that in order to satisfactorily regulate their internal environment, firms require "corporate permeability" so that they become systems that are open to the influence of internal and external stakeholders. When this occurs, management decision-making about issues such as OHS are improved. She observes that there are three ways to achieve this state: through the disclosure of information, consultation, and through having "systematic policies and procedures for allowing stakeholders to *contest* corporate decisions" (Parker 2002: 215, original emphasis).

Parker puts significant emphasis on the role of consultation and stakeholder (in this case employee) participation:

> The principle of consultation…[states] that good corporate self-regulation involves management *proactively taking into account stakeholder concerns and considerations* in decision-making (Parker 2002:221, original emphasis).

Certainly, the large majority of empirical studies in Western Europe (for an overview see Walters 2006) and Australia (Blewett, 2001), notwithstanding variation in terms of how they measure 'better performance' and in their general approach, conclude that joint arrangements between workers and management achieve better outcomes than unilateral management initiatives. A lack of consultation with workers and lack of worker participation coupled with poor communication are thus highly likely to be significant contributors to any disconnect on mine sites.

5.2.5 Regulating for OHS management systems

In recent years the requirement for organisations to establish OHSMS has been increasingly enshrined in legislation around the world. Scandinavian nations in particular have required systematic approaches to OHS in regulation since the early 1990s. Saksvik et al's review of the implementation of this requirement by 1999 (Saksvik, et al 2003) found that while most larger enterprises had implemented an OHSMS, most small enterprises had not yet done so. Teasing out the impact of this implementation is even more difficult. Saksvik et al were unable to determine whether national rates of occupational injury and disease had been positively or negatively affected. Sites that reported implementation of the regulation also reported an accompanying decrease in accident rates, but national rates had increased over intervening years. As a result of this and the limited number of other such evaluations, Robson et al (2007) concluded that:

> there is insufficient evidence in the published, peer-reviewed literature on the effectiveness of mandatory OHSMSs to make a recommendation either in favour of or against them (Robson et al 2007: 347).

One consequence of mandatory OHSMS may be that organisations are "motivated more to sustain organisational legitimacy, rather than more substantive action that achieves genuine improvements in OHSM" by regulation that requires particular procedures or systems but that does not adequately address how these procedures and systems are implemented (Bluff, 2003: 53-54). Thus the external context, regulation, may contribute to the disconnect; an unexpected outcome of well-intentioned regulation.

The debate in the environmental management literature is also relevant. Here, too, there is considerable ambivalence about enshrining EMS in regulation and one study of US experience asserts "that it is premature to adopt a policy mechanism that rewards or mandates the use of EMSs" (Metzenbaum 2001: 163). Hertin, et al (2004) reach similar conclusions on the basis of their European data.

5.2.6 How versus what

Another body of literature examining the roles of leadership, trust or culture on company OHS outcomes emphasises the critical effect on OHS performance exerted by these less tangible aspects of management (O'Dea and Flin 2003). Clarke and Ward (2006) suggest that leaders "can have a significant effect on individual employee behaviours in relation to safety", and argues that there is a need for leadership training to increase the trustworthiness of organisational leaders and so enhance employee's willingness to participate. Clark and Payne (1997), in their investigation of trust in management amongst British colliery workers, found that the most important elements of trust at work are: integrity, competence, loyalty, consistent/fair behaviour and openness (Clark and Payne 1997). We assessed these attributes in this research as they apply to the management of OHS.

The concept of trust is not a simple one, rather it is "a multidimensional construct that plays a number of distinct roles within safety-critical environments" (Conchie, et al. 2006: 1099). Others assert that trust is one of a bundle of OHS cultural attributes that may contribute to better OHS outcomes. Gunningham and Sinclair (2006) identify four others: leadership, ownership (of OHS initiatives), responsibility and accountability, and consistency. These variables are clearly not independent and thus reinforce the complexity of the field.

There is further research evidence, and it is our experience, that suggests that *how* OHS is managed is at least as important as *what* is done (Frick 2003). However, these studies do not reveal how these cultural aspects of OHS can interact with OHSMS to create or remove the disconnect identified by the Mine Safety Review. Developmental models such as Patrick Hudson's *Pathway to Safety* provide an analytic framework, but do not on their own explain how such cultural features arise or can be promoted.

5.2.7 OHS performance and organisational culture

A number of studies that have investigated the features that mark out high performing organisations in OHS find that these relate to the OHS culture of the organisation. Canadian research comparing features of the management of OHS in organisations with high and low injury (claims) rates (Shannon 1998:201-217) found that management concern for the workforce, participation in decision making and participative problem solving in relation to OHS were all linked to lower injury rates. The literature review accompanying the study confirmed these findings and further suggested that workforce empowerment was also an important feature (Shannon et al 1997). Whilst these cultural aspects of the organisations were found to be significant, some of the commonly recommended bureaucratic approaches to OHS management were not associated with lower injury rates; namely senior management representation on OHS committees and the existence of written safety rules.

These observations are supported by Hale and Hovden's literature review of OHS management studies over the last 50 years that also indicates some critical links between workplace injury rates and OHS culture (Hale and Hovden 1998). This review identified that:

- a belief that OHS is an important issue in the workplace;
- openness to power-sharing and criticism;
- work as a source of pride;
- workforce trust in management commitment to OHS; and
- a workforce belief that workers have some degree of control over the nature of their work;

were among the cultural features differentiating workplaces with lower injury rates from poorer performers. The presence of and adherence to formal OHSMS did not differentiate high and low injury rate enterprises in another Canadian study (Simard and Marchand 1995). In fact, initiative-taking, rather than compliance with safety procedures, was linked to superior OHS performance. The organisational features that were in turn linked to taking initiative were:

- participative management;
- non-routine work processes and organisation;
- cooperation;
- autonomy; and
- work group cohesiveness (Simard 1995: 124 - 25).

Other studies on the same group of companies reinforced the importance of participative management and work group cohesion in creating superior OHS performance (Simard and Marchand 1994; Simard and Marchand 1997).

Investigations into organisations which create reliable, safe workplaces suggest that such organisations create organisational "mindfulness", which Weick et al (1999) and Weick and Sutcliffe (2001) argue results from the following five processes:

- *A preoccupation with failure*, ie recognising that failures, no matter how minor, provide the opportunity to learn about potential disasters. Mindful organisations see "the reality of danger in a near miss".
- *Reluctance to simplify interpretations*, ie using complex systems to manage their complex environment and by encouraging diverse views and approaches to operations.
- *Sensitivity to operations*, ie ensuring that someone in the organisation has a clear understanding of the 'big picture' of operations at all times.
- *Commitment to resilience*, ie a commitment to ensuring that the organisation can cope with unexpected dangers.
- *Underspecification of structures*, or *deference to expertise* ie they do not rely on hierarchical structures, particularly in problem solving, when experience and expertise become more important than rank in the management hierarchy (Weick, et al. 1999: 89-93).

Finally, James Reason (1997) argues that the status and importance of OHS within the organisation is critical to a positive safety culture, citing the following questions as critical to any investigation into OHS culture:

> Who collates, analyses and disseminates information relating to organisational safety? By how many reporting levels is this individual separated from the CEO? What annual budget does this person's department receive? How many staff does he or she oversee?
>
> Is a safety related appointment seen as rewarding talent (a good career move) or as an organizational oubliette for spent forces? (Reason 1997: 220).

However, it is important to remember that OHS culture is much more than just the sum of all of these parts. OHS culture is not just something an organisation 'has', it is fundamentally what an organisation 'is' (Ackroyd and Crowdy 1990). Enterprises cannot simply change OHS culture by decree, but if they are to approach a

positive culture, the features cited above are critical. In other words, exhibiting the above features is a necessary precondition for having a positive OHS culture, but it may not be sufficient.

5.2.7 Conclusion

The literature suggests that a systematic approach to OHS management is a necessary, but not sufficient, condition for good OHS performance. On the other hand, a poorly designed and implemented OHSMS is likely to have negative effects. This review demonstrates that key features of effective OHS management systems are:

- management commitment and engagement;
- leadership at a variety of levels;
- workforce participation in the design and operation of the system;
- communication;
- integration of OHS within organisational systems;
- OHS competence and OHS as a high status function;
- planning and organising OHS, including reviewing progress through processes such as auditing and evaluation; and
- risk management.

Effective consultative arrangements at the workplace are marked by:

- respectful relationships between management and workers;
- opportunities for discussion with management on important OHS issues;
- adequate training and information;
- opportunities to investigate;
- opportunities to communicate with other workers; and
- genuine opportunities for participative decision-making.

The rest of this chapter describes the extent to which the NSW mining industry exhibits these characteristics.

5.3 Do sites have effective OHSMS?

The literature review identified key features of effective OHSMS and, not surprisingly, we found significant variation in the presence of these features across the sites we visited. As a result, the OHSMS varied from sites with very effective, proactive approaches to sites that were clearly overwhelmed by the OHS management challenges they faced. However, all sites were able to demonstrate that they had taken steps to address their OHS management needs.

Through analysis of our qualitative data from documentation provided by the sites and individual and focus group interviews, we were able to categorise sites we visited on the basis of the effectiveness of their systems and consultative processes. We were able to divide the sites into three categories that we have previously developed (Blewett and Shaw, 2001).

5.3.1 Why do sites implement OHSMS?

For all sites, external corporate and legal requirements have provided both the framework and the imperative for their OHSMS.

Particularly for smaller sites and in the extractive sector, regulation and enforcement by DPI was a major driver for implementing an OHSMS. However, this did not necessarily result in token systems. The extractive sites, particularly the small ones, were mostly able to describe their safety management plan in terms that made us confident that the system was not just a 'paper tiger'. They were almost all positive about the contribution made by DPI to their OHSMS:

> We developed the MSMP [mine safety management plan] from scratch. The work was being done but we had no paper trail. We needed to change the attitudes of the blokes. … Safety audits are done every month now. We update the schedule every month at the Safety Meeting. Sometimes the timeframes stretch out. … We investigate accidents and near misses. The manager, myself and the injured person are involved. … We then change the process or improve house keeping. … DPI are very helpful, they ran a few courses – small mine safety management. They are more interested in prevention than WorkCover (supervisor).

Others clearly recognised the limitations of their paper-based systems:

> The paperwork doesn't help our business run any better. It might make us more aware. I don't want to lose anyone, I don't want anyone to be hurt, but paperwork won't stop accidents. Doing paperwork costs money (mine manager).

Many people reported that cultural change in their organisation had led to changes in OHS, and thus the development of a site-specific OHSMS.

> When I started in this job the culture here was not pro-safety. I have tried to change that. … We developed the Mine Safety Management Plan to suit the site. We have SWMS and incident reporting. … I try to lead by example and influence new staff when they begin. I am trying to get people to report. At the last meeting I asked why are there no defective plant reports? (mine manager).

On some sites, the OHSMS was imposed by a corporate body and there is variable capacity to change the system to suit the local circumstances.

> Our system is the corporate system and is auditable against AS 4801. It is localised to suit us. We did a self-assessment last week and got 3.9, our target was 4. The scale goes up to 5. We are due for a corporate audit this year. … We need to improve our document control and to make documentation more accessible to the front line (OHS manager).

> The management has a goal of becoming accredited to ISO standards, which are incredibly paperwork heavy. It won't work if you keep loading our guys up with paperwork. I'm trying to pioneer a new system that covers off on all of those bases without being too intensive in paperwork. Getting safety out of my office into the workplace. Trying to get the guys to do it (OHS manager).

> We are pushed into complexity by corporate. We developed our system based on corporate requirements (OHS manager).

Externally imposed OHSMS may have gaps that take a long time to fill.

> The [OHSMS] was developed by an external group five years ago – it's under review now. I can identify gaps from Board level down – but

> the biggest issues are off site [in corporate]. Now we are trying to fill the gaps from there down (mine manager).

Where the OHSMS is externally imposed but evolving, opportunities for local input can be built in.

> Our OHSMS comes from corporate, I've seen drafts, but not been asked to comment; but I expect to be. I like the new structure, it's more formalised. I'm glad to be here while it's being introduced in stages because it's evolving around me – I'm able to absorb it better (mine manager).

As this suggests, while the OHSMS may be driven from outside the sites, most sites have at least tried to tailor their system to meet their specific needs, to various levels of success.

5.3.2 What works?

The qualitative data we collected on sites reinforced the findings of the literature review: where OHSMS were tailored to the site, used the paperwork as a tool but not an end in itself, were built on consultation and resulted in actions that controlled risks, interviewees reported more positively on their site's OHSMS.

Many people demonstrated a clear understanding that being systematic and having the system meet organisational needs is paramount:

> OHS is managed, but not in a particularly systematic way, which I'm trying to fix at the moment. Given the state of the system when I found it, which was completely disjointed, I'm surprised the problems are not worse. I would have expected more incidents, more problems, more property damage. Our guys, their instincts are good. Most have been around machines all of their life. They know it instinctively. But there's no hope of getting them to document it (OHS Manager).

Fine-tuning the system to reflect changes in the organisation or new knowledge allowed the system to better meet organisational needs:

> The SMS is pretty good; it's evolving all of the time. Mainly we deal with JSAs, which are evolving, we're looking at them all of the time. They have to review them each time they do a job and update them or write a new one. Everyone signs off before they start and I'm confident they're used properly (maintenance supervisor).

Systems and procedures that were grounded in reality were more likely to be used:

> There is a very small gap between what procedures say and how the job is done. I'd say the intent is followed. But perhaps no one follows the SWP to the letter (technical).

On some sites, people were able to make a link between the formal, paper-based system and risk control:

> We have forms we have to fill out before doing any job … the systems work very well – saves people getting hurt (other technical).

If the paperwork was useful and understandable, then it was more likely to be used well:

> Every job we do is from a work order, which generates a JSA for the job. When you print out a work order, the JSA prints off too. Resourcing makes the difference, could always do with more resourcing, but from an auditable point of view, we are very tight (mine manager).

And from the same site:

> We always use the paperwork. Maybe a year ago we would not, but we do now. We use JSAs for all jobs – we review them, they've given us clear direction. Procedures are followed. Supervisors make sure they are (operator).

Systems that were easy to access were also more likely to be used. We saw excellent examples of high-tech systems that were readily accessible, as well as some low-tech but very useable systems. One site had developed an effective process for providing access to their OHSMS through strategically placed computers around the site:

> There are policies, standards, guidelines, risk assessments, JSA – they are all home-grown. These are all easy to use and accessible via the [computer system] (OHS manager).

Most sites recognised that commitment must be followed through with consultation and action on site:

> You can have the greatest plan in world but it won't make the place safer – you need visible management who walk the talk — a safety culture. Consultation and implementation of plans is what helps. We used diagonal slices to

> do our major hazard plan. It's all the way you roll it out. Consult heavily…. Now it's just how we work around here (OHS manager).

Involving the workforce was the foundation on which effective OHSMS were built. Every effective OHSMS incorporated a high level of worker participation:

> Our [OHSM] system works. There are not too many rules, only rules for what we need. The workers helped to write it and we make it happen (operator).

> We have SWPs for each area – workers help put them together (supervisor).

Accountability to ensure implementation was also important. We received a number of reports that senior governing bodies, such as the board in larger organisations, can push OHS management activity by demanding information on progress:

> Audits are used to develop a 12-monthly action plan – this gets signed off by the board. We use [a computer system] to track actions. Progress against the improvement plan is reviewed quarterly. A progress report goes to the Board (OHS manager).

5.3.3 What doesn't work?

In contrast, interviewees gave negative reports when the focus of the OHSMS was on the paperwork, when it had been imposed, and when the system did not lead to effective risk control.

The burden of documentation was the most strongly expressed concern. Discussions with us on site about OHSMS were most frequently accompanied by exclamations such as "we are drowning in paperwork", "we spend so much time keeping up with the paperwork that we can't focus on our real work" and "it's ridiculous the amount of paperwork we have to keep" and robust words were used to describe the legislative framework in mining that was perceived to require this.

Many OHS managers reported that they spend considerable time doing paperwork and reported frustration that they can't do what they believe needs doing; that their time is diverted from the workplace to the paperwork. Often, the paperwork is seen as an imposition by DPI:

> We want less paperwork. The guys think it's bullshit. We used to just deal with a misfired shot, now we have to report it to the government inspector (operator).

> The paperwork is to protect you from the law, but to maintain the system you can't do your job. It forces you to work for the system (professional).

Others also spent time on paperwork that they asserted had no obvious use other than to satisfy somebody else's needs and could even lead to greater risk:

> Too much paperwork that doesn't concern us (other technical – questionnaire comment).

> …I think it's overdone. A lot of the stuff is crap. They gave me a JSA to clean a chute (operator).

> You don't want an OHSMS that is prescriptive. [Another site his friends work for] have that and you can't do anything without filling out a form. That means you can't think for yourself. People get injured as a result. I wouldn't want to work like that. You gotta use your brain in this industry, have to watch out, keep your wits about you. (miner).

Sometimes the system was adequate on paper but was not supported by equipment appropriate to the environment:

> The procedures pretty well reflect how things are done. We'll bend them without breaking it. Safety glasses for example get fogged up. You have to take them off to see properly and when you do you get pinged for it. You take your own safety into account (underground operator).

Where paperwork is the primary focus of an OHSMS, the need for ready access and excellent document control is critical. These are not trivial tasks and were often poorly done:

> …we are not really good at document control – this is a key project for 2007 – we need consistent documentation, good revision control – the pieces need to be internally consistent (OHS manager).

> Our procedures need improvement. We have our procedures on my computer. No one helps us keep them up to date. Elsewhere there is someone who keeps all this up to date. They let people know when their licences run out … we don't have that. My light vehicle licence ran out and I didn't know (professional/technical).

Where we found proprietary (or off-the-shelf) systems in place it was clear that they often lacked relevance. They tended to exist to

meet DPI requirements, not site needs. Other systems were an uncoordinated patchwork that might pass on paper but had no relevance to the real world of the site:

> The MSMP has been put together over the years, a few different people have had a go. It's all over the place – different types of writing, different styles of document. Very little is effective – it's really only an office document (OHS manager).

Production pressures at middle management level contribute both to poor system design as well as poor implementation. Supervisors may well receive mixed messages from their superiors about the relative priority given to production and safety; they are then likely to pass on the same mixed message:

> There are lots of production pressures at line management level. As a group they try to believe it [that safety comes first] but it's a big ask. If there is a safety issue … they try to find a work-around. They don't send people into an unsafe area (operator).

The quality of OHS advice provided to sites may also be playing a role in determining whether OHSMS are effective or ineffective. While many OHS professionals employed in the industry provide excellent service to their organisations, we found that advice from some internal OHS staff and from some external consultants was not always supporting sites in implementing effective rather than ineffective OHSMS. This may reflect the general skills shortage that the industry faces:

> Safety managers … we've cycled through a few. It's good if they come underground. Safety is more of a line manager thing … you take the issue to your supervisor (operator).

Some contractors who work in many different sites longed for some consistency in systems and rules between organisations and sites. They called for standards to be set across industry to reduce error:

> …more should be done to standardise things like lock out/tag out systems – particularly in a region or area. This could also allow standardised inductions for contractors (maintenance supervisor).

A small number of sites we visited lacked resources generally, for example, they worked to a very tight budget with the minimum possible number of staff and employees. The potential for this to have any OHS consequences was not recognized although we were

sometimes told that people did "the best we can" under the circumstances. Where there is marginal profitability, OHS can be short-changed:

> Our systems are very good, but you need staff to operate them (maintenance supervisor).
>
> We need a safety manager with underground experience. My forte is to get the ore out, not safety (mine manager).

On sites, audits were relied upon as the method to ensure that the OHSMS was effective. However, audits can reinforce the problems described above when they fail to actively seek the opinion of the workforce, judge paper compliance only and do not seek opportunities to contribute to an improvement in workplace health and safety. This criticism was levelled at both DPI, external and internal audits that look at paper compliance without checking implementation:

> Audits by [parent company] aren't useful. The management changed and in the new audit regime we got smashed to bits…quite a bit of it was really silly – like the wording on our OHS policy didn't match AS4801 – it's very much on paperwork, not on implementation (mine manager).

Audits that are poorly focussed on minutiae at the expense of more significant issues were also likely to frustrate people:

> The regime of auditing is producing impractical recommendations. Some of the things that are getting audited are fairly minor relative to the other risks that need to be managed. The audit process is intended to keep you focussed on core hazards but it becomes a distraction (technical).

It was clear that audits alone were not providing adequate information about the system to encourage improvement. Audits by definition answer the question, 'Are we doing what we say we do?' whereas it is also important to ask 'Are we doing what we should be doing?'. This question is more properly answered by reviews or evaluation. We found little evidence of this across the industry. Almost all sites reported that they rely on narrowly defined audits for evaluation of their OHS systems.

5.3.4 Organisational categories

On the basis of our qualitative data, we categorised the sites into three categories according to the effectiveness of their OHS management, including consultation.

Proactive sites

The first category is called *proactive*. These sites were more likely to provide evidence of:

- well-developed and effective consultative processes;
- OHSMS that were well-developed and related to other organisational systems; and
- a risk management system that anticipated risks and sought to control them at source.

Six coal, seven extractive and three metalliferous sites were found to fit this category.

Reactive sites

The second category is called *reactive*. These sites typically demonstrated:

- no established or only token approaches to workforce consultation;
- no established or only token OHSMS; and
- reactive risk management approaches, with a focus on controls that acted on people, not the risk itself.

Three coal, six extractive and three metalliferous sites were found to fit this category.

Transitional sites

The largest grouping of sites did not demonstrate a proactive approach consistently, but were also more effective than the reactive sites. We called this grouping *transitional*, to represent that they are between the proactive and reactive categories. Some sites exhibited characteristics that were closer to proactive, and some were nearly reactive. In general, these sites demonstrated:

- variable consultative processes, with engagement varying by issue and by organisational level;
- inconsistent development and unreliable application of OHSMS; and
- rudimentary or patchy risk management, which was not focussed on control at source.

Eight coal, 13 extractive and two metalliferous sites were found to fit this category.

5.3.4 Proactive sites do things differently

We determined our organisational categories on the basis of qualitative data from sites. When we examined how the questionnaire responses varied across these categories, a consistent and significant pattern of differences emerged. This quantitative

data reinforces the differentiation between these organisational categories and triangulates our data.

We asked four overarching questions about sites' OHSMS and consultative arrangements on the questionnaire:

Q37 The OHS management system is well-managed on this site.

Q43 The OHS consultative arrangements on this site work effectively.

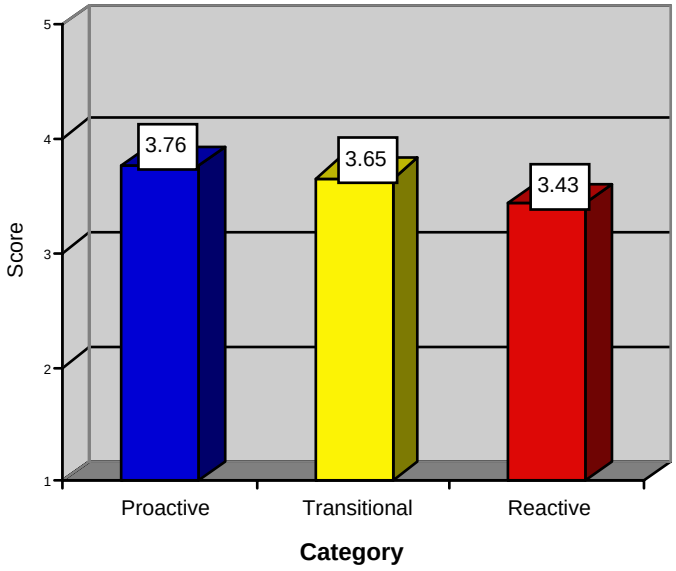
Q44 Managers are as concerned about people's health and safety as they are for other requirements.

Q64 How often does the OHS Management System get by-passed in order to get the job done?

Answers to questions 37, 43 and 44 were rated on a scale of one to five, where one represents 'strongly disagree' and five represents 'strongly agree'. Thus, higher scores represent more positive reports on these items on a site. Answers to question 64 were rated on a scale of one to five, where one represents 'never/hardly ever' and five represents 'always'. Thus, lower scores represent more positive reports on this item on a site.

Respondents from sites in the three categories of proactive, transitional and reactive answered these questions differently. Those from proactive sites were more likely to rate their site's OHS arrangements more positively than reactive or transitional sites, with statistically significant differences between proactive and reactive sites for each question. Differences between transitional and reactive sites were also statistically significant for some items.

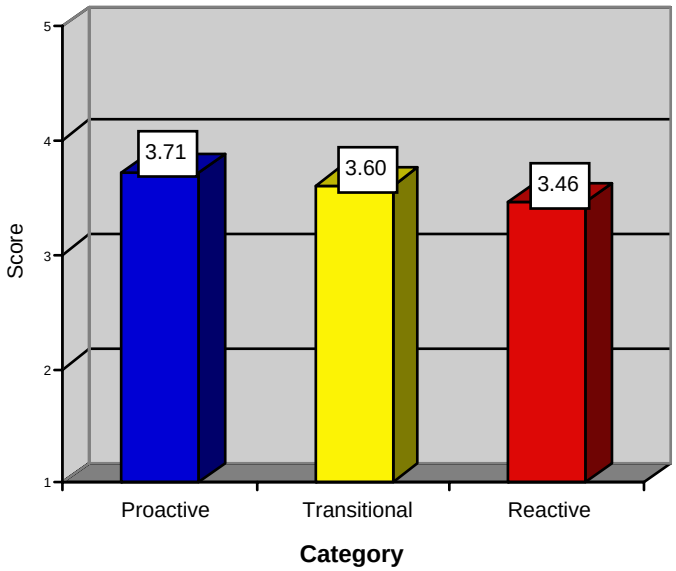
Given the independent development of the categories from our qualitative data, the importance of the differences between these quantitative scores is reinforced, even though the absolute size of the differences is often quite small. In surveys of this nature, scores are generally found grouped around the mid-point, meaning that what look like small differences between groups of respondents can be statistically significant, and quite important in terms of how the different groups of people are responding. While these differences do not appear to be large (and sometimes they are not), taken together, statistically they demonstrate consistent and important differences between proactive, transitional and reactive sites that have practical as well as statistical significance.



The differences between proactive and reactive; transitional and reactive are significant to at least .05.

Figure 5.1: Comparison of OHSMS category and Q37

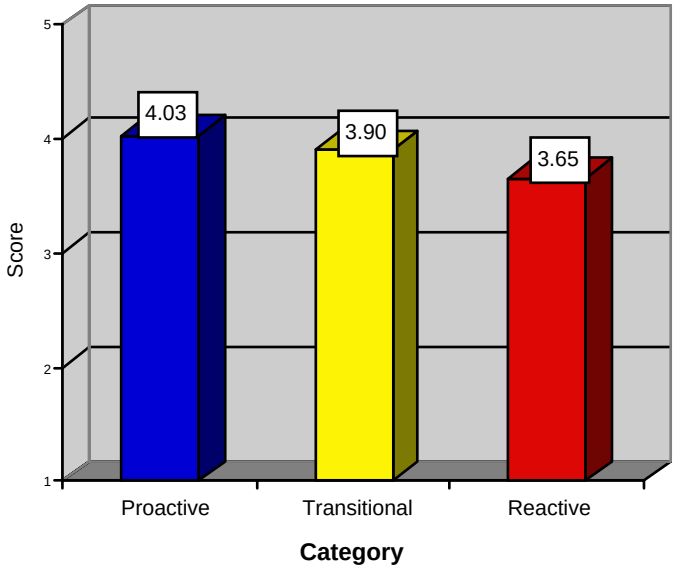
This graph shows that respondents from proactive sites more strongly agree that the OHS management system is well-managed on their site than those from transitional or reactive sites.



The difference between proactive and reactive is significant to at least .05.

Figure 5.2: Comparison of OHSMS category and Q43

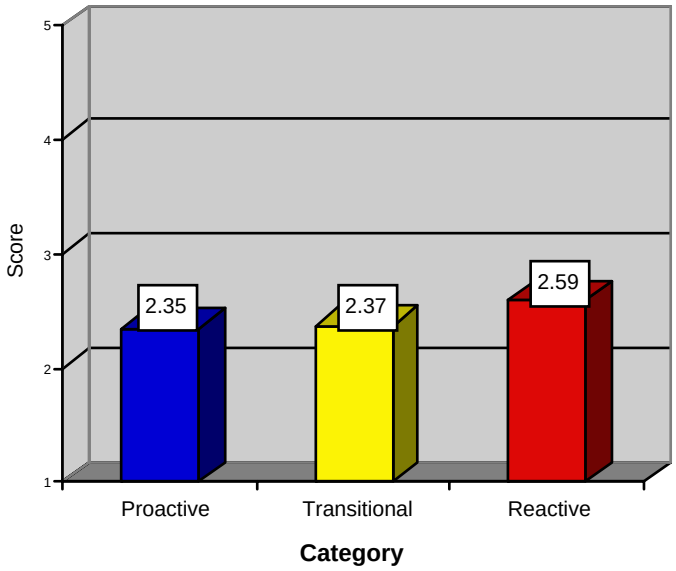
These scores show that proactive sites also rate OHS consultative arrangements more positively than transitional and reactive sites.



The differences between proactive and reactive; transitional and reactive are significant to at least .05.

Figure 5.3: Comparison of OHSMS category and Q44

These scores show that proactive sites have greater confidence in managers' concern for OHS than transitional and reactive sites.



The differences between proactive and reactive; transitional and reactive are significant to at least .05.

Figure 5.4: Comparison of OHSMS category and Q64

These scores show that respondents from proactive and transitional sites believe that the OHS management system is bypassed less often than those from reactive sites.

5.3.5 Conclusion

While the impetus for OHSMS at sites may have been external, many sites have embraced a more systematic approach to OHS management and are making sincere efforts to improve OHS management. Unfortunately, we found evidence that a number of common approaches to implementing OHSMS are ineffective and this has constrained the benefits that have resulted for many sites. However, many sites are successfully dealing with the complex challenges of managing OHS and the positive responses to OHS questions on the site visit questionnaire demonstrate that these efforts are making a real difference on sites.

Sites that had proactive approaches also had more positive assessments of key OHSMS features by questionnaire respondents than transitional and reactive sites. These consistent differences between responses from proactive, transitional and reactive sites show that those from proactive sites have greater confidence in OHS management. By triangulating our qualitative and quantitative data in this way, we are confident that the different categories of proactive, transitional and reactive reflect real differences in the effectiveness of OHS management at these sites.

A key question remains, however: What makes proactive sites better? What do they do that leads to more effective implementation of OHSMS? The site visit questionnaire also investigated underlying organisational factors that affect OHS management and proactive sites also reported more positively on these, further suggesting that proactive sites do things differently. The next section of this chapter describes in some detail exactly what proactive sites do differently in relation to these underlying factors.

5.4 What characterises effective OHS management?

The literature review in section 5.2 above describes a range of organisational factors that underpin effective OHS management. These factors were investigated in the site visit questionnaire and we have found significant differences between proactive, transitional and reactive sites with respect to these factors. Specifically, proactive sites are significantly more positive than the other categories with respect to:

- mindfulness;
- workgroup cohesion;
- trust in management;
- organisational justice;
- supervisor support; and
- role clarity.

The data presented in the graphs on the following pages show the mean scores for each of the organisational factors in the three organisational categories from responses to the site visit questionnaire. Sites in the proactive category consistently and significantly scored most highly for each of the factors; a finding that further supports our categorisation of sites and again triangulates our data.

The qualitative data we collected on sites also provides robust evidence of the differences between proactive, transitional and reactive sites with respect to these factors. As with the comparisons given in section 5.3.4 above, while the differences between the scores might be small, the consistency and significance of the differences mean that the data provide important insights into the different ways in which proactive, transitional and reactive sites operate.

5.4.1 Mindfulness

Mindfulness is a state of organisational readiness; being culturally and systematically ready to cope with the unexpected (Weick & Sutcliffe, 2001). We found evidence in proactive and some transitional sites, through consistent reports from a variety of levels within the organisation, that the features of a mindful organisation were developing.

Five questions on the site visit questionnaire provided quantitative data about the extent to which sites exhibited mindfulness:

Q38 If you make a mistake, it is not held against you.

Q39 People report near misses that might have serious consequences, even if no one else sees them.

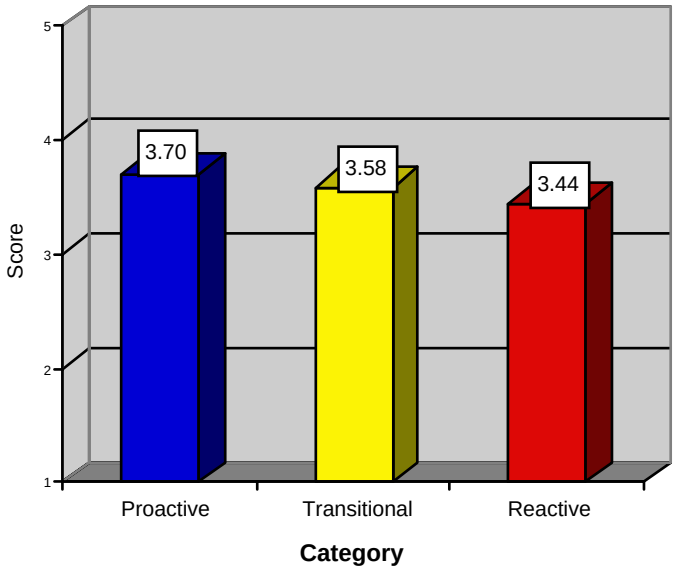
Q40 Managers seek out and encourage news about what could go wrong.

Q41 People are appreciated if they spot problems, mistakes, errors or failures.

Q42 People are not shot down for reporting information that might stop operations.

Answers to these questions were rated on a scale of one to five, where one represents 'strongly disagree' and five represents 'strongly agree'. Thus, higher scores represent more positive reports on the existence of mindfulness on a site.

The scores from all sites were positive for this factor and respondents from proactive sites reported significantly more positively in relation to this factor than transitional and reactive sites. Transitional sites were significantly more positive than reactive sites.



The differences are significant to at least .001.

Figure 5.5: Comparison of OHSMS category and mindfulness

Qualitative data from interviews and questionnaire comments reinforced these differences. Comments from proactive sites often reflected greater preparedness to do things differently. Being encouraged to state the bad news and identify areas for improvement is one sign of a mindful organisation:

> The workforce is encouraged to be innovative and to contribute. And they're willing to come forward with ideas (mining engineer manager).

While a tradesman from the same organisation told us that there was

> …very open communication here—if you've got an issue, it's very easy to raise it. You don't get shot down if you raise issues (technical staff).

A number of sites are developing systems to both encourage and address reports of OHS issues:

> We encourage people to report. We put all the information into the computer; people are assigned to complete the tasks – there are prompts to close out tasks. If they're not done in a month, then the notice goes to person's supervisor – it continues to escalate up the chain of command until it's either completed or it gets to the GM. This is also used as a performance measure – the number closed out on time (OHS manager).

> We are moving from the blame approach for incident investigation. We want to separate discipline from investigation. We need honesty. A guy backed over a car and said 'I stuffed up'. This was great. We need a no blame culture (mine manager).

Rewarding hazard identification reinforces the value the organisation places on information about risk:

> I love getting hazard reports – I write them a letter thanking them and go and see them. People make mistakes but we have to admit when this happens and catch 'em doing something right (mine superintendent).

We also found that when reports from the hazard identification system were addressed, then it was seen to be effective and was more likely to be used.

> If you use the hazard card system – it works, you'll get things fixed (operator).

But people need regular feedback to be confident that what they've identified is taken seriously:

> We don't have a fully engaged workforce, we have some people who use hazard reports, and other systems, others don't. To address this, we are now giving more feedback about progress in addressing hazards. Previously, the person reporting the hazard would not necessarily be aware that all hazards are all closed off, given a work order. Now, we report back, giving them more information. There was a perception that hazards weren't getting closed off (mine manager).

In contrast, an equipment operator noted on his questionnaire that he was working on a site that could be classified as "mindless" where,

> …you wouldn't dare bring up possible safety issues that would affect production. You wouldn't be employed for long; they would run out of work for you of course! (casual equipment operator – questionnaire comment).

5.4.2 Work group cohesion

Work group cohesion describes the organisational capacity for peers to work together, rely on each other and be able to ask for help, give health and safety a priority and work safely without cutting corners even under pressure.

Six questions on the site visit questionnaire provided quantitative data about the extent to which sites exhibited work group cohesion:

Q23 Health and safety has priority even when we are busy.

Q26 It is easy to ask others for help.

Q27 People are able to rely on others.

Q33 Everybody works safely here.

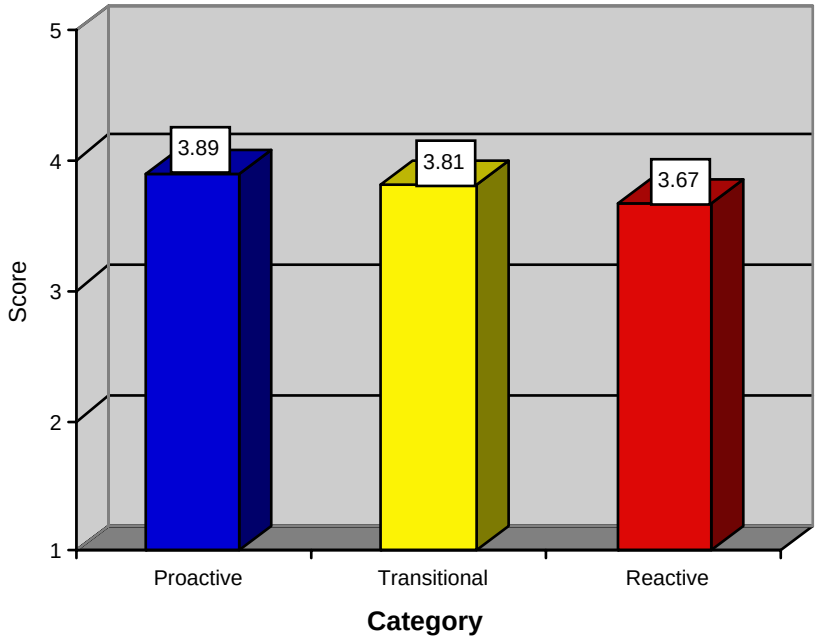
Q34 People rarely cut corners under pressure or otherwise.

Q35 The people I work with take health and safety seriously.

Answers to these questions were rated on a scale of one to five, where one represents 'strongly disagree' and five represents 'strongly agree'. Thus, higher scores represent more positive reports on the extent of work group cohesion on a site.

The scores from all sites were positive for this factor but respondents from reactive sites reported significantly more

negatively in relation to this factor than both transitional and proactive sites. The difference between transitional and proactive sites was not statistically significant.



The differences are significant to at least .001.

Figure 5.6: Comparison of OHSMS category and work group cohesion

Operators at different proactive sites identified the importance that working together has for effective OHSMS:

> OHS - it's a really important issue here. We all want to go home and the company's not going to ignore it. You can always get another job, you can't get bits of your body back (operator).

> As a team we look out for each other, we strive to do things safely and management stress that safety comes first - it does (operator).

OHS managers at proactive sites also recognised the importance of the capacity of work groups to work together to address OHS:

> [Company X] relies on workers to make their own decisions within their areas of expertise – [we employ] lots of ex-farmers: they're self-sufficient, sensible, not risk-takers (OHS manager).

While at a site in the reactive category a contractor reported that:

> You like sites where the place is ready, parts in place, management supports you, lets you get on with the job – none of that applies here (contractor).

Reactive sites were also more likely to report negatively on the extent to which work groups are loyal and engaged:

> There is no loyalty amongst the workforce. They want to get their foot in the door and then coast. Pride and job satisfaction have gone (supervisor).

5.4.3 Trust in management

Trust in management describes a set of beliefs held by workers and others about the commitment management has to health and safety. It is manifest in the place OHS has in management decision-making, the provision of equipment and procedures to ensure health and safety, and managerial competence with respect to OHS. The link between perceived management commitment to OHS and management competence in OHS was very strong – questionnaire respondents and interviewees alike demonstrated that stated commitment to OHS was not believable if managers did not also demonstrate competence to deliver on that commitment.

Four questions on the site visit questionnaire provided quantitative data about the extent to which sites exhibited trust in management:

Q24 Management is competent when it comes to health and safety matters on this site.

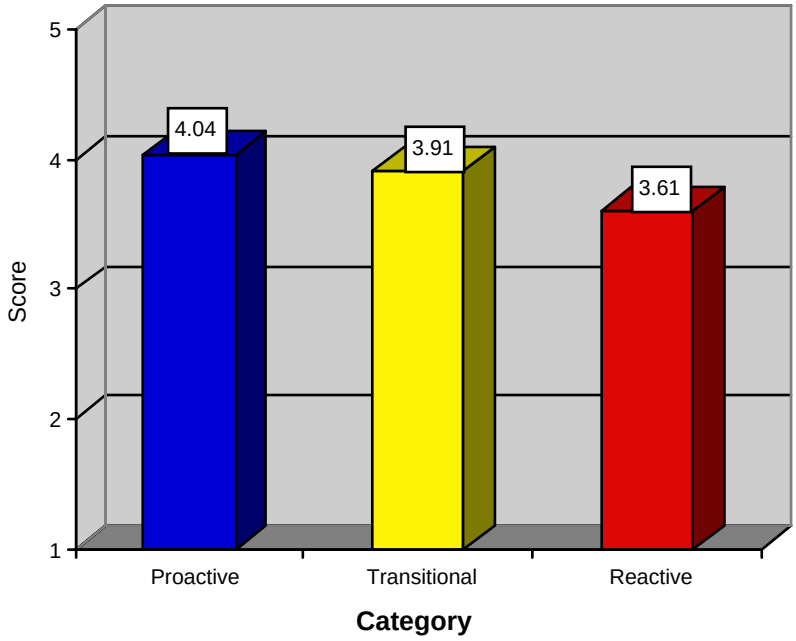
Q30 Management takes health and safety into account when they make decisions.

Q32 Management makes sure that equipment and procedures meet health and safety requirements.

Q44 Managers are as concerned about people's health and safety as they are for other requirements.

Answers to these questions were rated on a scale of one to five, where one represents 'strongly disagree' and five represents 'strongly agree'. Thus, higher scores represent more positive reports on the extent of trust in management on a site.

The scores from all sites were quite positive for this factor and respondents from proactive sites reported significantly more positively in relation to this factor than both transitional and reactive sites. The difference between transitional and reactive sites was also statistically significant.



The differences are significant to at least .001.

Figure 5.7: Comparison of OHSMS category and trust in management

Respondents were as ready to praise management and demonstrate trust in them as they were to criticise them. This was evident at senior levels as well as at operator level. The mine manager at one proactive site reported that,

> If you don't comply with health and safety your future [in the company] would be frowned upon. I had the GM on site and he asked more questions about OHS than about [product] sales. (mine manager).

A supervisor at another observed that issues,

> …to do with OHS, actions are placed against people. Once an issue is resolved, you've got to report that it's been completed. It can't just fall through the cracks (supervisor).

Operators on proactive sites were confident that action would be taken promptly to address risks:

> If something snaps off a truck, it's welded back on before the next shift (operator).

While a check inspector at a transitional site assessed that,

> 90% of the time, management take OHS into account in decision making (check inspector).

Really putting safety before production shows commitment, which is interpreted as competence and gives people confidence that the system works:

> We are very safety focussed – safety *is* first, our open cut had a wall collapse – they filled it in rather than risk it; left [product] behind (staff).

Reactive sites provided comments such as:

> OHS is not done well here…We don't have sufficient leadership at the moment. Safety needs to be driven from the top (manager).

> The toilets, showers and crib room are dreadful (operator).

> It's much easier to say OHS is important when you are at the top of the food chain. For the mine, it's production that counts. For supervisors, OHS is a pain in the arse. Senior management stand up there and tell you how important it is, but if you stop to fix a safety issue, you've got them on your back. They're just saying it to cover their own arse. Safety comes after production – production is more important for senior managers and this flows downhill. It all feeds into supervisors' attitudes (miner).

5.4.4 Organisational justice

Organisational justice refers to the sense of fairness that exists at the workplace and the level of respect that is displayed for others. In a health and safety context, the way in which injured workers are treated is one way organisational justice is evident.

Three questions on the site visit questionnaire provided quantitative data about the extent to which sites exhibited organisational justice:

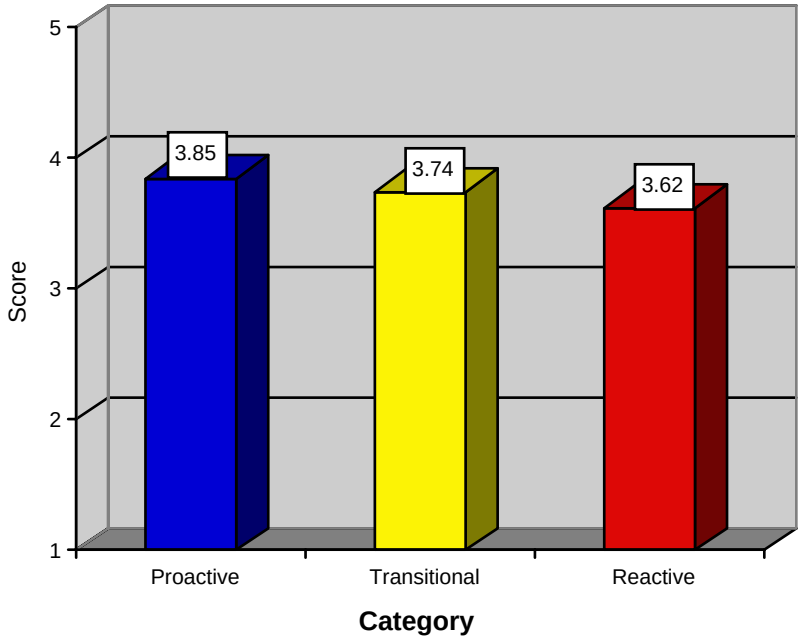
Q25 People are treated with respect here.

Q36 If someone gets hurt at work, they are not blamed for the injury.

Q52 Are you treated fairly at work?

Answers to these questions were rated on a scale of one to five, where one represents 'strongly disagree' or, for Q52, 'never/hardly ever' and five represents 'strongly agree' or, for Q52, 'always'. Thus, higher scores represent more positive reports on the extent of organisational justice on a site.

The scores from all sites were quite positive for this factor and respondents from proactive sites reported significantly more positively in relation to this factor than both transitional and reactive sites. The difference between transitional and reactive sites was not statistically significant.



The differences are significant to at least .001.

Figure 5.8: Comparison of OHSMS category and organisational justice

The differences evident on the graph above were reinforced by qualitative data from the sites. The OHS manager in one proactive site described the site's approach to OHS as:

> This company mixes safety with hard work and respect for fellow workers (OHS manager – questionnaire comment).

A relatively new employee at another proactive site told us,

> I haven't seen anyone injured, but I'd expect them to be treated fairly. Management would work out what went wrong and try to prevent it happening again (operator).

Comments on questionnaires collected from two different reactive sites reveal a different set of expectations.

> [The company] spends a lot of time and effort to deny their injured workers long-term help and devise strategies to force them out of work if they

have a long-term injury (supervisor, questionnaire comment).

There is a realisation that individuals are not valued!! (staff, questionnaire comment).

5.4.5 Supervisor support

Supervisor support is about information flows to subordinates, the consistency of information, the willingness of supervisors to listen to subordinates' concerns, and the help and support provided by the supervisor or manager. Without adequate supervisor support, addressing OHS problems becomes more difficult and communication channels become blocked and ineffective.

Five questions on the site visit questionnaire provided quantitative data about the extent to which sites exhibited supervisor support:

Q50 Do you get sufficient information from your immediate supervisor/manager?

Q54 How often do you get help and support from your immediate supervisor/manager?

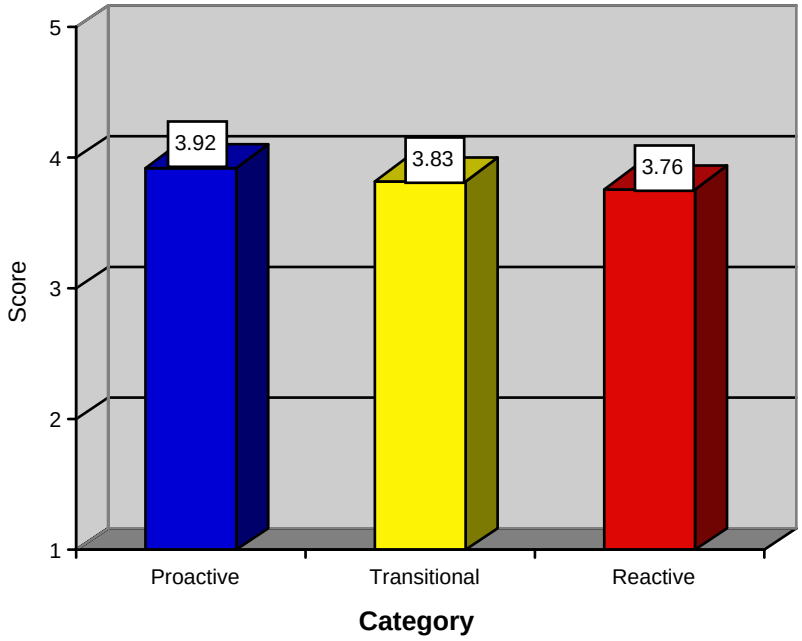
Q56 Do you get consistent information from your immediate supervisor/manager?

Q57 How often is your immediate supervisor/manager willing to listen to your work related problems?

Q58 Do you get adequate support in difficult situations?

Answers to these questions were rated on a scale of one to five, where one represents 'never/hardly ever' and five represents 'always'. Thus, higher scores represent more positive reports on the extent of supervisor support on a site.

The scores from all sites were quite positive for this factor and respondents from proactive sites reported significantly more positively in relation to this factor than reactive sites. The differences between proactive and transitional sites and between transitional and reactive sites were not statistically significant.



The differences are significant to at least .005.

Figure 5.9: Comparison of OHSMS category and supervisor support

In proactive sites we heard reports that

> I can see how what I do has impact, absolutely, if I don't do what I have to do. I set the culture for those around me (supervisor).
>
> You do hear about things, there's good communication – (operator).

In transitional sites we were told that,

> …communication seems effective and the reporting system is easy to use (check inspector).

While on reactive sites workers observed that,

> Supervisors are the meat in the sandwich (miner).
>
> This site has the worst communication between departments and between levels that I have ever encountered. Nothing is done to address this (supervisor, questionnaire comment).

5.4.6 Role clarity

Role clarity means knowing what is expected of you in your job, being given the information you need to do your job and being

informed well in advance about important changes or decisions at work. These all impact on the effectiveness of OHS management – when employees do not have the information they need to do their job effectively, ineffective and possibly unsafe approaches are more likely.

Three questions on the site visit questionnaire provided quantitative data about the extent to which sites exhibited role clarity:

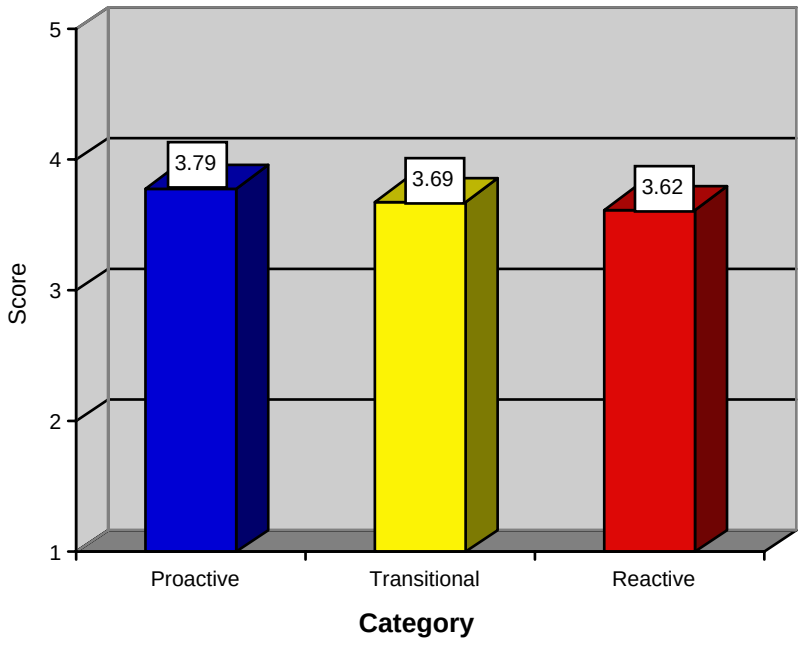
Q66 Do you receive all the information you need in order to do your work well?

Q67 Do you know exactly what is expected of you at work?

Q68 Are you informed well in advance about important decisions, changes, or plans for the future?

Answers to these questions were rated on a scale of one to five, where one represents 'never/hardly ever' and five represents 'always'. Thus, higher scores represent more positive reports on the extent of role clarity on a site.

The scores from all sites were quite positive for this factor and respondents from proactive sites reported significantly more positively in relation to this factor than reactive sites. The differences between proactive and transitional sites and between transitional and reactive sites were not statistically significant.



The differences are significant to at least .005.

Figure 5.10: Comparison of OHSMS category and role clarity

Proactive sites were characterised by having effective training and good communication, with people actively engaged in assessing their own work. For example, as one miner told us,

> We have good induction with useful reference material. Our SOPs are all being reviewed by people who are relevant to the job (miner).

While on transitional sites we were told that,

> Training needs improvement: inexperienced operators are training others. On knowledge: we need to learn different skills, eg about ground conditions. People are operators not miners any more, so don't know the trade, they don't know what they're looking at; don't know when things are wrong, they don't recognise the hazards (miner).

On reactive sites, lack of planning, poor communication and poor training resulted in disgruntled employees:

> Decisions are being made that affect other departments and are not getting notified. In general, the mine cannot stick to one decision, they are not thought through properly. Confusion is rife and then safety is not thought out properly as everything is rushed because of changes (tradesperson).

> Don't plan the next day ahead; it always changes before the next start! (contractor, equipment operator – questionnaire comment).

5.4.7 Effective OHS management is built on effective organisational culture

These findings provide clear evidence of the link between OHSMS and organisational culture. This does not establish a causal link in either direction, that is, we cannot say that systems cause culture, or vice versa. However, it is highly likely that an organisation with an effective culture characterised by mindfulness and high levels of workgroup cohesion, trust in management, organisational justice, supervisor support, and role clarity, will also have a proactive approach to the management of OHS. We can also show that this relationship is linear; that organisations with an ineffective culture are highly likely to have a reactive approach to the management of OHS, and those in between (transitional) fit on the gradient between the two extremes.

This reinforces the need to ensure that OHS management embodies the values and principles of an effective organisational culture. An approach to improving OHSMS that does not also increase mindfulness, build trust in management or encourage work group cohesion will not have the desired effect. While this finding will

not be surprising to many managers and OHS professionals, it is not entirely trivial and provides an important framework for developing improvement strategies. For example, it means that safety incentive schemes that reward employees on the basis of low levels of accident reports will not help to build proactive OHSMS. An approach to fatigue management that is perceived to unjustly penalise those who report adverse effects from their hours of work will not support the achievement of more effective management systems.

5.5 What influences effective OHS management?

The previous sections have described the interdependence of organisational culture and effective OHS management. This section describes the impact of external variables on the organisational factors. We found that the mere existence of formal OHSMS does not differentiate sites, but that location, size and sector have some correlation with the effectiveness of OHS management. DPI's role promoting and supporting effective OHSMS and consultation has been particularly important for small mines.

5.5.1 Formal OHSMS and effective OHS management

As a result of legislative requirements under the relevant OHS law, all sites we visited had some degree of formality associated with their OHSMS. The structural aspects of most OHSMS varied only slightly across all of the sites we visited. A few sites had not developed a coherent system and these were, by definition, in the reactive category. One reactive site described their system as:

> a very ragged piece of paper. Instead of building a framework, we've got [pieces] everywhere but no one's collated it all (manager).

Most extractive sites had adopted the DPI pro forma safety management plan and thus had almost equivalent OHSMS on paper. Some other sites were part of the same corporation and thus had identical OHSMS frameworks. Indeed, the contents pages of manuals and systems specifications from sites in all sectors covered almost identical topics – there was little to differentiate them. Almost all OHSMS included the key components set out in *Australian Standard 4801: OHS Management Systems* of:

- OHS policy;
- planning;
- implementation;
- measurement and evaluation; and
- management review.

They invariably included items and procedures such as:

- OHS policy;
- document control;

- accountability and responsibility;
- training and development;
- consultation and communication;
- planning;
- risk management, including core risk programs;
- emergency preparedness;
- incident investigation and reporting;
- purchasing;
- contractor management; and
- audit and review.

Thus, there were reactive sites with identical OHSMS on paper to sites in the proactive category – the actual content of the documentation was not a differentiator. The differentiation was in the extent to which the sites had actually implemented the OHSMS. This was markedly different across the three categories and was a key to determining whether a site was reactive, transitional or proactive.

This is not to say that formal systems are irrelevant. On the contrary, our data reinforce the findings of our literature review that some level of formality and documentation is key to having a systematic approach to OHS management. Our data show that having a coherent OHSMS was essential to being able to develop more effective implementation and thus allow a site to develop from being reactive to transitional. However, the formal OHSMS do not differentiate transitional and proactive sites in any meaningful respect – the formalities of OHS management played little or no role in developing from a transitional to a proactive site. This means that if the industry's aim is to achieve world class OHS performance, then focussing on the formalities of OHSMS, such as developing industry-wide agreement on detailed system elements, is a distraction. A sound OHSMS is a necessary but by no means sufficient condition for world class OHS management.

5.5.2 Regional differences

Sites from the different regions are represented across our organisational categories – proactive sites came from across NSW, as did transitional and reactive sites. Nevertheless, we did find statistically significant differences between the regions on key items in the questionnaire. Sites in the far west of NSW and in the Illawarra consistently scored lower than other regions to a statistically significant extent in relation to:

- Ratings of OHS management system effectiveness (Q37, 44 and 64);
- mindfulness;
- work group cohesion;
- management trust; and
- work role clarity.

Sites from the Illawarra also scored lower than other regions in relation to:

- rating of OHS consultation (Q43);
- supervisor support; and
- organisational justice.

5.5.3 Size differences

Qualitative data from sites revealed that small sites had an advantage when seeking to implement effective OHS management and consultation. More direct relationships meant that communication could be easier and that implementation could be more straightforward and easily monitored:

> I think that this place of employment is one of the easiest and less stressful places I have ever worked at in my entire life. It is so easy to get along with the people here (small site, supervisor, questionnaire response).

> Our OHS management system works – there's not too many rules, only rules for what we need. Workers help write it and make it happen (small site, tradesperson).

> The safety management system gets done the way it's supposed to. There's that much paperwork to be chased, or you get your arse kicked. But the paperwork is necessary, you've got to have the paperwork (small site, operator).

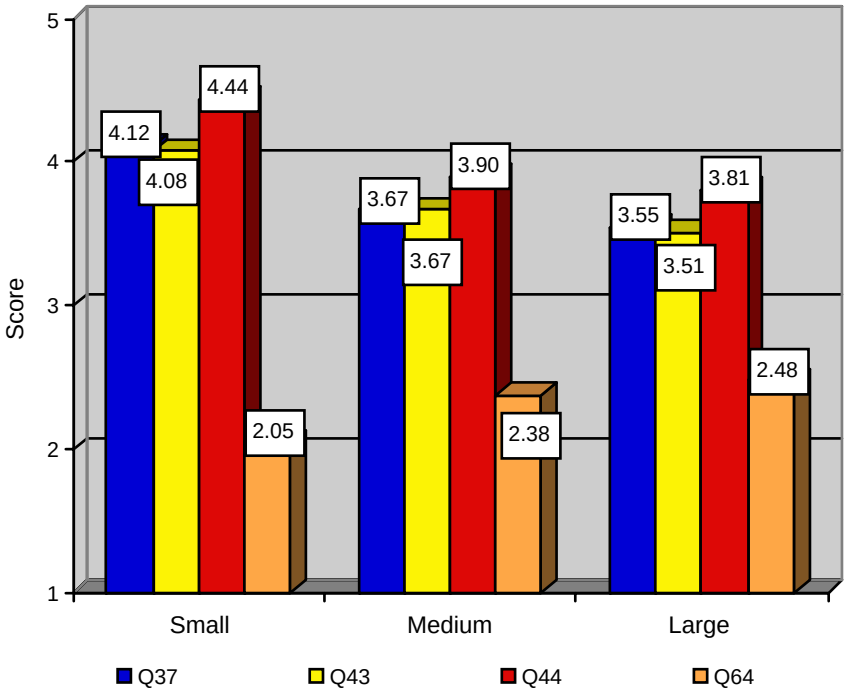
In contrast, larger sites could face barriers because of more complicated organisational structures and less direct relationships as a result:

> Communication between departments is not good. Decisions are being made that affect other departments and are not getting notified (large site, tradesperson. questionnaire response).

> [Site X] don't go in for authentic consultation. We're free to raise issues and then [the OHS manager] will tell us what we're going to do (large site, staff)

Larger sites also faced the risk that more top-down approaches to developing OHSMS might be used with the result that the purpose of effective OHS management is less apparent, as described in section 5.3.3 above.

While such differences were not universal, the quantitative data reveal that the advantages of small sites were evident across the questionnaire responses. The mean responses to key questions about OHS were significantly more positive for small sites than both medium and large sites, as illustrated in Figure 5.11. For Q43 (*The OHS consultative arrangements on this site work effectively*) medium sites also scored more positively than large sites, reinforcing the influence of organisational size on the effectiveness of consultation. These differences were statistically significant to at least 0.05.

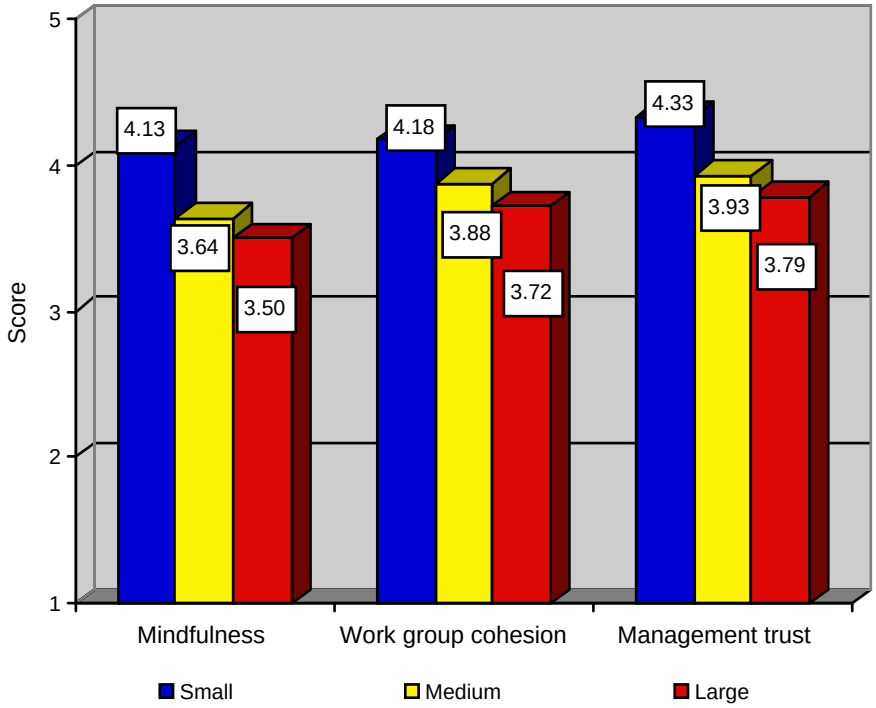


Q37 The OHS management system is well-managed on this site.
Q43 The OHS consultative arrangements on this site work effectively.
Q44 Managers are as concerned about people's health and safety as they are for other requirements.
Q64 How often does the OHS Management System get by-passed in order to get the job done? (reverse scale)

Figure 5.11: OHS in small, medium and large organisations

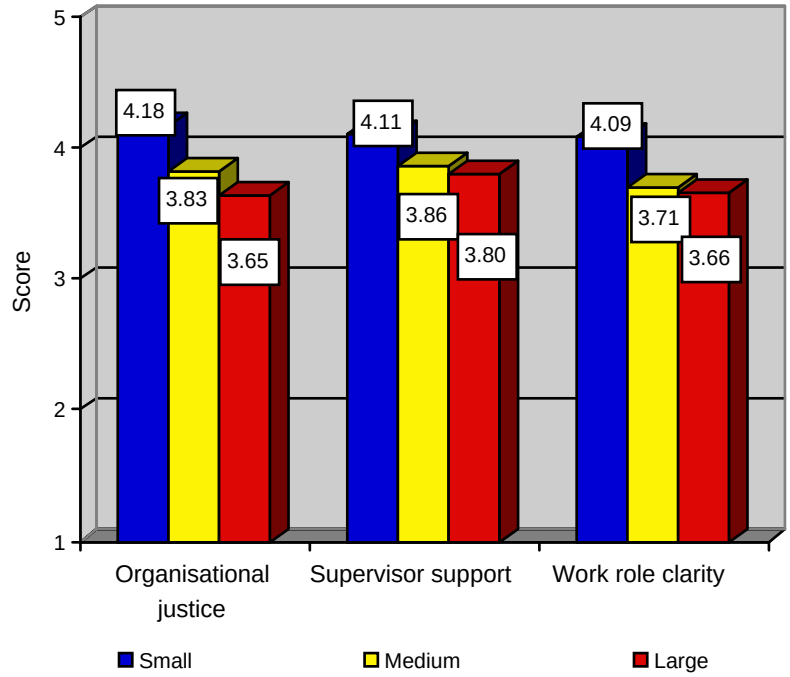
Similar differences were apparent in the organisational factors as well: respondents from small sites reported significantly more

positively on all organisational factors than respondents from medium and large sites. Apart from work role clarity and supervisor support, the differences between medium and large sites were also statistically significant, suggesting a gradient effect from small to medium to large sites.



All differences are significant to at least .05.

Figure 5.12: Organisational factors in small, medium and large organisations (1)



Differences between small and others are significant to at least .05, differences between medium and large are significant for organisational justice to at least .05.

Figure 5.13: Organisational factors in small, medium and large organisations (2)

5.5.4 Sector differences

In contrast to the obvious role played by size, we found limited influence from the different sectors on the effectiveness of OHS management. Coal, metalliferous and extractive sites were represented in all three organisational categories. While some differences between legislative frameworks and OHS processes exist, the qualitative data we collected across all three sectors was not substantially different. We have deliberately not ascribed the quotations in this chapter to a sector in order to protect confidentiality, but they have come from all sectors.

This limited differentiation by sector in the qualitative data is also evident in the questionnaire responses. The only statistically significant difference between the sectors on the OHS management questions is for OHS consultation, which respondents from the extractive sector rated at 3.78, compared to 3.59 for coal and 3.55 for metalliferous. This statistically significant difference is most likely due to the much smaller size of extractive sites. As we've described, size has a substantial and positive effect on the effectiveness of consultation.

Sector makes only marginal difference to the scores for organisational factors – responses from the extractive sector were consistently slightly more positive than those from metalliferous and coal sites. Significant differences were found between

extractive and coal respondents for work role clarity, organisational justice and mindfulness, although these were relatively small effects, again possibly associated with organisational size rather than specifically sectoral effects.

5.5.5 The role of DPI

There was a variable reaction amongst respondents to the role of DPI. It ranged from viewing DPI as a resource and a valuable source of information, to viewing it as overly bureaucratic and a source of irritation. Some interviewees with experience of both OHS regulators compared DPI most favourably to NSW WorkCover.

Those in the small to medium extractive industry were particularly satisfied with the guidance received from DPI. This was especially related to the development of OHSMS; testament to the value and effectiveness of DPI's program aimed at this group:

> DPI are really helpful. They want you to know what you are doing wrong and work with you to help you sort it out. We needed a guarding system. They tried to help. WorkCover just want to bust your balls (extractive, mine manager).

> DPI – I find them really good. They'll come to your site, will do an audit, give you recommendations. They're good because they're proactive. WorkCover are hopeless – they're reactive. They prosecute you for doing what they do themselves: react to incidents (extractive, mine manager).

> The inspector comes four times a year. He checked our new plant before I started it up. We do what he suggests. The guidelines the DPI produce cover all bases. These are a bit of arse covering. We keep them happy – but it also has to be done. (extractive, manager).

> DPI is very helpful to the check inspectors. We can ask them anything. They will talk for an hour on the phone if necessary. We have a six monthly forum for checkies with DPI (OHSC member).

All sites valued the advice from DPI and the safety alerts in particular were often raised as a useful source of information. Some wanted more information and better opportunities for benchmarking:

> I have a lot of respect for DPI, but lots of data they have, we don't get. They've got all of the data (mine manager).

> I would like to see DPI do better at communicating best practice through the industry. After all, they get to all mine sites …. they do it a bit, but could do it more (mine manager).

A varied response to DPI's enforcement role was evident throughout the regions we visited and in each of the sectors. Common words to describe a positive relationship were, *fair*, *reasonable*, *open*. The advice provided by inspectors was valued and many sites showed respect for the inspectorate, even where there had been enforcement action.

> We have a positive relationship with DPI. If we have a reportable we talk to DPI – if [the inspector] thinks he needs to come he will. There is open communication and trust. We've been proactive in inviting them to come out and have a look at things … and they have also run sessions for us on the Act and regulations (mine manager).

> Why is it good here? Because the governing body, DPI, put a lot of pressure on the site. 30-40 years ago there was none of this. Now, because of education and regulation, there are less people getting hurt, less claims, less court cases (operator).

> DPI provide a very open 2 way communication: it's very good. It's quite notable that they've made themselves available to give advice. They will bend over backwards to get information they don't have: they're excellent (mining manager).

DPI has conducted formal audits of consultative arrangements across the industry and the audits were reported to provide useful feedback to sites. As the OHS manager in a medium-sized site reported:

> DPI audited the consultative arrangements. [There were] a number of non-conformances, eg minutes weren't formal enough, the constitution wasn't up to scratch. We addressed these straight away (OHS manager).

In a small site, DPI's role was central to establishing formal arrangements:

> DPI mediated to get the OHSC running (night shift operator).

Another site reported that DPI 'keeps them honest' with respect to their consultative arrangements:

> I find that the people I'm dealing with in DPI are actively involved and ask as a matter of course, 'has your checkie been involved?' (mining engineering manager).

There was also criticism of DPI, with some employees reporting that inspectors were not available unless a serious incident had occurred. Others were critical of the lack of attention paid to workers and their representatives by DPI inspectors:

> …Our inspector doesn't contact HSRs as a matter of course and we don't get copies of reports (HSR).

Some interviewees reported that they found DPI inconsistent, overly bureaucratic, demanding and focussed on prosecution. These criticisms were more likely to be voiced in the coal sector and many managers on coal sites referred in a negative way to recent prosecutions arising from the Gretley disaster.

> DPI's approach varies with the individual and regional office – its not consistent. We're dealing with one Act and one rule but there are different approaches (manager).

> The role of DPI has changed from support (where you could have an off-the-record chat about a problem) to policemen. It's driving people out of the industry – fear of prosecution. There are always prosecutions happening. New legislation has come in because they haven't been able to make the prosecutions stick. The department is part of the industry – but they don't take any responsibility. They can even come after you when you retire from the industry – when does your responsibility stop? (mine manager).

We also observed a willingness on the part of some duty holders to attempt to abrogate responsibility for health and safety to law enforcers, that is, to suggest that fixing the problems in the workplace is the responsibility of the inspectorate:

> DPI are coming out next week to do a general rule audit. Nothing can be done. We have 20 year old plant and we probably won't comply with their rules now. It's getting too tough everywhere. We need to kick a few judges into not prosecuting so much. (mine manager).

We saw no evidence that DPI inspectors were willing to accept this responsibility or that their enforcement activity was diminished in response to it.

5.5.6 Conclusion

Few external variables appear to make a substantial difference to effective OHS management. The mere existence of a formal OHSMS, while necessary, is not sufficient to guarantee effective OHS management. We observed some significant differences on the basis of location, with sites in the Illawarra and the far west of NSW more likely to have lower scores on a number of factors. Sector has only limited effect, with extractive sites scoring more positively across organisational factors, but not always with statistically significant effects. DPI's role in supporting sites' OHS management strategies was mostly positively viewed across sectors, location and size, although managers in the coal sector were more likely to criticise perceived prosecution strategies.

The most important external variable is size, with small sites reporting more positively across the range of items and medium sites reporting more positively than large sites. This reinforces the importance of personal relationships to the effectiveness of OHS management and is also testament to the effectiveness of DPI's small mines strategy. Section 5.4 demonstrated the importance of organisational culture. The impact of size is further evidence that the intangibles of organisational life are the 'glue' that keeps the OHS system operating effectively.

5.6 How effectively are management intentions operationalised on sites?

The disconnect between the goal for OHS stated by senior management, the systems designed to implement that goal, and what actually happens in practice was identified by the Wran Safety Review as having a negative influence on OHS in the NSW mining industry. That such a disconnect might exist is not surprising. In an industry experiencing boom conditions, the competing demands on management are intensified. Managers must satisfy the often competing needs of shareholders, regulators, customers, financiers, unions, as well as site managers, line managers and workers. Management is expected to operate perfectly and produce an environment of zero risk – to business as well as to workers. To achieve this would mean avoiding all organisational and technical risk. But this is an impossible goal because management itself is a complex and imperfect business. In such an environment, the potential for a disconnect between intentions and actions is clearly significant.

A disconnect may be evidence of a failure to:

- set appropriate goals;
- establish systems and processes that are aligned with organisational goals;
- provide adequate resourcing in expertise, money and time and, most critically;
- be attentive to criticism from inside or outside the organisation (perhaps because of poor auditing, poor internal review or poor consultation).

The result is that the rhetoric of management is not matched by the practice.

5.6.1 The disconnect in practice

We saw considerable evidence that management intentions are not always effectively operationalised on sites, particularly on reactive and transitional sites, but also on proactive sites. It was demonstrated at the outset of this research when we negotiated to gain access for site visits. Some sites, with very considerable production pressures, allowed us access to sites because they wanted to contribute to the knowledge about OHS. Other sites publicly stated their overarching commitment to OHS but were privately reluctant to allow us access to sites or refused access

entirely because of the impact on production. This suggested to us that safety can be treated as subordinate to production.

We were not surprised, therefore to see a disconnect operating between corporate management and site management, and between site management and various levels within sites, as the following quotations suggest.

> The general manager is just totally committed [to OHS]. If we were all neutral, he'd be a 10. He's almost fanatical. So fanatical, he's gone beyond practicality in some cases. [*later in the interview*] …not once does the GM go out into the site, he's too busy to go out. I say, let's do it, but we still don't do it. We judge ourselves by our thoughts, others by their actions. (mine manager).
>
> …senior management say that OHS is important — got to be seen to say it, but they don't do it. They set a standard and then don't follow it (HSR).
>
> [What would you do if you had a magic wand?] Get them to say what they mean upfront and don't bullshit to us (operator).

This lack of consistency between words and deeds also marked a disconnect between off-site corporate management and site management. On some sites, mine managers asserted that they had been prevented by their corporate superiors from implementing changes they believed were necessary to control risk because the changes would involve significant cost or limit access to the ore.

Partly, this is an unintended side effect of unclear goals. We rarely found that sites had developed clear goals for OHS management. Interviews and documents revealed both varying and vague goals for the different systems to manage OHS. In some cases, critics claimed that the real purpose of OHSMS were external, to satisfy DPI and avoid prosecutions. Complying with the regulations and avoiding prosecution are both legitimate and important management goals. Yet, to improve OHS performance, the OHSMS have to be mainly aimed at the actual conditions at work and how these are managed. There, we met quite different goals, stated on paper, in interviews or simply assumed. One common goal we were told was to reduce the LTIFR, which can also have obvious benefits, as absence means both reduced production and possibly higher workers' compensation premiums. However, it can also be accompanied by pressure not to report injuries, an outcome that does not support an overarching goal to minimise risks of occupational injury and disease.

Thus, at the outset, there is already a disconnect between management intentions to make OHS a priority and what OHSMS actually are aimed at achieving. Often this is unintended by management, and we found little evidence that the difference between low LTIFR and good OHS was well recognised. For example, we found little understanding of or attention to effective risk control of the full range of risks on mine sites, such as ergonomics, psychosocial issues or even hazardous substances. Thus, one key measure to address the disconnect between management intentions and site practices would be for greater clarity in intentions - the starting point should therefore be to think through what the varying OHSMS really are aiming for.

5.6.2 Closing the loop between intentions and actions

For those at the mine site, failure to close the loop between intentions and actions may be interpreted as a hidden motive. Many workforce interviewees reported a perception that concern by management for OHS is driven by legal obligations and insurance, not a sincere concern about the welfare of employees. At such sites, management is not seen to provide commitment and leadership in OHS.

> My employer is more interested in their ability to defend themselves, if a case is bought against them then they are in real OHS issues. They pay lip service to safety (equipment operator – questionnaire comment).

On other sites, the statement that OHS is really important is undermined by the practice of not dealing with identified risks or not providing adequate resources to deal with them:

> Safety concerns are taken note of but not acted upon if it affects production or availability (tradesperson - questionnaire comment).

> Senior management are not serious about safety. Not at the expense of cost. They preach it and don't do it. Safety's really only important if it doesn't cost money (HSR).

> Improvement ideas are useful – but mine got implemented only after a truck busted some gear. Some things we suggest to improve safety – FM radios in trucks; air-conditioning – they're a hot potato. They don't get fixed (operator).

On some sites, stated management commitment was not reflected in the actions of line management or the support given to them.

> Senior management can tell us how important it is, but then they've got to make it happen (supervisors).

Many interviewees also recognised that setting unrealistic goals sets the organisation up for failure,

> We have a target zero. Most things are preventable – but in hindsight. It's good to have a goal – but it's not realistic (miner).

5.6.3 Balancing OHS and production

The balance between OHS and production can also provide evidence of the effectiveness with which management commitment is expressed. On a number of sites, we were told that the management state that OHS comes before production, but that production demands nevertheless override decisions to control OHS risk.

> …senior managers always say that safety comes first but they don't do it. It depends upon whether we're lagging tonnes or not (miner).

> Its not always safety before production. It's a bit variable and depends on the supervisor and the pressure they are under for production (OHS adviser).

Production demands can encourage line managers to 'not see' unsafe conditions and practices.

> Managers: some talk the talk, but don't walk the talk. If they want more dirt, they just do it, turn a blind eye [to safety issues] and still act as if it's not happening. As long as you're moving the dirt, they will turn a blind eye to doing it wrong, especially if it's going to cost money to do it right. The big picture is OK, it's the little things that they ignore (operator).

5.6.4 Attention to risk management

The management approach to risk control highlights another aspect of the disconnect. Despite stated objectives about the importance of OHS, we observed a limited understanding of the underlying causes of injury and ill health at work. Perhaps as a result, we also observed a lack of basic risk management systems oriented to upstream risk prevention and control on a number of sites. Some sites were focussed on getting workers to behave more carefully as a strategy to control risk through behaviour-based programs and well-being programs. These were often being implemented despite substantial gaps in their broader OHS programs.

In general we found that core risks were receiving attention across the industry and we were given evidence of a number of very effective engineering solutions on sites. However, there were indications that core risks may not always be managed effectively because of fatigue and a behavioural focus to risk control. On a number of sites, we were given specific and identifiable

information about core risk management that indicated less effective risk control. These dealt with issues such as emergency egress, ventilation and strata control. Instead of strategies to control these risks at source, some sites were using behavioural controls, such as providing PPE or relying on SWPs, when the sites themselves often acknowledged that controls at source were practicable.

Fatigue is also an important influence on the capacity of managers, staff and employees to effectively respond to changing circumstances of a mine site and thus control core risks. As Chapter 4 describes, we interviewed many tired people who demonstrated that their judgement was impaired by fatigue. This means that decisions critical to the effective control of core risks may not always be made in the best manner and increases all risks on and off site.

Many sites were implementing well-being programs, often as a strategy for fatigue management. These were also seen on some sites as a substitute for a range of risk control interventions; for example, instead of identifying, assessing and controlling manual handling risks through technical and organisational improvements, sites were implementing exercise programs in the expectation that this would reduce the incidence of musculo-skeletal disorders. This was not always positively viewed by the workforce:

> …the issue is not about personal behaviour but about making the workplace safe (HSRs).

The focus on worker behaviour was often treated with scepticism by the workers, although they may well 'play along':

> What works? Our job-based risk assessment process [proprietary name] works. It's used, it's led to changes. It's had a major impact on injury rates. It's not behavioural, it's about the assessment of risk and the control of risk. The [behaviour observation system] is regarded as a crock. You just have to look at the [observation] forms to see that (HSR).

In contrast, we also found evidence that, in some organisations, the workforce is particularly forgiving of its management and overlooks obvious failures to fix fundamental risks.

> Management practices what it preaches. [*later in the interview*…] we need to improve ventilation, dust is bad and dust suppression doesn't do too good. Visibility is bad, too (miner).

As this demonstrates, a focus on individual behaviour through behaviour based safety or wellness programs was diverting resources from risk control strategies that control risk at their source. On many sites, workforce interviewees were able to nominate risk control measures they believed were necessary but that had not been implemented. At many of these same sites, behaviour based safety or wellness programs were being implemented with the justification that all other possible causes of occupational injury or ill health had been controlled. This obvious disconnect may be having a detrimental affect on risk control strategies.

5.6.5 Conclusion

Sites that more effectively operationalised their management intentions – the proactive sites – were not perfect. Indeed, these sites were more likely to be aware of their failings through greater mindfulness. They were more able to identify and respond to mistakes. As this suggests, overcoming any disconnect it depends on:

- setting goals that are focussed on effective OHS management, not zero risk;
- providing the necessary resources to achieve the goals, such as competent advice, time and money;
- ensuring OHSMS meet site needs, embody the values and principles that underpin effective OHS management and, most importantly, lead to effective control of risks; and
- being prepared to identify and address errors and mistakes without blame or penalty.

Fundamentally, overcoming any disconnect at sites relies on people at all levels working together to address relevant needs. Effective consultation is the fundamental precondition for closing the loop between management intention and site practice.

5.7 What characterises effective consultation?

Effective consultation is fundamental to the management of health and safety at work and the goal of creating healthy and safe workplaces. It is a core part of an effective OHSMS; not separate from it. Both the qualitative and quantitative data from sites show that without engagement, involvement and influence from workers on site, stated goals for OHS are unlikely to be realised on mine sites. This research confirms what we already know: it is not possible to have an effective OHSMS without effective consultation. Given the importance of this aspect of OHS management, the weaknesses of consultation that we observed on many sites are most disappointing. Any effort to address the disconnect on sites or to build trust between the different groups on sites must start by improving consultation.

We know that consultation is considered important by players in the industry. Indeed, the outcomes of the *Future Inquiry* Workshop on this topic reinforced and acknowledged the importance of consultation. However, there was considerable uncertainty about what constitutes effective consultation.

5.7.1 What consultative arrangements are used in the NSW mining industry?

There are legal requirements for consultative arrangements in the mining industry that are imposed by the *Occupational Health and Safety Act 2000*, the *Mine Health and Safety Act 2004*, the *Coal Mine Health and Safety Act 2002*, and their various regulations. At site level, the arrangements mandated by law include OHS committees, formed under the *Occupational Health and Safety Act 2000*, and elected worker representatives: OHS representatives under the *Occupational Health and Safety Act 2000* and site check inspectors under each of the mining acts. These are taken up differently in each of the sectors as illustrated in Figure 5.14 below.

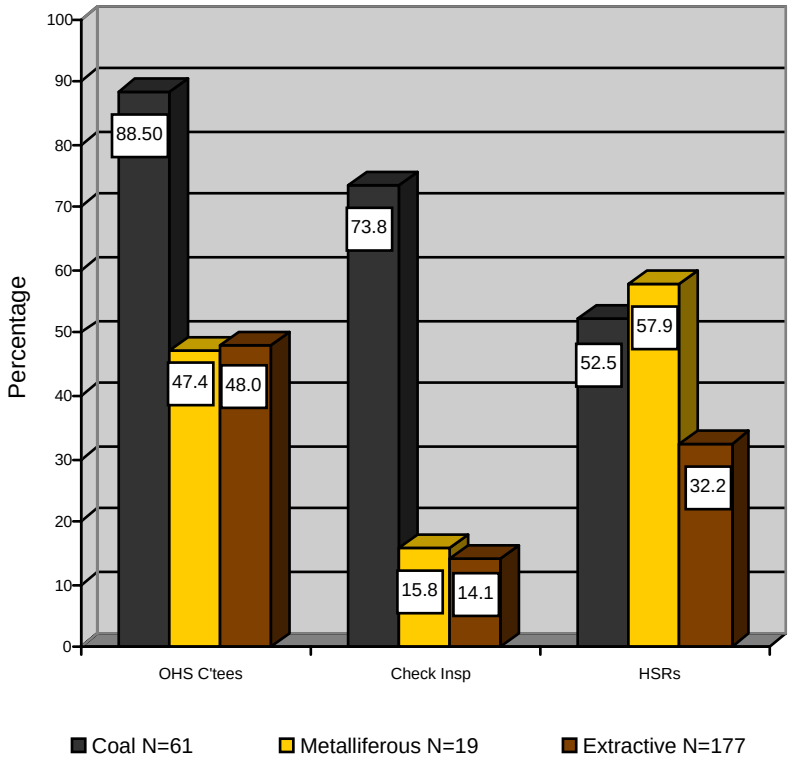


Figure 5.14: OHS Consultative arrangements by sector from census

There is a relatively low take up of OHS committees in the metalliferous and extractive sectors in comparison to the coal sector, however, these data may be skewed by the high number of small sites in the extractive sector where a formal committee is neither required nor always necessary. By comparison with the other sectors, coal has more fully embraced formal consultative processes.

The functions of the different forms of worker representative are roughly equivalent and although we differentiated them in our census data we did not differentiate between the different forms of worker representative in our site visit questionnaire. In this report we generally use the generic term, health and safety representative (HSR), to describe them unless their status was made known to us, or it is important to the discussion. Similarly, we have used the generic term, occupational health and safety committee (OHSC) although the actual titles vary widely across the industry. We do this to provide consistency and clarity in this report and also to protect the identity of any organisations with unique names for these groups.

5.7.2 What is effective consultation?

Consultation does not imply joint decision-making: management controls the workplace and retains the prerogative to make the final decision. However, effective consultation can influence

management decision-making because it provides management with an important source of ideas and information from a perspective not otherwise available to it; that is, from those who do the work. It has influence in the other direction, too, such that workers can hear and understand how management decisions are made, increasing the likelihood that those decisions will be accepted and acted on. Effective consultation is characterised by *listening* carefully and talking less. It is underpinned by two-way respect: management for workers, and workers for management. In an environment with effective consultation, critique is welcomed and people are not labelled as "whingers", but negative views are encouraged to ensure a complete picture of what is going on at the site.

Effective consultation will only happen if people and the processes are given time and resources. For all parties this means time for training and reading to improve competence in OHS, time to listen to the views of peers, time to discuss issues with peers and time to consider what they say. Giving time to consultation is often a stumbling block, as our research identified; particularly when people who work at the mine face need time that results in lost production.

5.7.3 What did we find on site?

In most instances, we found that formal consultative processes had been established in compliance with the law (such as the election of HSRs, the establishment of OHS Committees), although we found no examples of excellent practice. That is, we found no examples where the formal processes were accompanied by resources in the form of expertise, time and money that allowed those consultative processes to operate to maximum effectiveness. This is not surprising – consultation is difficult and time consuming and more participative approaches to OHS consultation are relatively new to the mining sector, which has traditionally relied on formal arrangements through the legally established position of check inspector.

Most importantly, however, data from the site visit questionnaires indicates a correlation between people's beliefs about the effectiveness of consultation on site and the OHSMS category, as discussed above. People on proactive sites reported more positively than those on reactive sites. The differences are small, but significant.

We found that there were criticisms of consultative processes across the sectors as well as across the OHSMS categories. These comments reinforce the link between consultation and OHSMS and reveal important features of consultation in this industry.

On our site visits we observed only a few examples of effective consultation at larger sites; in general small sites such as quarries

demonstrated more effective arrangements. This may also be a consequence of the relative market pressures and profit margins across the sectors that make workers' time more valuable in coal and metalliferous. It may be more difficult for management to justify the expenditure of time on consultation in these sectors.

However, this may be an indication of the generally poor level of consultation with workers within the NSW mining industry. Elsewhere, research consistently indicates that consultation tends to be more effective in large than in small workplaces. This is because:

- Workers and representatives are more likely to be supported by unions; they are easier to reach with training, information and other support.
- Larger workplaces are more likely to have an industrial relations climate where the different roles of workers-unions and managers-employers are accepted as a base for a constructive dialogue.
- Better organised procedures and practices for consultation are usually in place.
- Because larger companies can generally afford dedicated OHS personnel, higher OHS competence and maturity is available as a base for consultation.
- More trained and experienced safety representatives are available (Walters et al, 2005, Blewett, 2001).

5.7.4 What works?

Many small sites we visited relied on informal means of consultation. An informal gathering over a BBQ or informal conversations in the crib room or in the plant were often enough for the mine manager to find out what was going on and any problems or concerns employees had. In small organisations getting the whole workforce together can be a relatively simple matter; three people in the crib room with a cup of tea before work in the morning, or meeting employees at a regular time in their work place to find out how things are going can soon become an established habit. However, we found some small operators had transformed their informal consultative processes into formal ones, without changing the perceived formality. They accomplished this by writing down outcomes of discussions and then keeping track of resolutions to problems, collecting people's views on matters or encouraging them to write down a list of things to talk about to use as an informal agenda. Informal consultation can be open and effective, but if it does not work well it's difficult to tell unless there are some key things written down, so introducing some

degree of formality can be a sensible option, even in very small organisations.

The presence of senior managers was an important feature of more effective OHSCs. With senior managers present to hear concerns and ideas, consultation was enhanced because the communication was direct. Information that is needed to make considered recommendations can be made available immediately on the basis of knowledge, not speculation:

> We put our senior people (managers) on the safety committee. It's a very functional committee. I'm in the (workplace) every day or two – people talk to me regularly. I'm open for discussion. The managing director is also accessible (mine manager, proactive site).
>
> Our safety committee is pretty proactive, working with us to develop our SMS. Our committee has overall coverage for the whole site; it's well-respected. It meets frequently and works well together (OHS manager transitional).
>
> There is respect for the mine manager and his style. He's one of the blokes (OHSC member, transitional).
>
> The OHSC meetings seem to work well; we have good outcomes, it's a lot more open these days (check inspector, proactive).

Backing up consultation with action gained the confidence and continued buy-in of the workforce:

> We have a great OHS Committee. We have an open culture. We back up decision-making with action (OHS manager, transitional).
>
> Actions that come out of OHSC meetings are monitored and team leaders can see who's responsible for what (plant manager, proactive).

When consultative processes are established, they presented management and the workforce with an opportunity to critically appraise the workplace and plan to improve it. Necessarily this means that there is going to be discussion of what doesn't work in the workplace and what might be improved. Management therefore needs to be very open to hearing criticism of the workplace, and often of themselves. Some things will be outside the capacity of local management to resolve, but open discussion of the problems that management faces in seeking resolution, and working with management to find ways to make a difference within

the constraints imposed on them, will foster good will. But the first skill the manager needs to develop is the art of listening to bad news, welcoming it, and acting on it:

> The blokes selected me as their rep because I'm not afraid to speak up. At my first meeting I raised a problem with some materials that are delivered in heavy lots. I suggested they be delivered in smaller parcels. The Committee agreed and the mine manager arranged it with the supplier. My blokes were pretty impressed (HSR, reactive).

Unions can be crucial to the goal of making the workplace healthy and safe. Because they have access to considerable information about OHS and have the capacity to inform their members, they can be valuable in helping to skill their members with content knowledge as well as the 'how to' of consultation. Management that encourages employees to find things that don't work in the organisation or to raise issues will find that union members are more likely to speak up and be sure of themselves. We found places where this was demonstrated:

> We have an excellent OHSC, very open relationship with our union, excellent delegates (engineering manager, proactive).

The willingness to speak up is fostered when people are not blamed for things that go wrong,

> We have a 'no blame' approach to hazards on site. Some of our people don't have the right approach. But it's important to develop a relationship and treat people as adults when we are trying to effect change (supervisor, transitional).

Regular, formal contact for consultation makes it more likely that there will be good outcomes. This does not have to be only in the form of OHSC meetings. Other forums can work as effective consultation, too, provided employees really do have the opportunity to freely raise issues. Some pre-start meetings that we attended were rushed and had large numbers of attendees. Only the most confident individuals would feel safe speaking up in such environments.

> We have a safety meeting every month. People come up with good ideas. We also have tool box talks and site meetings (supervisor, transitional).

> We use the OHSC as our primary point of contact (OHS manager, transitional).

> Safety meetings are regular. We are battling to find things to address (union rep, proactive site).

Formal consultative processes are the norm in the industry, because they are a legislated requirement. We found some excellent examples of paper- and computer-based systems during our site visits. The paperwork will only make a difference, however, if it is relevant to what happens in the organisation, is maintained for a reason, and is kept up to date. When done well, formal procedures provide a framework for action – an opportunity for everyone to keep everyone else honest, so up-to-date and meaningful paperwork contributes to effective consultation and making the workplace healthy and safe:

> Following a [significant] organisational change we have to re-write the [OHS Committee] constitution (mine manager, proactive).

In summary, effective consultation on sites was marked by:

- building a culture of respect – treating people like thinking adults;
- using formal systems to demonstrate that consultation is really happening;
- having paper work that is relevant, up-to-date and meaningful;
- using informal discussions to build confidence in relationships and to find out what's going on in the organisation;
- engaging senior management in formal processes in order to listen to the views of employees and to bring their knowledge about the organisation to the table;
- taking action to resolve issues that are raised, using the OHSC to develop plans to improve workplace health and safety;
- managers being prepared to hear bad news, criticism, information about organisational and system failures without blaming the messenger; and
- engaging the union.

5.7.5 What doesn't work?

We found formal processes in place on almost all sites and even some quite small sites formalised ostensibly informal practices by, for example, taking minutes of toolbox meetings at which safety was discussed. However, in many places we were told that the

consultative arrangements were developed by management or the OHS officer or an external consultant with no input from workforce:

> The safety management system was presented [to] the OHS Committee. In it, it says it was "developed in consultation with the workforce". There was no consultation. We have poor systems and procedures for consultation. None of the [trades or operators] knew anything about the new system. You can't follow a procedure you haven't agreed to (check inspector, transitional).

At reactive sites we found the implementation of these processes for consultation to be either absent or token in nature:

> We've only had one meeting of the OHSC since…late 2006. We used to have them every month (administration manager, reactive).

> There's definitely a big belief that workers don't get told what's going on, what the goals are (OHS coordinator, reactive).

We were told on many sites that communication was poor and feedback was poor or non-existent. As one operator reported:

> We need better management. Communication from the top down is non-existent. If they tell you what's going on then you can have input (operator, transitional).

As this suggests, consultation was often undermined by ineffective communication, which was also commonly confused with consultation. Communication is a legitimate function within the OHSMS. That is, making a decision and then telling people about it is a clear management function and responsibility. However, confusion between communication and consultation leads to dissatisfaction:

> I'm not satisfied with our safety committee – it's treated as a safety briefing, not a consultative group (HSR, transitional).

It also meant that some sites did not even implement the basic formal structures that underpin effective consultation:

> We do not have an OHS Committee. Instead we have a monthly Communication Day. We have the GM at three per year. We can do refresher training, risk assessment, raise issues, and consult. Every 4 days we have a first shift back

> meeting. We discuss safety. We also use emails and circulars. The communication is OK (mine manager, transitional).

Although managers often complain that the workforce "doesn't take consultation seriously" and "only whinges", we were often told that management failed to attend formal consultative forums:

> Consultation process? There is none. We have a meeting and we all agree on things, but nothing gets done. Management won't come to meetings. We can't get them to come to meetings (OHS manager, reactive).

Others reported to us that management wanted to control consultation, not listen to the opinions of the workforce,

> We have a safety meeting every month. It is *sooo* boring. The Mine Manager talks all the time (operator, reactive).

In this situation workers may respond with conflict:

> The only way we get consulted is if we bring it to a head. Management runs the show. The OHS committee doesn't work. I was on it for four years and didn't think we accomplished anything (operator, transitional).

Some senior managers told us they avoided OHSC meetings because they thought their presence might stifle conversation; and this had often been their experience. However, if employees are treated with respect, as thinking adults, and are listened to, senior managers will soon earn their respect and trust and consultation will improve.

We found detailed paper-based systems and processes in place that included election of HSRs, meetings and minutes, but often only limited resources given to them to make them effective. For example, at one transitional site the deputies complained that:

> People on the OHSC have no deputy membership – it's been dropped with a change of management. We get minutes of the meetings, but no time to read them. The OHSC is a mouse that roared – stuff gets identified alright, but there are no dollars to fix things (deputy, transitional).

This lack of follow-through was a regular concern that was expressed to us. We frequently heard that the OHSC meets regularly, there are minutes, people attend, issues are discussed and

controls planned, but nothing happens as a result of the meetings, leaving members disheartened about the consultative process:

> The company keeps saying it'll fix the travelling roads, but nothing happens. People get injured on them, but nothing happens. It'll cost money to fix (operator, reactive).

> The safety meeting last week was good. We have the right ideas - but the follow up is too slow. Next meeting we find things aren't addressed (operator, proactive).

Lack of time and resources were identified as key constraints on many sites. At a proactive site, a supervisor and member of the OHSC who was concerned about the lack of time for effective meetings suggested that:

> I think the Safety Committee should meet more often than once a month.

Others identified the need for resources to make consultation work:

> We need to improve consultation. It needs time and input through the process not just at the end (HSR, transitional).

Lack of resources applied to consultation is conflated with lack of sincerity and results in a cynical attitude towards it:

> Consultation on this site is not good enough. The new Mine Safety Management Plan went to the OHS committee – a presentation was made and the Committee was expected to sign off on it. They had no hard copy and no time to read it (supervisor, transitional).

Workforce cynicism will also grow in an environment where management (not the workers) appoints people to the role of HSR, or where a HSR is 'elected' by their peers without their consent (perhaps while on holidays). Neither example fosters true representation or consultation.

Contractors, even those permanently on site, part-time people and shift workers are often left out of consultative processes although they may have significant matters to raise and may bring a very different viewpoint to the table than day-shift personnel,

> Permanent contractors are basically treated the same as employees but they're not on the OHSC. We should have one of our permanent contractors on our OHSC (supervisor, proactive).

> There are generally potentially more management reps than worker reps. Problem with shift workers is that they may not be on shift when the meeting is on. Need twice as many reps – have to have deputies – to cover for meetings. If HSRs are at work, then they are pulled off shift to attend. If they have been on site for 14 hours, then this can be a problem. Some will sometimes come in from home for a meeting, but this is asking a lot (OHS manager, transitional).

A frequent criticism was that workers and worker representatives who raise issues are marginalised, sometimes in quite subtle ways. For some people this has the effect of making them more strident in their criticism. Others keep observing but stop participating when management clearly doesn't want to hear bad news. Either reaction is detrimental to effective consultation:

> You do get input into procedures and risk assessments, but you don't get invited back if you are too negative (operator, transitional).

In summary, ineffective consultation was marked by:

- confusing consultation with communication;
- poor communication;
- imposing consultative arrangements without consulting about them;
- failing to follow-through with the outcomes of consultation;
- refusing people time and other resources to consult, and failing to consult regularly;
- failing to participate in consultation (management and employees);
- management appointing worker representatives, or 'elections' being 'rigged;
- not listening to the views of others;
- management being unwilling to hear bad news;
- not engaging with people who can adequately represent the whole workforce, including shift workers and contractors; and

- marginalising worker representatives or finding other ways to silence dissent, for example, by excluding individuals from formal processes.

5.7.6 Conclusion

We found a sincere desire on the part of industry players to work towards the goal of effective consultation. During our site visits we found that management and workers all recognised the valuable part that consultation plays as part of an OHSMS. Indeed, participants at the *Future Inquiry* Workshop on this topic considered consultation and communication so important that they identified it as one of the key strategies for immediate action by the industry as a whole.

From our site visit data and from the *Future Inquiry* Workshop it is clear that industry wants:

- clear guidance on the nature of consultation and how to make it happen;
- audit, review, evaluation and monitoring tools for consultation in the workplace;
- training on consultation;
- role models in the form of 'best practice' case studies;
- advice on more sophisticated approaches to consultation at large, complex sites; and
- encouragement for sites to establish priorities for consultation and provide resources.

Given the importance of effective consultation for sound OHSMS, it is disappointing that these measures are not already more sophisticated in the industry and that we did not find any examples of world class consultation. However, many sites, particularly proactive sites, have the essential building blocks in place. More importantly, as the *Future Inquiry* Workshop demonstrated, the NSW mining industry has a strong will to improve. This means that there are very few significant obstacles to achieving more effective consultation in the industry. The next chapter sets out how more effective OHS management and consultation should be evaluated, monitored and promoted on the basis of our findings.

5.8 How should OHS management and consultation be monitored, evaluated and promoted?

The data presented in this chapter provide further evidence of a key finding of our literature review, that *how* OHSMS are developed and implemented is at least as important as *what* they consist of. Thus, any strategies to promote effective OHS management and consultation must be built on the organisational factors that underpin effective OHS management, namely:

- mindfulness;
- workgroup cohesion;
- trust in management;
- organisational justice;
- supervisor support; and
- role clarity.

This means that detailed, prescriptive rules will not achieve the desired outcome of world class OHS. Instead, monitoring, evaluation and promotion schemes must build the capacity of sites to develop their own unique approaches and to ensure that they get timely information about how effectively these approaches are meeting organisational needs.

5.8.1 Monitoring OHS management and consultation

The data presented in this chapter reinforce findings from the literature review that effective auditing is essential to being able to close the loop between management intention and site action. Audits which only deal with paper compliance or which only provide good news are worthless. Unfortunately, auditing at most sites appeared to have these features:

> We had two audits last week. None of the auditors talk to each other (mine manager, transitional).

> The regime of auditing is producing impractical recommendations. Some of the things that are getting audited are fairly minor relative to the other risks that need to be managed. … What's happening – it's not sustainable. I've almost had enough … my family notices. Audits are extra work for people. It adds to time and worry and

> makes it difficult to do your job…. It's self-inflated under the cloud of prosecution (staff, transitional).
>
> We get audited from time to time. They cover the company. It's a load of rubbish (maintenance, proactive).
>
> There's too much emphasis on paperwork, whether relevant or not…. It's about protection from litigation and the more complex, the more likely to fool the auditor (manager, reactive)

More formal approaches associated with contractual arrangements or corporate relationships were evident as well:

> We use our own OHS management system. The principal does regular audits to make sure that the system is compliant with legislation. There have been two audits so far and the first was a real problem as the system wasn't compliant with the new legislation. The focus of next audits will be on implementation (contractor manager, transitional).
>
> Audits are used to develop a 12 monthly action plan. This is signed off by the board. We use our computer system to track actions. Progress against the improvement plan is reviewed quarterly and a progress report goes to Board (OHS manager, transitional).

However, the actual operation of these formal auditing processes were often criticised at sites because they were not confident that the audit reports truly reflected what was happening on site:

> audits [by the principal] aren't useful…. Quite a bit of it there was really silly, even down to our safety policy. Our wording didn't match up to AS4801. It's very much on paperwork not on implementation (manager, transitional).
>
> [external auditors] were doing a 2 hour desk top audit which gave everybody a warm and fuzzy feeling but wasn't accurate (OHS manager, transitional).

Without effective processes of audit and review, the industry will be unable to determine whether management intentions are being reflected in site practices, nor indeed challenge and refine the management strategies that have been adopted.

As well as formal internal and external audits, robust consultation and internal feedback are critical to monitoring OHS management. If consultative processes are bogged down in the minutiae of day to day OHS issues and if workforce representatives perceive that their involvement relies on only delivering positive feedback, it will not be surprising if OHSMS are ineffective. The processes for monitoring must build mindfulness by encouraging criticism and error reporting.

The regulator has an important role as the 'auditor's auditor' to ensure that these approaches to auditing are being used on site (see Parker 2002, Power 2004). Thus, DPI should be checking that sites have effective internal and external auditing processes, which is perhaps as important as conducting audits in their own right.

5.8.2 Evaluating OHS management and consultation

While effective auditing is critical, it will only ever report the extent to which the OHSMS is being implemented. Audits by definition answer the question, 'Are we doing what we say we do?'. Of even greater value are evaluations, which will examine the effectiveness of overall OHS strategy: 'Are we doing what we should be doing?'.

OHSMS are always imperfect and they must be continually reviewed to ensure that they are still supporting achievement of the goals of OHS management. Workforce consultation is a critical component of this. If OHSMS do not build in this continuous improvement loop, they will be handicapped from the very start and are likely to deteriorate into a paper tiger.

We found little evidence on sites of such evaluation processes. Partly, this results from the considerable resource demands required to implement and sustain systems – there is simply not enough time. Careful strategic choices about resource allocation rely on careful planning, which was often not evident on sites. Effective evaluation also relies upon clear goals for OHSMS and, as section 5.6.1 outlines, goals were often unclear and even contradictory.

Limited application of evaluation also results from the industry's continued reliance on narrowly defined outcome measures to evaluate performance. When there are so many internal and external confounders for such measures, this reliance may mislead and result in a false sense of security. In an environment facing catastrophic risk, such a false sense of security can be disastrous. Such problems with this approach have been identified many times and key industry players recognise their limitations.

Considerable work has already been undertaken on performance monitoring in this industry and the need for performance indicators of risk exposure and the effectiveness of other management

processes has been recognised for some time. Nevertheless, sites still relied on lag indicators and demonstrated a limited understanding of the power and use of lead indicators. Where lead indicators were used, they were often used well, as a means of improving activities to make the workplace healthy and safe. For example, sites with safety incentive schemes that recognised and rewarded contributions to OHS management tended to demonstrate more positive outcomes for organisational factors associated with effective OHS management than those that paid for achieving outcome targets, as described in Chapter 3.

Some years ago, the NSW Minerals Council developed a guide to using such measures and delivered training across the industry to encourage its adoption. Such measures, however, are still not being widely used to assess the overall effectiveness of OHS strategies at senior levels in the industry. If reward and recognition schemes depend upon measures that are relatively easy to manipulate, as we've described in Chapter 3, then boards and senior managers in the industry should not be surprised that their good intentions do not always result in effective OHS management.

Effective evaluation is built from a strategic plan based on a clear statement of where sites aim to be in two, three or five years. Appropriate performance measures can then be defined so that evaluation can be based on a realistic idea of what is achievable. Not everything can be achieved immediately and unrealistic goals can lead to frustration and failure. The guidance to performance measurement prepared for the NSW Minerals Council sets out an approach to developing a strategic plan with clear goals and relevant performance measures so that effective evaluation can be undertaken.

5.8.3 Promoting effective OHS management and consultation

Participants at the *Future Inquiry* Workshop on the topic of OHSMS and consultation considered that developing a robust approach to OHS management was a priority. They recognised that an industry strategy should not prescribe system elements but provide criteria for an audit tool. In particular, they proposed that sites needed flexible, robust systems that achieved necessary standards for risk management, consultation, training, audit and review.

Such strategies require clear goals and we have found that the goals for effective OHSMS and consultation are often poorly articulated within industry. As a result, company goals generally conflate outcome performance measures with goals, aiming for 'zero injuries' and the like, rather than effective management of risk. If companies want only to reduce the number of reported work-related injuries, then some of the strategies reported in Chapter 3 will achieve this and the features of effective OHS management

identified in this chapter are likely to get in the way, rather than assist that aim.

On the other hand, we are confident that the NSW mining industry sincerely aims to achieve world class OHS and make the industry workplaces healthy and safe. Clarity about the goal of OHSMS and consultation in the industry and on sites would allow better choices of strategy.

In particular, if, as the *Future Inquiry* Workshops identified, the mining industry is to become an employer of choice, it has to treat its workers as customers of the systems it uses. This is particularly important at a time of skills shortage when there is competition for labour. From this perspective, consultation can be viewed as a basic customer dialogue, in which workers should have a significant say on all aspects of the management system that is intended to deliver safe, healthy and attractive jobs. Thus consultation must start at the beginning, when defining the goals of the OHSMS, and influence how this management system is to be organised as an integrated part of general management.

The regulator has a critical role in promoting this approach. Clearly, detailed specifications are not only ineffective, they may well divert resources from the important and challenging work that needs to be done to implement effective OHS management. Rather, the regulator's role in promoting effective OHS management is more sensibly seen as a 'boundary rider', making sure that the mining industry is meeting minimum requirements for OHS management, but allowing considerable autonomy within these boundaries to achieve their goal. Of course, this implies significant penalties when companies operate outside the boundaries.

In particular, given the demonstrated importance of consultative processes to effective OHS management, DPI has a clear role in enforcing regulatory requirements for consultation. Promulgating guidelines, mediating committees, assisting with self-evaluation of consultative processes and auditing are all potential avenues that DPI can use. Where necessary, consideration may need to be given to improving the skills of existing DPI inspectors to enable them to perform this vital function effectively. They must be able to investigate consultative processes thoroughly to determine how effective they are in practice.

Participants from the regulator at the *Future Inquiry* Workshop identified areas for future action by the regulator, including:

- auditing communication;

- identifying and promoting good performers/systems to use as case studies;
- changing the role of DPI to lessen fear;
- rationalising information eg guidelines, Codes of Practice;
- introducing an awards, rewards system;
- working collaboratively with other jurisdictions on a national framework (National Mine Safety Framework);
- learning from other jurisdictions;
- participating in developing international standards through the ILO; and
- Explaining effective consultation through training.

All of these functions clearly have relevance in promoting effective OHS management and consultation.

The most important role for DPI is to provide the encouragement at site level to implement effective management practices; to not merely focus on paper compliance, but undertake a thorough investigation of involvement, action, resource allocation and outcomes through talking to key players on site, including workers and their representatives.

Stakeholders in the industry have demonstrated their preparedness to work together to achieve world class safety through MSAC. The final section of this chapter provides recommendations for addressing the findings of this project by MSAC that will promote effective OHS management.

5.9 Conclusions and recommendations

The NSW mining industry has committed to achieving world class OHS and the data collected in this project shows that the existing OHSMS and consultation arrangements at many sites position the industry very well to achieve this goal. We saw many excellent and effective strategies, but we also saw practices that could and should be improved.

In this chapter of the *Digging Deeper* research project we have provided information that will support further improvement. We have demonstrated a clear link between OHSMS and organisational culture. Organisations with a proactive approach to OHS management characteristically have risk management systems that anticipate risks and seek to control them at source, have systems that are well-developed, known and understood throughout the organisation, have well-developed consultative processes and have other means of feedback such as internal and external audit and review. Organisations that perform less well than the proactive sites were identified as either reactive or transitional.

We were also able to build a picture of organisational culture from the analysis of the questionnaires used in this research and identified organisational factors that described this: mindfulness, workgroup cohesion, trust in management, organisational justice, supervisor support, and role clarity. Proactive organisations were characterised culturally by high scores on these organisational factors. Reactive and transitional organisations scored less well in a statistically significant manner.

5.9.1 There is room for improvement

The industry's commitment to this project is clear evidence of its preparedness to embrace continuous improvement and we have been able to identify clear opportunities for this. We were able to construct a 'league table' of the sites we visited using our qualitative data and this was validated by statistical analysis. Some sites we visited had enviable processes in some areas, however, each of the sites we visited had room for improvement in some areas. Given we have a statistically significant sample of the industry in our research sample, we can confidently conclude that our observations are highly likely to apply across the NSW mining and quarrying industry. Areas that need to be addressed across the industry are:

- focussing on a systematic approach to OHS management, rather than adherence to a specific OHSMS;

- improvements in consultation and participation by the workforce;
- controlling risks at source;
- applying resources to OHS;
- seeking good advice; and
- monitoring performance through auditing, feedback and review.

Successful strategies for dealing with these must be built on the features of organisational culture that we identified as closely linked with effective implementation.

5.9.2 OHSMS

An effective OHSMS is built on the organisational culture that this study has identified. Thus, any approach to developing OHSMS must embody the principles of mindfulness, work group cohesion, trust in management, organisational justice, supervisor support and role clarity. This does not require the development of detailed specifications and standards. The *Future Inquiry* workshop participants agreed that defining the "perfect" OHS system was both unnecessary and diversionary. Instead, the industry should be encouraged to develop a systematic approach to managing OHS, not complex, paper-based OHS management systems. Such an approach must be built upon clear goals and participative strategies to achieve them. The OHSMS can then be a tool that supports achievement of agreed goals and effective risk control, rather than act as an end in itself.

Recommendation 11

MSAC should develop a strategy to support all sites in the NSW mining industry to review the extent to which they have effective OHSMS in place, building on the concept developed at the *Future Inquiry* Workshop and using the findings of this research.

5.9.3 Consultation

Simply put, if the goal is to create healthy and safe workplaces, you must involve those whose health and safety is to be created. This makes consultation the cornerstone of effective OHSMS. Consultation and communication were identified as a key strategy for immediate action by the industry at the *Future Inquiry* Workshop. Although participants were vociferous about the fundamental importance of consultation to effective OHS management, there was a stated lack of understanding about what constitutes good consultation. Given there are numerous resources

available on the topic, including materials developed specifically for the NSW mining industry, this was surprising. We have provided a copy of previous guidance on consultation for the NSW mining industry prepared by Andrea Shaw for the predecessor to DPI, the Department of Mineral Resources, as Attachment 12 in Volume 2 of this report. This could be revised and used as guidance for the industry.

Recommendation 12

Sites should apply the tools currently available, and new tools as these are developed, to review and improve their consultative arrangements in consultation with their workforce.

Recommendation 13

DPI should further develop its intervention strategy on consultation to include assessment of effectiveness. This will require the development of review and evaluation guidelines that should also be made available to the industry. As part of this, DPI should also consider what further inspectorate training may be necessary to support such a strategy.

Recommendation 14

DPI should review their site visit protocols to ensure that they build effective consultation, in particular that they include the imperative to meet with workers and their representatives each time they come on site. Enforcement activity about compliance with legal consultation requirements should increase and sites should be actively encouraged to improve the time and resources expended on this critical area.

Recommendation 15

MSAC should develop a strategy to identify and promote good consultation practices building on the concept developed at the *Future Inquiry* Workshop and using the guidance that has been prepared previously for the industry. This strategy should identify and acknowledge best practice consultation in each sector and in SME as well as large enterprises. Case studies about these examples should be prepared and disseminated widely.

Companies that demonstrate best practice consultation should be encouraged to share their experiences with other firms.

Recommendation 16

MSAC should revise and update the guidance for consultation provided as Attachment 12 in Volume 2 of this report to include recent legislative changes to create a *Guideline on Employee Consultation*. This guideline should then be actively and widely disseminated throughout the industry, including via the internet, as a guide to effective consultation.

Recommendation 17

MSAC should derive a set of self-audit tools and self-review tools from the *Guideline on Employee Consultation* for use by the industry.

Recommendation 18

Industry bodies and unions should offer training on consultation based on the industry guideline.

5.9.4 Controlling risks at source

While we found excellent examples of engineering risk controls, we also saw some reluctance on the part of the industry to manage risks at source. This was coupled with an increasing take up of strategies that focus on worker behaviour as the primary means of risk control. The industry should strengthen its focus on controlling risks at the source, as the law requires. DPI has a significant role to play in enforcing such an approach. Industry bodies also have a role to play in promoting changes at enterprise level that make the workplace healthy and safe and advising against strategies that focus on worker behaviour as the primary source of risk control.

Recommendation 19

DPI should continue to require sites to use risk control strategies that focus on control at source and advise against using strategies focussing on worker behaviour as the primary means of risk control.

Recommendation 20

MSAC should identify where lack of information is inhibiting the ability of sites to develop effective risk controls and address this by improving information provision on such risks.

5.9.5 Applying resources

Throughout this research we have been surprised at the level of resourcing applied to OHS within the industry. OHS personnel were not always adequately resourced and expenditure to make the workplace healthy and safe was not always readily available. On many sites resources in the form of time were not applied to consultative processes, for example time was not give to elected representatives to fulfil their functions adequately. Competent advice was not always sought for key decisions.

Both the industry and DPI have critical roles to play in ensuring that appropriate competence, time and money are applied to making the workplace healthy and safe. This will not always require more resources, but simply more strategic application of current resources, for example through a carefully constructed and fully resourced OHS strategic plan.

Recommendation 21

The importance of adequate resourcing should be emphasized in any industry guidance prepared by MSAC to implement the recommendations of this report.

5.9.6 Seeking good advice

A disturbing finding of this research is the lack of good advice on OHS, both external and internal, that is accessed by organisations. This problem is multi-layered: it reflects the shortage of skilled personnel available for internal appointment to OHS positions, the willingness of the industry to "consultant shop" until they have the answer they prefer to hear, and the lack of control over the quality of OHS consultants available to the industry.

Recommendation 22

MSAC should develop guidance materials to assist enterprises to choose appropriate internal and external advice based on the findings of this research. This should include advice to senior

managers on what they need to know in order to select and use the best specialist advice.

5.9.7 Monitoring performance

Closing the continuous improvement loop of plan, do, check, act relies on sound processes of monitoring and evaluation. Despite the widespread use of auditing in the industry, we did not find effective evaluation processes. The need for more effective methods for evaluating OHSMS was recognised by participants in the *Future Inquiry* workshop and our research shows the need for greater clarity in goals as the essential underpinning of evaluation.

Recommendation 23

MSAC should review and revise the performance measurement guidance materials prepared for the NSW Minerals Council to develop a guide to monitoring and evaluating OHS management. MSAC should then actively promote the use of such an approach throughout the industry.

Recommendation 24

As well as conducting audits in its own right, DPI should establish inspection protocols that check whether sites have effective internal and external auditing processes and specify appropriate remedial actions where necessary.

On many site visits and during the *Future Inquiry* Workshops, people told us how much they valued the opportunity to mix with others in the industry. Some smaller operators complained that the annual Mine Safety Conference had become too expensive and, even though they considered it valuable, had been unable to attend this year. They expressed a desire for process benchmarking through small workshops where they could share ideas and work through issues of relevance to them.

Recommendation 25

MSAC should provide opportunities for benchmarking and sharing industry data and knowledge and establish opportunities for the exchange of ideas, problems and solutions (eg through internet sites, regional meetings and *Future Inquiry* type initiatives).

5.9.8 If you think you are good, you can't improve

The NSW mining industry is well-placed to build on its substantial achievements in OHS management to reach its goal of world class OHS. The barriers we identified through this research are not associated with lack of ambition or lack of information. To some extent, we have observed lack of attention to the basics of OHS management.

The message to the industry is clear, if uncomfortable. Implementing effective OHS systems and making the workplace healthy and safe is the legal and moral responsibility of management. It requires resources and time. It may be a business expense, but it is an operational requirement for business. It is appropriate for senior management to declare a high priority for OHS, but in doing so it must be prepared to follow the stated intent with consistent and continuous action at each level of the business.

The problem of improving OHSMS and consultation is not really lack of guidance – we found numerous examples where existing guidance was not applied to key issues. Rather, a strategy that builds effective local action is needed, supported by clear and accessible information. In the final chapter of this report, we outline a set of basic principles for OHS management that will direct attention to what our research demonstrates are the most important of these actions.

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Chapter 6 Conclusion

Our findings across the three research topics set out in the preceding chapters reinforce the commitment of the NSW mining industry to world class OHS. The very act of commissioning this research demonstrates the industry's recognition that this commitment requires preparedness to thoroughly review actions in key areas.

We have found considerable room for improvement across the three research topics addressed by the *Digging Deeper* project and our recommendations for addressing each topic are set out in the preceding chapters. Given the overlap between the data needed to address the three research topics, our research strategy deliberately addressed them together. As a result, we have identified an underlying theme across all three topics: the need to get the basics of OHS management right. In pursuing OHSMS certification, in implementing health and well-being programs to address fatigue and in dealing with the OHS and industrial relations complexities of production bonus and safety incentive schemes, sites may have lost sight of the basic principle of OHS management. To make the workplace healthy and safe, there is no substitute for making the workplace healthy and safe.

We have prepared a set of 10 *Platinum Rules* to codify the fundamental steps the industry should take to more effectively manage OHS. Following these rules would substantially fill the gaps we have identified in OHS management in the NSW mining industry.

The Platinum Rules

1. **Remember you are working with people—**
   - Don't exhaust them;
   - People aren't machines;
   - Treat them with dignity and respect.
2. ***Listen* to and *talk* with your people—**
   - Be inclusive;
   - Do it frequently;
   - Value and develop people skills in supervisors and managers.
3. **Fix things promptly—**
   - Don't let issues fester;
   - Keep people informed of progress.
4. **Make sure your paperwork is worth having—**
   - Keep it current;
   - Make sure it's meaningful.
5. **Improve competence in OHS—**
   - Particularly at management levels.
6. **Encourage people to give you bad news—**
   - Canaries are the most important workers in a mine.
7. **Fix your workplace first—**
   - Before even thinking about the bells and whistles.
8. **Measure and monitor risks that people are exposed to—**
   - Don't just react to incidents: fix things before incidents happen;
   - Control risks at their source.
9. **Keep checking that what you are doing is working effectively—**
   - Are you achieving what you think you are?
10. **Apply adequate resources in time and money**

Making it happen

These actions appear simple and conceptually the rules are not hard to understand. But actually making them happen can be difficult. More detailed and greater quantities of guidance is not the missing link. Australia's experience with OHS strategies over the last 20 years demonstrates that improving OHS management is more an issue of workplace change than of lack of information and guidance. If enterprises sincerely seek to improve the quality and quantity of their OHS activities, they face few problems in finding adequate information and advice on what to do. But without better internal enterprise action on OHS, it is hard to promote OHS improvements simply by spreading practical advice. Instead, the industry needs to work cooperatively with all stakeholders, across sectors, companies and regions to reinforce the need for local action to implement more effective approaches to OHS management.

As we have reported, we were often told on site and at the *Future Inquiry* workshops of the value people have found from industry events that allow them to share ideas and solve problems together. Such an industry development approach is more likely to support the kinds of actions this research has identified as necessary. Implementing Recommendation 25 is therefore essential to support local actions to implement *The Platinum Rules*.

By getting the basics right, the NSW mining industry can achieve world class OHS.