SAFETY CULTURE SURVEY REPORT

of the Australian Minerals Industry

JULY 1999

Conducted by

SAFEmap

MINERALS COUNCIL OF AUSTRALIA

Safety Culture

Safety Culture Survey Report

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Australian Minerals Industry

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SAFEmap

Table of Contents

The following documents are also available from the Minerals Council of Australia on request:

Synopsis

An important survey and analysis of the safety culture of the Australian minerals industry, initiated by the Minerals Council of Australia, was carried out by SAFEmap and completed in April 1999.

The purpose of the survey was to identify strategic strengths and opportunities of the minerals industry's safety culture and to provide recommendations on specific actions, initiatives or systems based on the results of the survey. This was to be done by analysing the major strengths and weaknesses in the work culture of minerals organisations throughout the country. A total of 42 mines participated, all selected as typical of the industry. A number of other mines agreed to participate on a commercial arrangement.

The surveys were conducted during the period January to March 1999, mostly as group sessions, using a new survey technology called Profile-R. A total of 7100 employees participated in the survey, selected proportionally from all employee groups.

The SAFEmap safety culture model used in the survey consists of 41 factors, arranged in eight categories of employee perceptions of the key factors of Organisation, Management, Supervision, Management Processes and Safety Systems, as well as Job, Team and Individual factors. Responses to the 41 factors were measured electronically, with groups of employees reacting (pressing a hand held button) to a read-out of random positive and negative statements. Response trends of each factor were analysed and make up the outcomes of the report.

The results are summarised as follows:

Extremely positive responses to the safety culture factors in general were recorded at Manager levels. Responses were less positive, but still high at Supervisor and Specialist Staff levels, but were considerably lower at Operator levels.

Contrary to a popular negative perception of Contractors, the responses of this group were significantly more positive when compared with Operator employees.

Employees were generally most positive about the perceived commitment to safety among the leadership groups, and they were also most positive about their relationships with direct supervisors. Most of the negative responses were on issues such as Job Security, Risk-Taking and Fatalism.

Employees were generally more positive to the safety culture factors in Western Australia and in New South Wales. However Operators in New South Wales and Queensland were less positive – the major influence being the extremely negative trends in the Coal sector. There were slight but negligible differences recorded between Underground and Surface mine employees and extremely more positive responses at Smaller mines, when compared to Bigger mines.

Mines that reported more success in the effective application of the MINEX criteria were clearly also the mines that achieved the more positive responses in the survey – at all employee levels. Similarly, mines that reported their preference to a "Team-Performance" mix of safety strategies were also the mines where more positive safety cultures were measured, in contrast to the more negative cultures at mines where no clear safety strategies existed.

The conclusion drawn from these results is that the industry needs to consider some of the more serious safety culture issues. These issues include the perceptions about fatalism and risk-taking identified among most employee groups in the survey, the more negative trends at Operator levels – where the risk exposures exist -- and the potentially serious problems at the supervisory levels, where a large "gap" between their overall responses and those of operators below them has been measured. Combine these with some very satisfying strengths, such as the extremely positive trends at Manager and Contractor level, and there exist very important opportunities for the industry.

The industry should also consider the nature and content of safety and risk management approaches as these are not enjoying wide support from most of the employee groups surveyed.

The survey findings also suggest that macro-environmental influences (from the political, legal and community spheres) may prevent the industry from pursuing the opportunities identified by the survey.

The industry has stated a goal of "zero accidents" and there are clear directions from this survey's outcomes how this can be achieved and what obstacles to be overcome.

Gaining agreement and support within the industry amongst stakeholders is the next challenge.

Australian Minerals Industry

SAFETY SWOT PROFILE – FROM SURVEY FINDINGS

Strengths	Weaknesses
✔ The safety message (policy and goals) is communicated well to all levels ✔ General willingness to comply with safety rules ✔ Commitment to safety is clearly shown ✔ Employees express high levels of job satisfaction ✔ High levels of participation exist ✔ Positive views of safety rules ✔ High levels of overall positive responses amongst leader groups ✔ Safety Staff viewed positively by most employee groups ✔ Perceptions of "Companies" are extremely positive ✔ Very positive perceptions of quality and safety of tools and equipment ✔ Formal aspects of safety well-managed	✘ Low levels of Management Credibility ✘ High levels of Job Insecurity and Stress ✘ Limited "real" acceptance of own responsibility for safety ✘ Employees see safety driven as a necessity, not as a positive Value ✘ Lack or absence of reward and recognition for safe work ✘ Current safety systems/programs are viewed as rigid and ineffective ✘ A strong "engineering model" of management exists in the industry ✘ High levels of risk-taking are evident ✘ Middle manager group shows signs of "disillusionment" ✘ High levels of Fatalism at most employee groups and huge differences exist between management and operator groups ✘ Safety committees losing credibility/effect
Opportunities	**Threats**
✔ Good "vertical" (subordinate) relationships ✔ Good "horizontal" (team) relationships ✔ High levels of positive responses amongst contractor employees ✔ Clear directions about future safety approaches evolved ✔ "Team-performance" safety approach shown to be superior ✔ Strong links between MINEX criteria and positive cultural outcomes shown ✔ Positive trends at Smaller mines can be duplicated at Bigger mines ✔ Dynamic and simpler safety systems can increase safety performance ✔ Safety as a strategic issue of the business can create excellence ✔ New regulatory approaches can be designed to foster high performance safety culture	✘ Limited "alignment" between Manager, Supervisor and Operator groups ✘ Inability to improve workplace relations could impair flexibility ✘ Increasingly prescriptive and punitive legislation and regulation could impede openness ✘ New safety approaches will make new demands on competencies and skills ✘ Centrally driven safety management systems could continue to marginalise supervisors ✘ Certain industry sectors lag behind on managing safety dynamics ✘ Increasing underground mining, where higher levels of fatalism/risk-taking exist ✘ Increasing litigious nature of safety can create imbalance towards compensation ✘ Zero-accident goal may be difficult to achieve in current culture, programs and regulations

Safety Culture Survey Report
Australian Minerals Industry – July 1999

1. INTRODUCTION

In 1998, the Minerals Council of Australia initiated a safety culture survey of the Australian minerals industry. The survey was completed in the first quarter of 1999 and a total of 42 mines and refineries participated.

A second group of 10 mines is now in the process of conducting more surveys, and this data will be available for more detailed analyses of sectors.

2. OBJECTIVES

The objectives of the Safety Culture Survey were as follows:

- To identify the strategic strengths and limitations of the minerals industry's safety culture.
- To measure, against a baseline of industry employees, supervisors and managers, the trends in perceptions and attitudes of employees in different sectors of the minerals industry.
- To measure the changes in perception and attitude trends against each participating company's own baseline. Note that this process can be implemented in a second, follow-up survey.
- To provide recommendations to industry leaders on specific actions, initiatives or systems based on the results of the survey.

3. THE THEORY OF CULTURE SURVEYS

3.1 Background

The term "culture survey" is commonly used in business today, but it often has varying meanings and implications. Most will agree that a culture survey sets out to examine "the shared values and beliefs in an organisation".

Leaders attempt to mould those values and beliefs into a desired culture, and thereby achieve the goals of the organisation. In common with other industries, the minerals industry of Australia has a typical culture of shared values and beliefs.

3.2 Defining Safety Culture

To define the concept "safety culture" it is best to provide a brief overview of the concept "culture" and its related terms.

The concept of culture became popularised in the early 1980's with the publication of two best-seller books, namely Corporate Cultures, by Terrence Deal and Allan Kennedy and In Search of Excellence, by Thomas Peters and Robert Waterman, both published in 1982.

As already mentioned, culture is popularly defined as the "shared values and beliefs". Each of these terms requires closer scrutiny.

Schein (1992) defines culture as "a pattern of shared assumptions that has worked well enough to be taught to new members as the correct way to perceive, think and feel".

Kotter and Heskett (1992) take a different approach to culture by including behaviour (and values) as part of culture. They define values as "notions about what is important", and something that can vary greatly in different companies.

Kotter and Heskett define behaviour as what people do every day, or the "patterns or style of an organisation that new employees are automatically encouraged to follow".

Culture, for the purposes of this project, relates more to the philosophical level of thinking in the organisation that translates into, and affects, the behaviours of people. Technically, it is very difficult, maybe even impossible, to measure the *culture* of an organisation. What *can* be measured are the behaviours of people and, in the strict technical sense, the *perception* of people's behaviour. The term "climate" is often used as an alternative to "culture", and can be defined as the "aggregate perceptions which employees have of the work environment".

While, technically speaking, we are reporting on a "climate perception survey" we will continue to use the term "safety culture survey". All organisations definitely do have a climate that can be measured, but not all organisations have a culture that can be measured.

The term safety culture (or climate) is therefore defined as the characteristics of the organisation's approach to safety that:

- ♣ Distinguish one organisation or work unit from another
- ♣ Endure over time
- ♣ Influence the behaviour of people in the organisation.

These "characteristics" are the "collective behaviours of people in the organisation that over time become patterns, typical or habit".

In Britain the ACSNI study group (HSC, 1993a) proposed the following definition for safety culture:

> *"The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management."*

In the simplest terms, this translates into "those things that are regarded as important in the company, and how they affect the behaviour of people".

3.3 Measuring perception

Employees have distinct perceptions of the typical or habitual behaviours in an organisation. A person's actions will be largely influenced by his/her perceptions of what behaviours are expected, permitted or even required.

A person may perceive members of his/her group as "inclined to take risks", and this will have a strong influence on the person's own willingness to take short cuts in the job. A person will act without giving the (risk-taking) behaviour much or any thought.

It is therefore imperative, when measuring such perceptions, that the process and technology of measurement should not be foreign, threatening or unnatural to the respondents. Measuring the perceptions that people have about their work culture should ideally be done at work during working hours and in a group context. The measurement should be a "snapshot" of what the culture is, and should ensure that the surveys reach all employees or at least a valid sample of them. It should not exclude those who don't like, or have difficulty in, completing questionnaires, or who may feel threatened by them.

Terms such as attitudes, values and beliefs of employees should be avoided because these concepts are laden with ambiguities, imprecision and emotion. The focus should be on what is tangible, neutral and clear: perceptions of the employees about their work environment.

3.4 Purposes of Organisational Surveys

Conducting surveys has one or both of only two objectives, namely to assess and/or to effect changes.

Conducting surveys has also been compared with pulling the pin of a hand grenade. If you don't do something with it, it can hurt you.

It is imperative that the results of any survey are used in a constructive way. Some of the purposes of surveys are:

- To pinpoint areas of concern, where the emphasis is on specific issues or topics. It may well be possible to introduce specific interventions to improve on areas of concern. This report will comment on a number of such issues.

- To observe long-term trends. The insight this gives into changing patterns or behaviour in an industry may make it possible to stem the tide of developing unwanted trends.

- To monitor the impact of a program, especially at the organisational level. Specific training or organisational change programs can be measured for effectiveness and impact.

- To provide input for future decisions by uncovering employee preferences or specific problems. From an industry point of view, strategic decisions about improving safety will be more informed and focused.

- To add a communication channel. This can be very easily achieved by making perception surveys part of the management toolkit, and by conducting surveys on a regular basis.

- To facilitate change and improvement. This is the most powerful application of surveys. Surveys are the "cutting edge" technology to assist organisations to benchmark themselves against high performing entities.

Improving safety performance is essentially the same as improving any other organisational performance, yet safety culture surveys have not been used much in the past for this purpose.

The completion of the SAFEmap survey has created a significant opportunity to improve the industry's safety performance. It is foreseen that the quality and quantity of feedback to the participating companies could be an important catalyst for change in those companies and it is hoped that this report's findings, analysis and recommendations will trigger, change and improvements in the industry as a whole.

It is important that the feedback to the industry and companies is followed up with specific action planning and execution. It is also strongly recommended that employees in participating companies receive comprehensive feedback. For this purpose a detailed section on feedback and action planning is provided as an Annexure in the participating companies' reports.

3.5 A Synthesis of Culture Change and Performance Improvement

Several studies have shown clear links between culture and performance. However, the link is not a simple and direct correlation. It is actually a very complex topic – which falls outside the scope of this report.

It is however clear from a variety of studies that work culture contributes significantly to performance.

The major studies include the research work of Kotter and Heskett (1992). They found that in 202 companies in the USA the strength of work culture is correlated positively with economic performance measures.

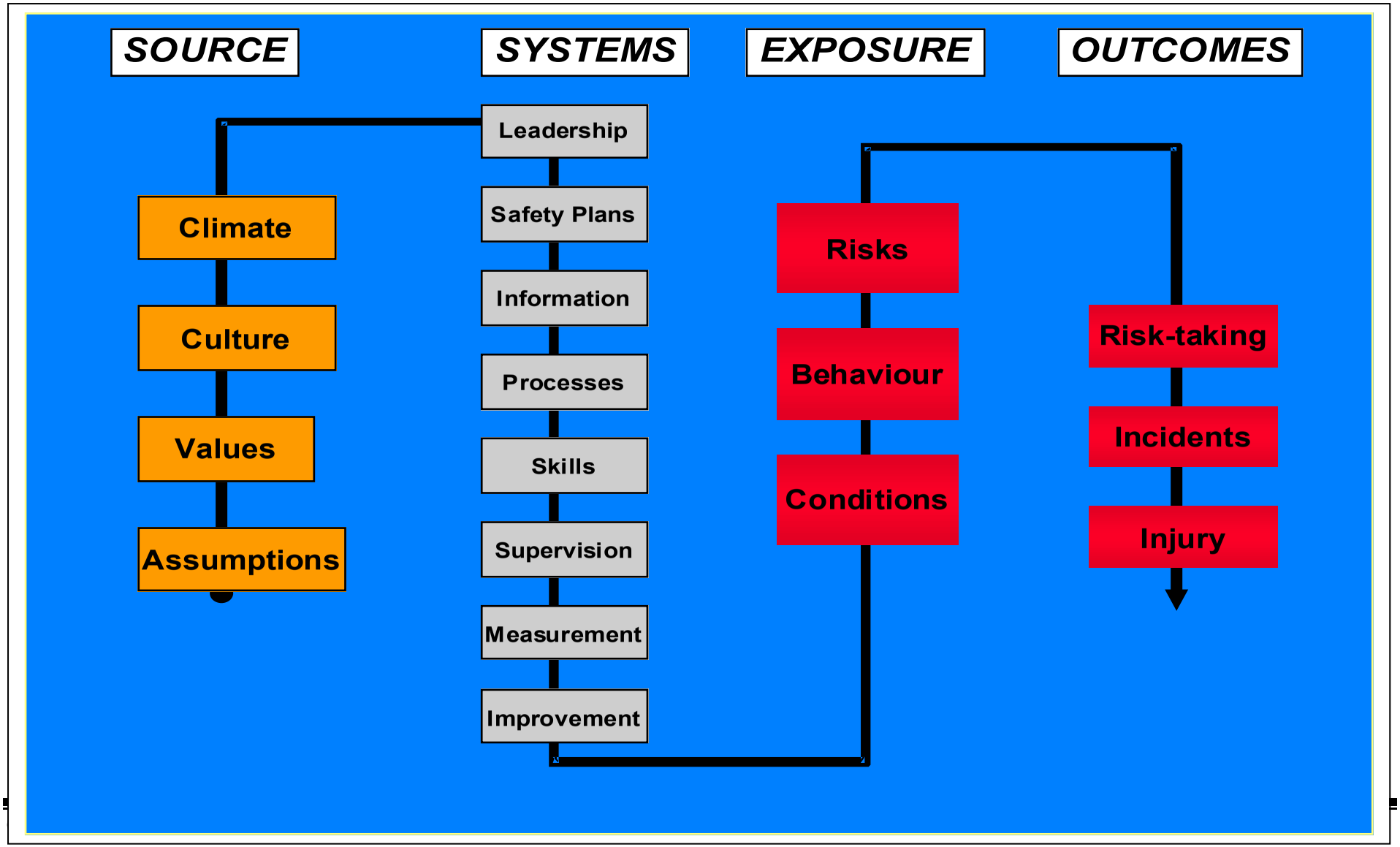
Collins and Porras (1994) came to similar conclusions after studying several companies over their entire histories. Companies with a strong positive culture outperformed similar companies by a factor of six and the general industry by a factor of 15.

Studies on the links between safety performance and production performance are also many and varied, but most generally conclude that the productive work environment is also a safer work environment. The most comprehensive review of these links was done by Randolph (1989) of the US Bureau of Mines (presented at the Minesafe conference in Perth, 1992). This study showed the strong links between production efficiency and safety performance in coal mines in the USA.

To link safety performance directly with safety culture is more difficult, because at this stage there are no comprehensive studies available on this topic. Safety culture is also a fairly recent concept in the literature. A study performed in the USA by the US Bureau of Mines in 1976 found strong support for the hypothesis that climate and management practices have an effect on the incidence of disabling injuries. Several other studies support this notion. Donald and Canter (1992) found that employee attitudes toward management, employee training, employee satisfaction and management support had a strong influence on accident rates. This was also reflected in the British Institution of Occupational Safety and Health statement that organisations with positive safety cultures are also those organisations that most competently control dangers at work.

The following conceptual model is provided to put the influence of culture on performance into perspective.

Figure 1.1. A Process Flow Model for Safety



4. THE SAFETY CULTURE SURVEY PROJECT

4.1 Background

The Minerals Council of Australia initiated the safety culture survey in 1998 with the aim of making a further contribution to the stated goal of the industry: "To achieve an Australian Minerals Industry free of fatalities, injuries and diseases."

The survey process commenced in October 1998, with preparations by the consultants completed at the end of November 1998. Surveys at the identified sample mines commenced towards the end of January 1999, and most mines completed their surveys by the end of March 1999.

This first report is based on information received from all mines that completed their surveys by the end of March 1999 – a total of 42 mines, plants and refineries.

A second report is planned for later in 1999. It will take the form of an update incorporating data from an additional number of participants in the project and will include feedback from the industry on the report's outcomes.

4.2 The Survey Process Design

4.2.1 The Sample of Mines

It was necessary to identify a number of mines that could be considered as "representative" of the minerals industry. The participating mines were identified according to the criteria described below.

State representation was considered the primary criterion, because the sample needed to be fully representative of the demographics of employees in all the "mining" states.

An overall total of approximately 94,000 minerals industry employees are distributed as follows:

- ♣ Western Australia 43%
- ♣ New South Wales 19%
- ♣ Queensland 21%
- ♣ Victoria, NT, SA and Tasmania 17%

Within each state, the criterion of "Commodity Mined" was used to further stratify the sample. In New South Wales and Queensland the main division is Coal and Metalliferous, while in Western Australia the main division is Gold and Nickel and other Metals/Minerals. The sample was also stratified proportionally in each state into Underground and Surface mining.

The size of the mines was a secondary criterion, and in the overall sample small, medium and bigger mines (in terms of employee numbers) were proportionally represented. As far as possible, the ownership (i.e. whether the mine was or was not part of a larger corporation such as Rio Tinto, BHP, WMC, Exxon, Shell, Pasminco, North etc.) was also factored in.

The sample structure is as follows: -

Western Australia
- ♣ Eight gold/nickel mines
- ♣ Four other metals/minerals mines
- ♣ Two groups of contracting companies at several mines

New South Wales
- ♣ Eight coal mines, from the different regions, including both open cut and underground coal mines in the appropriate proportions
- ♣ Four metalliferous mines/units

Queensland
- ♣ Five coal mines, from the different major regions
- ♣ Five metalliferous mines

Other States
- ♣ Two gold mines
- ♣ Four other mines, including metals, coal and minerals

The sample consisted of a total of 42 mines that well represented the stated criteria.

It was decided to keep the identity of the participating mines strictly confidential. Apart from the legal reasons for this, it was also considered imperative that the participating company or mine retained the ultimate and exclusive right to disclose its participation. There will therefore be no disclosures made by the consultants or the Minerals Council of Australia -- an undertaking asked by and given to participating companies when they were first asked to participate.

4.2.2 The Sample of Employees

The most basic organisational structure on most mines was used for determining the type and numbers of participating employees. The following categories were used:

- ♣ Upper management, as the most senior management team of the company/mine site.

- ♣ Middle management, as the group of managers between the top management team and first line supervision, such as superintendents or foremen. Some mines do not have this group of employees.

- Staff/Specialists as the group of employees that performs specialist functions, without necessarily commanding other people. Examples are planning, technical environment, training, and human resources personnel. The response data in this category contained mixed data at a few mines, mainly because they included operators in this category where these operators are considered as "staff" on those mines. For the purpose of analysis, the data in respect of these groups were moved to the Operator categories.

- Supervisors, namely the first line of supervision or team leaders, who are in command of operational activities.

- Operators, namely the groups or individuals who are responsible for operational activities in the organisation.

- Contractors, normally employees who are not directly employed by the participating company, but who perform operational activities. In some organisations, contractors form the bulk of the operator level.

The companies that participated in the project reported the following employee numbers in their companies:

Employee Group	N	% of Total N	Sample	% of Total S
Senior Management	**212**	**1.8**	**161**	**2.3**
Middle Management	**380**	**3.2**	**279**	**4.1**
Staff/Specialists	**1733**	**14.8**	**1030**	**15.3**
Supervisors	**700**	**5.9**	**476**	**7.1**
Operators	**6647**	**56.6**	**3837**	**57.1**
Contractors	**2074**	**17.7**	**935**	**13.9**
TOTAL	**11746**	**100**	**6718***	**100**

*While a total of 7100 employees have participated in the surveys to date, the actual numbers of some of the employee categories had to be reduced by a total of 382 employees -- mainly from the Staff/Specialist category (using a random elimination procedure) in order to maintain an overall balance of proportions in the sample. The Contractors group is slightly underrepresented in the sample, but given the significance of differences reported in this analysis, this is not considered a problem.

4.2.3 Sample Size Consideration

Participating companies were required to ensure that certain minimum numbers of employees participated in order to satisfy the psychometric properties associated with samples.

The accuracy of the survey results relies to a large extent on the size of the sample. Most research designs for culture surveys try to achieve a 95% confidence level (or a margin of error not larger than 5%). This was also set as a requirement for this survey project.

If approximately 94,000 minerals industry employees were represented by a simple, random sample, the sample could have been as small as 1% of the population, or approximately 940 employees (in the same way that Newspoll uses only 1000 interviews to measure national voting trends during elections). However, it was necessary to increase the sample sizes because of the significant degree of stratification of the sample.

Also, if individual mines were to use the data to analyse their own trends, and benchmark them against industry norms, the sample size on those particular mines needed to comply to the requirement of the set confidence level. It was therefore necessary to ensure that companies allow the participation of at least 40% of their employees in bigger mines, and as much as 80% in smaller mines.

Furthermore, the various employee groups also required different participation levels. The smaller the groups as defined, say management, the larger the sample size of that group. In most companies, between 60% and 100% of small groups such as Managers or Supervisors were called on to participate, as against approximately 40% of Operators in the same company.

The consultants found that, surprisingly and disturbingly, some companies expected only 10% of their employees to participate, based on their experience with previous surveys.

The following table was used as a guideline for the sample size determination. It provides an indication of population size vs sample sizes, as adopted from Rea & Parker (Designing and Conducting Survey Research: A Comprehensive Guide, Jossey-Bass, San Francisco,1992).

Population Size	Sample Size @ 95% Confidence Level	Sample Proportion
10	**10**	**100**
20	**19**	**95**
40	**36**	**90**
60	**52**	**87**
100	**80**	**80**
150	**108**	**72**
200	**132**	**66**
360	**186**	**52**
460	**210**	**46**
500	**217**	**43**
1000	**278**	**28**

It is essential that in a survey project such as this one, where the results and findings are intended to be applied and used in practice, the basic scientific parameters are satisfied and exceeded.

It may be adequate for academic research to survey relatively small groups of employees and still achieve a high level of accuracy. However, benchmarking and

comparisons across states, types of mines and employee groups demand larger sample sizes.

4.3 The Safety Culture Model – Definition and Content

The safety culture model used in this project was developed over a period of several years in the minerals industry of Australia. There were two phases of development and application.

The first safety culture model was developed between 1992 and 1994, resulting in a model consisting of 21 factors, in four categories, namely:

- Management Credibility (one factor)
- Management Practices (seven factors)
- Supervisory Team Issues (seven factors)
- Individual Factors (six factors)

This original model has been applied widely in the Australian resources industry, in all states of Australia and in every minerals sector. A database of approximately 8000 employees was built up over the five years it was applied.

This original model served as the basis for the development of an expanded model of 41 factors, used in the Mineral Council's Survey Project. This model was refined and finalised during the extensive validation process followed when developing the questionnaires.

The SAFEmap Model consists of eight sections, namely perceptions of:

- Organisation (the company)
- Management (the senior management of the company)
- Supervision (the direct supervisor)
- Management Systems (formal systems of day-to-day managing)
- Safety Systems (typical issues of safety management)
- Job Factors (perceptions of job-related issues)
- Team Factors (perceptions of peer group influences)
- Individual Factors (typically individual attitudes and perceptions)

Each of these sections is made up of a number of the so-called "factors", described below.

Readers should always remind themselves, when observing trends on graphs and making inferences about these trends, that they merely illustrate the perceptions of employees about the various factors in the model. If a category such as "Commitment" shows a negative trend, then it is a trend about the perceptions and not an indication that the commitment is actually lacking – although for all intents and purposes, if the commitment is not visible to employees, it may as well be non-existent!

The factors in each category are best described by the statements used to measure them. Readers should primarily be focusing on the content of the statements themselves and less on the factor definition or term.

4.3.1 Safety Culture Definitions

CULTURAL FACTORS	
FACTOR	**POSITIVE PERCEPTIONS**
ORGANISATION	
Commitment	**"This company is very serious about safety"**
Policy	**"This company clearly states that safety is important"**
Goals	**"This company has clear goals and targets for safety"**
Leadership Style	**"This company is interested in employees' views on safety"**
Value	**"This company does a lot for its employees"**
Security	**"Our jobs are secure with this company"**
MANAGEMENT	
Credibility	**"You can trust the management in this company"**
Commitment	**"Management is genuinely serious about safety"**
Balance	**"Management always puts safety first"**
Management Style	**"Management listens to our views on safety"**
SUPERVISION	
Credibility	**"I can trust my supervisor"**
Commitment	**"My supervisor genuinely cares about safety"**
Balance	**"My supervisor always puts safety first"**
Supervision Style	**"My supervisor listens to our views on safety"**
PROCESSES	
Consultation	**"The safety committee does a good job on safety"**
Information	**"We get enough information from management on safety matters"**
Discipline	**"When you break a safety rule, you will be treated fairly"**
Participation	**"My supervisor listens to my ideas on safety"**
Follow-Up	**"If you raise a safety concern, someone follows up very quickly"**
Decisions	**"People are mostly happy with management's decisions on safety"**
SAFETY SYSTEMS	
Safety Staff	**"Safety personnel generally do a good job"**
Systems Quality	**"The safety program is well managed in this company"**
Safety Rules	**"We have good safety standards in this company"**
Training	**"Safety training in this company is of high quality"**
Recognition	**"If you work safely, you will get recognition for it"**

CLIMATE FACTORS	
FACTOR	**POSITIVE PERCEPTIONS**
JOB FACTORS	
Risk Incentives	**"In my job, it is not necessary to cut corners"**
Work Pressures	**"My job is just enough to handle everyday"**
Tools & Equipment	**"Our tools and equipment are generally safe and well maintained"**
Satisfaction	**"I enjoy the work I do"**
Risk Level	**"I am worried about the dangers in my job"** **"I am not worried about the dangers in my job"**
Job Design	**" Given the opportunity, I can make a lot of improvements in my job"**
TEAM FACTORS	
Rule Compliance	**"People around me generally comply with safety rules"**
Risk-Taking	**"I know people don't have to break safety rules to get jobs done"**
Team Spirit	**"There is a positive team spirit in our team"**
Conflict	**"I get along quite well with my supervisor"**
Team Work	**"Our team is often involved in safety improvements "**
INDIVIDUAL FACTORS	
Fatalism	**"It is possible to achieve zero accidents"**
Duty	**"If I have an accident, it will be my own fault"**
Motivation	**"I am happy to work for this company"**
Stress	**"After a day's work, I go home and forget about work matters"**
Risk Perception	**"The safety standards in this company are very high"**

Safety Culture

Safety Culture refers to the formal safety issues in the company, dealing with perceptions of Management, Supervision, Management Systems and perceptions of the Organisation (company). Where the respondents are managers themselves, their perceptions on the Supervision factors refer to their direct supervisor/manager.

Safety Climate

Safety Climate refers to the more intangible issues in the company, such as perceptions of Safety Systems, Job Factors, Team Factors and Individual Factors. These are also commonly referred to as the social work climate and are the dynamic influences on the individual and on the group.

Important Note

The factor "Risk Level" can be considered as a measurement of employees' risk "awareness", and was measured by a combination of two statements.

The factor of "Duty" can be considered as the "extent to which employees accept responsibility for an accident", and should not be simply equated with "duty of care".

4.3.2 Safety Culture Model

4.3.3 Measurement Scales (Sections 1 and 2)

Measurements are done in two distinctly different scales.

Absolute Responses (Section 1)

The graphs show the responses to each of the categories as they were measured. It shows the percentage of positive responses in each of the categories. This obviously cannot be compared to any other information and simply gives a picture of the overall levels of positive perceptions. These graphs are provided and discussed in Section 1 of the report.

Comparisons (Section 2)

These profiles are the most useful, since they compare the responses on each category with an overall benchmark, as described below. It shows, for each category, the extent to which the responses in that category were more positive or more negative when compared with the benchmark. In simple terms, these profiles show "how long the piece of string" is.

A bar graph is used to illustrate the comparisons. A blue bar to the positive (above the zero line) indicates a category as more positive than the baseline. A red bar is more negative and the yellow bars represent those factors on which a more neutral trend was measured.

The baseline (with which comparisons are made) is an industry standard derived from a large information base of employees in the minerals industry of Australia and is defined on each profile (left bottom corner).

Where, for example, a state is compared with the overall baseline, the data of that particular state is excluded from the baseline, so that it is compared with a baseline from which its own data is excluded.

A positive statement and a negative statement measure each category. These statements were randomly organised in the questionnaire, and respondents indicate which statements they agreed with. (See a description of the survey methodology described below.)

For example, the results shown under Management Credibility (as compared with a similar industry) could be as follows:

QUESTION	INDUSTRY GROUP	THIS COMPANY	DIFFERENCE	TREND
"My supervisor always puts safety first" (Positive)	40%	20%	-20% Less positive	The decrease in positive responses is added to the increase in the negative response. A red bar with a Y-value of -35% is indicated, being the largest trend.
"My supervisor often cuts corners on safety" (Negative)	30%	45%	-15% More negative	
Not responded to either statements	30%	35%	5% difference	

Another example:

QUESTION	INDUSTRY GROUP	THIS COMPANY	DIFFERENCE	TREND
"My supervisor always puts safety first" (Positive)	80%	70%	-10% Less positive	The decrease in positive responses is added to the increase in the negative response. A red bar with a Y-value of -15% is indicated, being the largest trend.
"My supervisor often cuts corners on safety" (Negative)	10%	15%	-5% More negative	
Not responded to either statements	10%	15%	5% difference	

In the second example, the overall responses (or absolute responses) may still be very positive in the company (as high as a 70% level of positive responses), but when compared with the benchmark group, the profile may still show a more negative trend. Obtaining a comparison is, of course, the very purpose of a benchmark.

These trends can be more positive, more negative or more neutral, compared with the baseline of the measurement. A trend can be "statistically significant" at the 95% confidence level if the bar crosses the line ($p \leq 0.025$), or at the 99.75% confidence level. In these profiles, only the 99% confidence level is shown.

It must be clearly understood by the reader that when comparisons are made between, for example, two states, and "more positive" trends are identified in one state, it does not mean that all employees in that state are "more positive" than all employees in the other state. It means that, as a group, there is a higher percentage of respondents that agreed

with the positive statements and/or a smaller percentage that agreed with the negative statements.

4.3.4 Special Independent Variables (Section 3)

Apart from the "structural variables" such as State, Type of Mining, Commodity Mined, Size of Mine etc. used to identify trends in the industry, two additional variables were included in the surveys. The survey investigated the role and influence of:

- compliance with the MINEX criteria; and
- the strategic approach to safety

on the safety culture of the organisation.

4.3.4.1 MINEX Criteria

As part of the survey, the management team members of the organisation were asked to individually conduct a self-assessment of their company against the MINEX criteria. The six categories of the MINEX criteria used are as follows:

- Leadership
  This category examined the role of leadership in setting direction and goals and in the creation of a positive safety culture.

- Safety and Health Management
  This category examined how the enterprise systematically manages the processes that contribute to its safety and health performance.

- People
  This category examined the extent to which people at all levels in the organisation are involved in safety and health and are committed to corporate safety and health goals and objectives.

- Information and Analysis
  This category examined how the organisation uses data to support continuous improvement in safety and health.

- Safety and Health Processes
  This category examined how the enterprise utilises specialist processes to contribute to its safety and health performance.

- Performance
  This category covered the "critical few" safety and health performance indicators used by the leadership of the organisation to monitor, plan and improve safety and health performance across the enterprise.

The self-assessment was done on two scales, namely a comparison with the industry and a comparison against the mine's past performance.

The purpose of this measurement was to identify the relationship between safety culture and performance on the MINEX self-assessment. This may clarify whether excellence in management systems has an effect on the safety perceptions of employees.

For example, the following question was posed on the category of "Leadership":

> **What is your assessment of:**
>
> **How management established strategic safety and health direction and goals for the company?**

A 10-point scale was used to conduct these assessments.

The detailed findings of this analysis are reported in **Section 3: Trends and Analysis.**

4.3.4.2 Strategic Safety Approach

Individual members of the management team also completed this survey to identify:

- The prevailing strategic approach to safety as set by management.
- The degree of "convergence" between management team members in that approach.

The measurement of the company's strategic approach is based on a well-known theoretical model of Human Synergistics-Verax, where the broad management approach can be classified along two axes, forming a "grid" of four distinct approaches.

- The first continuum is on the "task" or "people" focus of the management.

  "Task" is understood to be the focus of management on matters that have to do with work output, and the physical and technical aspects of the workplace, while under "people" the focus is more towards the behaviour, attitudes and social conditions of the workplace.

- The second continuum is on the "flexibility" that management allows in the organisation.

  A flexible management approach allows different teams or departments, even individuals, more freedom to perform tasks outside limiting rules or procedures, as against a more controlled work environment where adherence to rules or procedures takes precedence and compliance is expected, demanded or rewarded.

The result of this survey is provided in **Section 3: Trends and Analysis**, where the preferred safety strategies of the Top Fifteen Mines (on positive scores on the culture survey) are compared with the strategies of the Bottom Fifteen Mines.

Below is an example of the questions put to management team members during the survey.

A set of four choices mixing the four approaches outlined above, was provided on-screen with the following instruction:

Select which one your company is MOST LIKE and which one your company is LEAST LIKE.

Monitor, encourage, recognise safety efforts improvements	**Maintain a process of employee involvement and support for safety**
Provide firm leadership and direction for safety	**Ensure close supervision of task execution at operator levels**

Each management team member completed this analysis individually by answering six sets of evaluations like the one above. The full list of questions is provided in **Section 3: Trends and Analysis**. From this it was determined whether a management team "favoured" a specific approach more than the other approaches and whether there was agreement (convergence) or disagreement (divergence) amongst members of the team.

The detailed findings of this analysis are reported in **Section 3: Trends and Analysis.**

4.4 The Profile-R Survey Technology

The surveys were conducted with an electronic (patented) technology called "Profile-R".

It consists of the following:

- A set of electronic hardware that includes a set of 16 buttons, a length of electronic cable and an electronic monitor box.
- A software component installed on a standard PC-type desk top or laptop computer.

The software program "steps" the facilitator through the survey process. A group of employees (maximum 16) gathered at a given time at a venue where the computer and electronic cables and buttons were installed. Each employee held a concealed button in his/her hand and after explanations, the facilitator read a series of statements to the group, pertaining to the safety culture model.

People responded by agreeing to the statement (pressing the button) or disagreeing (not pressing) or by being neutral (not pressing). Each factor was measured by two opposing positive and negative statements, and therefore resulted in certain proportions of responses to the positive and negative statements as well as a proportion of no

responses to either statement (neutral). This is known as the Kuder Forced Choice format of questionnaire item design.

This survey technology (when compared with questionnaire-type surveys) does have a few limitations associated with it, mainly the fact that employees must gather at specific times to participate and that a facilitator must actually conduct the surveys. This requires more time and effort to complete a survey than a questionnaire.

However, the benefits far outweigh the limitations. These benefits are:

- Responses are more direct and more accurate because people do not get the opportunity to "think" about their responses, eliminating many of the so-called "sources of measurement error", where respondents may construct "desirable" responses.

- Responses are clearly confidential, which in questionnaire-type surveys can at best be merely a proffered "assurance".

- The biggest advantages of this technology are that high levels of employee participation are achieved in a natural work setting, data manipulation is virtually error-free and all employees can participate equally. It is often the case that employees with reading and comprehension difficulty (which in the minerals industry can be as high as 20% of employees) are simply excluded from questionnaire-type surveys. Such exclusions often result in sample bias and non-random measurement error.

Profile-R was specifically developed for the safety culture survey project, and will continue to be available to the industry. A new software version, called e-Profile, with enhanced capabilities and a wider variety of other surveys, will be released in July 1999.

5. RESULTS OF THE SAFETY CULTURE SURVEY

5.1 Overview

The report contains the following sets of results.

Section 1: Absolute Response Trends

- Overall responses per employee group.
- Overall responses per minerals sector.
- Overall responses on most positive and most negative factors.

Section 2: Comparisons

Comparisons are made between:

- The States of Australia, namely Western Australia, Queensland, New South Wales and Other States (Victoria, Tasmania, South Australia and the Northern Territory).
- The Commodity Mined, namely a comparison between coal, gold/nickel and other metals/minerals.
- The Type of Mining, namely a comparison between underground and open cut mines, in all states.
- The Size of Mines, namely a comparison between bigger and smaller mines in Australia.
- The Employee Groups, between Managers and Middle Managers, between Supervisors and Specialist Staff and between Operators and Contractors.

Section 3: Trends and Analysis

The following trends are investigated and commented on.

- Factor trends, namely the extent to which factors of the model contribute towards overall positive and negative responses.
- Alignment of the different employee groups.
- Trends on the correlation between MINEX criteria and safety culture.
- Trends on the correlation between Safety Strategies and safety culture.

Each section will also include conclusions and recommendations.

5.2 Summary

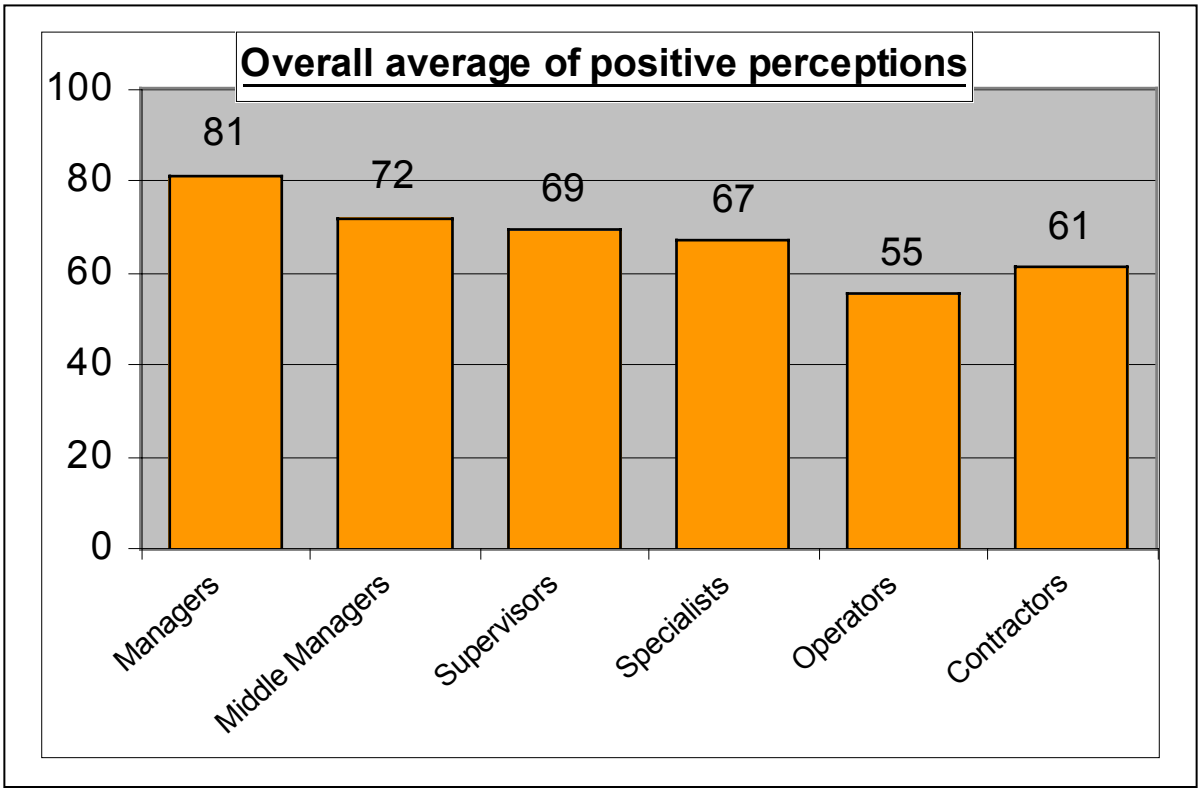
Summary

In this section, a summary of the major findings is provided. It offers profiles and discussions that summarise the findings of the report. More detailed information can be found in Sections 1, 2 and 3.

The following information is provided:

- **Profile and discussion of overall trends in actual responses, by employee group**
- **Profile and discussion of most extremely positive factors**
- **Profile and discussion of most extremely negative factors**
- **Profile and discussion of comparisons by State, Commodity Mined, Type and Size of Mine**
- **Analysis of impact of Minex Criteria and Strategy on trends**
- **Factor analysis and alignment**
- **Overall conclusions**
- **Recommendations**

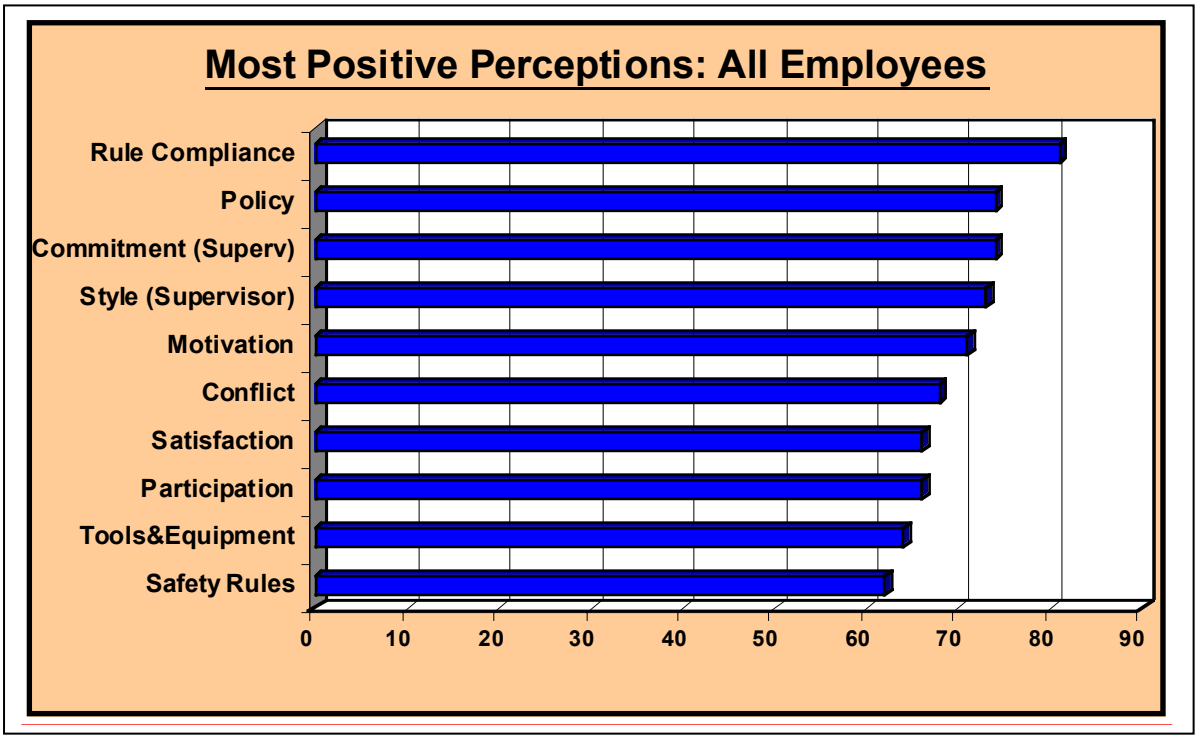
5.2.1 Summary of Overall Trends in Actual Responses, by Employee Group



Findings

- The above graph shows the overall level of positive responses as measured in the four employee groups. It shows that the group of Managers responded on an average of 81% to all the positive statements of the 41 factors, while the Middle Managers averaged a significantly lower 72%.
- This is only slightly higher than the 69% of the group of Supervisors and the 67% of the group of Specialist employees.
- The Operator group responded significantly less to the positive statements, namely only 55% on average.
- The group of employees classified as Contractors (performing operational work, but not directly employed by the company) shows a higher average response of 61%.
- It is not possible, nor desirable, to compare these average levels with other surveys on similar topics. It is however a cause for concern that the Operator group responded significantly less to the positive statements – especially when compared with Contractor employees.

5.2.2 Summary of Most Extremely Positive Factors – All Employees.

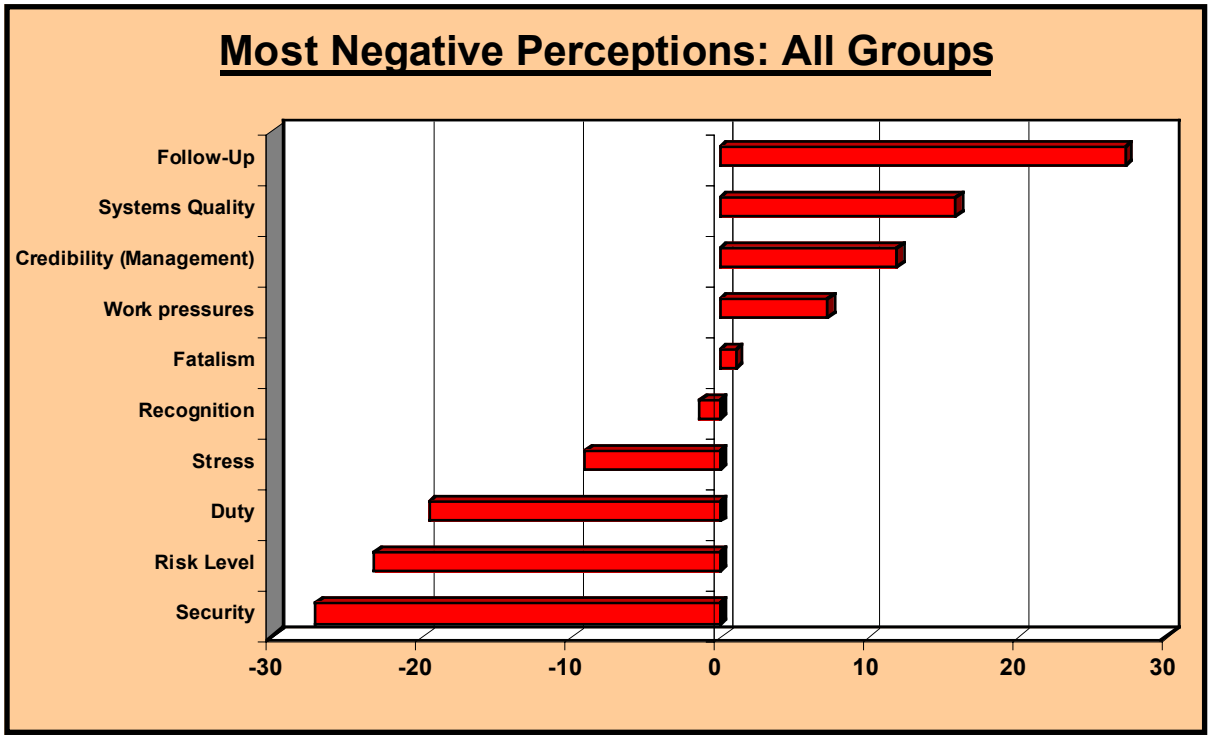


Findings

The above graph shows the 10 factors that were most positively responded to by all the employee groups. (Note: not average responses to negative statements, but the net result calculated by subtracting the proportion of negative responses from the proportion of positive responses)
These five factors ranked consistently highest in the analysis for each employee group. In Section 1, the detailed rankings for each employee group are provided, and the top 10 factors for each are listed.

- The factor most positively responded to was Rule Compliance, with extremely high levels (around 90%) in all employee groups responding to the positive statement of this factor: *"People around me generally comply with safety rules".*
- The second most positively ranked factor was Commitment to safety of the direct supervisor/manager, as measured by the statement: *"My supervisor genuinely cares about safety".* Similarly, very high responses were recorded on the statement: "*This company clearly stated that safety is important*". (Policy).
- The Leadership Style of the direct supervisor/manager as "listening to my views on safety" showed high responses and all employees strongly expressed a view of: "*I am happy to work for this company*".

5.2.3 Summary of Most Extremely Negative Factors – All Employees

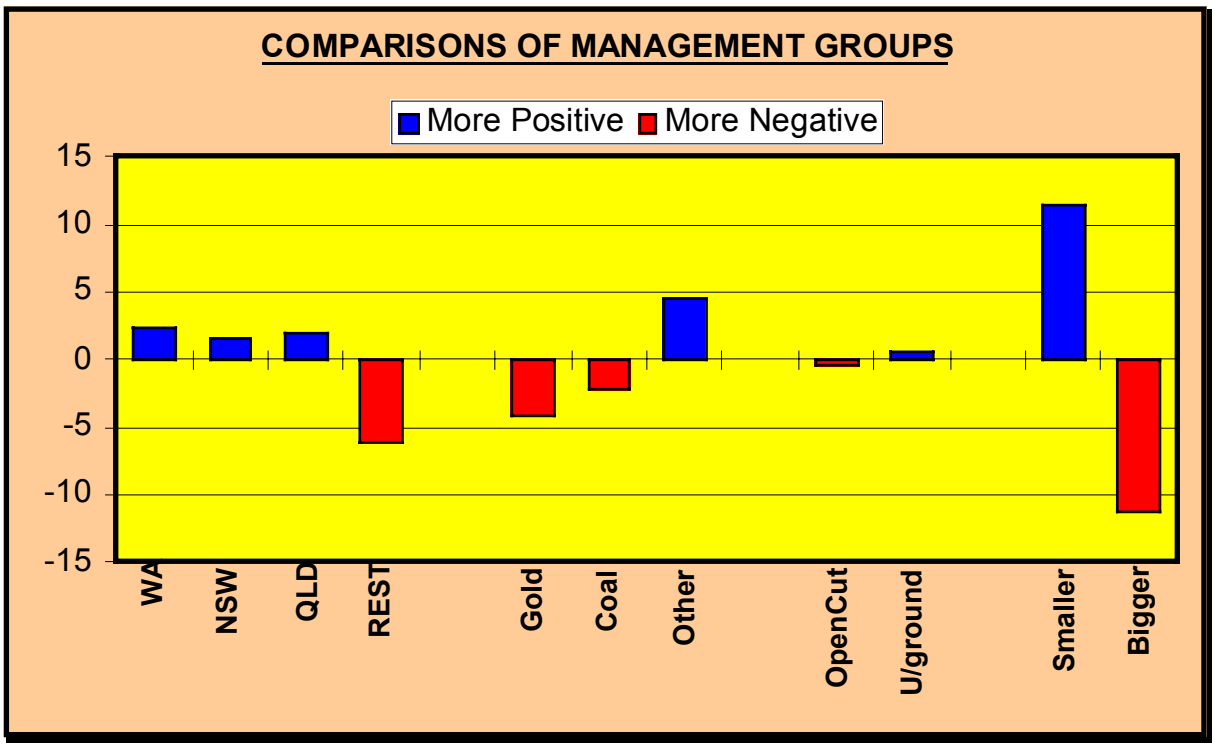


Findings

The above graph shows the trends of negative responses. (Note: not average responses to negative statements, but the net result calculated by subtracting the proportion of negative responses from the proportion of positive responses). These 10 factors ranked consistently as the ones most negatively responded to in all employee groups. More detailed rankings for each employee group are provided in Section 1.

- Job Security showed extremely negative trends and was consistently the most or second most negative factor.
- Risk Level/Awareness, or the proportion of employees who showed neutrality towards dangers in their jobs, is disturbingly high.
- Duty, as measured by the statement: *"If I have an accident, it will be my own fault*", had consistently low responses.
- Disturbingly, on the factor of Fatalism, very low responses were consistently recorded on the statement: *"It is possible to achieve zero accidents".*
- Lack of Recognition for safety also was strongly evident in all employee groups and a strong perception exists that safety programs are "mostly too much paperwork", as a measurement of Systems Quality.
- These are all very serious problems, which may hamper effective management of safety.

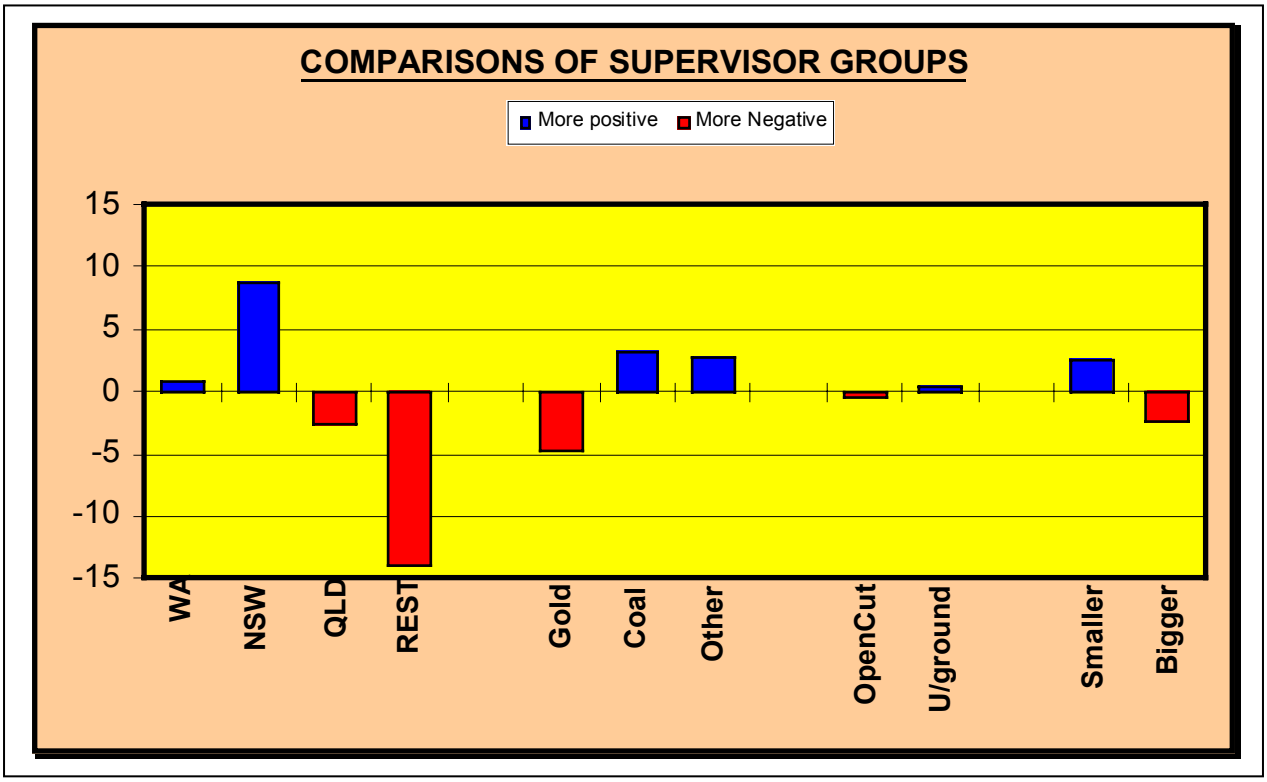
5.2.4 Summary of Comparisons of Management Groups



Findings

- The Management groups from the major mining states -- Western Australian, New South Wales and Queensland mines -- responded proportionally more positively to the statements than managers in the minor mining states of Victoria, Tasmania, the Northern Territory and South Australia combined.
- Managers of Gold and Coal mines responded more negatively when compared with managers from Other mines, such as manganese, iron ore, zinc, alumina etc.
- There was very little difference in the response patterns of Underground and Open Cut mine managers.
- Managers from Smaller mines were significantly more positive proportionally than managers from Bigger mines.

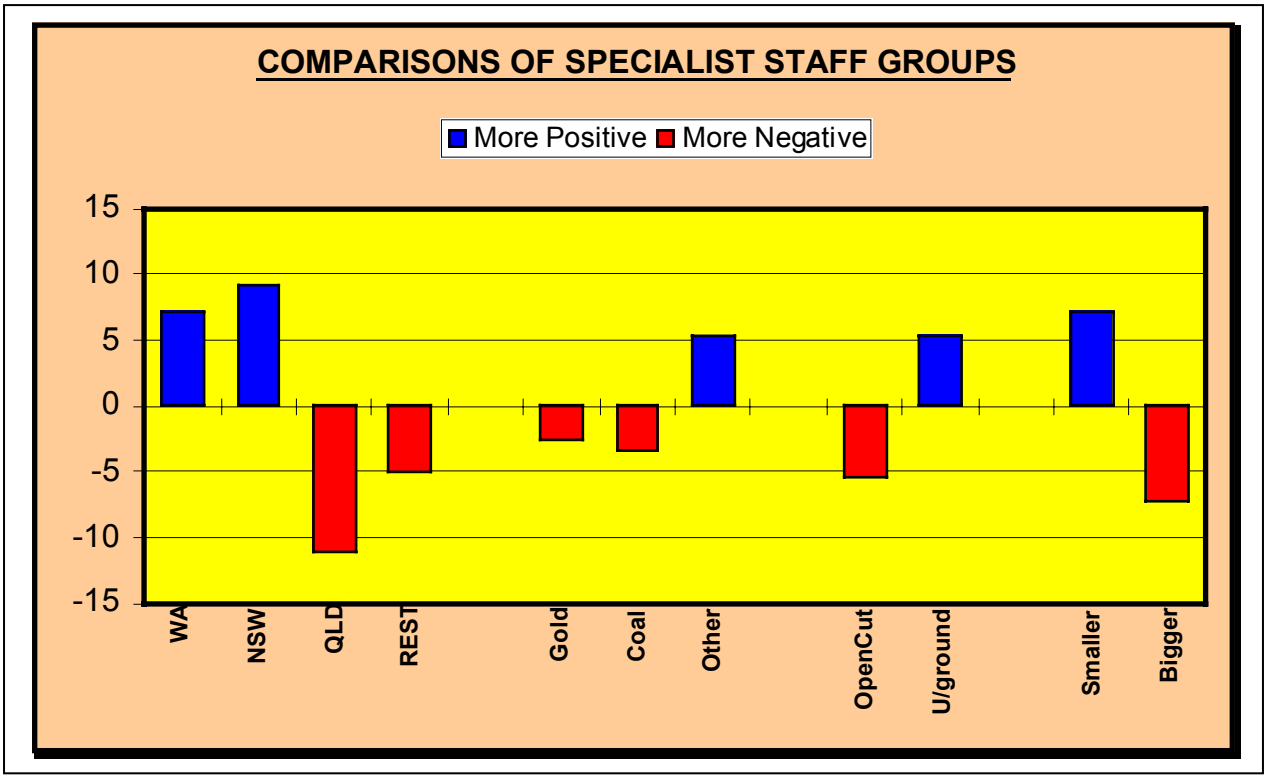
5.2.5 Summary of Comparisons of Supervisor Groups



Findings

- The Supervisor groups in New South Wales mines responded significantly more positively than supervisors from the Minor Mining States and those from Queensland. The responses between Western Australia and Queensland differ only slightly overall.
- Supervisors on Gold mines responded more to the negative statements than supervisors from Coal and Other Minerals mines.
- There was very little difference between the Supervisor groups on Underground and Open Cut mines, as was the case for the Management group comparison above.
- Supervisors on Smaller mines responded slightly more positively than Supervisors on Bigger mines. (This is markedly different from the Management groups' comparison, where the difference between these two groups was much bigger.)

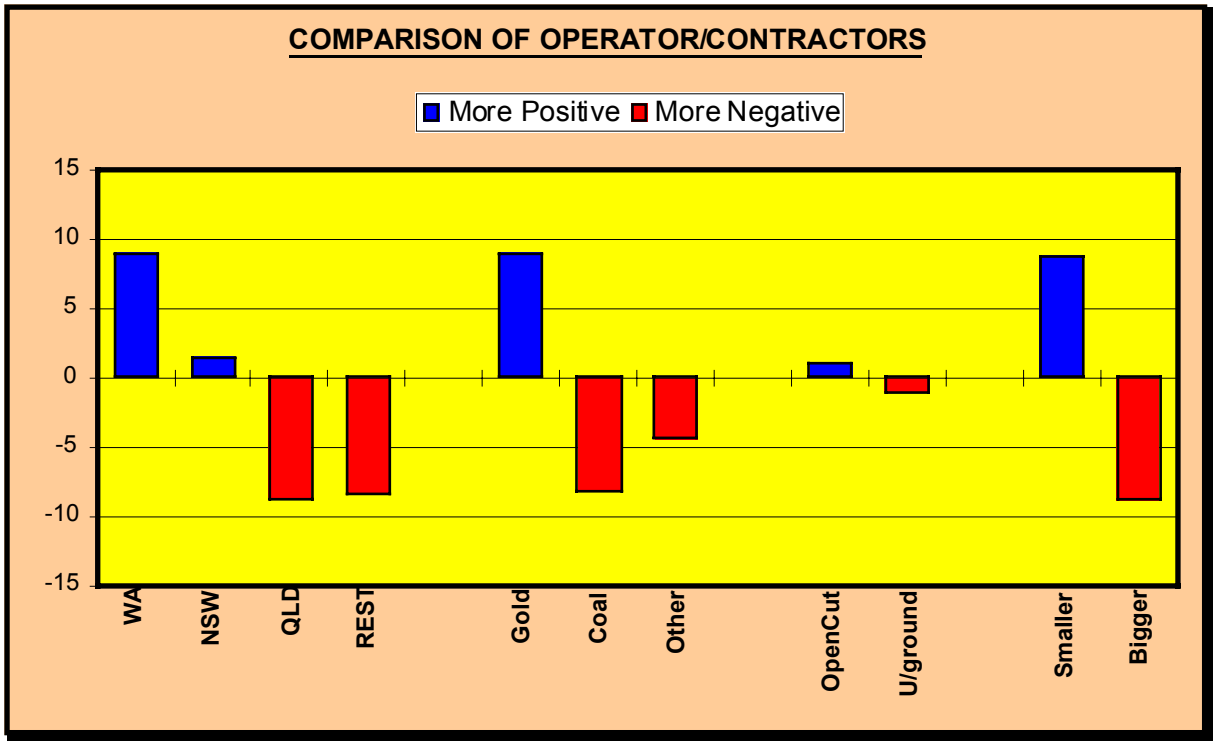
5.2.6 Summary of Comparisons of Specialist Staff Groups



Findings

- The Specialist Staff groups of Western Australia and New South Wales mines responded significantly more positively than supervisors from the Minor Mining States, and those from Queensland. The Queensland groups were significantly more negative than those groups in all other states.
- Specialist Staff on Gold and Coal mines responded more negatively as a group than Specialist Staff from Other Minerals mines.
- The Specialist Staff at Open Cut mines responded significantly more negatively than Specialist Staff at Underground Mines.
- Specialist Staff at Smaller mines was significantly more positive as a group when compared to the same personnel on Bigger mines.

5.2.7 Summary of Comparisons of Operator/Contractor Groups



Findings

The Operator level comparisons were done with the Operator and Contractor groups combined, because of the inequality in employee numbers for some of the structural variables. For example, a comparison between Gold and Coal contractors would hardly be possible because of the very small numbers of contractor employees on coal mines.

- Operator/Contractor groups in Western Australia were extremely more positive overall than the same groups in all the other states. These groups of employees in New South Wales were slightly more positive as a group than those in Queensland and the Other States. It will be demonstrated later that this is largely due to the influence of the Contractor groups in Western Australia.
- The Operators/Contractors on Gold mines also showed extremely more positive responses as a group than Coal and Other Minerals mines.
- Again, very little difference existed between Underground and Open Cut, but Smaller mines' employees were significantly more positive as a group than Bigger mines' employees.

Discussion of Comparisons by State, Commodity Mined, Type and Size of Mine

- The different employee groups in Western Australian mines were consistently more positive than their counterparts in the other states. This difference was marked at the Specialist Staff and Operator/Contractor level, and less so in the Leadership groups of Management and Supervision.

- Gold mine employees were consistently more negative than employees on Coal and Other Mines, except for the Operator/Contractor level, where Gold mine employees were significantly more positive, as a result of the Contractor group's influence in the Western Australia proportions. There is clear evidence that the popular view of contractors as less focused and serious about safety is incorrect.

- There is little evidence to suggest that Underground employees (another popular view) are proportionally more negative towards safety. Except for the Specialist Staff group, there is little difference between the two groups. It is suggested that observers and commentators about the "safety problems in the underground minerals industry" are making incorrect inferences simply because of the higher incidences of fatal accidents in that sector. The mere fact that higher actual risks in the underground sector contribute to fatal accidents may be obscured by expedient and political arguments and by talk of "poor safety culture".

- Smaller mines consistently show more positive responses in all the employee groups, although this difference was much less marked in the Supervisor group. While Bigger mines are often the ones that implement bulky safety management systems or auditing systems, the Smaller mines' ability to achieve closer contact between employee groups outweighs this benefit of greater resources. (One of the most extreme negative trends in all of the employee groups is the perception that "safety systems are too much paperwork".)

  This suggests that there is considerable scope for the implementation of more dynamic and team-oriented safety approaches, as will be demonstrated later in this report.

- The consistently more negative responses among all employee groups in Queensland and the Other States require further consideration to identify the possible reasons why this occurred, while closer attention should be given to the positive gains made by the contractor companies over the past few years.

5.2.8 Summary of Advanced Statistical Analyses (Section 3)

A number of advanced statistical analyses were performed on the data to determine what relationships, if any, exist between several variables. The results, findings and conclusions relating to the data in this section are highly complex and "technical" and the reader requiring detail should read Section 3. The findings and conclusions are summarised below.

Investigation of the relationship between the factors and categories in the safety culture model. In other words, what contribution does each factor make towards the overall response trends of the model? The results were as follows:

- **Findings**: The internal contribution of the various factors in this culture model was strongest in the categories of Organisation, Management, Supervision, Processes and Safety Systems.

- **Conclusions**: More positive perceptions on safety are primarily achieved through effective leadership, secondarily through processes, team factors and safety systems, and thirdly through job factors and individual factors.

Investigation of the relationship between high achievement on the MINEX self–assessment scale and the response trends on the safety culture model.

- **Findings**: Overall more positive responses on the safety culture model showed a moderate to high correlation with higher scores on the MINEX self-assessment.

- **Conclusions**: Excellence of systems and the quality of management process are strongly linked to a more positive safety culture. Organisations can expect improved safety performance by pursuing the MINEX criteria.

Investigation of the relationship between the Safety Strategies that the management team focuses on and the response trends on the safety culture model.

- **Findings**: The analysis indicated a positive relationship between the cohesion/convergence of the management team members' views on what safety strategy to follow and more positive responses on the safety culture survey. More importantly, a strong relationship is indicated between more positive safety culture and pursuing a so-called Team-Performance oriented safety strategy. More positive companies were also strongly against a Compliance-oriented safety approach.

- **Conclusions**: Organisations that are flexible in management style and focus on people are more likely to be successful in achieving a positive safety culture. This may be contrary to current and future directions of mining regulation.

Investigation of the alignment of employee groups, namely the extent of similarity or difference in the response patterns of employee groups.

- **Findings**: The analysis indicated that the response patterns of the employee groups were quite dissimilar, suggesting that "positive downward influences" in organisations from Manager to Supervisor to Operator levels are limited.

- **Conclusions:** The internal "cohesion" of minerals companies may be less than desirable and divergence between groups may lead to more dissent and conflict between the various levels of employees, e.g. Supervisors and Operators.

5.3 Overall Conclusions

The following are extracts from the conclusions on each section in this report. More information and the supporting data are provided in each of the sections of the report.

5.3.1 Conclusions on Actual Responses (Section 1)

- Employees are under no doubt about the intentions and goals of companies to improve safety. The results suggest that most organisations and the industry as a whole have been very successful in communicating the "safety message".

- Despite this powerful message, the "value" of "care about employees" that underpins the achievement of a positive safety culture seems lacking in the industry. This is evidenced by a lower response rate on the factor of Value, especially by Operator and Contractor groups. While the industry has been very successful in communicating the importance of safety, the pervasive message employees connect with is that management does not "value" employees. This is reflected in the direct data on the Value factor and also suggested by trends on linked factors: high levels of job insecurity; low credibility of senior management; high levels of dissatisfaction with safety management systems; and diminishing value of the traditional safety committee.

  Employees may view the emphasis on safety as management's reaction to external pressures, and not necessarily as management really wanting to achieve safety outcomes themselves.

- Widespread job insecurity in the industry will almost certainly hamper well-intentioned interventions and any effort to achieve improved safety. It is certainly a multi-faceted issue that requires consideration at the macro-economic and strategic levels of the industry.

- The task of managing organisations towards higher achievements in productivity and safety is seriously impeded by a lack of perceived credibility of the management group.

- The "systems" aspects of safety management – managing a safety program and providing training – seem substantially deficient, with all employee groups indicating higher levels of dissatisfaction with the quality of programs and training.

- The traditional forum of discussion and negotiation on safety, the safety committee (Consultation), may face a demise over the long-term, arising from the relatively low level of support from the management groups reducing the effectiveness of these committees.

- Higher levels of professionalism amongst safety practitioners and a gradual change in their roles more towards that of "advisers" have resulted in very high levels of positive support for their quality of work – especially high among management groups.

- The issue of Recognition (or lack of recognition) for safety and for safe work is a very serious deficiency, especially at the Operator/Contractor level in organisations, indicating a significant absence of formal and informal recognition for safety and safe work performance.

- From the results it can be concluded that the formal work environment (of safety standards) is very positively viewed by all of the employee groups, but that there may be a distinct "willingness" among most groups, especially Operators, to take risks to expedite work. When this is coupled with a very low response to the factor of Fatalism, and a low response to the factor of Recognition, it can readily be expected that risk-taking behaviour will occur frequently. This is especially the case in circumstances where employees do not necessarily have a high level of awareness of risks in their work.

- The peer group relationships and employees' relationships with their direct supervisor were consistently more positively viewed by most employees and it offers a significant opportunity to further improve workplace relationships. It seems to be an opportunity not fully exploited at this stage.

- A critical factor is the one of Fatalism (defined in this survey as the achievability of "zero accidents") which, as a psychological construct, may play a very substantial role in the occurrence of risky behaviour. It is of concern that although very high proportions of Managers responded positively to this statement, at all other employee groups this response level dropped remarkably – even to as low as 38% amongst Operators. The full scope and impact of this factor on risk-taking behaviour is not yet fully understood and may require further and in-depth research.

- The actual response levels differ significantly between the various employee groups. There is a very large "gap" between the positive responses of Managers and those of Operators, which may indicate that minerals organisations largely lack cohesion and full support for safety. Even if not detrimental, this gap will certainly limit the industry's ability to introduce change and improvement in safety performance.

- In the Manager group the extremely negative responses on Job Stress may be linked with the negative response patterns on the Work Pressures factor.

- The Middle Manager group responses are, unexpectedly, significantly lower than those of the Manager group. Normally, one would expect the differences between managers and middle managers to be very small. While there is satisfactory alignment and closeness in their responses on some of the factors between these two groups, there are several factors where the difference is disturbing.

- The Supervisor group plays a key role in the achievement and maintenance of a positive safety culture in any organisation. On the whole, this group seems to be relatively positive. However, the group does show areas of concern, most notably high levels of Job Stress, lower levels of Risk Awareness and accepting responsibility for safety, Job Insecurity and high levels of Work Pressure. There are also indications that Supervisors are having a somewhat limited impact on the levels below them, as was shown by the analysis in Section 3 of the report and the substantial gap between their overall responses and those of the Operators. It is possible that Supervisors are "side-lined" by the very strong presence of managers in safety matters.

- The Specialist Staff group shows very similar response levels to those of the Supervisor group. Factors such as Job Insecurity, lower levels of Risk Awareness and high levels of Job Stress are also evident in this group. They also share the high negative response level on Recognition with most of the other employee groups.

- The Operator group, as the "coal face" of the minerals industry, shows very disturbing trends and response levels on a number of the factors. Most disturbing is the extremely low response levels on the factor of Fatalism (i.e. the achievability of "zero accidents"), combined with more negative responses on several of the other risk behaviour-related factors.

- The Contractor group, or the "coal face" on many mines using contract employees for activities such as mining, and the group of employees most directly exposed to the risk in the workplace, shows very satisfactory response trends when compared with those of the Operator group. An important conclusion from this comparison is that, if contractors are over-represented in accidents in the minerals industry, and this is not only due to the fact that they are mostly employed in higher-risk work environments, then the source of the problem is one of skill and/or risk awareness.

In summary, both high levels of positive responses at the work face and close alignment between various employee groups are essential for the achievement of improved safety performance in the industry. The results suggest we have neither, especially in the Operator group.

5.3.2 Conclusions on Comparisons (Section 2)

- The management practices and approaches in Western Australia have more positive effects on the safety culture in that sector of the industry than in most other sectors, except for some problem areas identified in the ranks of Supervisors. This may be due to the fact that the mines in this sector more readily share information and technology.

- The responses in the state of New South Wales indicate that overall, formal safety processes and systems are effective, but that the positive perceptions on culture at leadership levels do not affect the operator level in the same way – especially in the Coal sector.

- In the state of Queensland, more serious problems and deficiencies are evident. The effectiveness of the leadership groups on these mines seems limited.

- The trends in responses at mines in Minor Mining states indicate that the effectiveness of legislation and corporate initiatives on these mines generally is limited. While some of the minerals companies may achieve high levels of excellence, most do not.

- In the Gold sector, the effectiveness of supervision is seriously limited, in view of the more negative responses of Gold mine supervisors when compared with supervisors on Coal and Other mines. In the Coal sector, on the other hand, there is an indication that external issues and conflicts have impacted negatively on the safety culture at operator level – given the fact that the leadership levels in the Coal sector are at least, or more, positive than other sectors. However, Operator level employees in the Coal sector are significantly less positive than Operators in other sectors.

- The difference between Underground mines and Open Cut mines is unexpectedly small and even negligible, except possibly more negatively entrenched perceptions on Risk-Taking. Smaller mines are clearly much more effective in guiding and creating a positive safety culture, despite their apparent lack of resources. It is suggested that it is this same "simplicity" of safety management and the focus on performance and teamwork which underpin the more positive trends amongst Contractor employees than with Operator employees.

5.3.3 Conclusions on Trend Analysis

- The formal factors in the safety culture model (Organisation, Management, Supervision, Management process and Safety Systems) all have a very strong impact on employee perceptions. The factors in the categories of Job Factors, Team Factors and Individual Factors have a lesser impact overall. In simpler terms, perceptions of Management and the Company have a stronger impact on a person's perceptions of safety overall than whether he/she perceives the team spirit as positive or not.

- The industry can gain significant improvements in safety if it can change the general management approaches towards "quality of systems" approach, as represented by the MINEX criteria, and towards more team-oriented strategies where team outputs and performance on safety are more prominent.

5.4 Recommendations

The results of this survey project give decision-makers in the Australian Minerals Industry the opportunity to consider the following recommendations. The recommendations provided here by SAFEmap (in no order of priority) focus on specific issues and findings in the survey.

It is recommended:

1. That an independent review be done of the typical safety management systems and approaches of Contractor companies, to identify what features can be linked to the more positive response rates in these organisations. It is suspected that these organisations apply safety systems that are more focused on performance outcomes and are effective because they are simpler.

2. That the Contractor companies further consider the issue of Risk Awareness. The report mentions that a skill and/or risk awareness problem might be apparent in this group. The Contractor employers may certainly be aware of this as an issue. If that is the case, they may need to give extensive consideration to the development of risk awareness of people employed by them. Creative techniques exist to develop this "skill" with "coal face" employees.

3. That the Gold Mining sector take steps to identify possible reasons for the more positive perceptions at the Operator/Contractor level of Safety Systems factors such as Safety Staff and Safety Rules and Training, again with a view to disseminating information about the constructive features these perceptions may identify.

4. That the Gold Mining sector, or the Western Australian sector, where most gold mines are, continue with extended and more in-depth research of the problem of risk-taking behaviour and the issue of (the lack of) Risk Awareness. The significantly more negative perceptions on Risk-Taking at both Operator and Contractor level in Western Australian mines is a cause for concern.

5. That the Gold Mining sector review the very serious deficiencies at the Supervisor levels and ascertain whether current training programs in the industry are sufficiently supported by the gold industry. Further investigations may also examine whether the economic conditions in this sector have a detrimental impact on the perceptions of this group.

6. That the Coal Mining sector conduct further research into the serious deficiencies identified at the Operator/Contractor levels. It is recommended that this sector support a sector-wide culture survey, with the aim of identifying more specific issues that are related to the extremely negative trends.

7. That providers of safety programs and systems, of whatever types being utilised in the minerals industry, be requested to review the paper-intensive nature of their systems and programs. This may need to be preceded by an industry-wide assessment of the range and types of such safety systems being utilised by companies and followed by an evaluation of the extent to which these are in fact "paper-intensive".

8. That the factor of Job Stress at the leadership levels of the industry be further investigated from a health perspective.

9. That more specific research be conducted into the whole issue of "risk awareness" and that consideration be given to the development of more effective training programs. It is suggested in this survey analysis that "risk awareness" may not be an "attitude" but simply a skill -- a skill that is rapidly lost when "risk ignorance" naturally develops. This aspect probably requires more academic research.

10. That consideration be given, specifically, to the issue of Fatalism – its links to risk-taking behaviour and its links to overall safety performance of individuals, groups and companies. Evidence from this survey suggests that there is a moderate to low positive correlation between Fatalism and overall perceptions to safety. This suggests that this factor is similar to Risk Awareness, described in this report as a "subliminal skill" rather than a perception or attitude. This is considered a critical issue for the industry, given the "zero accident" stance taken by the industry.

11. That the role and function of Safety Committees be reviewed and possibly benchmarked against industries such as the coal industry in the USA and Canada, to identify possible weaknesses in our systems, legislation or industrial relations practices. Furthermore, it should be expected that the role of safety committees would continue to diminish, as organisations move further towards team performance strategies. The safety committee will increasingly be replaced by participative safety systems. To achieve this, legislators may need to be lobbied towards a greater recognition of these types of safety systems.

12. That the high levels of credibility of Safety Staff be further developed by establishing an Institute for Safety Practitioners, modeled on the Human Resources Institute or other similar professional organisations, where accredited membership, developmental programs and quality information sharing would ensure the maintenance of high professional standards.

13. That a review be done of available training programs in the safety field to ensure that people management competencies are adequately addressed and include basic, but critical, behavioural skills such as:

    - ♣ Stating and reviewing team safety performance goals
    - ♣ Applying positive reinforcement techniques
    - ♣ Modeling safe behaviour
    - ♣ Reducing unsafe behaviour.

14. That the concept of "diagnosis of deficiencies" be extensively reviewed, especially in respect of accident and trend analysis. Most accident analyses are actually little more than accident investigation. Organisations will hardly be able to identify organisational deficiencies by using limited or superficial tools of analysis.

15. That the contents of this report be widely distributed throughout the minerals industry, in full and in summary formats, and that debate, consideration and feedback be sought as widely as possible – including from industry groups, regulators and employees. Ideally, each mine in the industry should have access to a full copy and mine management team members should receive copies of the Summary Report. This will ensure that the rich array of data in the report can be further investigated and used for informed decision-making.

16. That versions of the report be made available on the Minerals Council website, from where full or abbreviated text can be downloaded. Associated websites in Australia should also establish links from their sites to the report.

17. That a series of workshops be conducted in different regions and sectors of the minerals industry in which the results, conclusions and recommendations of this report would be considered, and from which more detailed, more operational-level conclusions and recommendations could be developed. Obvious opportunities to consider and take action on the report's findings present themselves at forthcoming events such as the Safety Conferences of the Queensland Mining Council and the NSW Minerals Council.

18. That industry leaders be requested to give focused and strategic consideration to the findings of the survey. This could be done through the publication of a series of "strategic issues papers" -- to be developed by selected authors in a variety of specialist fields. These authors could be requested to identify long-term issues the industry is likely to face and identify possible shortfalls in our current safety culture. After a series of these papers have been developed and considered by industry leaders, a stated "vision and strategy for safety in the new millennium" could be developed.

6. FUTURE SURVEYS AND BENCHMARKING

A Commercial Strategy for Long-term Safety Culture Monitoring

- The original proposal to the Minerals Council for the survey project included a long-term vision for future surveys. It envisaged that the same survey would be conducted again at various times in future and the changes in the industry's safety culture would be monitored, analysed and guided towards specific goals. Not only would participating companies benefit from this, but various sectors of the industry, such as states, corporations or commodity sectors could actively use the information towards achieving an overall strategic goal of safety improvement.
- To achieve this, SAFEmap has made the survey technology available to the industry at extremely low cost (between 20% and 25% of normal costs for such surveys) and

will transfer the surveying skills to the participating minerals companies. A new software package will soon be released to replace Profile-R (to be called e-Profile) with which mines can fully manage and conduct not only safety culture surveys but a wide range of other types of surveys, either standard or customised.

Cost-Effectiveness

The cost-effectiveness for the long-term strategy is assured in several respects:

- The cost to the Australian Minerals Council of the second and future surveys is contained because of the semi-commercial arrangement made with SAFEmap.
- The cost to participating companies is contained because overheads and consultants' on-site costs are eliminated once they have the on-site capacity to conduct expert surveys themselves.
- Cost-effectiveness for companies is also achieved because there is a significant "transfer-of-skills" to companies. Culture surveying has always been the exclusive domain of costly experts and consultants. The surveying process itself can now be conducted by in-house staff, which means that processing, recording and collating the information (from questionnaires) is now a very small part of the process and therefore no longer a significant cost factor for companies.

The Benefits

Benefits to the Australian Minerals Industry / Minerals Council of Australia

- The ability to achieve a continuous monitoring of safety culture without the need to commission costly studies every three to four years.
- An improvement in the level of thinking (about safety culture) and the level of sophistication (of safety management interventions) because the e-Profile technology and costs make widespread participation possible.
- The ability to target specific problem areas of safety culture with confidence because of the accuracy of problem identification.
- The ability to consider, as a result of the above, more targeted interventions, such as training, change programs or other management development schemes.
- The capacity to develop benchmarks for safety culture in the industry, and to disseminate improved management tools/techniques to all participants in the resources industry.
- The assurance that the relatively high level of semi-literacy or functional illiteracy in the industry does not confound the results.
- The ability to invite other industries (power, chemical, petroleum, construction and heavy manufacturing) to participate in the concept and eventually to make industry comparisons possible. A common survey technology unaffected by, for instance,

literacy problems ensures a level playing field to compare and develop valid benchmarks. See the comments under Benchmarking below.

Benefits to Participating Companies/Mines

- The opportunity to access the sophisticated arena of safety management with relative ease. The cost benefits of this are obvious, with access to this technology being easily available at a lower cost in absolute terms. This is only achievable through the introduction of computer and Internet technology. Any other technology will continue to be prohibitively costly.
- The opportunity to develop in-house skills in surveying techniques, which can then be applied to other areas of management concerns.
- The ability to make informed decisions on safety interventions, based on culture analysis, and to make sure the surveys are focused to enable specific sections of the organisation to be followed up.

Participating mines could practically apply the survey outcomes as follows:

- A mine could conduct surveys at any stage, and get immediate feedback of results.
- A mine could conduct a survey of a particular section of organisation (e.g. a department, or level of employees, or even teams) and obtain immediate feedback of results.
- A mine could, in any of the above circumstances, obtain expert analyses of its profiles, available as comprehensive reports and recommendations.
- A mine could continuously introduce management or Occupational Health and Safety interventions in the organisation, and measure the effectiveness of these interventions – enabling it to maintain a proactive and sophisticated approach to safety management.
- A mine could have, through the ongoing database on the SAFEmap website, an ability to measure itself continuously against industry averages and benchmarks – which would otherwise not be available unless special industry surveys were conducted.

Benchmarking

Once the project is well established, the aim is to embark upon two marketing strategies with the e-Profile technology, namely:

- ♣ To market it to the non-minerals industry, specifically among other "higher-risk" industries such as power generation, building, manufacturing, oil and gas etc. This will provide the resources industry with the opportunity to measure itself against these industries and identify more specific deficiencies

and problem-areas and also to integrate successful management techniques and approaches from these industries, where warranted.

- ♣ To market the e-Profile technology to other minerals industries internationally, especially in the United States, Canada and the United Kingdom. This will provide the Australian minerals industry with a further opportunity to identify strengths from other countries' industries and integrate improved management technology from them

Final Word

Risks cannot be avoided, accidents can. An industry like ours needs to develop a "competency" to identify and manage risks. We are already extremely competent in identifying and engineering the physical risks. We now need to become competent in identifying and managing the most complex and elusive risk: the organisational risks embedded in "culture".

Accidents, big or small, seldom occur because of isolated events or mistakes. Organisations "breed" mistakes and, through an insidious accumulation of deficiencies, latent forces and a culture of risk-taking, the scene is set for accidents to occur.

While it may not be possible to trace each accident directly to an organisational deficiency, there are complex links and influences operating in the mindset of the organisation and the mindsets of individuals and teams.

These mindsets are a potent mix of attitudes, perceptions, beliefs, biases and stereotypes and they are the single most powerful influence on behaviour. The future of safety management does not lie in managing that behaviour; it lies in managing the mindsets.

The safety we want is the safety we get and is the safety we deserve.

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He completed Bachelors and Honours degrees in Industrial Psychology, Honours in Business Management, an MBA (Human Resources Management) and a postgraduate Diploma in Education.

He has published several papers, for the Australian Institute for Mining and Metallurgy, the Minerals Council of New South Wales and several others. He is Managing Director of IOSA Pty Ltd (SAFEmap), providing consulting services to the minerals industry of Australia since 1992.

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Rawden Hill is a Director of IOSA Pty Ltd (SAFEmap) and principal consultant in safety and health in Western Australia. After completing a B. Commerce degree majoring in Industrial Psychology and Organisational Development, he continued with postgraduate studies, completing a B. Commerce Honours degree majoring in Industrial Relations and Organisational Behaviour. He completed a Masters in Business Administration (MBA). He has worked in various industries as a senior human resources executive and also extensively in the minerals industry.

Notes on David Blyth

David Blyth is Executive Director of IFAP in Western Australia, holds the degrees Bachelor in Science, Master in Applied Science and MBA, and specialises in strategic management and organisational and learning culture models.

7. LIST OF TABLES AND PROFILES

Main Section:

The following documents are available from the Minerals Council of Australia on request:

Section 1: Actual Responses

Section 2: Comparisons

Section 3: Trends and Advanced Analysis

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Safety Culture Survey Report

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