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Workplace hazard identification: What do people know?

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Abstract

The correct and proactive identification of hazards in the workplace underpins all occupational health and safety practice and risk management strategies and is therefore paramount to effective business practices and the health and safety of all organisational members. It is a basic right of employees to be safe at work, but working safely relies on identifying risk. If managers and employees cannot identify risk then their safety cannot be assured. Managers and employees need to have sufficient knowledge to identify hazards that lead to risk in the workplace in order to inform processes to successfully control those risks. This paper draws upon the findings from two hazard identification and hazard management training workshops conducted with 77 employees of an underground mining operation in Western Australia in April and May 2011. The statistics provided by the organisation show that the training had a positive impact on reported incidents.

Introduction

Employee safety and the profitability of organisations rely on occupational hazards successfully identified and managed within competent risk assessment processes. Occupational hazards can be physical, chemical or psychological and can lead to workplace incidents and work-related injury, that impact on organisational productivity and profitability (Hollmann, Heuer & Schmidt, 2001; Lees, 1996; Ramsay, Denny, Szivotnyak, Thomas, Corneliuson & Paxton, 2006). The identification and proactive management of risk is critical for safety (Bohle & Quinlan, 2000). Risk management is also about dealing with the unknown because not all hazards are easily recognised. Indeed, the revised Risk Management Principles and Guidelines for Australia and New Zealand ISO 31000:2009 defines risk in terms of ‘the effect of uncertainty on objectives’ (Standards Australia, 2009:ii). Organisations use risk assessment processes and practices to identify hazards and manage risks. Harms-Ringdahl (2003:1) argues risk assessment is ‘a systematic procedure for analysing systems to identify and evaluate hazards and safety characteristics’.

From 1 January 2012, Australia is moving towards OHS harmonisation that will occur through a model *OHS Act Regulations* and *Codes of Conduct*, replacing the differing state-based *OHS Acts* and *Regulations* (SafeWork Australia, 2010). The *Model Act* is underpinned by the ‘duty of care’ concept, requiring employers to identify and implement appropriate measures to ensure a safe system of work and employees to follow that system. The *Model Act* will permit workers to stop work if they consider themselves exposed to a serious risk, while OHS representatives will also be able to direct workers to stop work if exposed to a potential risk. Employers will be required to exhibit due diligence in all activities including: identifying the risks and hazards in the nature of their operations; examining their resources and processes to ensure a safe system of work is in place; having a knowledge of OHS matters; having practices that facilitate a timely response to incidents and a process that enables full legal compliance (SafeWork Australia, 2010). The *Model Act* assumes that managers and employees have the appropriate knowledge to effectively identify hazards.

It is the ability of managers and employees to successfully identify workplace hazards that forms the topic of this paper. Hazard identification requires the individual to recognise not only obvious hazards, but also emerging hazards. In short, if managers and employees are not skilled at hazard identification, then the risk assessment process will be incomplete and workplace safety cannot be guaranteed. This paper draws upon the findings from two hazard identification and hazard management training workshops conducted with 77 employees of an underground mining operation in Western Australia in April and May 2011. Research has traditionally focused on the end process of the reporting of hazards and risk management (Biggs et al, 2006). There has been limited research nationally, and internationally that has documented the hazard identification skills of managers and employees to improve practice.

So what is a hazard?

Manuele (2010:33) defines a hazard as ‘the potential for harm’ and describes hazards as ‘all aspects of technology and activity that produces risk’. Hazards contribute to workplace risk and include the actions of people and the characteristics of equipment, dust, and chemicals, for example. However, how risks are perceived affects how they are managed and the subsequent effect on organizational processes (Fung, Tam, Lo, & Lu, 2010; Hambach, Mairiaux, Francois, Braeckman, Balsat, Van Hal, et al., 2009). Herein lies the problem, different people judge the same risk situation in different ways (March & Shapira, 1987; Kahneman, Slovik & Tversky, 1982; Weyman & Clarke, 2003; Tolbert 2005; Binder, Scheufele, Brossard, & Gunther, 2010). Brewer, Chapman, Gibbons, Gerrard, McCaul and Weinstein (2007), note that workers generally have difficulty in determining the probability that risk will eventuate into serious harm or injury with their perceptions often influenced by their own individual experiences (Burke, Scheurer & Meredith, 2007). For example, if a person has experienced a situation that was a close call or ‘near miss’ in relation to a possible work-related injury they are far more likely to perceive a similar situation as high risk or hazardous.

Can workers successfully identify a hazard?

Industries and professions such as nursing, dental health, mail deliveries, nano-technology, manufacturing, construction and mining are identified in the literature raising the importance of good hazard identification in the workplace as a preventative injury mechanism (Bentley & Haslam, 2001; Ramsay et al, 2006; Schulte & Salamanca-Buentello, 2007; Biggs et al, 2006; Reinhold & Tint, 2009). Hambach, et al (2009) stated that workers in a chemical plant felt they had specific knowledge of the risks within their working conditions; however Manuele (2010:30) counters this argument with the notion that there is generally ‘a lack of awareness of the nature of risk’ in organisations. Carter and Smith (2006) conducted a hazard identification study on three UK construction projects and found that workers were able to identify 89.9 per cent of all possible hazards for a construction project within the nuclear industry, 72.8 per cent for a railway project, and 66.5 per cent for a project that encompassed both construction and the rail work. They concluded that hazard identification levels were considerably lower than ‘ideal’ (Carter & Smith, 2006). They identified two types of barriers to improving hazard identification: knowledge and process. Similarly a project conducted in the construction industry in NSW Australia revealed significant weakness in the formal process of hazard identification by contractors (Trethewy, 2000). Finally, Ramsay, et al (2006) investigated hazard analysis in the US nursing profession and found that although nurses are exposed to a number of hazards on a daily basis the core competencies within their accreditation and training failed to mention a requirement to demonstrate competence in hazard identification or control.

Some organisations are becoming aware that their managers and employees may have weak hazard identification skills and have processes in place to assist their workers with this task. Japanese manufacturing workers in an effort to improve their mental health were asked to identify hazards based on the surveillance of stress using self administered questionnaires (Tsutsumi, Nagami, Yoshikawa, Kogi & Kawakami; 2009). Harms-Ringdahl (2001) developed an organisational Safety Function Analysis that has six stages and asks the user to select a set of hazards and identify the existing safety functions for these hazards. Cromie, Robertson and Best (2001) and Mattila (1985) working in the health sector suggest the use of checklists, workplace inspections, injury records and consultation with workers will assist with hazard identification. However, the aforementioned all assume that the participants have the skills and knowledge to successfully identify hazards and in Australia specific training in hazard identification is limited.

Research method

The hazard identification and management training for this study was supported by a participatory action research methodology (Stringer, 1999) with the data analysed according to an interpretive, critical realist perspective (Sayer, 1992). Zuber-Skerritt (2001) asserts that action research combines the dual aims of both action in practice and research. That is, bringing about a change in a field of practice and increasing understanding and knowledge about this event. The training sought to make a change for the participants by increasing their awareness of the types of workplace hazards they and their colleagues encounter each day. The emphasis was upon effecting change, with the research process primarily contributing to that purpose, and secondarily providing the opportunity to understand and conceptualise the process.

Most approaches to research polarise the fields of theory and research, segregating them, yet moving from one to the other, to ground, test or generate knowledge. Action research emphasises the dialectical relationship between action and theory as ‘praxis’ (Morgan 1980). That is, the focus is on the interrelated and interdependent relationship between action and conceptualisation, practice and theory. Action research is characterised by cycles of *action* and subsequent *reflection*, where an evaluation of the impact of the changed practices leads to re-planning, further action, and another subsequent action research cycle (Stringer, 1999).

Sample

The training was delivered in two workshops; to the staff of an underground mining operation in Western Australia. The first phase ‘Hazard Identification’ consisted of 6 half day workshops held over 3 days in April 2011 with a total of 77 participants. For each of the phase 1 workshops the participants were divided into 18 mixed teams (4-6 participants), 54 of whom were contractors working for the company and 23 direct employees. One group consisted entirely of those in management and supervisory roles. Each group was asked to list on butcher’s paper workplace hazards divided into four categories: Obvious, Trivial, Emerging and Hidden Hazards. These four hazard categories were outlined in a slide presentation to each group to define and describe them using workplace examples.

The second phase of the training, ‘Managing Hazards’, brought the same groups back together again into 5 two hour workshops delivered over five days in May 2011 and presented a summary of the data collected in phase one, consistent with the an action research methodology. Workshop two was delivered to the same people as in the first workshop, however as in workshop one there was one group of managers and supervisors and the

previous 5 groups of mixed roles was condensed into 4 groups. The participants were divided into 4 teams for each session (a total of 20 teams) and asked to brainstorm strategies of what to do when presented with the identified hazards and how better to manage them in the workplace. Each team was responsible for one of the four categories of hazards (Obvious, Trivial, Developing and Hidden) identified in workshop one to develop strategies to address them. These four hazard categories were discussed with the participants and defined as follows: Obvious hazard, eg: a broken electrical wire; Trivial hazard, eg: spanner left on floor; Emerging hazard, eg: overheating engine, and Hidden hazard, eg: toxic and asphyxiating gases and vapours inside confined spaces.

Findings

Workshop 1

The range of hazards identified in the first series of workshops was extensive by some groups and very limited by others. The ability to identify hazards was not predetermined by length of experience in the job. Some of those in supervisory positions and others with extensive experience identified few hazards. On average each team identified 8-12 hazards under each category; however, the team with staff with the least experience (only 3 years collectively) were unable to identify more than four obvious, two trivial, five emerging and three hidden hazards.

Thirty four obvious hazards were identified (shown as the overall per centage over all teams) including: moving machinery (72%), unsupported ground (55%), faulty equipment (50%), misfires/explosives (50%), slips and trips (38%), and incorrect personal protective equipment (PPE) (38%). However, 62 per cent of the sample did not identify incorrect Personal Protective Equipment or slips and trips as an obvious workplace hazard. This is significant in that slips and trips made up 23.9 per cent of both the 386 injuries requiring 60 days or more off work, and the 877 injuries requiring 5 days off work in 2008-09 in the mining sector (WorkSafe WA, 2011). Additionally only one team identified manual handling as an obvious hazard when 40.8 per cent of all injuries in 2008-09 were the result of body stressing (WorkSafe WA, 2011) and only one team identified poor housekeeping which can be a cause of many slips and trips in the workplace.

Twenty two trivial hazards were identified by the teams including: poor housekeeping (55%), faulty equipment (44%), slips and trips (38%) and spillage (33%). It is of concern that 55 per cent of the sample identified poor housekeeping as a trivial hazard and that these participants did not recognised how significant a clean site is in the prevention of workplace injuries. Even more concerning is that 38 per cent of participants determined slips and trips were trivial hazards given the prevalence of these types of injuries (WorkSafe WA, 2011).

Twenty three emerging hazards were noted including: 72 per cent identifying faulty machinery, and 55 per cent noting fatigue/boredom/rushing hazards. Other emerging hazards identified by at least 25 per cent of the groups included: dehydration, ground conditions, ventilation, irregular servicing of machinery, poor communication and speeding/driving to road conditions. It is interesting to note that one group recorded a 'lack of training' as an emerging hazard.

Twenty four hidden hazards were identified. Here the groups exhibited knowledge and understanding of hidden and latent risk (Tolbert, 2005). Seventy two per cent of the groups identified gas leaks, 50 per cent noted hydraulic pressure, 44 per cent recorded electrical

faults, 38 per cent noted water hazards underground and 38 per cent acknowledged human behaviour and a lack of knowledge as hidden hazards. Almost 25 per cent of participants noted uncontrolled ground movements, unsupported ground and weather conditions as hidden hazards.

For the two week period immediately after the first workshops were conducted there were zero recorded incidents for injury, equipment damage, near misses or non compliance. This is a significant outcome of the training in that the mine had not previously ever recorded a week free of incidents. However, although it is a positive result of the training to have two weeks free of workplace incidents the effect was not long lasting with incidents once again reported after three weeks.

Workshop 2

For the second workshops 'Managing Hazards', staff was once again divided into groups. One group was made up of those in management roles and the remaining four groups were made up of mixed staff roles. Each group was divided into four teams to determine strategies to address the hazards within the four categories of Obvious, Trivial, Emerging and Hidden hazards. The shift supervisors within each of the mixed teams were asked not to participate in this exercise as it was thought they may influence the teams' efforts. They were instead called upon at the end of the session to confirm and comment on the teams' findings to identify any gaps. It was agreed by all groups before completing this task that general safeguards such as procedures and job safety analyses, workplace inspections, pre-starts, personal protective equipment, ground control standards and faulty equipment tags would not be included in their analysis. These processes were considered as everyday requirements and a starting point to addressing workplace hazards. Instead, the participants were asked to identify *specific* strategies to address each of the hazards.

Participants identified key areas such as the importance of good communication including using clear and concise instructions, listening to their colleagues during their shift and when handing over to the incoming shift, and when working with trainees or new operators. Training was also identified as important to skill staff to address the handling of hazards. Strategies to address the category of obvious hazards were on the whole comprehensive. However, trivial hazards were treated as such with participants providing humorous responses, for example, to a lack of exposure to the sun and therefore a lack of vitamin D, such as sitting on 'the beach'. Some teams were harsh in their treatment of breaches such as not driving to road conditions with strategies to address this hazard including terminating the employee. One team suggested as a strategy to combat fatigue stimulants such as coffee should be used. One team suggested that mentoring new staff would be a good strategy to assist in the reduction of hazards in the workplace. It should be noted that trivial hazards that are ignored can escalate into something more severe and that comprehensive management of risk requires them to be recognised and addressed. For these two categories there was no significant difference between the responses of the management group and that of the remaining four mixed groups. However, what is of interest is that the workshop for the management group ran for three and a half hours because they were so enthusiastic, with the facilitator having to call the training to an end even though they had not fully completed the task.

Strategies to address emerging hazards included more Shift Boss supervision, with work place risks blamed on employees' laziness to conduct thorough pre-starts and to keep the site clean. Interestingly, one team set the task of identifying strategies to address emerging

hazards could not commence the task at all and required one-on-one assistance by the training facilitator. It should be noted that these were not inexperienced staff; in fact there was an average of twelve years experience between the teams' participants. Their lack of ability to suggest strategies to address emerging hazards is of real concern. Conversely, some of the most recently appointed staff within the mixed teams showed greater understanding in addressing and managing hazards than the long term employees. In addition, the management teams did not show any greater ability in completing this task; in fact one team produced minimal content in the workshop even though they were engaged in the activity for over three hours.

Within the hidden hazard strategies, the issue of fitness for work and fatigue emerged strongly from the data with the home environment identified as a major contributor to fatigue. In addition, some teams noted the need to have sufficiently long breaks between shifts of a minimum of nine hours and to take a five minute break when tired. They suggested random screening for fatigue should become a practice in the organisation and that this should be at the discretion of the Shift Boss based on other workers identifying colleagues at risk. Interestingly, several teams suggested the use of caffeine drinks to assist in combating fatigue. One team noted that the use of alcohol and drug consumption at home should be reduced. Given the mine has a zero tolerance of drug use, with a one strike you're out policy; it is significant that there is acknowledged home drug use. For those identified as not following procedures and incorrect isolations, some of the teams suggested punishment for their actions including ridicule from their fellow workers. Proficiency with the English language also emerged in this category with acknowledgement that correct reading of signage was crucial. In Australia the shortage of skilled workers has led to the recruitment of overseas workers on temporary work visas, some of whom have limited ability to speak, read and write in English. Recently the Australian Government has tightened the laws surrounding temporary work visas to address migrant workers' English literacy issues (DIAC, 2009).

The statistics

Figure 1 provides internally reported incident numbers for the underground mine between July 2010 and September 2011. Incidents are divided into 8 categories: Lost Time Injury, Near Miss, Modified Work Injury, Medical Treatment Injury, First Aid Injury, Environmental Damage, Non Compliance (not performing task according to procedures) and Equipment damage. It should be noted that there had been no fatalities at this mine site during this period. Prior to one lost time injury in March 2011, the mine had been lost time injury free for almost 2 years. The figure shows that February 2011 recorded the highest number of equipment damage incidents that by April 2011 had gradually reduced by 50 per cent but were back to the high level by August 2011. However, it should be noted that August marked the change to a new machinery maintenance contract, the introduction of new machinery and the employment of new personnel. First Aid Injury incidents remained fairly constant between March and July 2011 but gradually reducing from July 2011. Near misses decreased from February 2011 with none reported in May, June and August 2011. All other incident categories reported remained infrequent and at constant low numbers. Of the 80 reported incidents since April 2011, 35 were attributed to newly employed personnel that hadn't undergone the hazard identification of management of hazards training. Prior to the safety culture change initiative the incident statistics were generally trending upwards. From April 2011 this trend reversed suggesting the training, mentoring and documenting of safe work procedures had a positive effect on the safety culture.

Examples of damage to equipment incidents included: tyre damage on heavy machinery and damage to vehicles through rocks hitting or rolling onto them and reversing into walls. Examples of medically treated injuries included: sprains and strains and a fracture. Examples of first aid injuries included: sprains and strains cuts and abrasions and an eye injury. Near miss examples included: Failure to use fall arrest equipment, vehicles left running without wheel chocks in place, and a refuge chamber with inadequate carbon dioxide cylinders.

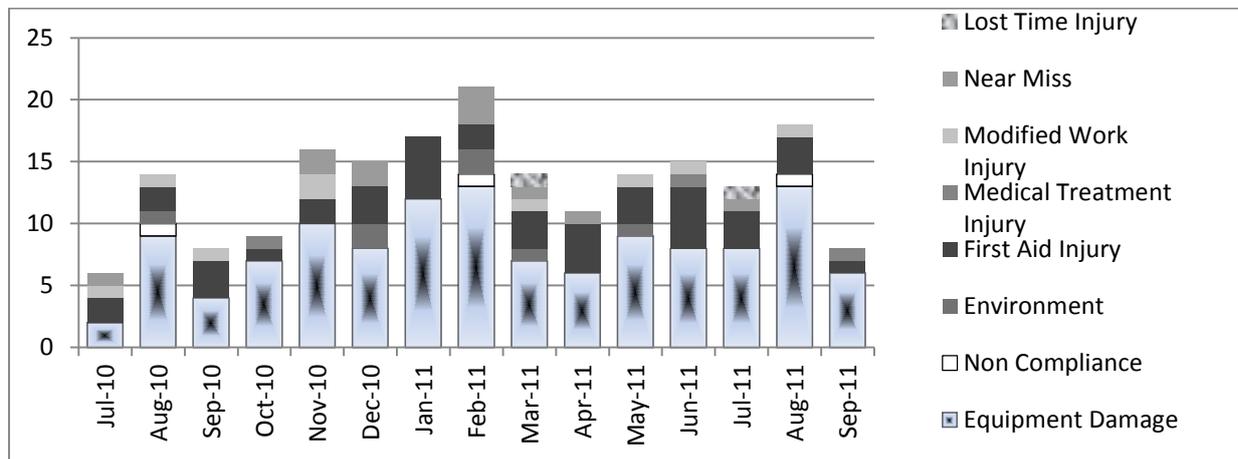


Figure 1: Incidents July 2010 – September 2011

Conclusion

The purpose of the first training workshop was to determine the underground mines staff’s abilities to identify hazards in their work areas. In the first workshop it was noted that employees had significant difficulty in identifying and categorising hazards and underestimated their potential severity. It is apparent from this data that many participants simply do not recognise the risks in their workplace. Risk becomes amplified when it is not recognised by the workplace actor as a threat to their personal safety (Hopkins, 2005).

The teams recorded ‘poor housekeeping’ as trivial, emerging and hidden hazards; ‘slips and trips’ as obvious as well as trivial hazards; ‘water’ and ‘ground support’ and human actions such as ‘inattention’, ‘complacency’, ‘fatigue and boredom’ hazards in all four categories. This is evidence that the participants are confused as to how to categorise hazards and indicates that they have limited understanding of the risks associated with them. As discussed previously, different people see the same risk situation in quite different ways (March & Shapira, 1987; Kahneman et al, 1982; Tolbert, 2005). This data confirms their research findings. Managers are presented with a problem in that how risks are perceived affects how they are managed with an ultimate effect on the organisation (Fung et al, 2010).

Workshop one also revealed that new entrants to underground mining generally identified few hazards; however in workshop two, some of them showed greater understanding in addressing and managing hazards than the long term employees. Experience does not necessarily equate to sufficient and comprehensive knowledge of hazard management. Specific training in hazard identification and proactive management of risk is required to reduce work-related injury in organisations. Underground mining is viewed the world over as one of the most hazardous occupations. This study has shown that new entrants require training in hazard identification specific to their current workplace environment and that

experienced employees, including management, are not always competent in addressing emerging and hidden hazards.

Workshop two showed that many of the participants were able to identify extensive strategies to address hazards in their workplace. However, some of the longest serving staff had difficulty completing this task. Interestingly, some of the suggested hazard management strategies appear harsh and unsupportive of their fellow workers. Given underground mining is extremely high risk; perhaps these workers are becoming less tolerant and more proactive in ensuring their personal safety? Future studies with this group would be interesting to see if the safety culture has become more compliant with heavier penalties or whether the harsh strategies identified in workshop two were simply written for the sake of the training exercise.

On a final note, the training resulted in an improvement of the recorded incidents for the mine. Immediately after conducting the hazard identification training in workshop the mine recorded their first ever two weeks' incident free. This had never happened before; however, old patterns re-emerged in the third week. In addition the prior to the training the incident statistics were generally trending upwards. Since conducting the training this trend reversed, suggesting a positive effect on the safety culture.

It is early days and more research is needed to test whether intensive hazard identification training can produce long term safety culture improvements in the form of a reduction in workplace incidents. However, keeping employees safe is paramount to the profitability of organisations and safety is underpinned by the successful identification and subsequent management of occupational hazards.

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