Development of a New Scholarly Health and Safety Journal

EDITORIAL

The publication of the first edition of the Journal of Health and Safety Research and Practice is a landmark in the history of the Safety Institute of Australia. The genesis of this new scholarly journal is in no small part attributable to the late Dr Eric Wigglesworth. Those who are familiar with Eric's work will remember the tenacity with which he pursued high standards in research and scholarly writing and the exacting standards he demanded be met by his students. Through his work, Eric played a highly significant role in the development of the safety profession as we know it today. However, he contended that "The acid test of a profession lies in the extent to which that profession has contributed to the quality of life of the community that it serves." (Wigglesworth, 2006 p.11) and "… until we have some evidence of the beneficial contribution of the SIA to the Australian working community, that organisation cannot begin to claim professional status." (Wigglesworth, 2006 p.14). Implicit in Eric's contention is that professionals must publish the findings of research and workplace interventions to establish a robust knowledge and evidence-base. Even in the weeks before Eric died he was seeking assurance that a scholarly journal would be established under the auspices of the SIA.

Scholarly publication is central to the communication of new work and ideas (Hames, 2007) and a fundamental tenet of scientific and scholarly work is that it is subject to critical appraisal (Jefferson et al., 2002). Such critical appraisal is almost universally via peer review, which is "…the critical assessment of manuscripts submitted to journals by experts who are not part of the editorial staff."…and "…can therefore be viewed as an important extension of the scientific process." (International Committee of Medical Journal Editors, 2009b). As Smith and Guidotti (2008 p.3) suggest, "Peer review is the scientific community assessing the worth and meaning of a body of work before it is published. It is the first step in assimilating findings or insights into the worldview of scientific thought and integration into the broader scientific literature" and is "…a means by which significant findings or insights are better integrated into the broader sphere of scientific knowledge."

Owing to the drawbacks of other systems, this journal will employ a double-blind review process i.e. the peer-review process is completely closed, and neither the author nor the reviewer knows the other's identity (Smith et al., 2008). A robust process is a vitally important part of the publication process; it is the means by which discoveries and ideas are attributed to individuals; it is a quality control mechanism; and is a filter for interest and relevance (Hames, 2007). Robust processes should ensure that all participants (authors, reviewers and readers) benefit from peer-review of scholarly work (Godlee et al., 2003).

in this issue:

The establishment of this peer-reviewed journal provides an avenue for sharing the findings of research, challenging ideas and documenting evaluated solutions. It is aimed at an international audience of health and safety professionals; allied professionals; researchers; and students. There is evidence that a relationship exists between open access and increased citation rates (Open Citation project, 2009) and thus to facilitate knowledge transfer electronic versions of articles will have open access via the internet.

The publication of this journal is a testimony to the drive and enthusiasm of the late Eric Wigglesworth. It is therefore important that the Editor in Chief honour his memory by discharging the responsibility to maintain the highest levels of quality through the management of a robust and ethical peer-review process (Hames, 2007; International Committee of Medical Journal Editors, 2009a). There is also a responsibility to facilitate knowledge transfer and shape the future direction and development of the journal such that it becomes an internationally respected and valued resource that is used to inform OHS research and practice and contributes to the prevention of injury and ill-health.

It is also incumbent upon health and safety professionals, allied professionals, researchers and students to participate in and contribute to the journal such that we may pass Eric's "acid test" and demonstrate that the "…profession has contributed to the quality of life of the community that it serves." (Wigglesworth, 2006)

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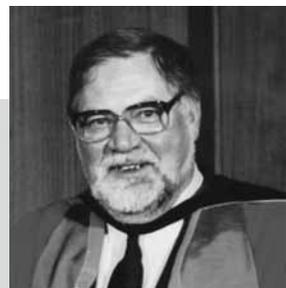
This first edition of the Journal of Health and Safety Research and Practice is dedicated to the memory of Dr Eric Wigglesworth AM FSIA(Hon).

Breaking the Barriers of Insider Research in Occupational Health and Safety

ANNABEL GALEA

ABSTRACT

Despite an increased interest in examining workplaces from an insider's perspective, there has been little scholarly focus within the literature on qualitative insider research, particularly in the field of Occupational Health and Safety. There are three key elements that provide strength and veracity to insider research: the People; the Organisation; and the Insider. These three elements are interdependent, dynamic and reciprocal. The importance of insider research is the interplay between these three elements and how they can manifest into an intensity of research that cannot be derived to the same extent from an external positioning. These three elements provide a useful framework for conceptualising the conduct of research that is relevant to the needs of the organisation, pragmatic in its approach and holistic in its application. This approach is particularly useful in the field of Occupational Health and Safety. The aims of this paper are to examine the literature from a thematic perspective on the areas of definition, application, issues of validity, benefits and constraints of insider research, ethical considerations and how it can be applied to Occupational Health and Safety using the proposed framework.

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INTRODUCTION

Insider research has not been a widely reported approach for researching organisational settings (Brannick & Coghlan, 2007). However, although there have always been researchers opposed to the use of insider research, there has been an increasing number of published articles using this perspective over the last decade. For example, Brannick and Coghlan (2007) have articulately countered the negative views presented by Morse (1998) regarding funded qualitative research, particularly the dual roles of researcher and employee, and recently, a whole volume of the internationally peer-reviewed journal *Action Research* was dedicated to insider action research. In their editorial to this special edition, Coghlan and Holian (2007, p. 9) commented that the responses to their call for contributions to this special issue indicated that insider action research was 'alive and well and indeed thriving'.

Despite an increased interest in examining workplaces from an insider's perspective, there has been little scholarly focus within the literature on insider research, particularly in the field of Occupational Health and Safety (OHS). While, many OHS practitioners have chosen to conduct research within their place of employment, this work has not been explicitly identified as qualitative research from an insider's perspective. As such, there has been limited acknowledgment of the benefits, constraints

and ethical considerations of the research process.

Insider research is an approach that is most applicable to OHS because practitioners choose to research their workplaces to make improvements to OHS systems and practices. This methodology maximises their knowledge of organisational life in order to understand and make change.

The aims of this paper are to examine the literature from a thematic perspective on the areas of definition, application, issues of validity, benefits and constraints, ethical considerations and how it can be applied to OHS using the proposed framework.

DEFINITION OF INSIDER RESEARCH

An 'insider' is a researcher who conducts a study that is directly concerned with the setting in which they work (Robson, 2002) or their community (Stephenson & Greer, 1981). In this case, research is conducted by 'complete members of organisational systems and communities' (Brannick & Coghlan, 2007, p. 59) and the insider is undertaking an 'explicit research role in addition to the normal functional role' (Coghlan & Holian, 2007, p. 5). This definition has been advanced by the reference to 'deep insider' research which has been defined as research undertaken by a person who has been a member of an organisation or community under study for a minimum of five years (Edwards, 2002).

Rooney (2005) identified five different categories of insider research from the literature: (i) professionals carrying out a study in their work setting (Holian, 1999; Robson, 2002; Smith, 1995); (ii) researchers belonging to, or accepted as a member after a period of time in a community in which they are studying (Stephenson & Greer, 1981); (iii) collaborative research in which the researcher and subject are both actively participating in the research (Titchen (1996) quoted in Jarvis, 1999); (iv) the researcher is partisan to the emotional, political and / or sexual affiliations of those being researched (Devault, 2004; Leck, 1994) and; (v) personal narrative whereby

the researcher is the subject of the study (Foster, McAllister, & O'Brien, 2005).

The term 'practitioner-research' describes research conducted by practitioners, as insiders, within their own profession (Fuller & Petch, 1995; Jarvis, 1999). Other terminology used to denote insider status has been derived from the methodology chosen for the research. For example, in qualitative research, action researchers adopting research from an insider's perspective may use such terms as 'insider action research' (Coghlan & Brannick, 2005) or 'participatory action research' (Kemmis & McTaggart, 2000). In the case of an ethnographic methodology, numerous terms have been applied, including 'native ethnography' (Brannick & Coghlan, 2007; Kanuha, 2000; Ohnuki-Tierney, 1984); 'indigenous ethnography' (Kanuha, 2000); 'self-ethnography' (Alvesson, 2003); 'autoethnography' (Hayano, 1979; Hockey, 1993); and 'insider ethnography' (Young, 1991).

Each of these methodological choices can have slightly different meanings, yet framed within an insider's perspective. Autoethnography provides an example where there has been a proliferation of definitions and applications. Ellis and Bochner (2000) provide an informative overview of the terminology used, in which they support the notion that autoethnographers can place differing emphasis on their research process (*graphy*), culture (*ethnos*) and self (*auto*) along a three-dimensional continuum. More recently, an autoethnographic approach has been directed at organisational research (Blenkinsopp, 2007; Duarte, 2007; Riad, 2007; Vickers, 2007; Yarborough & Lowe, 2007) whereby the focus 'moves from cultural and social situatedness to the inner self and then back again to the situated individual' (Boyle & Parry, 2007, p. 186). This approach opens the door to issues not previously discussed, providing a rich and candid insight into organisation phenomena.

Fundamentally, the insider researcher has knowledge and experiences of a familiar setting in terms of their own organisational, community, culture, gender, religion, geography, or ethnic background upon which they reflect. This contrasts to the term 'emic' which portrays the informant's or insider's way of understanding and interpreting experience (DePoy & Gitlin, 1998) but is not necessarily the researcher's view.

The boundaries between insider and outsider research may not necessarily be clear-cut. Some features of a researcher's identity are innate and unchanging, such as gender and ethnicity whilst other features are innate but evolving, for example age and experience. These features have an impact upon the insider-outsider continuum, while time and place, power relationships and personalities between the researcher and researched, and the topic under examination may further influence the insider-outsider status (Mercer, 2007).

Merriam et al. (2001) acknowledged the complexities inherent in their status as insider researchers and found that the boundaries between the position of an insider and outsider were not clearly delineated. They highlighted a number of factors, which could alter an informant's perceptions of the researcher as an insider, including determinants of social status, colourism (shade of skin colour, facial features and hair texture), education, religion, cultural values, age, gender, experience, feminist stance, perceived power, use of language and the ability to generate wealth.

An OHS professional undertaking insider research may find themselves as an insider in the broader context of organisational life but be viewed as an outsider by a subculture, department or regional office. In this light, the insider researcher will be theoretically sensitive (Bonner & Tolhurst, 2002) to build upon prior knowledge more quickly than a total stranger. Coghlan and Brannick (2005) suggest the need to establish relationships with key players who will cooperate with the process. However, where this is not possible, Humphrey (2007) offers the alternative of being both an insider and an outsider, using reflexivity, where the crossing-over between life-worlds can create a complex, yet powerful narrative.

APPLICATION

The context of qualitative insider research transcends a wide range of disciplines and communities. Some examples from the literature have included such areas as academic research (Brannick & Coghlan, 2007); fields of anthropology (Ohnuki-Tierney, 1984); community based social exclusion (Braithwaite, Cockwill, O'Neill, & Rebane, 2007); culture and cognition (Morris, Leung, Ames, & Lickel, 1999); education (Edwards, 2002; Mercer, 2007; Ravitch & Wirth, 2007); feminist studies (Devault, 2004), geography (Delyser, 2001); human resource management (Holian, 1999); lesbian research (Leck, 1994); nursing (Bonner & Tolhurst, 2002); organisational research (Moore, 2007; Roth, Shani, & Leary, 2007); personal childhood experiences (Halley, 2002); social work (Kanuha, 2000; van Heugten, 2004), World War II Japanese war brides (Creef, 2002) and the trade union movement (Humphrey, 2007).

Insider researchers have chosen different methodologies to develop a framework for their research. A selection of qualitative methodologies that have been cited in the literature include action research (Braithwaite, Cockwill, O'Neill, & Rebane, 2007; Brannick & Coghlan, 2007; Holian, 1999; Humphrey, 2007; Moore, 2007; Ravitch & Wirth, 2007; Roth, Shani, & Leary, 2007); auto-ethnography (Foster, McAllister, & O'Brien, 2005; McIlveen, 2008; Ronai, 2002; Travisano, 2002); case studies (Mercer, 2007); critical ethnography (Tricoglus, 2001); ethnography (Kanuha, 2000; Stephenson & Greer, 1981; Young, 1991); Kaupapa Maori research (Bishop, 2005; Smith, 2005) and grounded theory (van Heugten, 2004).

The motivation to use insider research may be many and varied. It was a passion to facilitate change to enhance educational outcomes for students in an under-resourced urban school that led Wirth to undertake doctoral insider action research (Ravitch & Wirth, 2007). Kanuha (2000) described three major influences for her insider research. Firstly, to gain a greater understanding of others whose life experiences were similar to hers; to identify a theoretical and conceptual framework for a commonplace phenomena rarely discussed; and to make a contribution to knowledge and foundations for practice to enhance the provision of services to a marginalised group. Moore (2007) identified the need to improve governance practice and performance through doctoral research in the charity organisation in which he was Deputy Chief Executive. Vickers (2007) chose to conduct an autoethnographic account of her personal experiences of organisational bullying in as much a sense-making exercise as an insightful reflection that the reader could enter her world and experience the feelings and emotions as though they were their own.

ISSUES OF VALIDITY

Insider research has been under scrutiny for the very fact that the insider is an actor within the setting. The notion of validity for insider researchers is complicated by the relationship between the researcher and the researched. From an intellectual basis it is more difficult to reference supporting techniques and procedures for controlling 'subjectivity' (Alvesson, 2003).

Rooney (2005, p. 6) has acknowledged the complexities of qualitative research, in addition to the problematic nature of insider research. In her contribution to this issue, she has raised questions about researcher's biases, which may threaten validity and trustworthiness including; the researcher's relationships with subjects that may have a negative impact on the subject's behaviour; the researcher's tacit knowledge leading them to misinterpret data or make false assumptions; the researcher's knowledge may lead them to miss potentially important information; the researcher's politics, loyalties, or hidden agendas may lead to misrepresentation; and the researcher's moral/political/ cultural standpoint may lead them to subconsciously distort data.

Brannick and Coghlan (2007) have suggested that we are all insiders of the sub-units of the society in which we live and that the knowledge we have of these systems is deep and contextual. They argue that:

> As researchers through a process of reflexive awareness, we are able to articulate tacit knowledge that has become deeply segmented because of socialisation in an organisational system and reframe it as theoretical knowledge and that because we are close to something or know it well, that we can research it (p. 60).

They provide justification for the validity of insider research through recognised methods of reflexivity in line with the appropriate research paradigm engaged. Alvesson (2003, p. 190) supported this view of self-reflection by suggesting 'a more reflective approach in which data management matters less than a revealing, insightful account and interpretation. Self-reflection is thus crucial.' In light of the complex nature of obtaining validity, perhaps it is an objective to be worked towards rather than fully achieving it (Deem & Brehony, 1994).

A PROPOSED FRAMEWORK

There are three key elements that provide strength and veracity to insider research: the People, the Organisation and the Insider, as presented in Figure 1. These three elements are interdependent, dynamic and reciprocal. The importance of insider research is the interplay between these three elements and how they can manifest into an intensity of research that cannot be derived to the same extent from an external positioning.
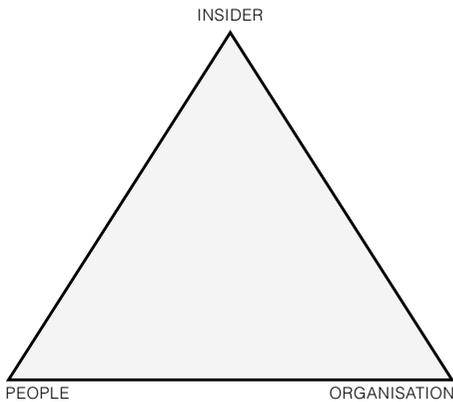
Figure 1 Key Elements of Insider Research

PEOPLE
The insider researcher is familiar with the people who make up the organisation. In this context, the 'people' element is characterised by individual behaviours, personalities, traits, management styles, priorities, preferences and moods. The insider has an awareness of individual idiosyncrasies, which can assist with practicalities such as timing, gaining interest and support, identifying and utilising resource networks and the establishment of trust. From this perspective, an insider will be aware, particularly during interviews and observations, whether a participant has been open, honest and transparent and if participants have modified their normal pattern of practice (Bonner & Tolhurst, 2002).

ORGANISATION
An organisation is made up of a collective of people who share similar values or basic assumptions that have been learnt, producing a culture (and subcultures) which develop a shared or agreed way of doing things (Schein, 2004).

An organisation or workplace can appear complex and overwhelming to the uninitiated. The insider researcher has direct access to knowledge and can understand the full complexity (Hockey, 1993) of the organisation's procedures, systems of work, machinery, schedules and layout which may otherwise take years to acquire. Some production cycles or schedules may be encountered infrequently and can be overlooked to those unfamiliar with the process or organisation. Although an insider researcher may not have specific knowledge of some areas, they usually have some knowledge in the overall processes and can complement their lack of familiarity through the resource networks they have previously established.

THE INSIDER
An insider researcher, as a member of the organisation, has previously been immersed in the organisational minutiae and has developed an awareness and understanding of the organisation. This is derived from engagement 'in the experimental learning cycles of experiencing, reflecting, conceptualising and experimenting in real life situations' (Coghlan, 2007, p. 336). They also have both practical experience and knowledge to identify 'real' research needs (Costley & Armsby, 2007) which makes the work meaningful not only to the practitioner, but also to the group of interest (O'Donnell et al., 2003).

These three elements provide a useful structure to undertake research that is relevant to the needs of an organisation, pragmatic in its approach and holistic in its application. This approach is particularly useful in the field of OHS for these reasons.

The key elements of insider research from Figure 1 can be used to frame the benefits and constraints of the methodology. These have been summarised in Table 1. This table highlights the beneficial and constraining components, which make up each element.

Table 1 Framework for Insider Research

THE PEOPLE	THE ORGANISATION	THE INSIDER
Peer Relationships Trust and Rapport	Access Organisational Politics Invisibility	Preunderstandings and Familiarity Dual Role Emotional Distancing Interviewing and Recording Skills Holistic View Economic Efficiencies

Source: Bonner and Tolhurst (2002), Braithwaite, Cockwill, O'Neill and Rebane (2007), Brannick and Coghlan (2007), Coghlan and Brannick (2005), Coghlan (2007), Coghlan and Holian (2007), Delyser (2001), Edwards (2002), Fuller and Petch (1995), Hammersley and Atkinson (1983), Hayano (1979), Hockey (1993), Kanuha (2000), Mercer (2007), Merriam et al. (2001), Minichiello, Aroni, Timewell and Alexander (1995), Moore (2007), Ohnuki-Tierney (1984), Ravitch and Wirth (2007), Robson (2002), Roth, Shani and Leary (2007), Stephenson and Greer (1981), van Heugten (2004), Young (1991).

The 'People' element is participant or subject-driven. This reflects an individual perspective and can be influenced by personalities and behaviours of individuals and their willingness to be open, cooperative and/or collaborative towards the insider. The 'Organisation' element is organisationally (or community) driven and can be difficult for the insider to influence. The third component to this framework is the 'Insider'. This element is internally driven and reflects both explicit and tacit knowledge, status, skills and perspectives of the insider.

The three elements of insider research are interwoven and dynamic. The delicate interplay between the three elements can be demonstrated within the research conducted by Holian (1999). She was employed to facilitate a management development and organisational change programme, which became the focus of her PhD. Consequently, she had dual roles as the Insider and found that in the course of her research, peers would discuss their issues with her at a greater depth than would have otherwise occurred. When she raised these issues within the organisation, she was viewed as raising the 'undiscussables'. As a result of the organisational politics, Holian found that she could no longer continue juggling the multiple roles of researcher, senior executive and programme facilitator and left '…before the organisational impact "imploded" on me' (Holian, 1999, p. 5).

The need for further qualitative research in OHS has been documented (Runnalls & Cowley, 2004), and in this respect the framework in Table 1 can be used by OHS practitioners interested in pursuing insider research. These three elements and their 'drivers' should be critically evaluated before the research topic, methodology and research design have been formalised, in order to overcome some of the barriers commonly encountered. There are a number of strengths to insider research that give rise to contributions not only to a group of interest but also to the wider community. Despite the great depth of knowledge generated, Alvesson (2003, p. 188) cautions that insider research is not for everyone, particularly those 'eager to conform to workplace norms and to be very loyal'. Further, there is the need for the insider researcher to be aware of the ethical considerations required, in light of the positioning of the researcher and the researched.

ETHICAL CONSIDERATIONS

There are four key ethical issues that have been identified regarding insider research (Holian & Brooks, 2004). Firstly, consideration of who owns the data of interest and its release; secondly, the nature of the relationship between the researcher and researched; thirdly, the nature and level of informed consent and freedom not to participate; and fourthly the nature and level of anonymity and confidentiality for individuals and the organisation.

Fundamentally, a common sense approach to ethical considerations should be raised by asking 'what is the potential for harm and for good?' and 'when does 'normal work' become research?' (Holian & Brooks, 2004, p. 20)

Insider action researchers have unique ethical considerations due to the collaborative nature of the research. They must consider (i) the collaborative process and how confidentiality can be maintained; (ii) how informed consent can be meaningful as the project evolves; and (iii) how doing harm to others can be avoided as a consequence of organisational politics (Coghlan & Brannick, 2005).

Every researcher's experiences are unique and they shed light on the complexities of insider research. This was particularly evident from Holian's (1999) research where multiple roles made it difficult for her and her participants to distinguish which role she was playing, leading to confusion during follow-up activities and ultimately organisational backlash.

Mercer (2007) through her experiences suggests that it is better that insider researchers do not publicise their own views about their research topic and not to contribute their own stories during interviews. Further, Mercer experienced an ethical dilemma concerning the use of 'incidental' data gained from meetings and informal conversations but justified the use of this data, as she held no position of responsibility and had no intention of presenting her findings at the institutions she was employed and researched.

In contrast, Edwards (2002) raised two very different ethical concerns. The first relating to the potential for repercussions from responding to colleagues of long-standing and close relationships who digressed during the interview process to discuss personal work-related issues and the second, where he was privy to the humiliations, failures and warnings of individuals and he recognised the need to exercise the appropriate tact and sensitivities in his research.

Although the ethical implications of insider research are problematic, Holian and Brooks (2004) argue that the contributions from qualified, skilled 'insiders' working within organisations who have insights into the way an organisation operates, the people who run it and work in it, is invaluable. They believe that the benefits to the wider community from conducting insider research are grounds to pursue ethics approval for research despite the complications.

In Workman's (2007) discussion of the constraints and benefits of insider research, she suggests that ethics is a constraint. However, Smith (2005, p. 101) suggests that there is a need to recognise that 'research ethics is not just a body of historical "hiccups" and their legal solutions'. Particularly in OHS, ethics provides a systematic framework in which to protect the researcher, respondent and the organisation involved, and from this perspective should not be perceived as a constraint. There is a far greater significance that must not be overlooked with the ultimate outcome of how people fail and succeed at treating each other with respect.

CONCLUSION

Insider research as an approach to researching organisations and communities is gaining acceptance as a credible research

pursuit. Its contribution to the scientific literature is valuable as it can provide insights into various disciplines and communities that would otherwise not be acknowledged. The definition of insider research may be overtly tenuous, in as much as it is how the informant(s) may view the researcher, rather than the researcher viewing the research setting. Yet, the insider status may be defensible from the identification of the researchers positioning within the research context and appropriate reflexivity on the subject matter.

Arguments of validity have often been raised, yet from a holistic perspective, insider research provides a solid example of the justification for greater depth and understanding of the research material through the use of appropriate reflexivity. Ethical considerations must be taken into account, with the benefits outweighing the displacement of subjects, setting and researcher. There are important implications for insider research particularly for postgraduate students wishing to partake in research within their place of employment. There is a need for careful consideration of ethical issues before a research project is undertaken. Supervisors and educators can also play a critical role to support students conducting insider research.

There is limited material summarising the complexities of insider research in a succinct manner. The proposed framework examined in this paper provides a means to explore the possibility of insider research and to identify the balance between the people, the organisation and the insider, and their drivers as can be applied in OHS research. Although the constraints are numerous, the benefits should place it in the credible scientific arena for further discussion and refinement to advance its application.

ACKNOWLEDGEMENTS

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Are health and safety representatives more effective at representing their designated work group having completed a Certificate IV course in OHS?

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ABSTRACT

Some elected Health and Safety Representatives in Australia choose to undertake a Certificate IV level OHS course. To determine if they are more effective at representing their Designated Work Group as a result, a sample population of Health and Safety Representatives and members of their Designated Work Group were surveyed. The survey participants were also tested in regard to their approach to solving health and safety problems posed in three hypothetical workplace scenarios. The results were compared with the results of the same test undertaken by Health and Safety Representatives that had only completed a 5-day training course.

As a result of undertaking a Certificate IV OHS program, Health and Safety Representatives have more confidence in undertaking workplace inspections and the frequency and the quality of those inspections is increased. They seek more information from their employer in regard to workplace hazards and are consulted by management more often and also consult with the members of their Designated Work Group more frequently.

There were statistically significant differences between responses to the three hypothetical workplace scenarios given by subjects that had undertaken a Certificate IV course and those that had only completed a 5-day training program. The Certificate IV course group were more likely to apply safe place control principles to problems. Together with increased frequency of inspections and greater consultation, this is likely to lead to more effective representation of the DWG.

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Key words
training, education, safety, representation, hierarchy

INTRODUCTION

In Victorian workplaces, employees may request the establishment of a Designated Work Group (DWG) (Victoria, 2004). A DWG is a grouping of employees that facilitates representation of those employees on health and safety issues and is determined in consultation between the workers and management. Once established the members of the DWG can request the election of a Health and Safety Representative (HSR). This election is coordinated by the employer in consultation with the employees. All members of the DWG can nominate for election. Once elected a HSR is entitled to attend training. The entitlement extends to attending an Initial 5-Day occupational health and safety (OHS) Program that is approved by the Victorian WorkCover Authority and a refresher course at least once in each year during the HSRs 3-year term of office. HSRs may be re-elected on completion of the 3 year term (Victoria, 2004). The training entitlements are a minimum and some HSRs attend further training either with or without the support of their employer.

While the content of safety training for workers' representatives has been reviewed by many (NIOSH, 1999) there is a dearth of material that links the content to the influence and impact that the training has on HSR action at the workplace (Walters et al., 2001 p. 16).

A review of the literature shows that OHS training for HSRs is rarely assessed against safety improvements in the workplace, and is more likely to be assessed by subjective culture change surveys (Calkin et al., 2000; Doucouliagos et al., 2000; McQuiston, 2000) or assessment of workers' subjective perceptions of change (Blewett, 2001; Brown et al., 1992; Gotsch et al., 1994; Vanderkruk, 2003).

In their seminal paper that assessed the impact trade union health and safety training on the activity of HSRs in the UK, Walters, Kriby et al. (2001), concluded that continued training of HSRs does have an impact on safety. However, they advise that more evaluation would be useful. Culvenor, Cowley, et al. (2003b) undertook an analysis of the HSR training in South Australia where health & safety representatives could undertake 3 levels of training: basic, advanced, continuing. An immediate improvement in the way HSRs judged effective solutions to safety problems was observed following basic training. However results suggested that this effect diminished over time. There appeared to be some shift in thinking by the HSRs who undertook continuing training, although the thinking of most remained distinctly orientated towards victim-blaming in regard to workplace incidents and towards the application of behavioural risk controls instead of engineering controls. The latter was described as a "safe-person" orientation rather than the "safe-place" orientation that is consistent with contemporary approaches to health and safety management and legislative requirements in each Australian jurisdiction (Culvenor, 1997).

Some elected HSRs in Australia choose to undertake a Certificate IV level course in occupational health and safety (OHS) through the vocational education system (TAFE). This paper reports research that was undertaken to determine if health and safety representatives (HSR) that have completed a Certificate IV level course in occupational health and safety (OHS) are more effective at representing their Designated Work Group (DWG) than HSRs who have only completed the Victorian Initial 5-Day OHS Program.

METHOD

The methodology had four elements; (i) a questionnaire survey of elected HSRs (n=27) that had completed a Certificate IV OHS course between 2001 and 2005 (henceforth referred to as the HSR survey); (ii) a test of the HSR survey participants (n=27) in regard to their approach to solving health and safety problems posed in the descriptions of three hypothetical workplace scenarios (henceforth referred to as the Certificate IV HSR scenario test) (iii) a questionnaire survey of the members of the DWG's (n=220) that were represented by the 27 HSRs that had completed a Certificate IV OHS course and were participating in the HSR survey (this element henceforth referred to as the DWG survey); and (iv) a test of a separate population of HSRs ($n = 147$) in regard to their approach to solving health and safety problems posed in the descriptions of three hypothetical workplace scenarios (henceforth referred to as the 5-day HSR scenario test). The scenarios applied in this test were the same as those presented within the Certificate IV HSR scenario test. This test was conducted upon completion of Initial 5-day HSR training provided by the Australian Workers Union. All surveys and tests were conducted between November 2002 and November 2007.

All HSRs that participated in the research were members of The Australian Workers' Union and were recruited by representatives of that organisation. Those that had undertaken a Certificate IV course in OHS had completed a program delivered by the University of Ballarat. The program conformed to the National Vocational Education and Training BSB41407 Certificate IV in Occupational Health and Safety delivered under the auspices of the Training & Further Education (TAFE) Business Services Training Package. The

course required 10 days of classroom attendance and the completion of a number of assessable written tasks in accord with the Training Package requirements. The research was approved by the University of Ballarat Human Research Ethics Committee in March 2007.

The questions used in the HSR and DWG surveys were designed to elicit information about the role the HSR plays in the workplace and the extent to which they undertake activities in accord with those mandated within the Victorian OHS Act (Victoria, 2004) as well as outlined in the Victorian Trades Hall Council (VTHC) "Union Charter of Workplace Rights, Occupational Health and Safety, Rehabilitation and Compensation" (Victorian Trades Hall Council, 2003). Thus the purpose of the surveys was to gather information about the extent to which HSRs were representing their respective DWGs by performing the duties expected of them and those duties that were expected of them by their DWG peers.

The HSR scenarios presented subjects with 3 case study type problems used elsewhere to assess knowledge of the control-at-source and hierarchy of control problem-solving model that underpins Australian OHS legislation (Culvenor, 1997; Culvenor et al., 2003b; Culvenor et al., 1997). Each scenario presented problems that consisted of a short description of an accident followed by a set of six potential solutions. For each problem, subjects were required to rank the solutions to indicate what they believed would be the most effective solution through to the least effective. When ranking these solutions, subjects were instructed to put aside practicalities such as cost and concentrate on what would be most effective. To test the relationship between a subject's response and the ideal model, each response (rank from 1-6) was compared with a standard rank based on the hierarchy of control model. The standard ranking of solutions is based on the judgements of experts in occupational

health and safety (Culvenor et al., 1997).

The HSR scenario test results were compared to the Certificate IV HSR scenario test results using the Spearman correlation coefficient with a range of -1 to + 1 on a scale of sliding interval quality. The comparison was made between the two sets of results using a Mann Whitney U-test for independent samples (Culvenor, 1996). The results indicate if the participants prefer safe-place solutions that remove the hazards from the workplace (higher order control measures) or safe-person solutions that rely on training and administration controls to hazards (lower order control measures). Thus the results may be used to (i) predict whether the members of the respective are likely to propose higher order controls while representing their designated work group on health and safety matters and (ii) indicate whether the Certificate IV training is more effective at instilling safe-place approaches within participants.

RESULTS

Valid completed questionnaires were received from 19 (70% response) HSRs who had completed a Certificate IV in OHS (the HSR survey) and from 53 DWG members (24% response) (the DWG survey). Of the Certificate IV HSRs; all were more than 30 years of age; 47% (9 of 19) had served as a HSR for 10 or more years; 47% (9 of 19) had been or were a union delegate; and 47% (9 of 19) finished their education at year 10 or below. 82% (42 of 53) of the respondents to the DWG survey indicated that they knew their HSR had undertaken a Certificate IV in OHS.

Only 16% (3 of 19) of respondents indicated that they were consulted by management in regard to OHS matters "often" or "always" before undertaking the Certificate IV course while 74% (14 of 19) indicated that they were consulted "often" or "always" after. 52% (10 of 19) stated they were "never" or "rarely" consulted by management prior to undertaking the program. 60% (40 of 53) respondents to the DWG survey supported

the assertion that their HSR is consulted more by management after completing the Certificate IV OHS course; 72% (37 of 53) of respondents strongly agreed or agreed that the HSR attends more safety related meetings since completing the certificate IV course. A total of 94% (48 of 53) of the DWG members indicated that they agreed or strongly agreed that the HSR has shown more leadership since completing the Certificate IV. 52% (10 of 19) of the HSRs believed they were discriminated against prior to undertaking the Certificate IV course whereas 37% (7 of 19) reported discrimination having completed the Certificate IV course.

Only 16% (3 or 19) of HSR survey respondents indicated that prior to undertaking the Certificate IV course they "always inspect their DWG for hazards"; whereas 57% (11 of 19) indicated that having completed the Certificate IV OHS Course they "always inspect their DWG for hazards". This was supported by 69% (35 of 53) of respondents to the DWG survey that indicated that "the HSR is now conducting more inspections of the work area since undertaking the Certificate IV". 78% (29 of 53) of respondents also indicated that the quality of the audit conducted by the HSR had improved. Eighteen (18) of the 19 HSRs who completed the Certificate

IV OHS course either strongly agreed or agreed that they had more confidence in undertaking inspections after completing the Certificate IV course in OHS.

A total of 37% (7 of 19) of respondents indicated that prior to undertaking the Certificate IV course they "Access information from the employer on hazards in the Workplace". This rose to 95% (18) after completing the course.

The results of the scenario tests revealed that that the HSRs who had undertaken a Certificate IV OHS program had a stronger tendency to recommend safe-place solutions (i.e. scores closer to +1.0 and closer to the top of a hierarchy of controls) than the HSRs who had only completed a 5-Day Initial training program as shown in Table 1. The HSR responses were compared with a standard rank (i.e. solutions to the health and safety problems posed ranked in accord with the judgements of experts in occupational health and safety (Culvenor et al., 1997)).

The comparison was made between the two sets of results using a Mann Whitney U-test for independent samples (Culvenor, 1996). The results of the Mann-Whitney tests indicate that the difference between the groups in each scenario is significant at the 0.5 level (scenario 1 p=0.018, scenario 2 p=0.012, scenario 3 p=0.032).

LEVEL OF TRAINING	MEAN CORRELATION WITH STANDARD RANK		
	Scenario One	Scenario Two	Scenario Three
	Mean	Mean	Mean
Initial 5-Day	0.00	-0.03	0.04
Certificate IV	0.42	0.38	0.39

Table 1 Certificate IV & 5-day HSR scenario test results

DISCUSSION

The results of the questionnaire surveys suggest that after undertaking the Certificate IV course, HSRs were consulted by management more frequently. Increased consultation creates opportunities for HSRs to influence the direction of safety for the site. It should be noted however, that there were changes to the Victorian

OHS legislation while this research was underway and a renewed emphasis on the importance of consultation may confound the findings. However, the responses to the DWG survey indicated that more consultation occurred between the HSR and the DWG after the HSR completed the Certificate IV OHS course and this is less likely to be influenced by the changes to

legislation. HSR consultation with DWG members and consultation with the HSR by management is widely recognised as being vitally important to effective representation by HSRs (Blewett, 2001; Sweeney, 2006; Walters et al., 2005).

The HSR and DWG surveys indicated that after completing a Certificate IV OHS program, HSRs conducted significantly more site hazard inspections. One DWG survey participant volunteered that they know when their HSR is doing a good job, "when I see him doing inspections". The HSRs also reported greater confidence while undertaking inspections after completing the course. Walters also found that HSR training in the UK leads to an increase in self-confidence (Walters et al., 2001). One HSR who had completed the Certificate IV and been a HSR for 20 years volunteered that they are a better HSR having, "Broader knowledge i.e. guarding, understanding of management views".

Discrimination against HSRs is considered a major road block to effective representation (Blewett, 2001; Walters et al., 2005) and is an issue of high importance to HSRs and trade unions (Victorian Trades Hall Council, 2003). The results of the survey indicate that there may be less discrimination of HSR after having completed a Certificate IV OHS course.

The HSRs who have completed a Certificate IV are more likely to seek information from the company on safety issues (57% increase). Greater information about workplace hazards increases the ability of HSRs to negotiate risk controls and facilitate improvements in working conditions for the members of their DWG.

The surveys revealed that the Certificate IV HSRs were sought after by their fellow HSRs on site for advice and guidance. This is consistent with the DWG survey results that indicated that the Certificate IV HSRs were not only showing leadership qualities, but also performing some duties that were perceived to be more usually management duties.

The results of the HSR scenario tests suggest that HSRs who have completed a Certificate IV program are more likely to apply the principles of a hierarchy of controls than are HSRs who have only completed a 5-Day Initial training program. This is consistent with findings in other studies where HSRs as well as safety professionals with different levels of health and safety training were compared with their respective peers using the same scenario tests (Cowley et al., 1999; Culvenor et al., 2003a). In particular, Cowley et al. and Culvenor et al (1999; 2003a) found that among HSRs who undertook the scenario tests, those with more training had a greater tendency to recommend safe place controls. However, to a large degree, the HSRs who undertake a Certificate IV program are self-selecting and possibly introduce bias to the sample given their levels of motivation and possibly higher academic ability.

While an understanding of the hierarchy of control alone does not directly indicate more effective representation, with an increased degree of consultation, this understanding is likely to lead to better controls in the workplace and greater respect from DWG members, from other HSRs and possibly from management.

CONCLUSION

The findings of the research suggest that as a result of undertaking a Certificate IV OHS program, HSRs have more confidence in undertaking workplace inspections and that the frequency and the quality of those inspections is increased. They seek more information from their employer in regard to workplace hazards and are consulted by management more often and also consult with the members of their DWG more frequently. The results indicate that discrimination against HSRs may be less likely having completed a Certificate IV OHS course.

Importantly HSRs who have undertaken a Certificate IV course are more likely to suggest safe place control principles when faced with a health and safety problem. Not only is this likely to lead to better

controls in the workplace, but it is also likely to attract greater respect from DWG members, other HSRs and management and increase the extent to which they are sought for consultation. Together with increased frequency of inspections these are likely to lead to more effective representation of the DWG.

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The fifth age of safety: the adaptive age

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ABSTRACT

It has been argued that OHS has developed and evolved through a technical age, a human factors age and a management systems age or through a technical wave, a systems wave and a culture wave. A fourth age of safety has been described as the integration age. As the limitations of OHS management systems and safety rules that attempt to control behaviour are becoming evident, it is proposed that we are moving into a fifth age of safety, the 'adaptive age'; an age which transcends rather than replaces the other ages of safety. The adaptive age embraces adaptive cultures and resilience engineering and requires a change in perspective from human variability as a liability and in need of control, to human variability as an asset and important for safety. Embracing variability as an asset challenges the comfort of management. However, the gap between work as imagined and work as performed and the failure of OHS management systems and safety rules to adequately control risk mean that a new perspective is required.

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Key words
resilience, mindfulness, culture, adaption

INTRODUCTION

This paper presents a review of existing and emerging approaches for managing occupational health and safety (OHS) and puts forward the view that, under certain circumstances, more adaptive approaches to managing OHS are required.

Hale and Hovden (1998) have argued that OHS has developed and evolved through three so-called 'ages of safety'. The first age was a technical age, the second a human factors age and the third a management systems age. A different sequence of development was put forward by Hudson (2007), who suggested that safety has evolved through three waves. The first was a technical wave, the second a systems wave and the third a culture wave. Both of these views suggest that the process of development has been sequential. Glendon et al. (2006) posits an alternative view, that each period of development does not leave behind, but rather builds on, what has gone before. He refers to this process of development as the fourth age of safety or the 'integration age' where previous ways of thinking are not lost, but remain available to be reflected upon as multiple, more complex perspectives develop and evolve.

Notwithstanding the suggested integration age (Glendon et al., 2006), it may be timely to introduce the possibility that we are moving into a fifth age of safety or an 'adaptive age'. The adaptive age transcends all other ages without discounting them, whilst introducing the concept of 'adaptation', the adaptive age goes beyond simply integrating the past. This notion is informed by current discussions around resilience engineering (Hollnagel, 2006)

and 'efficiency-thoroughness trade-offs' (ETTO) (Hollnagel, 2009a) that take us beyond the contemporary ways of thinking about managing OHS that typically focus on OHS management systems (OHSMS), safety culture and safety rules.

BEYOND OHS MANAGEMENT SYSTEMS TO ADAPTIVE CULTURES

Increasingly, the limitations of an over-emphasis on documented management systems have started to emerge. Robson et al. (2005) in their systematic review of health and safety management systems found that "there is insufficient evidence in the published, peer-reviewed literature on the effectiveness of OHSMSs to make recommendations either in favour of or against OHSMSs" (p. 9). The 1999 Report of the Longford Royal Commission into the explosion at Esso's Longford gas plant in Victoria found that although Esso had a world class OHSMS, the system had taken on a life of its own, "divorced from operations in the field" and "diverting attention away from what was actually happening in the practical functioning of the plants at Longford" (Dawson & Brooks, 1999, p. 200).

Similarly, Hopkins (2007), in his analysis of the 1996 Gretley mine disaster concedes that "experience is now teaching us that safety management systems are not enough to ensure safety" (p. 124). Further, a 2007 report commissioned by the New South Wales Mines Advisory Council argued that an OHSMS should be built on the principles of mindfulness and not be a "complex, paper-based OHS management system" (p. xiii).

Reason (2000) contends that managers believe that OHSMS sit apart from culture. He suggests that an over-reliance on systems and insufficient understanding of, and insufficient emphasis on, workplace culture, can lead to failure because "it is the latter that ultimately determines the success or failure of such systems" (p. 5).

Safety culture has emerged as a major focus in improving OHS performance.

Hopkins (2005) argues that this stems in part from recognition of the limitations of OHSMS. In his analysis of the 1999 Glenbrook train crash involving a commuter train and the *Indian Pacific*, Hopkins identifies the danger of a culture of rules, a culture of silos, a culture of on-time running, together with the related dangers of a culture that is risk-blind or risk-denying. These are matters that are outside the scope of traditional OHSMS and it may be that OHSMS mask the emergence of these cultures which become all too readily available to see with hindsight.

Hopkins (2007) views safety culture as one aspect of organisational culture, or more particularly an organisational culture that is focused on safety. Further, culture is viewed; as a group, not an individual, phenomenon; efforts to change culture, should, in the first instance, focus on changing collective practices (the practices of both managers and workers) and the dominant source of culture is what leaders pay attention to. Much of Hopkins work draws on Reason's (1997) notion that a safe culture is an informed culture and Weick and Sutcliffe's (2001; 2007) principles of collective mindfulness.

Reason (1997) argues that culture can be socially engineered by managers and that a safe culture is an informed culture. He argues that in navigating the safety space between increasing vulnerability to risk and increasing resistance to risk, organisations should strive for maximum resistance to risk (as opposed to the unobtainable goal of 'zero risk'). He goes on to argue that there are three cultural drivers that allow organisations to achieve maximum resistance to risk: (i) Commitment reflected in the provision of resources to mitigate risk, even in tough times; (ii) Cognisance reflected in an awareness of the dangers that threaten operations; (iii) Competence gained from an information system that provides managers with an understanding of where they are relative to the edge of safety without having to fall over it first.

The latter point is achieved through the engineering of an informed culture and in

Reason's view; an informed culture is a safety culture. An informed culture is made up of the four interlocking sub-cultures of a reporting culture, a learning culture, a just culture and a flexible culture.

Hudson suggests (2007) that safety culture evolves and may be represented by a five step ladder of distinct stages: pathological, reactive, calculative, proactive and generative. Progression up the ladder is associated with increasing trust, accountability and informedness (as in Reason's informed culture). What remains unclear is how organisations move from one step on the ladder to another.

An alternative view suggests that culture is not homogeneous within organisations and can be both differentiated and fragmented (Richter & Koch, 2004). Much as managers may espouse the safety values associated with a single corporate culture, organisations may consist of many cultures based on professional groupings (Gherardi et al., 1998; Schein, 1996) or other communities of practice (Gherardi & Nicolini, 2000).

The adaptive age requires an acceptance by organisational leaders that groups of workers may, through interaction with one another and the tasks they perform together, create their own shared meanings about what it is to work safely. Under this view that culture is 'socially constructed' (Gherardi & Nicolini, 2000), leaders do not so much hope to engineer a single culture but attempt to understand and influence these differentiated and fragmented cultures such that they are at least aligned with the corporate culture (Martin, 2002). Further, Weick and Sutcliffe (2007) argue that where integrated cultures deny ambiguity, differentiated and fragmented cultures handle ambiguity better, a feature more consistent with High Reliability Organisations. The implication is that the adaptive age requires adaptive cultures.

The notions of an adaptive age and adaptive cultures may also require a change in perspective in relation to the causes of fatalities, injuries and disease and a corresponding implicit awareness of more than one perspective for preventing fatalities injuries and disease. This change in perspective is captured by Hollnagel (2008a) who contrasts two perspectives on safety: theory W and theory Z as shown in Table 1. He argues that to improve safety, a change in perspective is required towards theory Z; a theory that accepts that humans, because of their capacity to adapt to demands, are an asset to the proper functioning of modern organisations.

**Table 1 Summarising the key perspective changes required in the adaptive age**

THEORY W : MANAGERIAL PERSPECTIVE (TECHNOLOGICAL OPTIMISM)	THEORY Z: SYSTEMIC PERSPECTIVE (TECHNOLOGICAL REALISM)
Things go right because people: Systems are well designed and scrupulously maintained Procedures are complete and correct People behave as they are expected to – as they are taught Designers can foresee and anticipate every contingency	Things go right because people: Learn to overcome design flaws and functional glitches Adapt their performance to meet demands Interpret and apply procedures to match conditions Can detect and correct when things go wrong
Humans are a liability and variability is a threat. The purpose of design is to constrain variability, so that efficiency can be maintained.	Humans are an asset without which the proper functioning of modern technological systems would be impossible.

Source: Hollnagel, 2008(b)

However, the need for adaptation is contingent upon an understanding of the complexity of the organisation (socio-technical system) that is being managed. In some organisations (systems), adapting may be a pre-requisite for safe performance whilst in others it may be disastrous. Dekker (2001), for example, makes the point that failing to adapt can be disastrous under certain circumstances and he cites the case of an aircraft which crashed into the sea off the cost of Nova Scotia in 1998. In this case, following procedures for dealing with smoke and fire and not descending too fast, rather than dumping fuel and descending rapidly, led to the plane becoming uncontrollable and crashing into the sea. The dilemma here is that, under certain circumstances, following procedures may result in fatalities and injuries. However, at another time and in a different context, not following procedures may also lead to fatalities and injuries. Thus adaptation is a double-edged sword (Dekker, 2006). This poses a challenge to how we are to think about and action Hollnagel's Theory Z. In the adaptive age, Theory Z does not imply mindless abandonment of procedures, or a "free for all", rather it requires a more demanding standard of attention resulting in a more subtle, nuanced and refined appreciation of how OHS is managed that embodies the capacity to be adaptive rather than rule bound. To better understand this dilemma, Hollnagel (2009a) offers a two dimensional model of performance variability and risk as shown in Figure 1.

Figure 1 Hollnagel's Dimensions of performance variability and risk
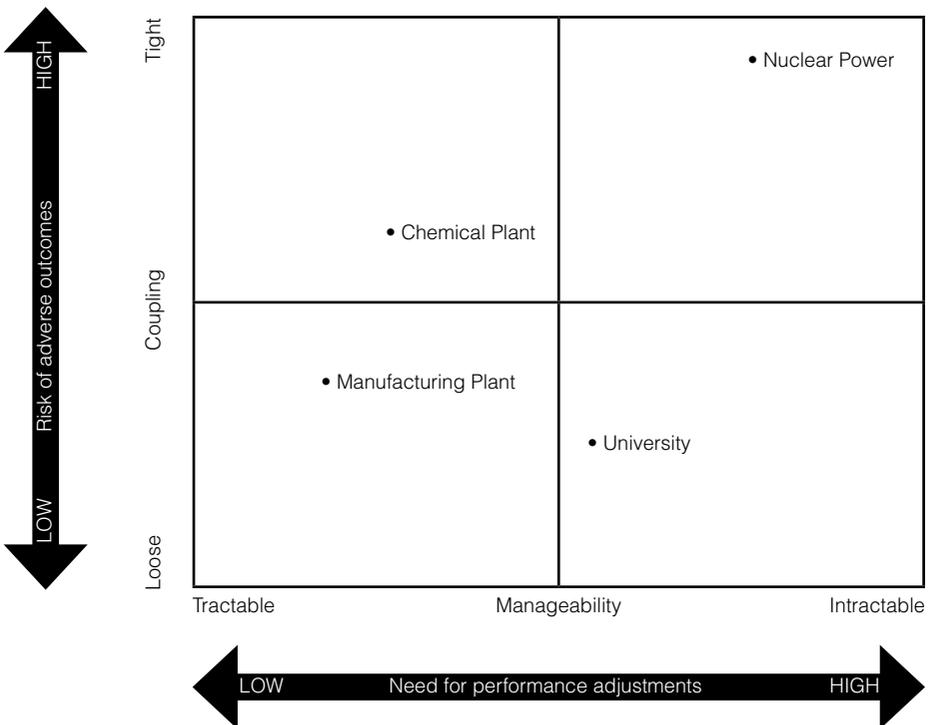
The first dimension in Hollnagel's model (Hollnagel, 2009a) is system 'manageability' or controllability. Within tractable systems (simple, stable systems that are easy to control) the need for adaptability is low. By comparison, intractable systems (complex systems subject to change) the need for adaptability is high. The second dimension is coupling (or the degree of inter-dependence between parts of the system). Tightly coupled systems are characterised by more time dependant processes, invariant sequences, little slack and only one way to reach production goals (Perrow, 1999). In tightly coupled systems the risk of adverse outcomes is high. Within loosely coupled systems it is low. This results in four possible ways to characterise an organisation (Hollnagel, 2009a); (i) a *loosely coupled tractable system* where the work is routine, requires little in the way of performance variability and any performance variability that is present will have negligible impact upon performance; (ii) a *loosely coupled intractable system* is less predictable and the need for performance adjustments will be higher, however, any performance variability will have negligible impact upon performance; (iii) a *tightly coupled tractable system* also requires little in the way of performance adjustments; however, performance adaptations that are made and that fail (Dekker, 2003) may quickly result in unwanted consequences because of tight coupling; and (iv) a tightly coupled intractable system may require constant performance adjustments to operate safely.

Therefore the ways of thinking about and approaches to managing OHS must be at least equal to the demands and complexity of the socio-technical system associated with the organisation's activities. If it is decided that the organisation is a tightly coupled, intractable system, for example nuclear power, then a more adaptive response will be necessary. Alternatively, if it is decided that the organisation is a loosely coupled, tractable system, for example, a manufacturing plant, then fewer adaptive responses will be necessary.

BEYOND SAFETY RULES TO COLLECTIVE MINDFULNESS

Safety rules are often written on the basis that greater control of workers' behaviour will not only lead to a safer workplace, but also act as a buffer against prosecution in the case of an accident. However, opinions are emerging that more safety rules and less variability in worker behaviour does not necessarily equate with improved safety performance. In some cases, writing more rules following an incident may lead to conflict between the rule and the actions required to undertake a task (Reason, 1997). Hopkins (2005) prefers to complement safety rules with a strategy of risk-awareness which invites workers "to attend to the risks they face and not simply comply with rules in a mindless fashion" (p. 18). This is supported by examples from industry (Hale et al., 2003; Jeffcott et al., 2006) and by Dekker (2003) who argues that "rather than simply increasing pressure to comply, organisations should invest in their understanding of the gap between procedures and practice, and help develop operators' skill at adapting" (p. 233). He goes on to propose that organisations need to:

> "(a) Monitor the gap between procedure and practice and try to understand why it exists (and resist trying to close it by simply telling people to comply).
> (b) Help people to develop skills to judge when and how to adapt (and resist telling people only that they should follow procedures)" (p. 236).

This is captured by the term "Collective Mindfulness" that is based on the premise that "unvarying procedures can't handle what they didn't anticipate" (Weick et al., 1999, p. 86). Or to put it another way, variability in human performance enhances safety whilst unvarying performance can undermine safety, particularly in complex socio-technical systems.

In his analyses of the Esso Longford gas plant in Victoria (Hopkins, 2001) and the Gretley mine disaster (Hopkins, 2007) Hopkins is critical of the absence of mindfulness among managers and identifies the need for mindful leadership as one strategy for averting disaster. In his analysis of the BP Texas City explosion Hopkins (2008) discusses how BP had embarked upon a quest to become a High Reliability Organisation (HRO) (to exhibit the characteristics of collective mindfulness) but was largely unsuccessful because they focused on educating front line workers to think differently without instituting the organisational practices necessary to support collective mindfulness.

Effective HROs organise themselves to learn from failure rather than celebrating success (Weick et al., 1999) and give strong responses to weak signals (Weick & Sutcliffe, 2001, p. 4). In short, they are "complex adaptive systems" (Weick et al., 1999, p. 117). HROs are adaptive because; they are 'preoccupied with failure' and treat "any lapse as something wrong with the system" (p. 9); they are 'reluctant to simplify' and strive to simplify less and see more; they are 'sensitive to operations' and encourage situation awareness among front line workers; they have a 'commitment to resilience' and do not allow errors to disable them; and they exhibit 'deference to expertise' and move decision making to those people on the front line with the most expertise.

More recently, Reason (2008) has argued that both individual mindfulness and collective mindfulness are necessary for "maintaining a state of intelligent wariness" (p. 241). This view represents a departure from the view expressed by Weick and Hopkins, a view that emphasises collective mindfulness over individual mindfulness. Reason (2008, p. 31) defends the need for individual mindfulness by posing the question: "If we cannot make systems immune to organisational accidents, what can we do to improve the reliability and error wisdom of those at the sharp end?"

The 'sharp end' refers to any person who is directly interacting with the hazards in a particular context and at a particular time. In essence, it is these people that are the last line of defence between safe and unsafe outcomes. Therefore, providing people at the sharp end with the skills of knowing when to adapt is good for safety and when it could be life-threatening. It may mean complementing safety rules and procedures with what Iszatt-White (2007, p. 452) refers to as "heedfulness". However, workers will need to trust in the "efficacy and applicability" of the safety rules if the rules are to over-ride workers propensity to think that they can work safely without following the safety rules (Iszatt-White, 2007, p. 461). To enhance heedfulness, Iszatt-White (2007, p. 463) argues that "the HRO notions of heedfulness, mutual checking and initiative offer a useful lens through which to consider the shortcomings of rule-based safety approaches". This approach to managing OHS is again indicative that we are entering an adaptive age.

Providing that interventions designed to encourage individual mindfulness or heedfulness are complemented with mindfulness or heedfulness at the organisational level, then it represents a worthwhile step forward particularly if one is to adopt the perspective that variability in performance is better for safety. Individual mindfulness requires workers at the sharp end to have the skills and knowledge to be able to judge when and how to adapt to local circumstances, and when not to adapt, and is consistent with the third HRO principle of being 'sensitive to operations'. Some organisations attempt to achieve this through programs that encourage mindfulness or what Hopkins refers to as "risk-awareness" (Hopkins, 2005) in individual workers. However, Borys (2009) in a study of one program, found that the program was little more than a ritual that focused on completing paperwork rather than an incentive to think carefully about risks. All that it managed to achieve was a culture of completing the paperwork, highlighting the need for organisational practices to work in support of individual mindfulness.

FROM COLLECTIVE MINDFULNESS TO RESILIENCE ENGINEERING

Contemporary approaches to safety have attempted to establish safe systems and ensure that managers and workers work inside the boundaries of those safety systems (Woods & Hollnagel, 2006). Thus it is assumed that constraining human performance is essential for safety. An alternative paradigm that is emerging is that safety is achieved by managers and workers adapting to changing circumstances. In this case, it is the variability in human performance, relative to the situation, that is essential for safety. Although this paradigm emphasises adaptive practices, these practices are designed to complement not replace good safe design principles whilst acknowledging that complex socio-technical systems will always present opportunities for surprise. Therefore, under this alternative paradigm, safety is understood as a "characteristic of how a system performs" (Woods & Hollnagel, 2006, p. 347) and that resilience is a quality that emerges from the functioning of the system. Resilience engineering subscribes to this alternative paradigm and in doing so, is similar to collective mindfulness and heedfulness as all three concepts focus on the importance of performance variability for safety. However, what sets resilience engineering apart from collective mindfulness is the focus on learning from successful performance as well as unsuccessful performance (Hollnagel, 2008c, 2009b) i.e. why things go right and as well as why things go wrong. The rationale for this perspective is that failures and successes result from the same underlying processes (Hollnagel, 2009b). Hollnagel (2008b) argues that "it is necessary to study both successes and failures and to find ways to reinforce the variability that lead to successes as well as dampen the variability that leads to adverse outcomes" (p. xii). Thus Hollnagel (2009b, p. 117) states:

> A resilient system is able effectively to adjust its functioning prior to, during, or following changes and disturbances, so that it can continue to perform as required after a disruption or a major mishap, and in the presence of continuous stresses.

Resilience engineering research has focussed on intractable and tightly coupled systems such as air traffic control centres and hospital emergency departments and led researchers to identify a range of markers of resilience. While there is no agreement on these, one marker that has been referred to repeatedly in the resilience engineering literature is the gap between work as imagined and work as actually done (Dekker, 2006; Dekker & Suparamaniam, 2005). One reason for the widening of this 'gap' is a phenomenon known as "practical drift" (Snook, 2000).

Practical drift refers to a situation where, over time, local work practices 'drift' away from the original intent at the time of system design, to more locally efficient work practices. However, if the local practices drift unnoticed and the degree of coupling in the system switches from loose to tight coupling, for example, circumstances may change resulting in functions becoming more time dependant (Perrow, 1999) without a corresponding change in local practices from task to rule focused, then the results can be catastrophic. Such was the case in the friendly fire shoot down of a Blackhawk helicopter over northern Iraq in 1994 (Snook, 2000). In this case, crews were struggling to make sense of their situation and in the time available, failed to do so. Each level of the system, individual, group and organisational, failed to identify that local practice had uncoupled from the written procedures. When there is slack in the system, this is seen as being efficient, but when circumstances change and revert to being tightly coupled and time dependant, like when attempting to identify if the helicopters below you are friend or foe, then the resultant decisions can be deadly. The adaptive age demands that people at all levels of the organisation need to be able to distinguish between drift that is adaptive and improves organisational performance

and drift that becomes dangerous.

The solution to drift is not attempting to further restrict performance variability as this simply sets up a new cycle of practical drift. Rather, it is more appropriate to monitor and detect drift toward failure and attempt to estimate the distance "between operations as they really go on, and operations as they are imagined in the minds of managers and rule-makers" (Dekker, 2006, p. 78).

Therefore "drift into failure" can be used as a metaphor for organisations wishing to become more resilient. For organisations this may mean making the gap between work as imagined and work as actually performed visible because the more the gap remains hidden, the more likely it is that the organisation will drift into failure. In fact Dekker and Suparamanian (2005) go so far as to say that the larger the gap "the less likely that people in decision-making positions are well calibrated to the actual risks and problems facing their operation" (p. 3).

CONCLUSION

As the limitations of OHSMS and safety rules that attempt to control behaviour are becoming evident, it is time to consider that we are moving into a fifth age of safety, the 'adaptive age'; an age which transcends rather than replaces the other ages of safety, ages which include the dominant safety paradigm that assumes that safety is achieved by establishing safe systems and ensuring that managers and workers work inside the boundaries of those safety systems.

The adaptive age challenges the view of an organisational safety culture and instead recognises the existence of socially constructed sub-cultures. The adaptive age embraces adaptive cultures and resilience engineering and requires a change in perspective from human variability as a liability and in need of control, to human variability as an asset and important for safety. In the adaptive age learning from successful performance variability is as important as learning from failure.

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