

# **USING KNOWLEDGE MANAGEMENT TO IMPROVE RISK MANAGEMENT STRATEGIES AND COMMUNICATIONS IN MINES.**

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## **INTRODUCTION**

The management of health and safety risks, the effective communication of risk management strategies and their controls are key issues for all Australian mines. Most states are adopting performance-based legislation for the management of health and safety. This approach places significant duties on employers and mine managers to effectively manage health and safety. The approach of performance based legislation is one of hazard identification, risk assessment and control and requires mines to implement management systems and procedures to control mining risks.

The setting out of duties for employers and employees as well as the use of risk management as a basis of health and safety legislation has been in vogue for the past twenty years. Most mining companies have a risk management program with a risk register, procedures and processes to identify, assess and control risks. Significant resources are put into the management of health and safety risks in the mining industry. So after many years of using risk management processes to manage health and safety risks how are we going? Well it would seem that we still have a long way to go. As an industry we have high rates of injury and many employees are still being killed as a result of workplace accidents compared to other industries. Last year there were seven fatalities in the Australian Minerals Industries (Minerals Council of Australia, 2003, p 2).

In Australia high occupational injury and illness rates are undermining our economic performance and reducing living standards and the value of undertaking health and safety risk management is being increasingly questioned (Viner 2002, Tillman and Robinson 2002, Harvey, 2002, Cross and Trethewey, 2002).

At a national level the Occupational Health and Safety Commission (1999: p 1) estimates more than one million working weeks were lost in 1996 - 97 due to work-related compensated cases. In comparison, working days lost annually due to industrial disputes totaled only 650,400 in 1999 (Australian Bureau of Statistics, 2001 [on-line]).

## **RISK MANAGEMENT IN MINES**

Mining today involves the use of cutting edge technologies, new equipment, changes to work processes and staffing arrangements. To survive and be profitable in a competitive environment mine management and employees must be flexible and move quickly. This involves making constant and ongoing changes to the working environment. This can place unrelenting pressures on the management and employees of a mine to remain competitive. These developments also have the potential to introduce new hazards and risks to the workplace.

To combat these problems the use of risk management is growing. It is used by many mines not only as a method of managing health and safety risks but also as an effective way of coping with a more volatile economy, rapid changes in technology, new equipment and avoiding costly mistakes.

Effective risk management on mine sites however is more than just developing a procedure, undertaking risk assessments and having a risk register. Mines should develop strategies to regularly review their risk management profile. This means conducting a review or audit of what the mine needs to know about the risks on site, identifying any gaps in its risk management strategy and developing controls to ensure all risks are effectively controlled. As the workplace is constantly changing mines also need to determine what their people know about health and safety risks and how that knowledge can be used by the organisation to reduce risks. An effective risk management strategy also needs to ensure that the nature of the risks and their controls are communicated to the workforce.

At the same time the use of risk management is increasing, the management of health and safety risks is becoming more complex and difficult and there are signs that many organisations are having difficulty managing risks using old techniques and paradigms because of the volatility and pace of change in the economy (Smallman 1996: p 246). Mining is not immune to these pressures. Covello (1986: p 441) sums up the current debate about risk management and asks, "in response to the changing economic conditions and the effects of globalisation are the traditional methods of managing risk and communicating risks adequate?" He suggests that to cope with the demands of the new economy and performance based legislation we need to seek improved risk management techniques and concepts. Knowledge management may be the key to unlocking those improvements.

The principles of knowledge management can be used to develop improved risk management techniques and concepts. Organisations including mining companies should consider developing a knowledge management strategy to cope with our fast moving and competitive economy (Chorafa 2001: p 3). Knowledge management can be applied to health and safety risks and it has the capacity to contribute to the bottom line of a mine through improved risk management, better risk communications and enhanced organisational problem solving capacities.

## **WHAT IS KNOWLEDGE MANAGEMENT?**

Before we discuss knowledge management it is appropriate to discuss what is knowledge in the context of the workplace and provide an overview of what we call knowledge management. The Macquarie Dictionary (2003, p 1054) defines knowledge as "the fact or state of knowing ... that which is known, or may be known". Von Krogh, Ichijo and Nonaka (2000, p 6) go further than this and argue that knowledge (what is known) can be in two basic formats either tacit or explicit.

Explicit knowledge can be referred to as knowledge that has been recorded as information in a document, image, computer data, film clip, photograph or in some other medium. It can be put on paper, formulated in to sentences, or captured in drawings and specifications (Von Krogh, Ichijo and Nonaka 2000, p 6).

Tacit knowledge refers to knowledge that resides in a person's mind and can include aspects of culture or 'ways of doing things' (Standards 2001 p 7). It can also be tied to the senses, skills in body movement, individual perception, physical experiences, rules of thumb and intuition (Von Krogh, Ichijo and Nonaka 2000, p 6).

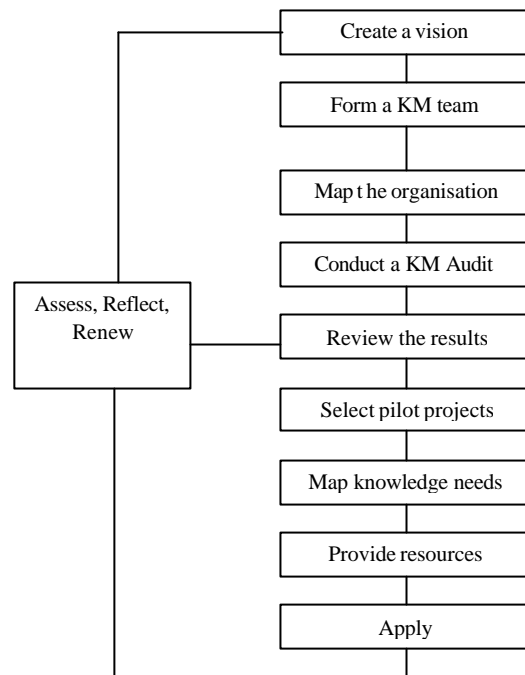
In the workplace knowledge management can be seen as a processes of sharing, acquiring and creating knowledge to solve organisational problems (Standards Australia 2001, p 5). Collision and Parcell (2001 p 8) refine this definition and state that knowledge management is the "capturing, creating, distilling, sharing and using knowledge. This definition includes both tacit and explicit knowledge and provides a good working definition of what knowledge management means within organisations.

## **DEVELOPING A KNOWLEDGE MANAGEMENT STRATEGY**

A knowledge management strategy sets up a framework to assist with implementation process and provides a road map for the organisation to follow and measure progress against. Like risk management the components of a knowledge management strategy can be divided into a number of interconnected steps. Figure One below describes these interconnected steps.

**Figure One: Overview of Knowledge Management Process**

1. Create a vision – set the scope of the project. Establish the goals and objectives.
2. Form a project team.
3. Map the organisation.
4. Conduct a knowledge management audit.
5. Review the results – identify gaps.
6. Select pilot projects or identify health and safety or risk management initiatives.
7. Map knowledge needs.
8. Provide resources.
9. Connect across the organisation.
10. Review and continually improve.



## IMPLEMENTING A KNOWLEDGE MANAGEMENT STRATEGY

Once you have decided to implement a knowledge management strategy it is useful to create a vision statement to define what you actually want to achieve. A vision statement should describe the overall aims of the strategy and set out the major supporting concepts that will be used to achieve it.

## MAPING THE ORGANISATION

The next step in the process is to identify and document its current knowledge-based resources and capabilities. This is called mapping and it will identify what knowledge is currently available and how it is being used within the organisation. Mapping the organisation should clearly identify:

- Where are all of the business units within the organisation are located
- What their main functions are
- What are the main tasks undertaken in those areas
- Who are their key personnel in those areas
- What are their areas of expertise
- The organisational mapping can also include all all-major processes, technologies and equipment

In risk management terms this is known as establishing the risk management context.

## KNOWLEDGE MANAGEMENT AUDIT

Once the organisation has been mapped an audit of each business unit or process should be conducted. This will determine how the organisation is currently managing its health and safety risks and knowledge. The audit should include what knowledge is available about controlling these health and safety risks and what knowledge should be collected, acquired or created. A knowledge management audit can reveal potential knowledge gaps in the management of health and safety risks. Several techniques can be used to collect data such as questionnaires, focus groups and critical incident technique.

Issues that could be raised during the audit include:

- What are the organisation's highest health and safety risks?
- What controls are in place to manage these risks?
- Are these controls effective?
- Why / why not?
- What could be done to improve the management of specific health and safety risks?
- What could be done to improve the overall management of health and safety?
- How do you find out about health and safety?
- Is this source reliable?
- What is the best source of health and safety information?
- How could health and safety communications be improved?
- Where are health and safety resources located
- What specific skills people in relation to business functions, health and safety and health and safety risks

Although many organisations will already have comprehensive hazard and risk registers. What they may not have done is to subject them to this level of intense scrutiny and review. The objective of the knowledge management audit is to identify strategic gaps in the health and safety risk management process and discover opportunities for improvement.

The results will also form a baseline measurement of how the employees of the organisation perceive how health and safety communications and knowledge is managed within the organisation. Auditing offers opportunities for identifying methods of improving communication and safety management.

## **IDENTIFYING ANY KNOWLEDGE GAPS**

The results of the knowledge management audit should be properly documented. Once this is done a gap analysis should then be conducted on the results of the audit. The purpose of the gap analysis is to identify what knowledge is currently available against what is required to effectively manage health and safety risks. The audit should also identify any individuals and resources with particular knowledge that can assist the organisation to achieve its goals.

A gap analysis should be conducted against:

- current risk management policies, procedures and processes
- existing health and safety Hazard and risk registers
- known sources of health and safety knowledge the effectiveness of specific controls including procedures
- perceived health and safety needs
- the level of training provided / required
- communication methods

The collection and analysis of this information will assist with current risk management activities and future projects.

## **KNOWLEDGE MANAGEMENT PROJECTS**

Once the knowledge gaps within the organisation have been identified through the audit, projects and project teams can be developed to apply knowledge management to various health and safety and risks. Projects that could be developed include:

- improvements to the overall risk management processes
- a comprehensive review of hazard and risk registers (breadth and depth)
- the review of scope, application and completeness of health and safety policies and procedures
- the effectiveness of current risk controls
- benchmarking of health and safety systems, risk processes and performance
- investigation and identification of new controls
- a review of documentation systems

- identification and recording of tacit information
- developing skills and knowledge inventories
- recording and restructuring of explicit knowledge into a more useable format
- improving communication methods
- a review of general and specific training needs

## **ESTABLISH PROJECT TEAMS**

The next phase of the strategy is to implement the findings of the gap analysis. This is done by establishing project teams to work on specific health and safety projects. These teams should be cross-functional if possible to spread the benefits of the projects as widely as possible. Leaders or champions of the group should be identified to facilitate the process for specific issues. The leaders or champions should be briefed on their role and how the projects will be rolled out. This is a crucial phase of the implementation strategy and adequate resources should be provided to ensure the success of the project.

To avoid different project groups working in isolation the organisation should develop strategies to enhance communications not only throughout the organisation but also within the teams themselves. The development of discussion or focus groups, inter-team briefings, internal newsletter or web-site can be used to help communications. Many sites are part of larger organisations and a dedicated web could be created so that all sites can access and share information. The web site could form part of an existing portal or be an entirely new site.

## **TEAM BASED TOOLS**

There are many team-based tools that can be used to support an implementation strategy.

## **PEER ASSIST**

Peer assist is a meeting or a workshop where people are invited from other project teams to share their experience, insights and knowledge with a team who have requested some help. It is worthwhile holding a peer assist when a project team is facing a challenge, where the knowledge and experience of others will really help. A peer assist:

- targets a specific or technical or commercial challenge
- gains assistance and insight from people outside the team
- identifies possible approaches and new lines of inquiry
- promotes sharing and learning with each other
- develops strong networks amongst staff.

## **BENCHMARKING**

Benchmarking against other business units and organisations. Benchmarking can be on specific issues such as high risks, developing controls, communication strategies etc to acquire knowledge.

## **WORKSHOPS AND DISCUSSION GROUPS**

Knowledge workshops and focus groups are conducted within and across teams to share and create knowledge. They can be used to evaluate current risks, identify risks associated with new innovations or changes to the workplace. They can be similar to an in depth after action review. They do not have to be limited to what went well. They can also be used to discuss what could have been done better and what would be done different next time.

Discussion groups and inter team briefings are less formal and are also used to promote knowledge throughout the organisation. New and innovative approaches to managing risks can be discussed.

## **AFTER ACTION REVIEWS**

After Action Reviews (AAR) are a deliberately short and sharp discussion and analysis session designed to aid team and individual learning. The United States army first developed the process. The purpose of the AAR is to improve the ability of soldiers to learn from the midst of action and to improve team working. "An after action review is a professional discussion of an event, focused on performance standards, that enables soldiers to discover for themselves what happened, why it happened, and how to sustain strengths and improve on weaknesses" (Collision and Parcell, 2001, p 77).

The format is quick and simple and should not take more than twenty minutes. The AAR answers four simple questions:

- What was supposed to happen?
- What actually happened?
- Why where there differences?
- What did we learn?

## **WEB BASED TOOLS**

Web based tools allow work groups to connect across functional boundaries, time zones and distance. These sort of tools are very useful for geographically isolated people and sites. They allow people to become part of a community of knowledge and if they are properly structured to have access to large support networks.

## **CORPORATE YELLOW PAGES**

Corporate yellow pages are more than just a telephone directory. They are a searchable database where people can look for staff with relevant knowledge and experience. Corporate yellow pages can assist people to find the right source of information at the right time. Typical information in corporate yellow pages can include:

- Name, Job Title, Position
- Contact Details
- Photograph
- Structured Taxonomy of 'areas of expertise'
- Free text area
- Internal and external web links
- Qualifications
- Membership of networks and teams

To cut down of the time it takes to set up a corporate yellow pages many organisations have developed easy to fill in templates for people to fill out. Useful information may also include areas that are currently working on and past projects.

## **HEALTH AND SAFETY KNOWLEDGE AND RISK MANAGEMENT WEB SITE**

A knowledge or risk management site can be used to improve communications contain links to corporate information, provide opportunities for assistance and requests for help. Content could include:

- Overview of the KM project
- Results of the KM Audit
- KM Data base – Yellow pages
- Details of projects
- Org chart and project teams
- Ask the KM team questions
- What's new – messages from the team – photos etc
  - Help page – post questions and offers of help
  - Outside links

## **PRACTICAL KNOWLEDGE MANAGEMENT**

Knowledge Management is not just a concept or fad. It has practical applications for a range of risk management situations in the mining industry such as training, physical hazards and emergency management. All mines will have an emergency management plan and should conduct emergency response exercises. Many will also have a duty card system with documented roles and responsibilities for key personnel. Although such cards and exercises are of great value and can be used to prepare for emergencies they may not always cover every contingency or issue that occurs during an emergency situation.

In the event of an emergency or crisis situation how well would your mine handle it? How prepared would you be and do you know everything you need to know to deal with an emergency situation? Emergency planning and response is one area that knowledge management can be used at a practical level to improve a key risk management or safety issue.

All mines have a wealth of knowledge and experience but how often is it left to the mine manager or health and safety officer to develop and review the mine's emergency management plan. How often do these people get the time and resources to find out what people know and what skills they have. By using knowledge management techniques to map, audit and identify any gaps in the emergency management processes mines have an opportunity to make their emergency response plan and teams more effective and efficient.

## **GETTING STARTED**

A knowledge management project team reviewing an emergency management plan may need to consider some or all of the following issues:

- Emergency management team?
  - Do you have the right people with relevant knowledge of the events or hazard?
  - Do you have access to relevant technical experts and information?
  - Are these people available when needed?
  - Do you have the right number of people to handle a crisis?
  - Do these people need training, in what, where can we source it?
  - Are there any gaps in the team or its training?
- Hazards and risks
  - Have all hazards and risks been identified and assessed?
  - Are they included in the plan?
- Emergency communications
  - Who is responsible, are people trained?
  - Are there adequate mine communication systems including:
    - Telephones
    - Radios
    - Fax
    - E-mail
    - Back up communications if services fail (electricity, phones)
    - Back up power supply
- Coordination of emergency services
  - What services are available, who deals with them, are our employees members of a particular service?
  - Who is responsible for communication, maintaining relationships, training and liaison with external officers?
  - Are these groups familiar with the mine?
  - Have they been inducted / do they need to be?
    - Police
    - Security
    - Ambulance
    - Doctors

- Hospital
  - Fire fighters
  - Mine rescue
  - Flying doctor
  - SES
  - Coroner
  - Mines Inspectorate
- Provision of emergency equipment
  - What is needed, where can we get it, is it always available?
  - Is additional rescue equipment required in specific circumstances?
  - Do we need specialist equipment e.g. Jaws of Life, rescues from height etc?
  - Do we have people that can use it?
- Management of regulatory investigations.
  - Are there adequate?
  - Facilities including communications available
  - Liaison officer (s)
  - Notification and reporting requirements
- Local medical services
  - Do they know what to expect?
  - If there is an overflow what happens?
- Managing the media
  - who is authorised to speak,
  - who writes any press releases
  - who are our contact personnel
  - what should they say
  - who should be let on site
  - what security do we need
  - Do you have stock footage of the site to provide to the media
  - Do you have responses and explanations for key questions
- Debriefings for those involved
  - Debriefings / information for relatives
  - Coordination of employee / family assistance and support
  - How do we handle distraught family?
  - How do we deal with fatalities?
  - Where would we put any deceased while we treat the casualties?
- Internal Investigations
  - Who shall conduct them
  - Are people trained?
  - Collection and preservation of evidence
  - Report writing and photographs
  - Self incrimination
- Business continuity
  - Are alternative plans needed to ensure that the mine keeps operating (if appropriate).

The scope of the knowledge management review should be appropriate to the size and complexity of the mine. This can be done using the above list as a starting point. Once the scope of the review has been decided the team should map the current situation of the mine and conduct an audit of knowledge and skills associated with emergency management.

Once this is done the team can then begin to identify any gaps in the emergency management plan and then develop a strategy to improve how the mine manages its potential emergency situations. Once a plan has been developed a range of team and web based tools can be used to implement the plan. Appendix A contains a suggest contents of an emergency management plan.



## CONCLUSION

Mining continues to face many challenges including performance based health and safety legislation, new technologies and the ever-increasing demands of the new economy. As organisations seek to become more efficient to remain competitive they will need to break out of traditional risk management approaches and find new ways of doing things. The mining industry will need to look outward to other sectors to find new ideas and tools to adopt.

This paper has outlined some basic knowledge management concepts and provides a hands on example of how to apply knowledge management to a specific health and safety risk management issue. Whilst knowledge management is not a definitive answer to the problems of managing health and safety risks it is an important and useful tool in the war against occupational injury and disease. Knowledge management techniques can be used by mining companies to improve risk management, communications, health and safety management systems, processes and to share knowledge between sites.

Individual sites are able to use knowledge management techniques for site specific projects including training, risk management and task analysis as well as physical hazards such as plant safety, electricity, hazardous substances, noise and manual handling. Knowledge management can also be used to re-invigorate a flagging or complacent risk management programs, improve the quality of risk control options and promote better risk communications. Knowledge Management represents an important step forward in improving health and safety risk management and communications.

## APPENDIX A: A SUGGESTED EMERGENCY MANAGEMENT CHECKLIST

|                                |  |
|--------------------------------|--|
| <b>Site and Hazard Details</b> | <ol style="list-style-type: none"> <li>1. Name location, address and nature of operations</li> <li>2. The name, title and telephone number of the person with whom the details of the plan can be verified with</li> <li>3. Detailed map of the mine and surrounding area</li> <li>4. Listing of hazards (including cumulative hazards) – types of emergencies</li> <li>5. Minimum / maximum number of persons expected at facility including shift arrangements etc</li> <li>6. Infrastructure likely to be affected by major incident including control points for utilities</li> <li>7. Emergency planning assumptions</li> <li>8. Description of measures of control the consequences of each hazard and major incident</li> </ol> |
| <b>Command Structure</b>       | <ol style="list-style-type: none"> <li>9. Command structure and philosophy for emergencies</li> <li>10. Details of emergency contact personnel</li> <li>11. Details of the person responsible for liaison with the emergency services</li> <li>12. Allocation of personnel for implementing the plan including their roles and responsibilities of all personnel involved in implementing the plan (duty cards)</li> <li>13. Location of command center (s)</li> </ol>   |
| <b>Notifications</b>           | <ol style="list-style-type: none"> <li>14. Procedures for providing early warning of a major incident</li> <li>15. Details of on-site and off-site warning systems</li> <li>16. Contact details for emergency services</li> <li>17. Details of on-site communications systems</li> </ol>   |
| <b>Resources</b>               | <ol style="list-style-type: none"> <li>18. Details of emergency resources on site including resources for specific hazards</li> <li>19. Arrangements for obtaining additional resources</li> <li>20. Systems to ensure that persons trained in the use of rescue equipment are available on site, or are on call whenever any person is working at the mine</li> <li>21. Details of rescue equipment</li> </ol>  |
| <b>Procedures</b>              | <ol style="list-style-type: none"> <li>22. Systems including procedures that enables all persons within the mine at any given time to be promptly located</li> <li>23. Procedures for safe evacuation and muster of personnel</li> <li>24. Details of control points and procedures for essential services</li> <li>25. Procedures for the containment of any incident</li> </ol>  |
| <b>Systems</b>                 | <ol style="list-style-type: none"> <li>26. Procedures for testing the emergency plan in order to ensure its continued effectiveness</li> <li>27. Arrangements for the emergency services who have responsibility for the area in which the mine is located to participate in those tests</li> <li>28. Procedures for the review and audit of the Emergency Management Plan</li> <li>29. Procedures for the provision of information, instruction and training of employees, contractors and visitors to the mine</li> <li>30. Procedures for the debriefing of employees and their families and providing assistance</li> <li>31. Procedures for the update of the plan</li> </ol>   |

## REFERENCES

Australian Bureau of Statistics (2002) [online]. available at <http://www.abs.gov.au/ausstats/abs@.nsf/0/8028FDAA59046FE9CA2568A9001393F6?Open>

Chorafa, D. (2001). Managing Risk in the New Economy. New York, New York Institute of Finance.

Collision, C. and Parcell, G. (2000). Learning to Fly, Practical Lessons from One of the World's Leading Knowledge Management Companies. Milford, Capstone Publishing Inc.

Covello, V. T., Menkes, J., et al. (1986). Risk Evaluation and Management. New York, Plenum Press.

Cross, J. and Trethewy, R. (2002) Influences on Risk Assessment Decision, Safety in Australia, vol., no 24, no. 3, 27-31.

Harvey, J. (2002) Reliability of Risk Assessments: A Statistical Evaluation of Results from Six Assessment Tools, Safety in Australia, vol., no 24, no. 3, 22-25.

Macquarie University, (2003) The Macquarie Dictionary, Revised Third Edition. The Macquarie Library Pty Ltd, Sydney

Minerals Council of Australia (2003) Safety and Health Performance Report 2002 – 2002, Minerals Council of Australia, Dickson

National Occupational Health and Safety Commission (1999) National OHS Improvement Framework, Canberra, National Occupational Health and Safety Commission.

Smallman, C. (1996). Challenging the Orthodoxy In Risk Management Safety Science **22**(1-3): pp. 245-262.

Standards Australia. (2001) HB275 - Knowledge Management. A Framework for Succeeding in the Knowledge Era, Sydney, Standards Australia.

Tillman, C. and Robinson, R. (2002) Seven Risk Paradigms, Safety in Australia, vol., no 24, no. 3, 17-21.

Viner, D. (2002) Risk Assessments – Do They Work?, Safety in Australia, vol., no 24, no. 3, 12-16.

Von Krogh, G., Ichijo, K., et al. (2000). Enabling Knowledge Creation. How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation. New York, Oxford University Press

## FURTHER READING

Despres, C. and Chauvel, D. (2000). Knowledge Horizons. The Present and the Promise of Knowledge Management. Woburn, Butterworth-Heinemann.

Else, D. (1999 a). "Leadership - Transforming Occupational Health and Safety from a Problem Into a Competitive Edge for Australia." The Health and Safety Professional 8 (3): 1-9.

O'Dell, C. and Grayson, C. J. J. (1998). If Only We Knew What We know. The Transfer of Internal Knowledge and Best Practice. New York, The Free Press.

Probst, G., Raub, S., et al. (2000). Managing Knowledge. Building Blocks for Success. New York, John Wiley and Sons.

Ruggles, R. and Holtshouse, D. (1999). The Knowledge Advantage. Dover, Capstone Publishing Inc.

Standards Australia. (2001) HB275 Supplement 1 – 2002 International Best Practice – Case Studies in Knowledge Management, Sydney, Standards Australia.