Occupational Health & Safety Management Systems

Proceedings of the First National Conference

Edited by
Warwick Pearse, Clare Gallagher and Liz Bluff

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Email: mail@crowncontent.com.au

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Introduction

The papers in this book were presented at the First National Conference on Occupational Health and Safety Management Systems (OHSMS) held in Australia, at the University of Western Sydney in July 2000. The Conference shared information about a range of issues associated with the widespread use of OHSMS in many sectors of Australian industry. The Conference was part of the Club Zero project funded by the WorkCover NSW Injury Prevention Education and Research Grant Scheme.

The papers represent a cross section of views and experience from an academic and occupational health and safety (OHS) practitioner perspective. The papers are divided into two parts in the publication. The first part consists of papers which were peer reviewed by an international panel and represent those papers which have a more academic or theoretical focus. The second part consists of papers which describe different approaches to OHSMS in Australian industry.

To date the uptake of OHSMS has been slower in Australia than in many other countries. However, there is now a momentum which will ensure that in the future many more companies will embrace OHSMS. The drivers for this increase include the leading role played by some regulatory agencies and the tools they have developed like SafetyMap in Victoria, the NSW Government, Construction Policy Steering Committee Guidelines in NSW and the Safety Achiever Bonus Scheme in South Australia. In addition to locally generated activity, international trends have flowed through to Australian branches of multinational companies. The predicted increase in OHSMS has generated a number of questions about whether OHSMS contribute to improvements in workplace safety and how these improvements can be secured.

The following papers canvass a range of issues about OHSMS which arise from the adoption of OHSMS. How do we know whether an OHSMS is an effective way of improving OHS? What types of systems and arrangements are effective? How do we measure improvements in occupational health and safety? Do current performance measures really tell us what we want to know? How can we move

beyond paper compliance and develop cultural change in organisations to support an OHSMS? Can auditors help in improving OHSMS?

This book sets up a number of questions but the answers will take longer to find. One conclusion from the work presented here is that much more research is needed to answer a range of complex questions associated with OHSMS. Too often governments and companies embark enthusiastically on programs designed to improve OHS without setting up frameworks for evaluation of the effectiveness of the programs. A number of authors at the Conference presented papers which grappled with the difficulties of conducting research about OHSMS in the field. If OHS is to be truly multi-disciplinary then research approaches have to be developed which can tell us about what measures are effective in the "real world" of companies and production systems.

It is clear that an OHSMS will not make a difference unless it reflects an overall positive approach to management by the principals of a company. For example, it is difficult to believe that it would be possible to have an effective OHSMS and a poor approach to industrial relations or an indifferent approach to managing quality. An OHSMS is only part of the company or organisation's management system. However, an OHSMS can provide guidance and challenges for a receptive management. For example, the issues of design, planning and purchasing come into focus with an OHSMS in ways which they may not have done before.

OHSMS are not a panacea but they would seem to be a necessary part of any effective management system. In presenting a cross-section of research and practical experience, this book hopes to stimulate debate and challenge readers to further explore and clarify the character and contribution of OHSMS.

Warwick Pearse, Clare Gallagher and Liz Bluff
Editors

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Warwick Pearse convened the First National Conference on OHSMS as part of the

Dr Kaj Frick
National Institute for Working Life
S 112 79 Stockholm
Sweden

Professor Patrick Hudson
Centre for Safety Research
Faculty of Social Sciences
PO Box 9555, 2300 RB Leiden
The Netherlands

Dr Per Langaa Jensen
Department of Technology and Social Sciences
Technical University of Denmark
Building 303, DTU
DK-2800
Denmark

Professor Tord Kjellstrom
Faculty of Medicine and Health Science
The University of Auckland
Private Bag 92019
Auckland
New Zealand

Dr Claire Mayhew
Australian Institute of Criminology
GPO Box 2944
Canberra
Australia

Dr Maria Quartararo
School of Applied Social
and Human Sciences
Campbelltown Campus
University of Western Sydney
Australia

Dr William Verschuug
Centre for Safety Research
Faculty of Social Sciences
PO Box 9555, 2300 RB Leiden
The Netherlands

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Part One

Refereed Papers

Safety Management and Safety Culture The Long, Hard and Winding Road

Patrick Hudson

Address for correspondence:
Professor Patrick Hudson
Centre for Safety Research
Leiden University
The Netherlands

Introduction

Safety seems so easy – just make sure people don't get hurt. In practice it is a lot harder to achieve a safe organisation that is capable of sustained safe performance in the face of significant hazards. This paper will examine the role of systematic management systems in helping to ensure that organisations become safe and stay that way. The possession of a management system, no matter how thorough and systematic it may be, is not, however, sufficient to guarantee sustained performance. What is also needed is an organisational culture that supports the management system and allows it to flourish. This paper discusses the notion of a safety culture and how it might be constructed. The bad news is that creating a management system and keeping it alive is not a particularly easy task. The good news is that it is worthwhile, both in terms of lives and in terms of profits. Finally the other good news is that it is not as hard as it may seem.

This paper will examine briefly the history of systematic safety management systems and safety cases, drawing on my personal experience of the petrochemical industry and Shell in particular. While I attempt a balanced view, my experience has been constrained to the Oil and Gas industry and, more recently, the commercial aviation environment. It will take the view that, while safety management has a long tradition, what has often been lacking was a systematic basis for safety management that allowed organisations to see if they had any gaps in their coverage. To proceed further it is necessary to develop organisational cultures that support processes beyond prescription, such as 'thinking the unthinkable' and being intrinsically motivated to be safe, even when there seems no obvious reason to. The paper will examine the notion of Safety Cultures and High Reliability Organisations and put them in a context accessible to small and medium-sized businesses. Finally the paper concludes with a discussion of how to achieve such a safety culture and of the pitfalls that await the unwary. This will include a look at the regulatory environment that can encourage the development of systematic safety management and safety cultures without burdening those organisations that are supposed to be being helped. The road to safety may seem long and hard, and appear to wind, but the destination makes it well worthwhile.

The History: From Flixborough to Piper Alpha

The requirement for organisations to develop Safety Management Systems grew out of the aftermath of a number of disasters, predominantly in Europe. The Flixborough accident in 1974, when a whole village was blown away as a result of an explosion at the Nypro Ltd caprolactam production facility, led to the first requirement for petrochemical companies to present a Safety Case. The Control of Industrial Major Accident Hazards legislation (CIMAH) was restricted to UK onshore facilities. The Seveso incident in 1976 resulted in the European directive 82/501/EEC, known as the Seveso directive, which has been brought up to date with the Seveso II guidelines as required by the Council Directive 96/82/EC. After the Piper Alpha disaster in 1987, Lord Cullen identified the requirement for systematic *safety management*, with the Safety Case proving that a management system was in operation and was effective (1). Cullen's requirements were consistent with the previous legislation and also developed the goal-setting approach first laid out in the report of the Robens Committee (2) that resulted in the UK *Health and Safety at Work Act* in 1974.

Up to the mid-eighties the Oil and Gas business had been commonly regarded as a dangerous one in which "hard men" took risks, a stance still taken today in many

industries such as mining and construction. Shell had started to progress past this point by first realising that safety was important and that it was not just a matter of individual personal responsibility. Borrowing on the nearly two centuries of experience of the world industry leader, DuPont, Shell developed a set of eleven principles of Enhanced Safety Management – ESM (3). These principles set out requirements, such as having a leadership committed to safety, to having competent safety advisors, to investigating accidents etc. that should and did ensure considerably improved performance as measured in terms of injuries and fatalities (See Figure 4).

The problem with ESM was that it was essentially an unstructured list of eminently reasonable things to do. None of the principles are wrong, management commitment is as important as ever, but none of the principles show *how* one should act. Furthermore there is no guarantee that what is being done will actually work or, even, that more is done than is really necessary. In this environment, regulation both from without and within the organisation, was invariably prescriptive, defining what to do and how to do it. The prescriptions were defined top-down by those who knew best, and refined by experience from accidents. Typically, hardware and procedural requirements could be traced back to specific accidents and over time the requirements tended to increase. Regulators forced companies to defend themselves and their employees in ways that were often contrary to common sense or even sound engineering practice. The net result was paternalistic legislation and enforcement, and the ensuing responses, that can often be observed today. The Flixborough and Seveso disasters led to more stringent requirements, but essentially of the same top-down nature. Auditing processes involved checking that requirements were met, such as counting the number of fire extinguishers to ascertain whether there were as many as the law required. Auditing did not check, except indirectly, whether safety was assured.

The Piper Alpha disaster changed all that, at least for the Oil and Gas industry I am most familiar with. Lord Cullen proposed extending the goal-setting regime, which meant that society sets overall goals and organisations can find their own ways of meeting those goals. Such an approach was inherent in the Robens report (2) and also the Norwegian Petroleum Directorate's (NPD) legislative basis. The NPD's approach was influenced by the Ekofisk Bravo blow-out in 1977, that resulted in considerable pollution, and the Alexander L. Kielland disaster in 1980 in which 123 lives were lost (4). Goal-setting placed control back to those who 'possessed' the hazards, allowing them to manage their own hazards in ways best suited to their capabilities. But Cullen also required that the management of safety

be systematic, referring to the ISO 9000 and BS 5750 standards for general management systems (1). Figure 1 shows such a management system. Finally Cullen required that the concept of a Safety Case serve as a proof of assurance that the goals were being met by the management system, be revived. Safety cases were originally required after Flixborough and Seveso, but fell into disrepute because such documents were usually still-born and only collected dust on bookshelves after they had been written. Cullen wanted the Safety Case to be a living document, providing assurance that safety management was active and serving as a basis for continuous safe operations.

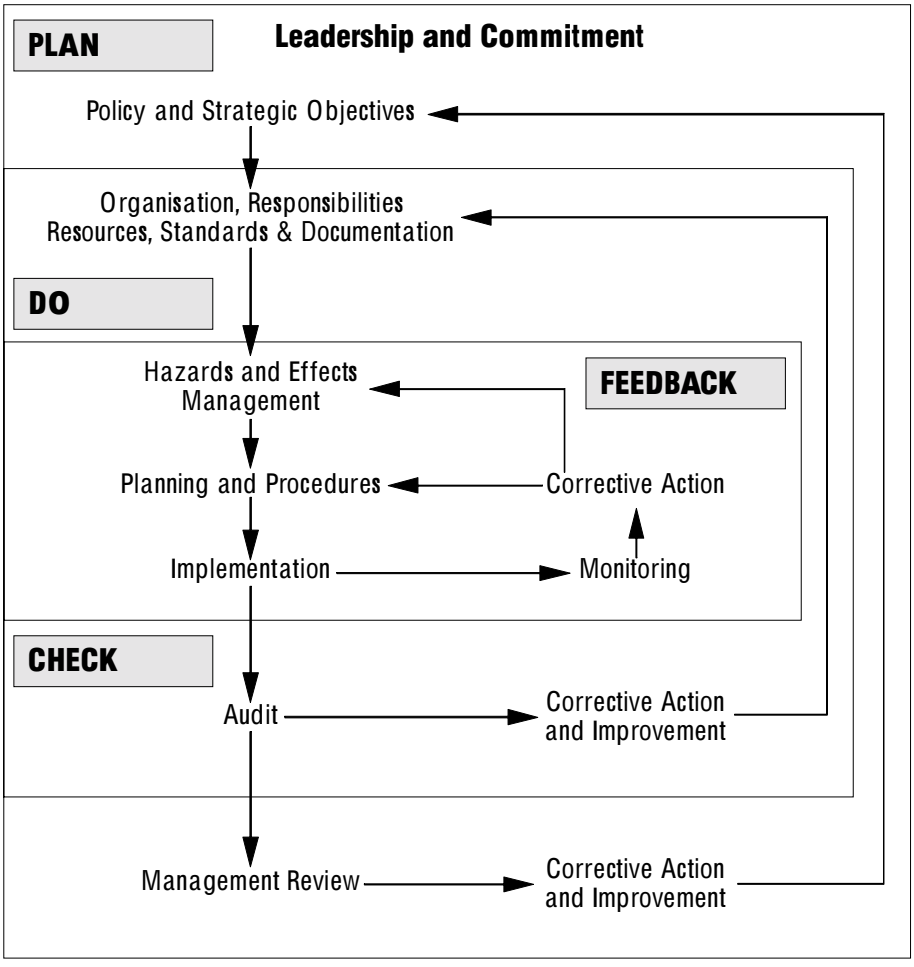

Figure 1. A generic Safety Management System The elements of a Safety Management System (SMS). A number of important elements are specified that have to do with the setting of policy and creation of plans and organisational capacity to realise that policy (PLAN) , the analysis of hazards and effects leading to planning and implementation of those plans in order to manage the risks (DO) and the control on the effective performance of those steps (CHECK). A number of feedback loops are specificed to see where the information gained should be sent (FEEDBACK).

Shell's Approach to Developing Safety Management Systems and Safety Cases

Multi-national Oil and Gas companies, forced by the legal requirements that spread quickly to many parts of the world, set to work to develop offshore Safety Management Systems (SMS). The first fears were that SMS, like the previous safety case regime, would create a vast amount of paperwork and prove to be very expensive to set up. Consultants probably fed this fear when they offered to take on the work and release the company's own staff back to productive work. Some companies decided to wait and see, given the length of time available before the safety cases had to be presented. Others, especially Shell, decided that they would rather decide their own future rather than have it forced upon them. There was a degree of internal variation, given the freedom operating companies had within the Group. In the UK, where Cullen's requirements became law first, the feeling was that a SMS and associated Safety Case would have to be massively detailed to pass and allow operations to continue. The Corporate view was that the SMS had to be structured and systematic, and the Safety Case had to provide clear assurance, but they did not need to be overly large. The Corporate approach finally prevailed, partly because Group-wide auditing practices were to be defined in terms of the Corporate vision, but also because they decided early on to require the approach be applied to both offshore and onshore exploration and production operations. Over the years it has become clear that a systematic approach can mean both clarity and brevity.

Shell's approach was based upon an analysis of the hazards, as these constrained the safety goals. The Hazards and Effects Management Process (HEMP) consists of four steps:

- Identify what hazards can be found in the operation?
- Assess how important are these hazards
- Manage how are the hazards to be controlled?
- Recover what will be done if hazards are released?

Identification

In order to uncover which hazards should be considered, a Hazards Register was compiled. Hazards ranged from releases of hydrocarbons, building fires, releases of toxic gases such as H_2S, to hippopotamus, crocodile and grizzly bear attacks

and heavy falling objects during construction. In the offshore environment one hazard involved structures being hit by vessels such as fishing boats and container ships that are completely out of the control of the organisation. Onshore a hazard that was identified involved military air-plane crashes on facilities. It became clear that many of these were real, in certain operations, and exotic in others. A register allowed a simple look-up approach to be supplemented by brainstorming, analyses of accidents etc. When a new hazard was identified it could be added to the register to save others the work.

Previous regulations subsequent to the original Seveso directive (89/391/EEC) had indeed required employers to maintain such a register of hazards and had a wider interpretation. They had also included hazards to long-term health rather than just to safety. Such hazards could produce chronic rather than just acute problems for employees. The split which still existed, in the early days of SMS implementation, between safety, environment and occupational health, together with the imperative to produce offshore safety cases, meant that it has been only recently that such hazards have been taken up in the *systematic* management system. This is not to say that there was no interest, but it was confined to the company medical services that had always guarded their autonomy jealously. The general approach as exemplified in the risk potential matrix still applied, but until recently (ca. 1998 onwards) Occupational Health remained the 'runt of the litter'.

Consequence				Increasing Probability				
				A	**B**	**C**	**D**	**E**
Rating	**People**	**Assets**	**Environ-ment**	Never heard of in industry	Incident heard of in industry	Incident heard of in company	Incident happens several times per year in company	Incident happens several times per year in a location
0	No injury	No damage	No effects	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk
1	Slight injury	Slight damage	Slight effect	Low Risk	Low Risk	Low Risk	Med/low Risk	Med/low Risk
2	Minor injury	Minor damage	Minor effect	Med/low Risk	Med/low Risk	Med/low Risk	Med/low Risk	Med/low Risk
3	Major injury	Local damage	Localised effect	Med/low Risk	Med/low Risk	Medium Risk	Medium Risk	**High Risk**
4	Single fatality	Major damage	Major effect	Medium Risk	Medium Risk	Medium Risk	**High Risk**	**High Risk**
5	Multiple fatality	Extensive damage	Massive effect	Medium Risk	**High Risk**	**High Risk**	**High Risk**	**High Risk**

Figure 2. The Risk Potential Matrix. The shading identifies the regions of risk that require different levels of control to ensure that such an event does not occur. Major safety cases are usually restricted to documentation of the medium and high level risks. However, hazards present still have to be managed even when the risk is low. The risk matrix can be seen together with the bow-tie diagrams that are intended to show exactly how consequences, denoted by ratings 0-5, are to be avoided.

Assessment

The hazards identified may be present, but that does not mean that they are sufficiently important to have to be actively managed. In Norway there are few hippopotamus in the fjords, in West Africa temperatures are never low enough to produce freezing conditions. The principle of ALARP – As Low As Reasonably Practicable – also means that very low frequency hazards can be lumped together with non-existent hazards and ignored. Assessment means recognising the high risk Major Hazards and those carrying medium risk but with widespread consequences, such as food and water contamination. The assessment process is sup-

ported by the use of an Incident Potential Matrix (Fig. 2). Probabilities are crude, but sufficient to designate hazards as worth considering (Major Hazards = High Risk; medium hazards = medium risk etc.). What assessment does is cut down the risks that have to be considered at later stages to those that are important. A regulator may disagree with the assessment, but the process is transparent.

Manage and Recover

The management of hazards is, naturally, the core of the HEMP process. Shell has developed a specific approach called the Bow-tie (Fig. 3) that is supported by software called THESIS. Central to the development is a bi-directional approach between the effects of hazard release and the types of catastrophic events that can result from failures of defences (barriers and controls). Also crucial is the acceptance that, for whatever reason Murphy thinks of, controls can and will fail, defences will be breached. Recovery measures are intended to ensure that events can be contained or mitigated. During development of the SMS approach, some people argued that with adequate management, recovery was unnecessary. I argued at the time that this was a philosophical stance that was itself dangerous, one I now know to be indicative of, at best, a calculative safety culture.

One lesson that was learnt during the initial stages was that it is difficult to envisage all the processes that need to be considered. The structuring principle was to use the results of a Business Process Analysis to identify safety critical tasks. Constructing a Business Process Model is daunting, especially for those with less resources than an Oil and Gas Major. But really all the Business Process Model consists of is *What we do* and *How we do it*. Smaller companies will have much less complex business processes. Again the use of the Business Process Model meant that only the critical processes need be considered. Furthermore there is no evidence that it is detrimental to business performance to understand what the business is and how the business is performed, especially if it is a hazardous one.

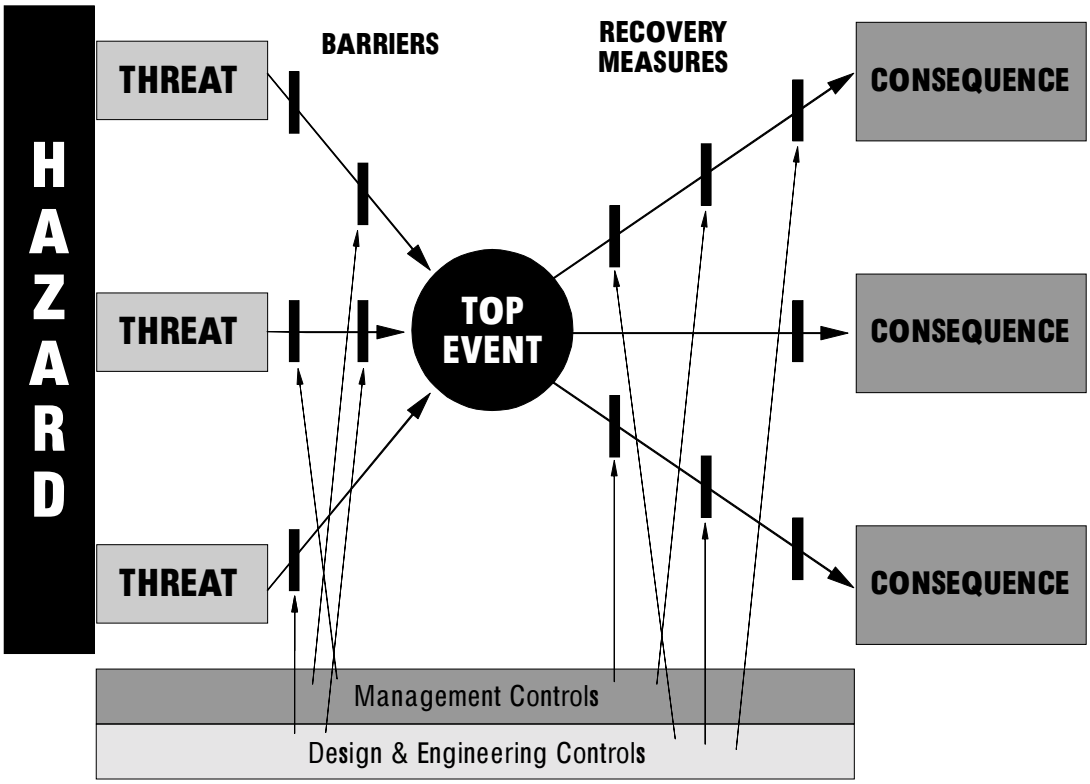

Figure 3. The Bow-tie Diagram.

- **Hazards** form the major ways in which damage or injury can occur.
- **Threats** are the ways in which hazards can be released.
- A **Top Event** is the event one wishes to avoid.
- **Consequences** are the outcomes that have to be avoided (See Risk Potential Matrix).
- **Barriers** are ways in which threats are countered to ensure that a top event does not occur.
- **Recovery measures** are what can be done to ensure that a top event does not result in the unwanted outcomes.
- **Management controls** are ways in which control is exercised by procedures, training etc.
- **Design and Engineering controls** are ways in which barriers and recovery and mitigation measures are built into the system.

Lessons Learnt

A number of lessons were learned at this time. The first of these were that it is not necessary to specify everything in the documentation. Where necessary references can be made to specific documents or procedures; what is needed is the overall structure, not necessarily the details. One of the earliest temptations was to over-specify and to attempt to control everything. This is a major reason why SMS were seen as over-complicated and expensive. Experience has taught us that an effective system is possible with much less.

The second lesson was that it is inadvisable to over-generalise, especially in the earliest stages. Some companies decided that, as the basis for SMS was an ISO-9000 type management system, it would be best to manage *everything* with the same system. This temptation has to be resisted; it is necessary first to learn how to be systematic in a part rather than the whole. Safety management can serve as a learning experience; generalisation can come later. The advantage associated with having safety as a starting point is that there is a safety imperative. Other solutions can be put off and problems fixed retrospectively. In safety these luxuries do not exist.

Thirdly, an unexpected discovery was made. Defining existing businesses is hard, because it requires examining what is taken for granted. Setting up new businesses with the SMS/Safety Case approach, however, is easy. Shell quickly learnt that once the initial decision had been made to operate a so-called New Venture, the first step was to define the SMS and then to run the remaining business processes off that structure. This leads to more inherently safe operations and considerable cost savings both up front and over the life span.

Once the basic systems were in place, and after sufficient institutional learning had taken place, it became possible to integrate management systems and to generalise. Shell has chosen to develop to include both Occupational Health and Environmental management in HSE-MS. Smaller companies in the Oil and Gas business, like Schlumberger, have even added Quality management. The experience suggests that smaller businesses can probably extend the range of processes covered by management systems further than can large ones. The reason for this is probably that smaller businesses are less diversified and have, therefore, smaller and more parallel issues to cope with.

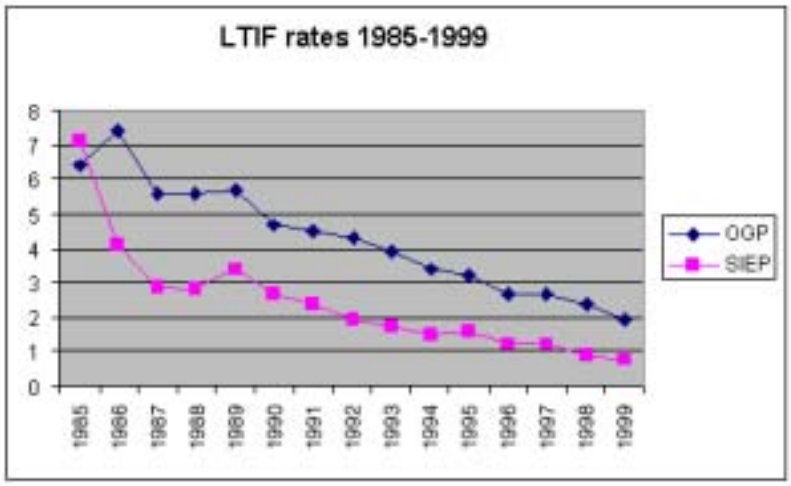

Figure 4. The LTIF rates per million hours for the total industry average(Shell contributes about 30%) as reported to the Oil and Gas Producers organisation, formerly the EP Forum, and Shell International's accident rates. Before 1985 Shell's figures were no better than average.

The final lesson learned for an Oil Major was that their contractors also have to have Safety Management Systems and that it is in the interests of both parties to have them. Because smaller companies are more specialised, right down the chain to the one-man specialist, their management systems may be different from larger companies, but it is actually advantageous for larger companies to help their contractors. It may seem surprising that a large company may even help pay for the development of its contractors, but the experience has shown that it pays off.

All in all experience has shown us that it is much easier to implement SMS and Safety Cases than was originally thought. What is important is to share information, such as the idea of a hazards register, and to use support systems like THESIS. We also learned that a good Safety Case is actually quite small, because what is important is having a *systematic* approach as the basis for assurance, not vast amounts of detail that can even obscure the existence of gaps and unwarranted assumptions.

Figure 4 shows the gradual but remarkable improvement of the Oil and Gas industry since 1985. The data can be read as showing how there was a general improvement after 1989, when management systems began to bite. Shell's improvement in 1986 can be related to a major turn-around associated with the introduction of Enhanced Safety Management. The effects of SMS can be inferred, but not proven by such a figure. Another factor that has to be considered is the change from lost work days after to incident to restricted work. Trend analyses of

LTIF, Restricted Work Cases (RWC) and Total Reportable Case Frequency (TRCF) in one company showed that a considerable proportion of the reduction in LTIF was due to LTI management shifting to restricted work (5). Over the years, however, this still resulted in a major shift in attitudes towards safety. This shift will be discussed in the next section.

The evolution of safety

Looking back we can see that safety has undergone a development from an unsystematic, albeit well-meaning, collection of processes and standards, to a systematic approach specific to safety. Piper Alpha served as the catalyst for this major change. Once SMS is in place it becomes possible to extend the range to include other elements such as Environment and Occupational Health, leading to an integrated approach to HSE as a whole. The question now is, is there another stage or is the integrated approach the end of the story?

The answer lies in the *way* in which safety management is carried out. Management systems are primarily rational inventions, defined on paper in offices and capable of objective evaluation in audits. The next stage is one in which the aims and intentions can be allowed to flourish, even if there are gaps. This is a situation in which formally undefinable characteristics such as enthusiasm, care and belief are to be found. The kind of organisation that provides this support is a safety culture. In a managed organisation it is still necessary to check and control externally. In a safety culture it becomes possible to find that people carry out what they know has to be done not because they *have* to, but because they *want* to. It is at this point that worker involvement becomes both meaningful and necessary. Advanced safety cultures can only be built upon a combination of a top-down commitment to improve and the realisation that the workforce is where that improvement has to take place. The workforce has to be trusted and has a duty to inform. What this means in practice is that in an advanced safety culture it becomes possible to reap extra benefits, beyond having fewer accidents, such as reductions in the audit frequency. The next question is, what exactly is a safety culture and how do you acquire one?

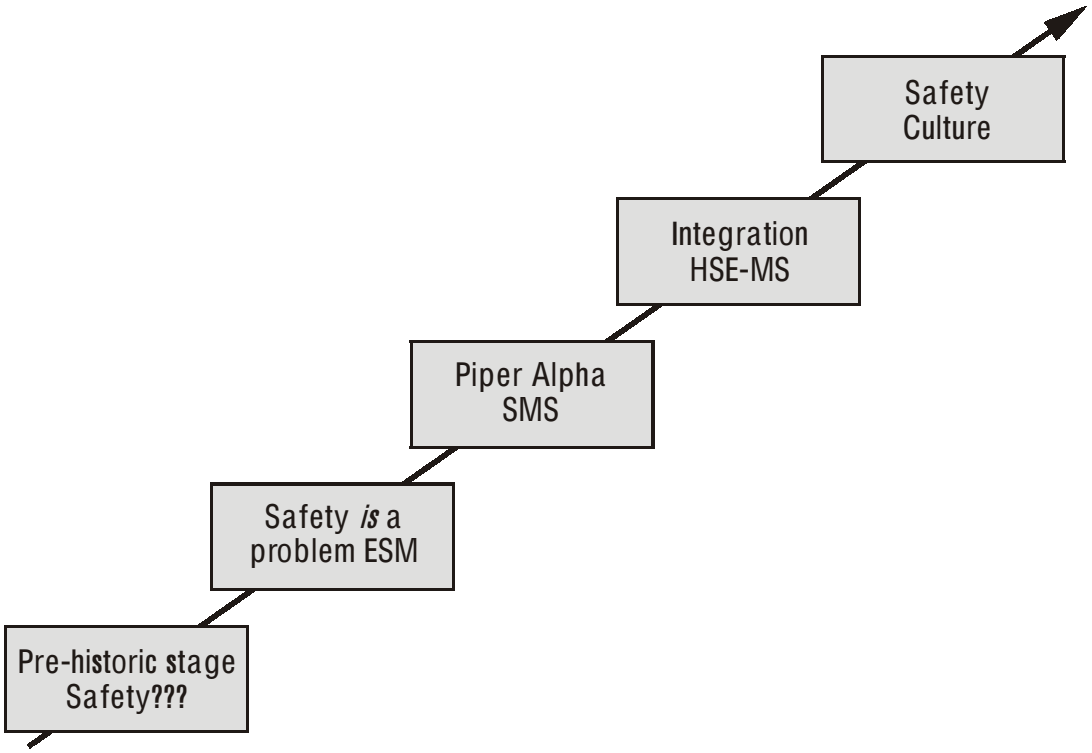

Figure 5. The evolution of safety in Shell's Exploration and Production function. Safety started by being regarded as an individual's own problem in a dangerous business. Once safety was taken seriously in the early 80's the Enhanced Safety Management Principles (ESM) were introduced. After the Piper Alpha disaster the requirement for Safety Management Systems (SMS) eventually led to the realisation that SMS could be generalised to Health Safety and Environment-MS. The next stage is to develop an organisational culture within which all these developments flourish.

Safety Culture

The systematic approach to safety enshrined in OH-SMS is not the end of the road. Recent studies into organisational safety cultures have enabled us to start to understand the notion of a Safe Organisation (6, 7, 8, 9). What we now know is that there is an evolutionary process from unsafe to safe organisations, from the Pathological to the Generative. The Calculative stage, where great value is placed upon systematic and managed approaches to operational safety, is an intermediate stage. The evolutionary process is usually initially driven by legislation, but it is possible for organisations to drive themselves in the beginning. Later, however,

we find that the best organisations leave the regulatory drive behind. This development means that the role of the regulator has to change from an enforcer to a facilitator. It also implies that, when things go wrong, the legal framework has to be capable of accommodating a wide variety of organisational attitudes and of responding appropriately. This is not to state that regulators are unnecessary, but rather that their roles should change as a function of what and who they are regulating. Pathological organisations are going to respond, if at all, to more old-fashioned legalistic control and threats. Advanced cultures need to be supported and reminded of their own high standards.

What is a safety culture?

Every organisation has some common, internal, characteristics that we call its culture. These characteristics have often become invisible to those inside, but may be startling to outsiders coming from a different culture. The notion of an organisational culture is notoriously difficult to define, so I take a very general approach and see the organisational culture as, roughly "Who and what we are, what we find important, and how we go about doing things round here". Rousseau (10) defined culture more specifically as "the ways of thinking, behaving and believing that members of a social unit have in common". A safety culture is a special case of such a culture, one in which safety has a special place in the concerns of those who work for the organisation. In one sense safety *always* has a place in an organisation's culture, which can then be referred to as *the* safety culture, but it is only past a certain stage of development that an organisation can be said to take safety sufficiently seriously to be labelled as *a* safety culture.

The notion of safety culture is somewhat different from that of safety climate originally propagated by Zohar (11). Zohar's approach concentrated upon the perceptions of employees, defining organisational climate as the "perceptions held by employees about aspects of their organisational environment, summarised over individual employees". The culture defines the setting within which the climate operates[2].

We can first distinguish culture into its static and its dynamic components. The term *static* refers to what *is*, generally the unchanging values held by the organisation, and the beliefs that permeate its members. The term *dynamic* refers to how

[2]It is a pity that Zohar (11) chose to use the term climate, which would have been an appropriate term to use for what is here referred to as culture. The changeable perceptions could then be referred to as 'weather' in the context of the overall climate.

the organisation operates, the types of work processes it feels comfortable with. Table I shows a set of definitions of the four major components that can be identified as constituting corporate culture (12). The distinction between common working practices and problem solving methods is not always drawn, but this may be because researchers tend to study companies in either periods of stability or of great change, but not through both. Operating in a stable world highlights the daily working practices, while periods of change are dominated by problem-solving processes.

A safety culture is one in which safety plays a very important role. Because safety is such a complex phenomenon, it is not enough just to add – "And be safe". The next sections examine the characteristics of a safety culture and look at the types of culture that can be recognised as forming a progression along which organisations develop.

Culture Component	Definition
Corporate Values	What the organisation regards as important or even sacrosanct
Corporate Beliefs	What the organisation believes about the world, how the world will react to actions, what the outside world finds important. Beliefs about what works and doesn't
Common Problem-Solving Methods	How the types of problem found in the organisation are tackled, e.g. project groups, consultants, panic
Common Working Practices	The way people go about their work, e.g. small meetings, lots of memos, project management of everything etc.

Table I. Corporate Culture definitions.

The characteristics of a safety culture

What does an organisational culture that gives safety a priority look like? Reason (13) has identified a number of characteristics that go to make up such a safety culture. These are:

- an *informed culture*-one in which those who manage and operate the system have current knowledge about the human, technical, organisational and environmental factors that determine the safety of the system as a whole.
- a *reporting culture*: a culture in which people are willing to report errors and near misses.

- a *just culture*: a culture of 'no blame' where an atmosphere of trust is present and people are encouraged or even rewarded for providing essential safety-related information- but where there is also a clear line between acceptable and unacceptable behaviour.
- a *flexible culture* which can take different forms but is characterised as shifting from the conventional hierarchical mode to a flatter professional structure.
- a *learning culture* - the willingness and the competence to draw the right conclusions from its safety information system, and the will to implement major reforms when the need is indicated.

The values associated with a safety culture are fairly straightforward. The beliefs are more complex. Taken together the five characteristics form a culture of *trust*. Trust is needed, especially in the face of assaults upon the beliefs that people are trying their best, such as accidents and near-miss incidents which all too easily look like failures of individuals to come up to the ideals of the organisation. This helps us to identify what beliefs are associated with a safety culture. Table II places safety into the framework set in Table I. Reason's characteristics are the outcome of corporate behaviours driven by the static and dynamic components of the corporate culture.

Safety Culture Component	Definition
Safety Values	The organisation regards as safety as sacrosanct and provides the licence to operate.
Safety Beliefs	The organisation believes that safety makes commercial sense; that individuals are not the sole causes of incidents; that the next accident is waiting to happen.
Common Problem-Solving Methods	Risk assessment, cost-benefit analyses, accident analysis as well as investigation, proactive search for problems in advance of incidents.
Common Working Practices	Safety integral to design and operations practice, safety #1 on meeting agendas up to Board level, chronic unease about safety.

Table II. A Safety Culture defined in terms of the organisational components. Note that the methods and working practices are not restricted to safety, but that safety is intimately involved in the way work is done.

Table III breaks down organisational cultures into more detail. The internals may be reflected at any cultural level, so managerial style will vary from pathological through to generative (see below). The Walk/Talk headings are intended to

distinguish the more passive from the active components. Filling in these components helps define how a culture appears and how a culture should be. The next section discusses a progression of cultures.

TALK		**WALK**		
Communication	**Organisational Attitudes**	**Safety**	**Organisational Behaviour**	**Working Behaviour**
Flow of data and information about safety	Workforce attitudes to management	Organisational status of safety Department	Managerial style and behaviour	Priority setting between production and safety
Management informedness about the true state of affairs	Management attitudes about the workforce	Rewards of good safety performance	Level of care for stakeholders	Risk appreciation by those at personal risk
Workforce informedness about the true state of affairs	Collective efficacy – the belief that people can get things done	Procedures and the use of initiative	Dealing with change	On-site behaviour by the workforce and management
		Design – safety as a starting point	Reaction to trouble when it happens	Environment seen as critical

Table III The Safety Culture dimensions and internal structure. These are filled in with different descriptions for each level of the safety culture attained. For each cell it should be possible to think in terms of the values, beliefs and practices that apply.

Types of safety culture

Safety cultures can be distinguished along a line from *pathological*, caring less about safety than about not being caught, through *calculative*, blindly following all the logically necessary steps, to *generative*, in which safe behaviour is fully integrated into everything the organisation does (6, 14, 15, 16). A Safety Culture can only be considered seriously in the later stages of this evolutionary line. Prior to that, up to and including the calculative stage, the term safety culture is best reserved to describe formal and superficial structures rather than an integral part of the overall culture, pervading how the organisation goes about its work. It is obvious that, at the pathological stage, an organisation is not even interested in safety and has to make the first level of acquiring the value system that includes safety as a necessary element. A subsequent stage is one in which safety issues begin to acquire impor-

tance, often driven by both internal and external factors as a result of having many incidents. At this first stage of development we can see the values beginning to be acquired, but the beliefs, methods and working practices are still at a primeval stage. At such an early stage, top management believes accidents to be caused by stupidity, inattention and, even, wilfulness on the part of their employees. Many messages may flow from on high, but the majority still reflect the organisation's primary aims, often with *'and be safe'* tacked on at the end.

Pathological	Bureaucratic	Generative
Information is hidden	Information may be ignored	Information is actively sought
Messengers are "shot"	Messengers are tolerated	Messengers are trained
Responsibilities are shirked	Responsibility is compartmented	Responsibilities are shared
Bridging is discouraged	Bridging is allowed but discouraged	Bridging is rewarded
Failure is covered up	Organisation is just and merciful	Failure causes enquiry
New ideas are crushed	New ideas create problems	New ideas are welcomed

Table IV. Westrum's original model. The Reactive and the Proactive stages have been added more recently and articulated in our work in the Oil and Gas industry. Table 5 shows an extended and more practical version that was worked out, in co-operation with Westrum, with the addition of the Reactive and Proactive stages.

The next stage, one that I feel can not be circumvented, involves the recognition that safety needs to be taken seriously. The term *calculative* is used to stress that safety is calculated; quantitative risk assessment techniques and overt cost-benefit analyses are used to justify safety and to measure the effectiveness of proposed measures. Such techniques are typical problem-solving methods. Often simple calculations suggest that failing to be safe, or at least having incidents, costs money. Furthermore organisations that are seen from outside as being uncaring about safety may have image problems that knock on to the bottom line. Despite this stance, and despite what can become an impressive safety record, safety is still an add-on, certainly when seen from outside. This is the level of mechanical application of a management system. What was sought in the earlier part of this paper is now clear, a true safety culture is one that transcends the calculative and bureaucratic levels.

The foundation can now be laid, nevertheless, for acquiring *beliefs* that safety is worthwhile in its own right. By constructing deliberate procedures an organisation

can force itself into taking safety seriously, or can be forced by a regulatory body, but the values are not yet fully internalised, the methods are still new and individual beliefs generally lag behind corporate intentions. This shows us a significant characteristic of a true safety culture, that the value system associated with safety and safe working has to be fully internalised as beliefs, almost to the point of invisibility, and that the entire suite of approaches the organisation uses are safety-based (17). What this also stresses is that the notion of a safety culture can only arise in an organisational context within which the necessary technical steps and procedures are already in place and in operation. Yet again, these are necessary but not sufficient preconditions for a safety culture (7, 18, 19).

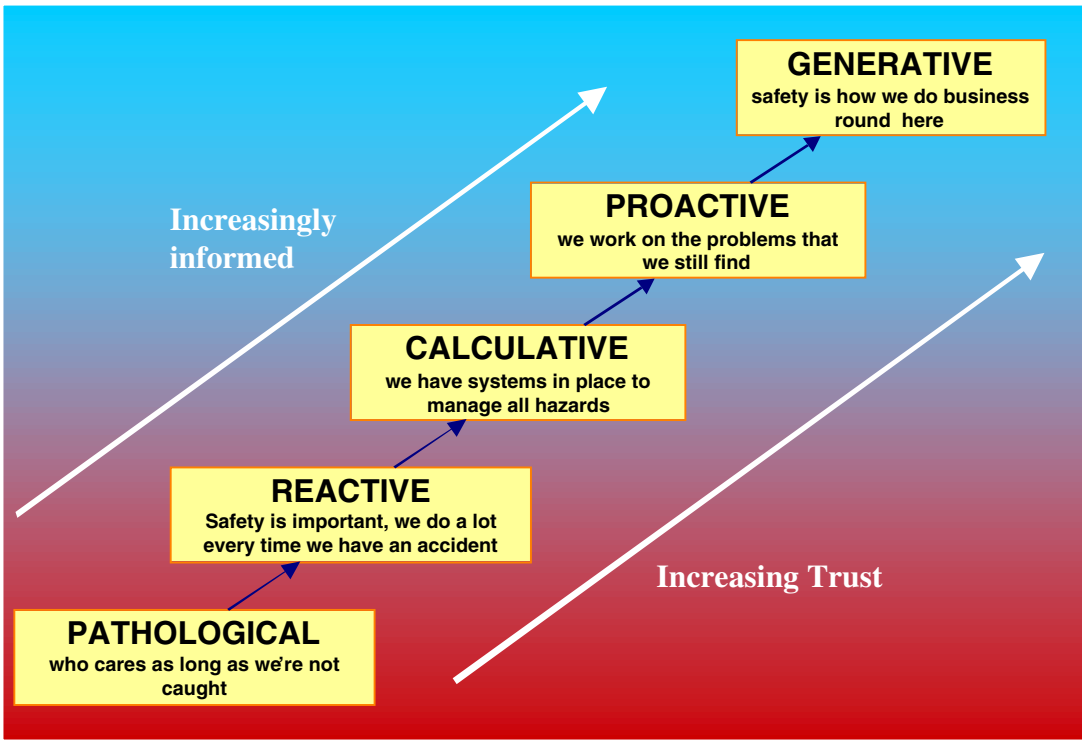

Figure 6. The evolutionary model of Safety Culture.

How Can You Achieve a Safety Culture?

We have been studying the production of safety culture in the Oil and Gas industry and it is clear that, to progress, one has to undergo a process of cultural change. These changes have to take place incrementally. It appears logical, at least, that it is impossible to go straight from the reactive to the proactive without going through the calculative stage if only because the proactive culture includes systems

typical of the calculative. Similarly it is probably impossible to go from the pathological straight to the calculative stage.

Change management

What has to be done for an organisation to develop along the line towards the generative or true safety cultures is a managed change process. The next culture defines *where* we want to go to, the change model determines *how* we get there. A model for developmental change has been proposed by Prochaska and DiClemente (20). This model was originally developed for getting people off drug and other dependencies such as smoking, alcohol and over-eating. It proposes that there are five stages that the authors have identified. These stages are:

- **Precontemplation –** Not yet at a stage of considering the need for change. In safety terms a complacent belief that what can be achieved has been achieved. Coupled with the belief that further improvement is 'not possible in this business'.
- **Contemplation –** A stage at which the realisation is arisen that further improvement is possible. There is no actual change in behaviour and no steps are taken. Nevertheless the possibility of improvement is entertained.
- **Preparation –** Active steps are taken to prepare for change (in smoking this would be characterised by trying not to buy cigarettes, by not maintaining a stock; in dieting this might involve avoiding certain eating situations, but in both cases without actually smoking or eating less). Characterised by much backsliding.
- **Action** - The stage when the practice built up in the preparation stage is put to work. The beliefs are now that it is important and possible to stop the addictive behaviour. This stage needs to be actively supported while the pull to slide backwards is actively countered (in contrast to the previous stage when backsliding is characteristic).
- **Maintenance –** This stage is vital in maintaining a new, lower baseline of behaviour. This stage needs to be kept up and can often be lost with reversion to the behaviour characteristic of preparation and action.

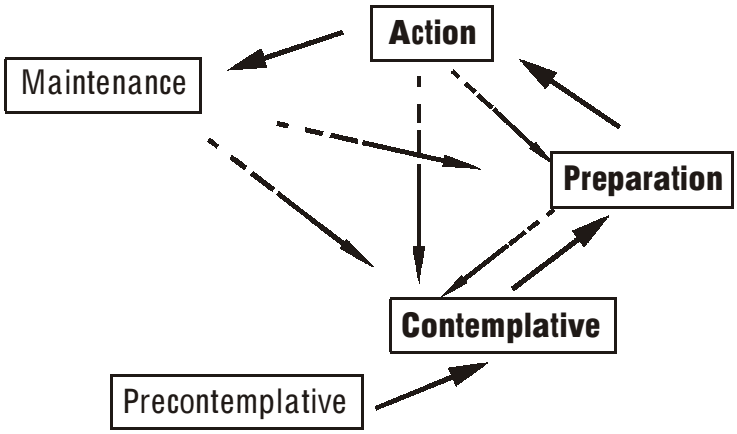

Figure 7. Prochaska & DiClemente's change model. The dotted lines denote possible ways to fall back. Note that it is not possible to revert as far as the pre-contemplative mode once one has become aware. The remaining stages are, however, unfortunately quite possible as anyone who has tried to give up smoking knows.

Figure 7 shows the basic set of transitions from precontemplative through to maintenance, with back-sliding as dotted lines. The step back to precontemplative is not possible (i.e. the values remain intact, but beliefs in the possibility of meeting them may be severely damaged). What is contemplated will be different at each stage of safety culture, so the transition from proactive to generative includes concepts, values and beliefs incomprehensible to those at lower stages. The application of this transition process leads to a spiral when we take safety culture into account.

What is important in this model is the recognition of which stage a patient finds themselves in and the methods available to shift them through the transition from one stage to the next. The stages will require the definition of tools to determine which stage individuals and groups (in organisations) are currently in. The *transitions* that have to be made will require change tools. The term stage is used to refer to one of these treatment situations. A transition takes place between stages.

A change model for organisations

A more articulated model has been developed for managing successful change within organisations. Its strength comes from the fact that it is intended to change both the individuals and the organisations they constitute, and realises that changing the one without the other is impossible. This model, shown below in Table V, puts together the requirements for change of individual beliefs that are so crucial in cultural development. What we have learned is that awareness is not

enough, the creation of personal need and belief in the value of the outcome is equally vital in ensuring a successful process for the organisation as a whole.

The model is very similar to any quality system Plan-Do-Check, but the internals of the stages, especially the Awareness and Planning stages, are often missed or treated very summarily. All too often, the active participation of those involved, in the awareness and planning stages, is replaced by a plan of action defined elsewhere. Such models are purely top-down, with plans typically handed down from senior management, external corporate departments or consultants. What are needed are: (I) the creation of a personal need to change, (II) a belief in the ability to effect such change and (III) the clear understanding that individuals have control over their own process. These are factors that have been repeatedly found in the literature on motivation to influence final outcomes positively. It is just these factors we feel get to the Hearts and Minds of the workforce. When the beliefs and values associated with a new (and hopefully better) state have been assimilated and internalised, then the change has really taken place. This model can apply to safety, but it can also apply to Cost Leadership or any other desirable development in an organisational environment. It gives substance to the oft-heard cries for workforce involvement and shows where and why such involvement is crucial, especially in the later stages of evolution towards a full safety culture.

Pre-contemplation to Contemplation - AWARENESS

- *Awareness* – Simple knowledge of a 'better' alternative than the current state
- *Creation of need* – Active desire to achieve the new state
- *Making the outcome believable* – believing that the state is sensible for those involved
- *Making the outcome achievable*- making the process of achieving the new state credible for those involved
- *Information about successes* - provision of information about others who have succeeded
- *Personal vision* - definition by those involved of what *they* expect the new situation to be

Contemplation to Preparation - PLANNING

- *Plan construction* - creation by those involved of their *own* action plan
- *Measurement points* - definition of indicators of success in process
- *Commitment* - signing-up to the plan of all involved

Preparation to Action - ACTION

1. *Do* - start implementing action plan
2. *Review* - review progress with concentration upon successful outcomes
3. *Correct* - reworking of plan where necessary

Maintenance - MAINTENANCE

- *Review* - management review of process at regular (and defined in advance) intervals
- *Outcome* - checks on internalisation of values and beliefs in outcome state

Table V. The articulated Change Model for Organisations. Prochaska and DiClemente's original five stages are elaborated to 14 to cover the details required in real settings.

What are the barriers to success?

If there were no barriers, the development of a safety culture would never form a problem and safety cultures would abound. Why, then, do attempts fail? The reasons are to be found in the beliefs and practices that characterise an organisation and its members. In many cases organisations will naturally limit their development unless active steps are taken. In the worst cases organisations may actually revert. As all organisational cultures past the Pathological hold safety high in their value systems, reversion may appear to the participants to be less significant than it actually is. When reverting organisations may trade in beliefs and practices, justifying what they do by reference to values. But as there are few differences in the values between any organisations past the pathological, while the beliefs and practices are critical, this justification has to be recognised as specious.

Bureaucratic cultures

One major reason is that the bureaucratic culture associated with the calculative safety culture is a powerful and comfortable one. An organisation that has struggled to become proactive may easily revert, especially in the face of success. Generative organisations have many characteristics that are essentially anti-bureaucratic; the hierarchical structures break down under high-tempo operations (18). What this demonstrates when it happens is that the beliefs, usually of top management, have never really moved on. The move from proactive to generative is also hard to make because, while the calculative and proactive stages may be fairly easy to identify and therefore acquire, the generative stage is more elusive. In a sense every calculative organisation will be the same, or at least very similar, despite differences in the tasks such organisations face. A generative organisation, in contrast, will be structured in ways specific to the tasks it has to accomplish. Therefore every generative organisation is likely to be subtly different from every other one. This makes it much harder to define where one is going when trying to transit from proactive to generative. It also makes it much easier to succumb to the temptation to prefer a well-defined organisational structure over an organisational process that is much harder to regulate.

Regulators and the law

The Regulator, possibly surprisingly, forms a barrier to development. This will not be the case in the earlier stages, going from pathological to reactive and on to

calculative. The later stages will be harder because they often involve dropping just those facets, such as specialised safety staff and extensive management systems, that regulators require (by law) and that got the organisation there in the first place. Regulators are, with some honourable exceptions, more inclined to the letter than the spirit of the law. This can mean that an experimental improvement, typical of generative and proactive organisations, may well be actively discouraged. The fact that things might well get better is often irrelevant to the legal mind. The simplest remedy for this problem is a goal-setting regime.

The problem faced by an enlightened regulator is that the law allows few distinctions based upon track record in the face of outcomes. What we are looking for is a regulatory regime that is measured against the aspirations of organisations and the degree to which they attempt to attain them. In this sort of regime setting almost impossible standards is laudable, while failing to meet them is not necessarily reprehensible. What counts is the activity and the whole-hearted commitment. In such a regulatory regime meeting low standards might well attract more attention from the regulator than failing to meet high standards. While such enlightened regulatory regimes do not exist, regulators may remain a block to progress by the best.

One approach taken by enlightened regulators is to reduce the audit frequency for cultures that they perceive as more advanced. The trust and informedness characteristic of the advanced cultures means that they are essentially continuously self-auditing. What regulators need to audit is the culture, not the detailed activities that are performed. The consequence of this is that cost-effectiveness can be increased, just for those organisations that have tried the best.

Management failure

Changes in top management, or management's priorities, at critical periods, may prove fatal to the successful transition to a higher safety culture. A cultural change is drastic and never takes place overnight. If a champion leaves, there is often no-one to take up the fight and the crucial top-down impetus is lost. But even without a personnel change there are two threats to the successful transition to a higher level of safety culture. One is success, the other failure. In the case of success, effective processes, tools and systems may be dropped, because the problem is perceived to have gone away. In the case of failure, old-fashioned approaches may be retrieved on the grounds that they worked before. But in both of these cases the

new, and often fragile, beliefs and practices may not have become sufficiently internalised to survive changes at the top.

A common problem in organisations that are struggling on the borderline between the calculative and the proactive/generative levels is success. Once significant improvements in outcome performance have been achieved management 'take their eyes off the ball' and downgrade efforts on the grounds that the problems have been solved. But this is behaviour typical of the reactive stance and represents a reversion. Management have to be truly committed to the maintenance of an advanced culture in the face of success, and such commitment is rare.

Change is hard

One final underlying reason why cultural change often fails to succeed is that the new situation is unknown to the participants. If this is added to existing beliefs, such as the belief that the current situation is as good as it gets, then there is little real need to change and failure is almost certain. If these failures are at the level of the workforce, then strong management commitment may save the day. If the problems lie with management, then there is little hope because they will enforce the old situation, which feels most comfortable, on the most proactive of workforces. A colleague has likened this to learning a new golf swing by changing the grip and the stance (21). At first the new position hurts, the old grip position much more comfortable. It takes time before the benefits of a new grip and the altered stance come through, you have to trust the pro, but you have to do the work! One advantage of this metaphor is that managers often play golf and can transfer their experience of learning a new swing to learning to manage an advancing culture. Change agents are like golf professionals, they can help develop a person's game, but they can't play it for them.

Conclusion

Safety management systems and associated safety cases can make a big difference. The systematic approach means that the hazards of the business are known, understood and demonstrably controlled. There is considerable evidence that those companies that are most safety-minded are also amongst the most profitable and the amounts of money that an effective safety management system can produce is considerable (22). But the problem with purely systematic management is that such activities can be carried out mechanically. The argument was that the

next step is the development of a safety culture that makes a system come alive (9).

The discovery that a safety culture pays, not just by reducing accidents, is crucial. One way a safety culture pays off, as the levels of trust improve, is in the quality of communication between management, and the rest of the company. As communication failures are always pointed to as a source of problems for organisations, having a definitive focus for improving communication can only result in improved performance at all levels. Another way a safety culture pays is in the reduction in time and paperwork devoted to checking whether elementary safety-related actions are carried out. The other main reason why safety makes money lies in the fact that, if one has the guarantee of safety that an effective management system provides, then one can devote resources more effectively and take (profitable) risks that others dare not run. What costs money is not safety, but bad safety management. Once the management of an organisation realises that safety is financially rewarding and that the costs incurred have to be seen as investments with a positive return (22), the road to a full safety culture should be open.

Given the financial inducements, why don't organisations try and develop the most advanced forms of safety culture? The answer seems to be contained in the type of culture the organisation is at the time. Pathological organisations just don't care. Reactive organisations think that there is nothing better and anyone who claims better performance is probably lying. They do what they feel is as good as can be done. Calculative/Bureaucratic organisations are hard to move because they are comfortable, even if they know that improvement is possible. The more advanced cultures, either Proactive or Generative, are probably easier to attain with small organisations. Large ones will inevitably be heavily bureaucratic unless active steps are taken to counter that tendency. The greatest challenge, then, is to shift large organisations.

Small organisations are often frightened to develop management systems, because they feel that they will commit more than they get back. I hope I have been able to argue that this is not the case. Small organisations are smaller, more focussed and flexible. Small organisations are also much more likely to be able to develop past the calculative stage and become generative. The greatest single barrier to success for smaller organisations is the belief that it is too difficult. The opposite view is that, in the long term, it is more dangerous not to.

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Expect the Worst, Achieve the Best

What is the role of OHSMS in helping to secure healthy and safe workplaces?

Dennis Else & Philip Beaumont

Address for correspondence:
Professor Dennis Else, Chairman, NOHSC
Protector Professor of OHS,
University of Ballarat, Victoria.

Introduction

Occupational Health and Safety Management Systems (OHSMS) now figure heavily in the thinking and strategies of the OHS jurisdictions and the management of many Australian organizations. What needs to remain in focus, however, is the requirement under duty of care legislation that OHS be managed in a systematic fashion and that effective internal control of OHS is achieved. Whether an organization has an OHSMS in place or not is secondary to these requirements and although an OHSMS is undoubtedly a useful tool to organize and execute the activities underpinning a systematic approach to managing OHS, an OHSMS can potentially be part of the problem rather than the solution.

Despite the widespread promotion of OHSMS and the committed view of most OHS stakeholders that OHSMS are needed, there remains a range of issues and concerns regarding the use of OHSMS and their effectiveness. The National

Occupational Health & Safety Commission (NOHSC) has a part to play in furthering the examination of these issues and the thinking that currently surround OHSMS and to keep the focus on improving OHS prevention efforts. NOHSC has an important role in:

- Speeding up and maximizing opportunities for learning through networks across states, territories, professionals and workplaces;
- Evaluating whether OHS prevention strategies and methods, like OHSMS, do work.

These functions have become part of the responsibilities enshrined by the National OHS Improvement Framework. The National Framework, released by NOHSC in December 1999, has arisen partly as a result of the success of the concerted and coordinated national effort to reduce road fatalities over the past two decades. The experience of reducing road deaths via a national effort has provided a model for improving OHS performance.

National Improvement OHS Improvement Framework

The Framework sets out the principles underpinning a systematic approach to better OHS outcomes at all levels, discusses national goals and objectives and the development of national targets, and identifies the infrastructure requirements that will lead to better national outcomes.

The National Framework for OHS Improvement embraces the adoption of systemic approaches by government and industry. It is based on:

- Locating responsibility for the elimination or control of risk at the source, be that with the designer, manufacturer or supplier, or in the workplace;
- Continuous innovation to develop better, safer and healthier ways of working; and
- Improvement through regular review and audit

The Framework provides a mechanism by which NOHSC stakeholders and other interested parties, such as the OHS Professionals' Organizations, have a direct link to the Workplace Relations Ministers' Council (WRMC). NOHSC will prepare an annual report for the Council on the Improvement Framework. The report will ask OHS stakeholders to provide information regarding the:

- Experience of using and/or implementing the Framework;

- The use of the Framework in strategic planning, goal identification, planning activities; and
- Comments regarding the strengths or weaknesses of the Framework

The report will provide a stock take of the activities undertaken by OHS stakeholders to address the nine national infrastructure goals and action areas identified in the Improvement Framework:

1. Data collections
2. Research
3. National standards
4. Compliance
5. Enforcement
6. Incentives
7. Awareness
8. OHS skills development
9. Practical guidance

The stock take will describe the activities undertaken by the OHS stakeholders to address the national infrastructure goals. OHS stakeholders will report on each of the nine action areas and give examples of best practice and of successful programs, providing OHS stakeholders with an opportunity to showcase their work. This format will also enable comparison with other initiatives and programs, from Australia and internationally where possible, and provide a discussion of possible areas for future actions and initiatives in order to maximize learning opportunities. As part of the action area Compliance Support, OHSMS-specific goals are set:

- Develop guidance on OHS management systems
- Establish auditing mechanisms which can test and authenticate management systems

Clarification of the role of OHSMS in compliance with regulations is important and OHS stakeholders will provide detail on what they have achieved with regard to these OHSMS goals and actions. The report to WRMC will also detail information on approaches to target setting for OHS performance improvement and information regarding benchmarking OHS outcomes. The first report on the National Improvement Framework for WRMC is due in November 2000.

OHSMS and National OHS Improvement Framework

OHSMS are now a major part of the OHS landscape in Australia and have the potential to significantly contribute to OHS achievements in the future. The National OHS Improvement Framework will assist in clarifying the role of OHSMS as well as determining ways to gauge their effectiveness in securing healthy and safe workplaces. It will also assist in sharing knowledge on how best to make OHSMS effective. Such information is especially important given the apparent lack of objective evidence demonstrating that OHSMS deliver OHS improvement and the suggestion that OHSMS can, under certain circumstances, hinder OHS efforts.

In his 1999 *OHSMS Strategic Issues Report* for NOHSC, Bryan Bottomley noted "There is limited evidence about the ability of OHSMS to prevent major incidents involving death, serious injury, ill health or disease and damage to property and the environment." The findings of the Leon Commission (Commission of Inquiry into Safety and Health in the South African Mining Industry, 1996) found that some organizations with highly sophisticated and credentialed proprietary OHSMS still had alarmingly high fatality rates. The Longford Royal Commission (1999) reported that "Even the best management system is defective if it is not properly implemented. The system must be capable of being understood by those expected to implement it." The use of an OHSMS can mask OHS problems, delude an organization into perceiving it is effectively managing OHS and distract effort and resources away from OHS towards the management system itself. Dust-covered tomes sitting on a shelf are not likely to be achieving effective OHS control!

Of significant concern is the view that the widespread promotion and adoption of OHSMS may spawn an external auditing and certification frenzy in the wake of the quality assurance movement that has swept the country. Although it is generally acknowledged that the management of OHS should be integrated with other management activities, like quality and environment, it is important that the assurance function remains in proportion. There is a danger that too much emphasis could be placed on assurance, because of the vigorous promotion of the benefits of certified systems by the unscrupulous and the naïve alike. An over-emphasis on the assurance programs of an OHSMS may result in expensive, complicated paper-based systems that are not effective in securing OHS.

Effective OHSMS must also be capable of ensuring OHS effort is distributed proportionally. A system may be consumed by managing a range of lower consequence events that occur frequently leaving no capacity to consider low probability

yet high consequence problems. An OHSMS can disproportionately move effort to the unimportant and if it is flat out dealing with slips and trips it may not be managing the deep risks in an organization. The OHSMS must be able to move the attention and activity of the organization onto the risks that potentially have catastrophic consequences, as well as dealing appropriately with day-to-day concerns.

An OHSMS may lead an organization into the trap of falsely believing that their OHS is being managed. An effective OHSMS should, however, create as unease about whether effective OHS internal control is being achieved and demonstrate a preoccupation with failure. The OHSMS should be constantly pointing out the potential for failure and discovering unexpected events. But as well as creating unease about the likelihood of failure, the OHSMS should be providing confidence that the unexpected can be dealt with. It should provide an organization with the competence to deal with failure if it occurs rather than being paralyzed with the realization of the hazard and risk. The OHSMS paradox is that an organization's systems must continuously assume it is failing to deliver internal OHS control for it to be achieving the best level of internal control.

Challenges for OHSMS

Two major challenges exist for OHSMS to make an effective and significant contribution to OHS improvement. The gap between what occurs in practice and what is represented on paper by an OHSMS needs to be closed. An OHSMS should link OHS activity directly to work tasks and resolve OHS problems as they relate to a task or job. Ideally the paper aspects of an OHSMS need to be minimized if not gotten rid of. Secondly, suitable methods for testing the performance of OHSMS need to developed and implemented.

The Government of Hong Kong has achieved a dramatic reduction in accidents and fatalities in their public works and construction industry since the introduction of a scheme revolving around OHSMS in the mid-1990's. The Government introduced an OHSMS package including a Pay-for-Safety Scheme and an Independent Safety Audit Scheme. The package also fostered a partnering approach that ties organizations contracting for major works into joint responsibilities for ensuring high OHS performance. The centerpiece of the package has been the production of a simple yet effective OHSMS, which is provided on CD free of charge by the Government. Apart from structuring the management of OHS, the OHSMS is a learning guide. But of greatest impact, especially for small and medium enter-

prises, is that the OHSMS acts as a planning tool for general business activities. OHSMS is integrated into overall business management so that it has parity of importance with other management activities and is not forgotten. The OHSMS has fostered a more structured approach to business management generally through improved documentation and standardization.

The effectiveness of an OHSMS, and its ability to adapt and improve, hinges on how well its performance can be evaluated. An OHSMS must be capable of measuring the indicators that unambiguously reflect its performance in achieving its primary objective, that is, delivering internal control and systematic management of OHS. Dr Anthony Boyle, in his paper *If You Can't Measure It, You Can't Manage It* (2000), identifies four principles that should be applied to the evaluation of an OHSMS's performance:

1. If it can't be measured it can't be managed
2. Make what is important easy to measure rather than what is easy to measure important
3. What gets measured gets done
4. Management gets what management inspects, not what management expects

The essential message is that performance testing must equal reality testing. This concept is reflected in the newly released OHS (Major Hazard Facilities) Regulations 2000 in Victoria. The Regulations contain innovative clauses on OHSMS performance measurement that require the setting of standards, indicators, audits and methods for testing those standards are met.

OHSMS should be based on active monitoring and auditing with performance being measured using appropriate process or lead indicators, such as the speed of hazard control and hazard "closed out" rates. Guidance on the Development of Positive Performance Indicators is available from NOHSC – www.nohsc.gov.au

The speed of response following hazard identification is a powerful indicator, not just in terms of accurately reflecting OHS performance, but because it reflects that on-going learning is occurring. Managers may also view this sort of indicator as significant in providing an insight into the overall state of an organizations capacity for improvement and continuous learning. Such performance measures, as part of an effective OHSMS, can motivate executives and managers to take further action to improve OHS.

Screened Investments

A potent motivator that is emerging is the trend towards ethical and screened investments. Increasingly, investment choices will be made not only on the basis of return but also according to the profile of a company and how well it measures up against an investor's personal values. People will choose to invest, either directly or indirectly through their superannuation funds etc., in organizations that provide assurance that their activities are not violating the investor's personal values. Investment choices will be made according to screens set up to rank various organizations in terms of their performance and risk in certain fields. There is at least one bank in Australia, Westpac, which is providing investment choices based on an OHS screen. And the good news is that the history of screened investment is that they out-perform their non-screened competitors in terms of return to investors.

The relatively high level of share ownership by Australians makes the notion of OHS screened investments a powerful motivating factor in ensuring Australian organizations improve their OHS performance. It is also likely that investment houses will look to an organization's OHSMS as providing the means of ranking organizations.

Conclusion

The work of the NOHSC OHSMS project aims to understand and develop the role, function and potential of OHSMS as a mechanism for encouraging all Australian workplaces to adopt a more systematic approach to the management of OHS. The project's current activities are focusing on closing the gap between paper and practice in OHSMS by developing competencies for OHSMS auditors. The project is also conducting a review of the evidence on whether OHSMS are effective in securing healthy and safe workplaces as well as the best methods for measuring the performance of OHSMS. This work, in addition to the information and learning captured via the National OHS Improvement Framework, will add to the knowledge and infrastructure that is determining a more effective role for OHSMS in Australia.

While OHSMS promise to play a significant role in OHS improvement strategies and efforts, it is vital that they remain focused on their essential role of delivering internal control and systematic management of OHS. For the gap to be closed between what OHSMS provide on paper and what occurs in practice, OHSMS

must be integrated with other systems that deliver continual improvement but not be overtaken by quality assurance programs. OHSMS must not lull organizations into thinking they have managed OHS effectively while concealing real and major hazards and risks. The role of the OHSMS is to seek out failure and to place effort where it can prevent high consequence events. And for the effectiveness of OHSMS to be measured in ways that provide an assessment of reality, appropriate performance measure need to be developed and adopted. These are some of the challenges facing OHSMS before they achieve best practice.

Lessons from Esso's Gas Plant Explosion at Longford

Andrew Hopkins

Address for correspondence:
Dr. Andrew Hopkins
Research School of Social Sciences
Australian National University
email:andrew.hopkins@anu.edu.au

Introduction

In September 1998 Esso Australia's gas plant at Longford in Victoria suffered a major fire. Two men were killed and the state's gas supply was severed for two weeks, causing chaos in Victorian industry and considerable hardship in homes which were dependent on gas.

What happened was that a warm liquid system (known as the "lean oil" system) failed, allowing a metal heat exchanger to become intensely cold and therefore brittle. When operators tried to reintroduce warm lean oil, the vessel fractured and released a large quantity of gas which found an ignition source and exploded.

In what follows I shall trace the reasons for this event, relying on evidence provided to the Royal Commission which investigated the disaster. (For further details see[1]).

Operator Error?

There is often an attempt to blame major accidents on operator error. This was the position taken by Esso at the Royal Commission. The company argued that operators and their supervisors on duty at the time should have known that the attempt to reintroduce a warm liquid could result in brittle fracture. The company claimed that operators had been trained to be aware of the problem and Esso even produced the training records of one operator in an attempt to show that he should have known better. However, the Commission took the view that the fact that none of those on duty at the time understood just how dangerous the situation was, which indicated a systematic training failure. Not even the plant manager, who was away from the plant at the time of the incident, understood the dangers of cold metal embrittlement.[2] The Commission concluded that inadequate training of operators and supervisors was the "real cause" of the accident[2]. It is clear therefore that operator error does not adequately account for the Longford incident. This is a general finding of all inquiries into major accidents[3].

Although the Commission spoke of inadequate training as the "real cause", we are entitled to ask: "Why was the training so inadequate?" or more generally "Why were the operators and their managers so ignorant of the dangers?" And as soon as we ask these questions, a host of other contributory factors come into view. We need to uncover these more fundamental causes in order to identify the real lessons of Longford.

The Failure to Identify Hazards

A major contributing factor was the fact that Esso had not carried out a critical hazard identification process, standard in the industry, know as a HAZOP (short for hazard and operability study, see [4]). This procedure involves systematically imagining everything that might go wrong in a processing plant and developing procedures or engineering solutions to avoid these potential problems. HAZOPs had been carried out on two of the three gas plants at the Longford refinery but not at gas plant one, the oldest of the three. A proposed HAZOP of this plant had been deferred indefinitely because of limited resources. By all accounts a HAZOP would have identified the possibility of cold temperature embrittlement caused by a failure of the lean oil system. Even Esso's parent company, Exxon, acknowledged that the failure to carry out this HAZOP was a contributing factor to the accident. The failure to identify this hazard meant that operating instructions made no mention of what to do in the event of lean oil failure and the result was that

operators neither appreciated the seriousness of the problem when it arose nor knew how to handle it. In short, inadequate training was a consequence of inadequate attention by the company to hazard identification.

The Failure of the Safety Management System Audits

The Royal Commission severely criticized Esso's safety management system (OIMS) and the auditing of that system. "OIMS, together with all the supporting manuals, comprised a complex management system. It was repetitive, circular, and contained unnecessary cross-referencing. Much of its language was impenetrable"[2]. As for the auditing of the system, Esso had conducted a major audit of OIMS less than a year before explosion. This audit failed to identify any of the problems which gave rise to the explosion, and in particular, failed to uncover the fact that the critical hazard identification process had not been carried out. The Royal Commission states that "it can only conclude that the methodology employed by the assessment team was flawed"[2].

The failure of audits to identify problems revealed in post-disaster inquiries is unfortunately commonplace. Following the fire on the Piper Alpha oil platform in the North Sea in 1987, in which 167 men died, the official inquiry found numerous defects in the safety management system which had not been picked up in company auditing. There had been plenty of auditing, but as Appleton, one of the assessors on the inquiry, said "it was not the right quality as otherwise it would have picked up beforehand many of the deficiencies which emerged in the inquiry"[5]. In fact audits on Piper Alpha regularly conveyed the message to senior management that all was well. In the widely available video of a lecture on the Piper Alpha disaster Appleton makes the following comment:

> When we asked senior management why they didn't know about the many failings uncovered by the inquiry, one of them said: "I knew everything was all right because I never got any reports of things being wrong". In my experience , ... there is always news on safety and some of it will be bad news. Continuous good news - you worry. (ICI video recording of a lecture by Appleton)

Appleton's comment is a restatement of the well know problem that bad news does not travel easily up the corporate hierarchy. High quality auditing must find ways to overcome this problem.

Esso's managing director reported to the inquiry that the Esso audit had shown that most elements of the safety management system were functioning at level three or better. "(Several elements of the safety system) were assessed at level 4, the highest assessment level", he said. He noted also that an internal review in May 1998, 4 months before the explosion, "highlighted a number of positive results", among them, six months without any recordable injuries... high levels of near miss reporting .. and major risk reduction projects." (T5455).

This was clearly the "continuous good news" which Appleton had said was a cause for concern. It indicated that Esso's auditing was not of sufficient quality.

The Failure of Esso's Incident Reporting System

There were numerous warning signs that things were going wrong at Longford. For instance, hours before the incident, ice was visible on piping which was normally too hot to touch. This was a direct precursor to the accident but the full significance of the anomaly was not recognised and there was no effective response. A similar cold temperature incident a month earlier had been allowed to pass without an investigation.

Ironically Esso's safety performance at the time, as measured by its Lost Time Injury Frequency Rate, was enviable. The previous year, 1997, had passed without a single lost time injury and Esso Australia had won an industry award for this performance. It had completed five million work hours without a lost time injury to either an employee or contractor. Skeptics might wonder whether this outcome was achieved by bringing the "walking wounded" back to work the day after an accident to prevent it counting as a lost time injury, a common practice in organisations which are assessed on the basis of their LTI performance. The answer to the skeptics is provided by Esso's figures on total recordable injuries, defined as injuries which require treatment by a doctor or which prevent the injured person from performing any part of their normal duties. In May 1998, just four months before the accident the company had gone six months without a single recordable injury. Finally, it should be noted that Esso's performance had been sustained; its LTI statistics for the whole period from 1990 to 1998 had been well ahead of the industry average.

To understand this paradox of how a company with such an enviable safety record was apparently so inattentive to the hazards which led to the fire we need to make a distinction between, on the one hand, high frequency low severity events such

as slips, trips and falls, which result in injury to single individuals and, on the other, low frequency high severity incidents such as explosions and major fires, which may result in multiple fatalities. LTI data are largely a measure of the number of routine industrial injuries; explosions and major fires, precisely because they are rare, do not contribute to the LTI figures in the normal course of events. LTI data are thus a measure of how well a company is managing the minor hazards which result in routine injuries; they tell us nothing about how well major hazards are being managed. Moreover, firms normally attend to what is being measured, at the expense of what is not. Thus a focus on LTIs can lead companies to become complacent about their management of major hazards. This is exactly what seems to have happened at Esso.

Esso had achieved its remarkable record by introducing a series of initiatives explicitly aimed at preventing minor injuries. For instance, it set great store by its "step back 5 x5" program. This required workers, every time they began a new job, to take five steps back (metaphorically) and spend five minutes thinking about the possible hazards of the job and means to control them.

Let us consider in more detail why Esso did not respond to the warnings. The petroleum coming ashore from the Bass Strait platforms is quite variable in makeup and the job of the Longford plant is to refine this product to specifications provided by Esso's customers. This variability in what enters the plant, as well as what goes out, can at times lead to "process upsets" which operators must manage. The failure to manage these upsets satisfactorily can sometimes affect the quality of product delivered to customers; it can also potentially affect the safety of the plant. The various cold temperature incidents which resulted in icing on pipes were examples of such process upsets.

Esso had a well developed incident and near miss reporting system. Senior managers read the reports daily and there was a clear protocol about follow-up action. In practice, process upsets were not treated as incidents or near misses and were thus not reported, although they could and should have been. Even process upsets serious enough to lead to temporary shut down of the plant failed to enter the reporting system. There was no good reason for this. Management's view was that it was up to the operators to report matters if they thought they had an "escalation potential" (T4132). But in practice neither operators nor more senior staff seemed to have considered the escalation potential of process upsets. None of the warning signs referred to above was reported in either of these systems. Had

they been they would have triggered investigations which would very probably have uncovered the problem which led to the disaster (T6546).

Instead, Esso's reporting systems were primarily used to report injuries to individuals, or incidents with the potential to cause injury to an individual. In this way, Esso's reporting system was transformed into a tool for dealing with lost time injuries and their value for disaster prevention was systematically undermined. According to counsel assisting the inquiry, this "lack of focus on process issues is a matter of grave concern" (T6535) . To put it bluntly Esso's focus on lost time injury rates distorted its safety effort and distracted the company's attention from the management of major hazards.

Clearly the lost time injury rate is the wrong measure of safety in any industry which faces major hazards. An airline, for instance, would not make the mistake of measuring air safety by looking at the number of routine injuries occurring to its staff. The number of injuries experienced by baggage handlers tells us nothing about flight safety. Moreover the incident and near miss reporting systems operated in the industry are concerned with incidents which have the potential for disaster, not lost time injury. Similarly, nuclear power stations in the United States have developed a number of indicators of plant safety which have nothing to do with LTIs. The challenge then is to devise ways of measuring safety in industries which face major hazards, ways which are quite independent of lost time injuries.

Designing a Reporting System to Avert Disaster

Prior to any disaster there will nearly always be warning signs - information somewhere within the organisation that trouble is brewing. The challenge is to find ways to assemble this information and move up the hierarchy to the point where it can be understood and responsibly acted on.

Any company which faces major hazards is likely to have an e-mail system or something similar which can greatly facilitate the flow of information up the hierarchy. The suggestions which follow depend in large part on this kind of technology.

The starting point is an incident or near miss reporting system. But if this is to have any chance of gathering relevant warning signs, management must put considerable thought into specifying what sorts of things should be reported: what are the warning signs that something might be about to go disastrously wrong? Some examples of warning signs are listed in Box 1.

Box 1. Examples of warning signs.

certain kinds of leaks
certain kinds of alarms
particular temperature, pressure or other readings
maintenance not being done
dangerous work practices
machinery in a dangerous condition

Management should also consider whether anyone on site is required to fill out an end of shift report. If so, might these reports contain warning information which should be entered into the reporting system?

Workers on site should be encouraged to report not only these matters but also any others about which they are concerned. In some circumstances workers will be frightened to make reports for fear of reprisals. Management will need to find ways to overcome these fears.

It is not enough that people make reports or pass information up the line. The outcome must be fed back in the form of a written response to the person who made the initial report. This will improve the morale of reporters and they will be motivated to take the reporting process more seriously. In the absence of such feedback, reporting systems are likely to break down.

To be truly effective the process must not terminate at this point. The next step is to require the person who initially raised the matter to indicate whether the action taken is satisfactory in his or her view. Where the initiator is not satisfied the matter should cycle through the system again until such time as the initiator is satisfied, or alternatively, some senior manager of the company is prepared to over-ride the concerns of the initiator, in writing.

Reporting systems must also specify a time by which management must respond, and people making reports should be able to some extent to specify how urgent the matter is and therefore how quickly they require a response, eg within a day, within a week, within a month.

Moreover, if the person to whom the report is made does not respond within the required time the system must escalate, that is, send the message further up the

corporate hierarchy. This not only draws the attention of more senior managers to the problem but also alerts them to the fact that their subordinates may not be responding appropriately. This chain of escalation should end up on the screen of the CEO.

If properly implemented such systems will go a long way towards ensuring that warning of impending disaster gets to the top of the management hierarchy, into the hands of people who can do something about it. And the good news is that such systems are already commercially available.

All this depends, however, on whether the system is properly implemented. Ultimately this turns on whether the person at the top of the information chain, the CEO, is committed to making it work or not. If the CEO allows messages to sit unanswered on his or her screen the system may end up a flop. But if the CEO responds by asking why the message has not been answered further down the line, the chances are the system will work.

Such systems must also be carefully audited, that is, tested to see if they are working. One such test is to track some of the information flows which have occurred to see whether bad news, or at least news of problems, is indeed being entered into the system and responded to. Another test strategy might be to enter a significant warning into the reporting system and see how the system responds. Experience shows that no reliance should be placed on the system described above unless and until it passes these kinds of tests.

The Failure of the Alarm System

Operators at the Longford plant were required to keep operations within certain parameters (temperature, volume etc). When the process went outside these parameters alarms would both sound and light up on control panels. The sound could be, and was, silenced immediately, but the visual indicators would remain until the process returned within the specified parameters. In practice, alarms were very frequent - hundreds and sometimes thousands every day. It was clearly impossible for operators to monitor these alarms, let alone respond to them, and they had become accustomed to operating the system in alarm for long periods. Operating in alarm mode was tolerable in some circumstances, but operators had no way of distinguishing critical alarms from nuisance alarms. The result was that operators became desensitised and alarms consequently lost their capacity to serve as warnings. It was the failure to respond adequately to these alarms which led to

the failure of the lean oil system which in turn led to the cold temperature embrittlement of the heat exchanger.

A similar process of normalising the warning signs has preceded other disasters. Prior to the Challenger space shuttle disaster there was evidence that the so-called O-ring seals on the booster rockets malfunctioned at low temperature. But previous launches at low temperature had not ended in disaster and so the malfunction had come to be accepted as normal. On the launch date in question the atmospheric temperature was even colder than usual, but the expected malfunction had been normalised and the launch was given the go-ahead. On this occasion the O-rings failed totally with catastrophic results.

Similarly, prior to the Moura mine disaster in central Queensland in 1994 in which 11 men were killed, warning alarms had become so frequent that they were regarded as normal and so discounted[6].

Inadequate Oversight by Senior Staff

The Royal Commission was critical of inadequate oversight of the production process by senior Esso staff. Esso had relocated all its engineers from the Longford site to head office in Melbourne in 1992. Some of these engineers were intended to operate from a distance as a "plant surveillance group" but the group did not carry out this function satisfactorily. For instance, it failed to notice or react to the frequency of alarms being generated by process upsets and it failed to recognise the danger of allowing operators to become accustomed to operating the plant in alarm mode. It was this failure of oversight which allowed critical alarms to be ignored. As the Commission put it, "the absence of regular monitoring of process operations by senior personnel in a high pressure hydrocarbon processing plant, which was not equipped with protective devices to make it completely fail-safe, exposed the plant to an unacceptable risk".

To generalise to other industries, it is vital that processes which can result in disaster be carefully managed by senior staff. Esso's policy at Longford was to leave the management of process upsets to the operators on the assumption that they knew best. In the words of the company's managing director, "operations personnel are best placed, given their experience in operating plants, to deal with operating matters including process upsets" (T5460). In the matter of disaster prevention, this is an unacceptable position. Senior management must accept responsibility for the management of hazardous processes.

The Need for a Safety Case Regime

Th so-called safety case approach is recognised as best practice regulation for major hazards facilities such as Longford. Safety case regimes operate in Europe and also in Australia, for the off shore oil industry. The National Occupational Health and Safety Commission has recommended it be adopted for all major hazards facilities in this country[7].

A safety case is a case which the operator of a hazardous facility makes to the regulator, setting out how safety is to be managed. It must include details of the hazard identification process, the hazards which have been identified and the procedures which have been set in place to control them. Such cases must be approved by the regulator before the facility is allowed to operate. The system remains self-regulatory in principle but rather than the facility being left to its own devices by the regulator it must convince the regulator that its strategy for managing safety is satisfactory. Under any safety case regime, facility operators are expected to adopt best practice risk management. In the oil industry this means the performance of HAZOPs on all plant.

At the time of the Longford explosion, Esso's off-shore platforms were subject to a safety case regime, administered in part by the federal Department of Primary Industry and Energy, but the Longford facility was subject only to the normal provisions of the Victorian *Occupational Health and Safety Act 1985*. Esso had performed the necessary HAZOPs off-shore but had not done so at its oldest on-shore gas plant at Longford. In a sense therefore the self-regulatory regime in Victoria had allowed Esso to fall short of best practice in the management of safety at its Longford facility. The Royal Commission concluded that all major hazard facilities in Victoria should be required to make a safety case to an appropriate regulatory body.

Conclusion

This paper has analysed the findings of the Royal Commission into the major accident at Esso's gas plant at Longford in Victoria in 1998. In the process it has identified a number of lessons which are applicable to hazardous industries generally. It is appropriate to summarise those lessons by way of conclusion.

1. Operator error is not an adequate explanation for major accidents.
2. Systematic hazard identification is vital for accident prevention.

3. Auditing must be good enough to identify the bad news and ensure it gets to the top.
4. Reliance on lost time injury data in major hazard industries is itself a major hazard.
5. Good reporting systems must specify relevant warning signs. They must provide feedback to reporters and an opportunity for reporters to comment on feedback.
6. Alarm systems must be carefully designed so that warnings of trouble do not get dismissed as normal (normalised).
7. Senior management must accept responsibility for the management of hazardous processes.
8. A safety case regime should apply to all major hazard facilities.

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An ACTU Perspective On OHSMS

Bill Mansfield

Address for correspondence:
Bill Mansfield
Assistant Secretary
Australian Council of Trade Unions
Lygon Street , Melbourne.

Introduction

I welcome the opportunity to participate in this conference. It is important that there be open and robust debate in Australia about occupational health and safety management systems (OHSMS) . The views of workers and unions should be central to a debate directed to the enhancement of occupational health and safety in Australian workplaces.

I want to outline the Australian Council of Trade Unions (ACTU) approach to some issues relevant to OHSMS, in the context of the ACTU's occupational health and safety policy. These issues are:

(i) Effectiveness of OHSMS
(ii) OHSMS and change in labour markets
(iii) Components of systematic approaches to OHSMS
(iv) OHSMS and regulation and enforcement

(v) The role of the National Occupational Health and Safety Commission (NOHSC)
(vi) OHSMS and competencies
(vii) International guidelines for OHSMS

ACTU OHS Policy

The ACTU Congress met on 26-30 June 2000. A comprehensive policy on OHS was endorsed by the Congress. The policy aims to focus activities of the trade union movement at national, state and territory, industry and workplace levels on the prevention of work-related death, injury and disease.

The policy supports a range of mutually supportive objectives, including:

(i) Enhanced union involvement in health and safety
(ii) Advancement of OHS through provisions in legislation, awards and industry / enterprise agreements
(iii) Development and implementation of nationally uniform standards and codes of practice
(iv) Integration of OHS into education and training
(v) Support for independent and ongoing OHS research
(vi) Improved collection and analysis of OHS statistics and data
(vii) Compliance by employers with their legal duty of care to provide a safe and healthy working environment and safe systems of work.

The objectives of our OHS policy will inform our approach to OHSMS, as well as other elements of occupational health and safety.

Effectiveness of OHSMS

The ACTU Congress policy on occupational health and safety provides that:

> "The ACTU, Trades and Labor Councils (TLCs) and unions will pursue analysis related to the effectiveness of Occupational Health and Safety Management Systems (OHSMS)."

The ACTU recognises that systematic approaches to OHS are desirable, not only at the workplace but also on the part of governments. However, we are concerned

about the imbalance between the widespread promotion of specific, formal OHSMS and the limited evidence for the effectiveness of such systems.

Advocates of OHS regulation are faced with demands for economic or regulatory impact statements in advance of agreement to regulate. OHSMS, on the other hand, have been promoted vigorously without rigorous articulation of their impact on workplace health and safety.

There has been consistent advice to NOHSC that evidence for effectiveness is limited. I will start by quoting from Clare Gallagher and Bryan Bottomley who are to speak after me today. Clare Gallagher, in her July 1997 report, *Health and Safety Management Systems: An Analysis of System Types and Effectiveness*[1], noted that:

> "The few research studies seeking to draw out the connection between health and safety management systems and injury outcome data give an indication of defining characteristics of better performing enterprises, but they also reflect the methodological constraints relating to the measurement of health and safety performance. Evidence on the performance of alternative systems similarly is scant. This issue does not appear to have been the focus of academic research and has received limited attention in the popular health and safety literature."

Bryan Bottomley reported in his November 1999 *Occupational Health and Safety Management Systems: Strategic Issues Report*,[2], that:

> "There is limited evidence about the ability of OHSMS to prevent major incidents involving death, serious injury, ill health or disease and damage to property and the environment."

Neil Gunningham and Richard Johnstone noted, in *Regulation of Workplace Safety, Systems and Sanctions*[3], that:

> "Unfortunately, only very limited empirical evidence is available as to the effectiveness of SMS."

The other NOHSC parties also are committed to examining the question of the effectiveness of OHSMS. This is evident in the recent NOHSC to undertake a "Review of the Effectiveness of OHS Management Systems in Securing Healthy and Safe Workplaces." The ACTU will be participating in the workshop that NOHSC proposes to convene to discuss the report from this consultancy. We will

be interested in the evidence from Commonwealth, state and territory agencies on the effectiveness of OHSMS.

Changes in Labour Markets

The Work Life 2000 Conference, to be held in Sweden in January 2001, concerns the problems of modern working life. As part of the project a workshop was held in Amsterdam in September 1998 on *Policies for Occupational Health and Safety Management Systems and Workplace Change*. The workshop discussed the implications of changes in the workplace, the workforce and the labour markets of industrialised societies for OHS management. Revised papers by participants in the workshop are expected to be published in October 2000, in *Systematic Occupational Health and Safety Management*, edited by Kaj Frick, Per Langaa Jensen, Michael Quinlan and Ton Wilthagen.

This publication should assist understanding of the relationship between OHSMS and changes in the workplace, the workforce and the labour markets. We need to understand the international debate, and its application to Australia.

The paper by Michael Quinlan and Claire Mayhew for the September 1998 workshop[4] is of interest. Prof. Quinlan and Dr. Mayhew argued that:

(i) The fracturing of the labour market and the growth of precarious employment represent particular threats to the development of OHSMS, but also undermine OHS regulatory regimes more generally.

(ii) The potential of OHSMS to improve general OHS standards will be increasingly constrained without a major re-orientation of regulatory strategies, including not simply those laws which focus on OHS but also the legal structure governing corporate structures, business arrangements, employment, unions and labour standards.

(iii) Labour market restructuring is likely to make it more difficult for even large firms to implement OHS management systems.

Bryan Bottomley's *Occupational Health and Safety Management Systems: Strategic Issues Report* [2] for NOHSC in November 1999, discusses whether OHSMS are relevant to changing labour markets and business structures. He argues that:

> "The suitability of OHSMS to small volatile workplaces is questionable, as the approach assumes a large, static workplace with a stable workforce."

The ACTU recognises that regulatory, enforcement, information and work organisation issues are associated with the OHS impact of changes to the labour market. The relevance of OHSMS across different employers in a workplace characterised by precarious employment, for example, raises particular issues.

The ACTU considers that the relevance of OHSMS to changing labour markets and business structures should be another priority issue to be addressed by NOHSC parties.

Prof. Quinlan and Dr. Mayhew also touch particular union sensitivities in their paper when they argue that:

(i) The growth of precarious employment makes it more difficult for unions to recruit and retain membership and to adequately service those temporary employees who do join.
(ii) OHS legislative changes since the 1970s were predicated on a collaborative approach built on informed employees and a high level of union organisation.
(iii) The OHS management systems approach adopted by a number of countries from the 1980s onwards required an even higher level of employee involvement than did the legislative changes.[4]

The ACTU is strongly of the view that active participation by workers and unions in decisions on health and safety is critical to achieving safe and healthy workplaces and safe systems of work.

The ACTU naturally would be opposed to any OHSMS which demand that all workplace stakeholders help implement a program devised solely by enterprise management.

Our OHS policy provides for a number of actions by the ACTU, state trades and labour councils and unions to strengthen union participation in occupational health and safety, including through unions encouraging and assisting their members to be active as health and safety representatives and/or on health and safety committees.

Components of Systematic Approaches to OHS

The ACTU would also welcome a focus on components of effective systematic approaches to OHS. Some analysis is available through recent reports. For exam-

ple, Clare Gallagher, in her July 1997 report to NOHSC, *Health and Safety Management Systems: An Analysis of System Types and Effectiveness*[1], noted that:

> "The cases with more highly developed health and safety management systems are found to share a range of key distinguishing characteristics, including those highlighted in the studies surveyed on health and safety management system effectiveness."

These cases are reported, for example, to be more likely to:

(i) Ensure health and safety responsibilities are identified and known, including responsibilities set out in health and safety legislation.
(ii) Have senior managers taking an active role in health and safety.
(iii) Encourage supervisor involvement in health and safety.
(iv) Have health and safety representatives who are actively and broadly involved in health and safety management system activity.
(v) Have effective health and safety committees.

Dr. Gallagher's study focused on relatively large work units. Another approach seems to be reflected in the report to NOHSC by Andrea Shaw and Verna Blewett in January 2000, titled *Small – Healthy and Safe?*[5], which focuses on small to medium enterprises (SMEs). Ms. Shaw and Ms. Blewett recommend against encouraging specific, formal OHSMS in SMEs.

However, it appears that despite differences in approach and in size of enterprises studied, some common components of desirable systematic approaches to OHS can be identified, such as:

(i) Priority of elimination of hazards
(ii) Participation of employees in OHS decisions
(iii) Integration of OHS with other activities of the enterprise
(iv) Avoidance of 'blaming the victim'
(v) Development of approaches which reflect the particular situation of the workplace

OHS and Regulation and Enforcement

The ACTU does not see OHSMS as an alternative to the regulatory, standards, inspection and enforcement measures set out in our policy. We advocate, for

example, stronger and effective enforcement and inspection measures. We support unions and state trades and labour councils pushing for state and territory governments to:

(i) Conduct ongoing enforcement campaigns, including campaigns targeted at specific hazards or industries

(ii) Upgrade the capacity of government inspectorates

We are anxious that governments apply the lessons learned from effective enforcement in areas such as transport safety to occupational health and safety. One of these lessons is that public agencies should not circumscribe the enforcement options by guaranteeing certain enterprises exemption from enforcement penalties that apply to other enterprises.

We do not support, for example, the suggestion by Neil Gunningham and Richard Johnstone of a two-track system of regulation as outlined in their 1999 book, *Regulating Workplace Safety, Systems and Sanctions*.[3]

I should state clearly that we appreciate the contribution to OHS of Professor Gunningham and Associate Professor Johnstone. However, we oppose their suggestion that organisations be able to choose to be set apart from the traditional regulatory approach and instead emphasise the organisation's OHSMS performance and internal monitoring. We would similarly oppose, for example, their suggested incentives to induce enterprises to adopt OHSMS such as "easing off on regular inspections for enterprises who agree to adopt a SMS", or "reducing penalties if prosecutions take place".

We obviously do not agree with the recommendation of the NSW Legislative Council Standing Committee on Law and Justice in its November 1998 *Workplace Safety Report* [6], that the two-track enforcement model developed by Professor Gunningham be implemented.

Our opposition is based on the view that an effective government regulatory and inspection role provides the most suitable mechanism for improving safety standards in workplaces and reducing injury and disease. The easy option of adopting an OHSMS can in too many cases lead to a fall in standards and a lower level of safety for workers.

The Role of NOHSC

The ACTU has supported a key role for NOHSC in OHSMS. The parties represented on the National Commission – governments, ACCI and the ACTU – should have a major influence on the OHS infrastructure.

In our view, it would have been more appropriate for NOHSC, rather than Standards Australia, to have taken responsibility for the development of guidance on OHSMS.

We welcome the cooperation between NOHSC parties on OHSMS in recent times. Discussions between NOHSC and Standards Australia involving the ACTU resulted in amendments to the draft Australian Standard 4801 on legal obligations, the rationale of systems, management accountability, training, consultation and contracting/suppliers. We saw these areas as major deficiencies in the draft standard and appreciated the support of other NOHSC parties for amendments.

The NOHSC OHSMS Reference Group agreed in May 2000 to oppose changes to Australian Standard 4804 which had been proposed by New Zealand members of the Standards Australia Committee. These differences have not been resolved yet and a revised standard has not been finalised. It is difficult to see how an Australian standard should be adopted without the support of governments, employers and unions.

I have previously indicated that we see a key role for NOHSC in areas such as OHSMS effectiveness and the impact of labour market changes.

OHSMS and Competencies

It is appropriate also that NOHSC take the lead role in the development of core competencies for OHSMS auditors and of national guidance on certification criteria. The OHS systems auditor competencies will be able to be used in education and training programs and to underpin the certification criteria.

There has been support from other interested bodies – including the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) – for NOHSC taking the leading role.

It would have been logical for the auditor competencies to have been developed before Standards Australia released the OHSMS Specification Standard 4801.

The ACTU supports the production of the OHSMS auditor competencies in Australian National Training Authority (ANTA) format to facilitate adoption by education and training organisations. We agree that the auditor competencies should take account of other OHS competencies – for example, generic OHS competencies, and competencies for OHS professionals and OHS inspectors.

We agree also that the competencies should be seen primarily as OHS competencies, rather than as auditor competencies. The auditor competencies should articulate with other OHS competencies. It is important that mobility between various OHS-related occupations be promoted by recognition of relevant skills.

It would be consistent with the ANTA training framework for competencies to be assessed and recognised regardless of the path taken to acquire those competencies. Rigorous assessment instruments would also need to be developed.

The ACTU welcomes work by NOHSC to achieve integration of OHS within occupational competencies. It is important that skills in OHS of managers be upgraded, including skills of front-line managers.

The ACTU would support a higher priority for education and training under the NOHSC budget, to permit appropriate inclusion of OHS in the major reforms to education and training taking place in Australia.

We welcome closer cooperation between NOHSC and ANTA as national authorities with employer and union representation and common areas of interest.

International Guidelines for OHSMS

The ACTU's position in the debate about responsibilities of international organisations is that the International Labour Organisation (ILO) should remain the international organisation responsible for OHSMS international documents. The ILO has a tripartite structure, unlike the International Standards Organisation (ISO), and has the role of developing work-related standards.

The international union movement, though the International Confederation of Free Trade Unions (ICFTU) and the OECD Trade Union Advisory Council (TUAC), was involved in debate leading to a decision by the ISO in early 1997 to discontinue efforts to develop its own OHSMS standard.

The issue was raised again recently within the ISO. In April 2000, national standards organisations affiliated to the ISO voted in opposition to the proposed development by the ISO of an international guide to the design and implementation of OHSMS, along with supporting standards. The ICFTU had asked member organisations such as the ACTU to indicate opposition to the proposal then before the ISO.

The ILO in 1998 started a review of existing OHSMS standards, guidance documents and codes of practice. According to the ILO Program and Budget for 2000/2001, draft Guidelines for OHSMS should be submitted in 2001 to a Tripartite Meeting of Experts for approval as general requirements for national conditions and as an appropriate enterprise level framework.

In this work the ILO should appreciate the need to recognise the importance of different national regulatory and industrial arrangements. I would also hope that the ILO, as well as yourselves, will recognise the importance of issues such as those raised in this paper.

Conclusion

In conclusion, the ACTU sees the need for further evaluation of the effectiveness of OHSMS prior to any general acceptance of their value in promoting safer workplaces.

Based on the evidence to date, we believe that any proposal that the approach represents a 'magic bullet' which produces uniform and positive results on OHS standards is not based on the available research.

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New Directions : Innovative Management Plus Safe Place

Clare Gallagher

Address for correspondence:
Dr Clare Gallagher
Victorian WorkCover Authority
Melbourne

Introduction

The strong interest internationally in health and safety management systems has lead Frick and Wren (1:8) to describe the phenomenon as the 'most important aspect of recent developments in OHS'.

For the past decade or so in Australia, governments have heavily promoted the benefits of a systems approach, through publications, audit tools, and in some jurisdictions the incorporation of a systems approach into government inspection strategies and workers' compensation incentive schemes. More recently, in New South Wales, a government inquiry has recommended a legislative duty on employers to adopt a systematic approach to occupational health and safety (2).

The United States and Europe have gone further down the path of mandated health and safety management systems. Needleman (3) reports plans by the U.S. Occupational Safety and Health Administration to introduce a mandatory health and safety management system standard. In Scandinavia, the 'internal control' legis-

lation requires employers to adopt a quality-style systems approach for health and safety (4).

There has also been much attention directed around the globe to the development of health and safety management system standards and guidance documents aligned with quality management systems (5).

What do we know about the impact of all this activity on workplaces? Anecdotal evidence suggests apparent increasing interest at enterprise level in the development and operation of health and safety management systems. Empirical evidence on the effectiveness of systems, on the other hand, is scarce.

In recent years we have seen more questioning of the systems approach, or of specific types of approaches. Gunningham and Johnstone (6:170) sum up the dangers of associated with health and safety management systems as the danger of 'implementation failure; of the token adoption of 'paper systems'; of degenerating into a behaviourist approach which results in blaming workers; of top-downism which disempowers rather than directly involves workers; and of a mechanistic, box-ticking mentality, which, far from achieving cultural change and continuous improvement, produces merely symbolic, rather than real benefits'. The authors propose that only best practice enterprises should have the opportunity for government-sanctioned participation in a systems-based regulatory approach.

Implicit in Gunningham and Johnstone's list is a particular concept of best practice, one which is founded on the 'safe place' approach to hazard elimination, in contrast to a 'safe person' behaviourist approach, and on a more innovative approach to management. Does this type of health and safety management system perform better than other types? What other types are there? How can we measure their respective performance?

This paper addresses these questions by reporting my research on the types and effectiveness of health and safety management systems (7). The study does not give a definitive answer to these questions. Given the novelty of the phenomenon and the lack of research on the subject, the study is exploratory. A hypothesis about the effectiveness of different types of systems is developed rather than tested.

The paper begins by considering what we know about system type and system effectiveness. Secondly, it outlines the research program which develops frameworks for assessing performance and system types and applies these frameworks

to twenty case studies. Thirdly, findings are presented on the relationship between system type and performance in the twenty cases and five 'best practice' cases are examined in more detail.

Effectiveness of Health and Safety Management Systems – What Do We Know?

While the need for a systematic approach to health and safety management has been heavily promoted, empirical research on the effectiveness of health and safety management systems has been limited. The existing 'effectiveness' studies are not focussed primarily on evaluation of health and safety management systems. Rather they provide a range of findings on the variables associated with successful health and safety outcomes. They stem from a series of studies (8,9,10) commenced in the late 1970s by researchers at the U.S. National Institute of Occupational Safety and Health (NIOSH) which sought to define the distinguishing features of firms with better health and safety performance. A number of possible discerning factors were identified in the NIOSH research, and in other studies linking health and safety management practices with injury outcome data (11,12,13,14,15, 16,17,18,19,20). Recurring findings across these studies were the critical role played by senior managers in successful health and safety management systems, and the importance of communication, employee involvement and consultation.

Two further studies (21,22) have examined the effectiveness of auditing instruments by comparing enterprise results on system audits with injury outcome data. The auditing instrument in question was the International Safety Rating 5-star system. These studies found no correlation between the star rating and injury outcome data.

There has been some assessment, also, of the impact and effectiveness of the Scandinavian 'internal control' initiatives. A study by Saksvik and Nytro (23) on early implementation of internal control in Norway found increased general awareness in 69 per cent of enterprises studied, despite a further finding that 66 per cent of enterprises had not prepared for the introduction of the new legislation. Notwithstanding these equivocal findings, the authors assess the early impact of the legislation as positive, even if most effort was directed at improving documentation of existing health and safety practices, and was concentrated upon enterprises with more developed health and safety management systems. The follow-up study by Nytro et al (24) found 45 per cent of enterprises had implemented the internal control legislation four years after its introduction and 72 per

cent had revised their assessments at least once since initial implementation. The study found the availability of internal enterprise health, safety and environment resources to be the strongest predictor of successful health and safety management systems. The authors continue to view the results of internal control implementation as positive, but they also note the shortage of time and resources accorded health and safety in the workplace and the frequent lack of commitment among top managers to championing a systematic approach to health and safety management. Jensen's (25) study of the implementation of equivalent initiatives in Denmark, similarly, judges the initiatives to have been a success, although implementation action was more likely in larger, public sector enterprises and was focused more on repair than on fundamental prevention activity.

In contrast to the success factors found in the NIOSH and related studies, there is empirical evidence pointing to factors that militate against the adoption of effective health and safety management systems. Dawson et al (15) found the capacity for effective self-regulation to be limited where there was a low degree of unionisation, where the firm was small and where sub-contracting was prevalent. In the Danish and Norwegian internal control implementation studies, too, the vast majority of small employers had not initiated implementation action (25,23), reflecting the myriad constraints impeding effective health and safety management in the small business sector, including lack of knowledge and expertise, and a mindset not conducive to a systematic approach to health and safety management (26,23).

There is also research to suggest subcontracting and related labour market changes threaten the development of effective health and safety management systems through their disorganising effect on employer/employee relationships (27), what Wright calls the 'endemic social disorganisation of work' (28:100). The study undertaken by Simard and Marchand (19) confirms the difficulty in establishing a systematic approach in enterprises operating in the socio-economic context of the secondary labour market, given evident adverse effects on top management commitment to health and safety and on supervisory participative management, as well as on workgroup cohesiveness and on workers' autonomy in the work process and work organisation.

Types of Health and Safety Management Systems – what Do We Know?

There has been little explicit description or analysis of types of health and safety management systems. One form of categorisation in the health and safety man-

agement literature is the distinction between new and old approaches, or innovative and traditional approaches to management of health and safety. An example is Weinstein's (29) categorisation of traditional and modern safety programs. Weinstein introduces the traditional approach as a series of failings, including safety as a staff function and the failure to achieve effective integration into the line management function, top-down management, and the failure of certain safety program elements to feature in empirical studies on program effectiveness, namely safety committees, safety staff, safety meetings, safety training, safety inspections, safety rules and safety records. He presents the modern approach as one based on Total Quality Management concepts, including top management strategy development, high employee participation, strong coordination across functions, and the systematic management of data to secure continuous improvement.

A similar example of the categorisation of management strategies into traditional and innovative is the Worksafe (30) overview of health and safety best practice. Here, new and old approaches revolve around the 'hard' and 'soft' management variables of strategy, structure, systems, style, staff and skills. The new approach to health and safety management is presented by Worksafe as preventive in strategy (linked to quality and best practice management), flexible in structure (devolved and team-based), with systems inclusive and integrated, staff empowered, skills centred on problem-solving, and a committed and open management style (consultative and participative, senior management leadership, accountability, role of workforce and union valued). The old approach is categorised as reactive (focus on legislation, personal protective clothing, and 'blame the victim'), with systems non-integrated and marginal, a directive command and control management style, employees excluded, and narrow functional skills confined to health and safety specialists.

The traditional approach to health and safety management reflects the enduring influence of the early safety programs and the seminal work of Heinrich (31). Heinrich's highly influential *Industrial Accident Prevention: A Scientific Approach* was first published in 1931. It documented the prevailing approach to health and safety preventative programs, and saw individual employees rather than work or hazards as the primary cause of accidents in the workplace.

The techniques for health and safety management advocated by Heinrich in 1931 are evident today in health and safety programs and systems. Techniques for safety management proposed by Heinrich include close supervision; safety rules; em-

ployee education through training, posters and films; hazard identification through analysis of past experience, survey and inspection; accident investigation; job analysis; methods safety analysis; production of accident analysis sheets; approval processes for new construction, installation of new equipment, and changes in work procedures or processes; establishment of safety committees; and arrangements for emergency and first aid. Heinrich presented lost time injury frequency rates as the best available measure of effectiveness, complete with the qualification of statistical limitations still common today. Also reminiscent of current approaches is the parallel drawn between the controls in safety and the control of the quality, cost and quantity of production. The causes of accidents and production faults Heinrich viewed as similar and the control methods as equivalent. Safety, he argued, should be managed like any other business function.

Safety organisation and responsibility in Heinrich's treatise is hierarchical. While overall responsibility is legislated and rests at executive level, in practice the duty is delegated and responsibility shared with safety management personnel. The supervisor he described as the "key man", the instructor of workers and the enforcer of rules. Employees may participate in safety meetings and committee activity, but more generally, they are accorded a passive rule compliance and hazard reporting role.

The similarities in the assumptions and methods between scientific management and the 'scientific approach' to accident prevention are striking - the distrust of worker competence, the need for tight control of workers by more focused supervisors, the centralisation of knowledge and rule-based control, the regulation of behaviour through central goal-setting and a hierachical set of formalised procedures (1,32,33). Further parallels are evident in the detailed measurement and analysis methods, of worker 'suitability' through job analysis and of hazards through method safety analysis, and the call for extensive record-keeping, replete with pro-forma prescriptions. In short, and in parallel with scientific management, the 'scientific approach' to accident prevention sought to apply scientific rationality, systematic thought, and bureaucratic administration to workplace health and safety.

In the traditional approach to health and safety management, health and safety specialists and supervisors have the key management roles, employees may be involved but they are not integral to system operation, and there is a low level of integration of health and safety into broader workplace systems.

In contrast to the traditional approach, innovative health and safety management might be defined as the outcome of a conscious strategy to integrate health and safety into broader management systems and practices such as Total Quality Management systems and other best practice management methods. The innovative approach seeks a fundamental shift in management, away from traditional top-down autocratic decision-making, towards flexible, adaptive, learning organisations.

Else (34), for example, writing from a safe place perspective, focuses attention on health and safety and the learning organisation. He proposes that the integration of health and safety into the learning organisation be informed by three consistent principles for improvement, namely:

Prevention	• identification, assessment and control • hierarchy of preferred control options
Consultation	• consultation at the design, planning and purchase stages consultative problem solving for tackling existing hazards
Integration	• integration of health and safety into management systems • questioning and auditing the robustness of systems

Else's focus on prevention is consistent with the safe place perspective, while integration and consultation are distinguishing features of the innovative approach to health and safety management. The emphasis here on consultation and employee involvement is very different from that applying in the traditional health and safety management approach, for it implies a far greater degree of involvement in all aspects of health and safety management.

Rahimi's (35) proposals provide an example of an innovative approach to health and safety management that reflects the safe person perspective. Rahimi proposes the adoption of 'Strategic Safety Management', a strategy for merging safety management with quality management. This 'total' safety management approach requires both top-down management influence and bottom-up employee influence in a continuous improvement culture. The key focus of Rahimi's proposal is self-managed work teams, with safety either as a separate team activity or integrated into a quality or work team. While Rahimi proposes extensive and meaningful employee involvement, team activities are proposed which incorporate a view of unsafe behaviour as a root cause of workplace injuries. An example is a team-based approach to unsafe act auditing.

Both innovative and traditional approaches to health and safety management can variously reflect 'safe place' and 'safe person' approaches to prevention of injury. These distinctions also can be traced back to Heinrich. Perhaps the most enduring legacy of Heinrich is the dichotomy between 'unsafe acts' and 'unsafe conditions', or the influence of unsafe behaviour versus hazards or technical deficiencies as the cause of workplace incidents. The axiom that the unsafe acts of persons are responsible for a majority of accidents lay at the heart of Heinrich's prevention philosophy. The axiom was central to Heinrich's domino model of accident causation, which depicted five dominoes ready to fall in sequence, portraying five inter-connected factors in an accident sequence. Unsafe acts/conditions were placed in the central position, preceded by inherited or acquired personal faults, and followed by an accident and injury. The removal of the unsafe act/condition was expected to interrupt the sequence. The expected result was prevention of the accident and possible injury. Control of the individual behaviour of employees was the key.

The concept of unsafe acts as the primary cause of incidents continues to thrive under various new terms. It has been incorporated, for example, into 'human error' and 'human reliability' theories (36), while refinements of Heinrich's original theory include multiple causation theory, multiple sources of human error and the concept of unsafe acts signalling failure in the management system (37).

'Safe place' theorists, on the other hand, reject the primacy of unsafe acts as postulated by Heinrich. Just as the safe person perspective allows for some consideration of unsafe conditions, the safe place theorists do not discount the role of the individual in incident causation, but place emphasis on prior prevention measures that are centred on the hazard. The safe place perspective, historically, has been the focus of health and safety legislation and is the focus of current legislation in Australia (34). As Else outlines, most current health and safety legislation, focused on a prescribed hierarchy of control measures, places greater value on controls which remove hazards or control them at source, than on controls which rely on behaviour modification.

The Case Study Research Program

The case study method was selected as most appropriate for an exploratory study of the types and effectiveness of health and safety management systems. Its strength lies in the scope for probing complex phenomena to identify new and significant ways of classifying and understanding social phenomena. It possesses

a corresponding weakness - that statistical generalisation is not possible. The case evidence can suggest plausible causal relations - for example that certain types of health and safety management systems will perform better than others - this cannot be expressed in terms of the likelihood of this result for any significant population.

Twenty cases were studied. They all had some form of a health and safety management system or program in place. They were medium to large in size. They came from a broad spread of industries, namely retail, construction, hospitality, health and finance, and five manufacturing industries - meat, carpet, chemicals, vehicle and vehicle parts manufacture.

Data were gathered in various ways, primarily through interviews with a range of workplace personnel, including senior managers, line managers and supervisors, health and safety representatives, health and safety committee members, health and safety specialists, and employees. Documents were examined or collected on all aspects of health and safety management, both as a source of information and to verify the interview data. In most cases, workplace inspections assisted the verification process and provided an opportunity to speak to shop floor employees. In a number of workplaces, further information on how health and safety management works in practice was gleaned from observing health and safety committees in action.

There were five-steps in the research procedure as outlined below.

First, to develop an analytical framework for distinguishing the types of health and safety management systems. From the literature and emerging case study evidence, two dimensions emerged as a basis for the categorisation of system type. These were the 'safe person' and 'safe place' approaches to injury prevention, and traditional and innovative approaches to health and safety management. These dimensions yielded a cross-typology of health and safety management systems comprising:

- the 'sophisticated behavioural' type, with innovative management and safe person characteristics;
- the 'adaptive hazard manager' type, with innovative management and safe place characteristics;
- the 'traditional design and engineering' type, with traditional management and safe place characteristics; and

- the 'unsafe act minimiser' type, with traditional management and safe person characteristics.

Second, to apply the framework to the case studies. In this step the twenty case study enterprises were allocated to one of the four types of health and safety management system. One case only was difficult to classify. This was a hotel with a palpable clash of cultures, one centred on employee empowerment and a high level of health and safety integration, the other on an authoritarian, 'hands-on' health and safety specialist. In three other cases, there was an overlap of type characteristics but in each case a dominant type was apparent. There was overlap also in the safe place/safe person characteristics of the case study enterprises. This was not a surprising finding in light of the safe place focus of health and safety legislation. Perhaps a more surprising finding was the strong residual focus on the person as the key to incident prevention, which contradicts both the safe place regulatory approach and quality management principles, but nevertheless continues to survive and to thrive. Where the case study enterprises displayed both safe place and safe person characteristics, in each case a dominant perspective was evident. The cases were evenly divided into safe person and safe place cases.

Third, to develop a framework to assess health and safety performance in the twenty cases. This evaluative framework stemmed from a review of the literature on the effectiveness of health and safety management systems and on performance measurement in health and safety. Scepticism in the literature about the reliability of injury and ill-health outcome data suggested that a process evaluation model was needed to analyse the effectiveness of health and safety management systems. Process assessment criteria were developed, based on activities or processes assumed to have an impact on the ultimate measure of effectiveness, the incidence and severity of work-related injury and ill-health. The process evaluation tool that was developed was built upon the Victorian government's SafetyMAP audit criteria which were amended to remove repetitive criteria and to introduce new criteria identified in the health and safety management literature. The use of process criteria introduced a problem, however, as a number of the assessment criteria duplicated data used to categorise system type. To preserve the independence of the evaluation data, an 'adjustment exercise' removed duplicate data. This exercise found the problem to be slight and likely to have a negligible effect on the research findings. Nevertheless, only 'adjusted' data were used when system types and performance were compared.

Fourth, to apply the process evaluation tool to the case studies. The performance data were analysed to determine the overall level of performance of the twenty cases and their relative performance on the thirty components of the process evaluation tool. The case studies were classified into three levels of performance, namely, above average performers, average performers and below average performers. The criteria set a high standard of achievement which few cases could meet satisfactorily. Two cases only were assessed as above average performers. Six cases were average performers. The remaining twelve cases were below average performers.

The cases were compared also in relation to injury/ill-health outcome data and they were assessed, where possible, in relation to the average industry claims frequency rates. While the limitations of these measures are acknowledged, they were employed as a potential independence check on the case performance ratings derived from the process-based assessment criteria. In the event, neither set of outcome data provided clear verification of the performance ratings based on the process criteria.

Fifth, to analyse the relationship between health and safety management systems and performance. With the categorisation of the type of health and safety management system completed, and the performance of the twenty case studies evaluated, the final step was to analyse the relation between the type of system and performance. Two types of analysis were conducted, the first a deductive test of the relation between system type and performance. Only 'adjusted' performance data were correlated against data on system types on the grounds that 'unadjusted' evaluation data was not independent of system classification data. The second was an inductive analysis of the common characteristics of 'best practice' cases.

Findings – Which Type Appears to Perform Best?

When the data on system type and performance are shown together (Figure 1) it is apparent that there is no necessary relationship between the two. However, there are patterns in the data which deserve attention.

	Safe Person	Safe Place
Innovative Management	**'Sophisticated Behaviourals'** Performance: Above average : 0 cases Average: 2 cases Below average: 1 case	**'Adaptive Hazard Managers'** Performance: Above average: 2 cases Average: 1 case Below average: 0 cases
Traditional Management	**'Unsafe Act Minimisers'** Performance: Above average: 0 cases Average: 1 case Below average: 6 cases	**'Traditional Engineering and Design'** Performance: Above average: 1 case Average: 3 cases Below average: 3 cases

Figure 1. Twenty cases : relationship between health and safety management system type and performance (adjusted data)

The two axes used to categorise system type offer, according to the literature, two arenas for progressive policy - first, elimination of hazards (safe place) and second, integrated management systems (innovative management). In theory, the 'adaptive hazard manager' demonstrates good performance on both criteria, the 'sophisticated behaviourals' and 'traditional engineering and design' on only one, and the 'unsafe act minimiser' on neither. Consideration of performance in relation to these two axes or criteria yields the following:

- Six enterprises are classified as innovative managers. Five of these six have average or above average performance, while only five out of fourteen traditional managers have average or above average performance.
- Ten enterprises have a safe place approach. Seven of these ten have average or above average performance levels, compared with only three of the ten safe person cases.
- The 'unsafe act minimiser' quadrant - cases with no progressive features - clearly performs worst with six of the seven cases evaluated as performing below average.

What these findings suggest is that there is a plausible relationship between system type and performance. Progressive enterprises which adopt a safe place approach, or innovative management, or both, are likely to perform better than those that do neither. This pattern is significant in three ways. First, it fits what we might predict on the basis of progressive policy. Second, it suggests that the two constructs – the typology of systems and the measure of performance - are reasonably robust in

capturing significant social phenomena. Third, it suggests the basis for those hypotheses that would merit testing upon data representative of a general population. Those hypotheses would derive from the proposition that "innovative and/or safe place health and safety management systems perform better than traditional and/or safe person systems".

Findings – Exploring 'Best Practice'

Five 'best practice' cases were selected and subjected to a cross-case analysis to search for common characteristics that might explain their performance. The 'best practice' cases are the five cases with average or better performance that are located in the innovative management quadrants of the cross-typology. There are two 'safe behaviourals' in the group and three 'adaptive hazard managers'.

The cases were analysed internally (within the group) and externally (against the non-best practice cases) on both 'people' and 'systems' characteristics. 'People' characteristics focused on the role of management personnel and the role and level of involvement of employees and their representatives. 'System' characteristics studied were system purpose, system quality and the level of innovation.

The analysis does not give strong support to a 'one best way' approach to best practice as there was some diversity within the group. Nevertheless, there were trends or tendencies amongst the best practice cases. The main points of similarity to emerge were with respect to 'people characteristics' where the 'adaptive hazard manager' type featured most prominently. Four key trends emerge from the analysis.

Firstly, the involvement of senior managers in driving health safety management systems emerges as a critical success factor. An active role for senior managers has long been highlighted as a precondition for success. This study points to the importance of senior managers as active drivers of change, in contrast to a more passive provision of support for activity driven by health and safety specialists and others in the enterprise. The senior managers who were active drivers of change had a highly influential and motivational role. They set the pace of health and safety activity, gave their time freely to health and safety as a work priority and provided the resources necessary to support broader involvement of managers, supervisors and employees.

A second characteristic concerns the role of employee representatives and in particular the importance of health and safety representatives working alongside

managers in a 'joint regulatory' relationship across system activities. A 'joint regulatory' approach can be characterised as a broad role for the health and safety representative in system planning and review and a high level of commitment of senior managers to the position of the representative. A 'joint regulatory' approach can be contrasted to a 'consultation' approach where management commitment to the position of the representative similarly is high, but where the representative has a narrower, more traditional issue resolution role. It can also be contrasted to 'management-driven' and employee-driven' approaches to employee involvement. Both are marked by a lower level of senior management commitment to consultative arrangements. In a 'management driven' approach, health and safety representatives will have a narrow, issue resolution role or there will be no representatives. In an 'employee driven' approach, employees are expected to drive health and safety activity in the context of limited management support.

Health and safety representatives in the joint regulation group see themselves, and are seen by their managers, as having a broad-based hazard management role. In one workplace, for example, health and safety representatives were central figures alongside the senior managers in the development and implementation of hazard elimination strategies. In another, the health and safety representative was valued as an initiator of systems solutions such as the mechanism for ongoing monitoring of the effectiveness of incident investigation corrective actions.

A third characteristic of best practice is the involvement of employees more generally, but not as a substitute for action by the key players, namely managers and health and safety representatives. This qualified approach sets the scene for employees to be enlisted as active players. Strategies evident in the cases to broaden and deepen employee involvement include innovative inspection programs, hazard research activity and extensive problem-solving team activity.

A fourth characteristic of best practice is positive management by the enterprise of high levels of trade union activity. Four of the five best practice cases have strong, active unions on site, compared with five of the fifteen non-best practice cases. In each of these best practice cases there is a high level of health and safety representative activity and a high level of management commitment to the role of the representative. The remaining best practice case is an exception and requires consideration.

One case differed from the remaining four best practice cases on a number of fronts. This was a 'safe behavioural' case with a 'management-driven' approach and a

high level of employee involvement. Employees are viewed as the central players, alongside senior and line managers. Supervisors are seen as a problem and mechanisms to by-pass the supervisor are in place. The company's policy is to downplay the role of the health and safety representative as part of a broader human resources management strategy which values direct employee involvement and seeks to minimise trade union involvement. While this case has a different philosophical approach to the 'people' characteristics, it performed well enough for inclusion in the best practice group and underlines the caution that there is no 'one best way' to best practice.

Conclusions

This study suggests that certain characteristics of health and safety management systems are more likely to distinguish the more successful enterprises. However, the findings cannot be generalised to a broader population without further testing on a representative sample of enterprises.

These characteristics, firstly, are an innovative approach to management and/or a safe place control perspective. Innovative management characteristics include a key role for management at all levels, a high level of employee involvement and a high level of integration of health and safety into broader management systems and practices. A safe place control perspective is one focused on the control of hazards at source through attention at the design stage and application of hazard identification, assessment and control principles.

The type of system which features most prominently is the 'adaptive hazard manager' type with both a safe place perspective and an innovative approach to management. These cases stand out from the remainder by the strength of their focus on hazard elimination as the underlying purpose of their systems activity. They had a planned approach to hazard management across hazards, in contrast to other cases which focused on one or two specific hazard management programs, and in contrast to the majority of cases where systems activity variously had an underlying risk management or cultural change purpose, or appeared to be aimed at system improvement as an end in itself.

The 'people' characteristics also distinguish the 'adaptive hazard manager' type. At one level these findings confirm the results of the various 'effectiveness' studies which highlight the critical role of senior managers and employee involvement and consultation. But they also suggest the importance of particular roles for the

key players – that the most senior managers should drive health and safety change and that health and safety representatives should move away from the margins of health and safety management, into more mainstream health and safety management planning, implementation and review. These findings support the argument of Quinlan and Mayhew (27) that the health and safety management system approach heightens the required level of collaboration and employee involvement.

The findings of this study suggest that the promotion of a systems approach needs to pay more attention to the familiar basic challenges – motivating workplace parties to work effectively to eliminate workplace hazards. Health and safety management systems provide a tool to support a planned approach to health and safety change.

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Club Zero: Implementing OHS Management Systems In Small To Medium Fabricated Metal Product Companies

Warwick Pearse

Address for correspondence:
Warwick Pearse
Manager, OHS Program Delivery
NSW Roads & Traffic Authority
PO Box K198
Haymarket NSW 1238
email: warwick_pearse@rta.nsw.gov.au

Introduction

Club Zero is a two year research project funded by WorkCover NSW. This paper describes the Club Zero research project and progress to date. This project has the principle objective of examining the implementation and effectiveness of occupational health and safety management systems (OHSMS). The study has a practical focus of improving the occupational health and safety (OHS) performance of selected fabricated metal product companies in South Western Sydney by implementing and evaluating occupational health and safety management systems. The study involves small to medium sized enterprises (SMEs). At the beginning of the

project the management of these companies agreed to adopt the goal of zero injuries and diseases. These companies also agreed to work together in a network or club, hence the name Club Zero. Networking between companies to improve occupational health and safety is a new feature in Australia. In this paper the background, research design and preliminary results of the intervention project are discussed.

In Australia there is increasing interest in OHSMS[1-3]. In the last five years there have been two major Inquiries into occupational injury and disease. In 1995 the Industry Commission (now Productivity Commission) conducted an Inquiry into Occupational Health and Safety. More recently, the NSW Legislative Council's Standing Committee on Law and Justice conducted the "Inquiry into Work Place Death and Injury" (1998). Both these Inquiries emphasised the fundamental importance of preventive strategies, including occupational health and safety management systems, in combating occupational injuries and disease. The Inquiries recommended more widespread adoption of OHSMS. These recommendations reflect the growing interest by governments in OHSMS as an essential factor in prevention.

Increasing Interest in OHSMS

The worldwide move towards planned and systematic safety management has been gaining momentum over the last few decades[4,5]. A number of countries have developed standards for safety management. Sweden mandated internal control in 1991[6]. In Norway regulations were introduced in 1992 to require companies to take a systematic approach to the internal control of health, safety and environment matters[7]. Australia and New Zealand have adopted the ANS/NZS: 4804:1997 Occupational health and safety management systems general guidelines on principles, systems and supporting techniques. Frick & Wren (1998) contend that the regulatory developments around OHSMS are the most important changes in occupational health and safety in the last fifteen years.

In Australia there are also moves to promote OHSMS by regulatory agencies[3, 8]. For example, in South Australia, the WorkCover Corporation has encouraged the introduction of management systems with the Exempt Employer Performance Standards Scheme and the Safety Achiever Bonus Scheme (1997). In NSW, tenders for government construction projects worth more than $3 million are required to have documented evidence of an OHSMS[9]. Gunningham & Johnstone (1999) have proposed a "two track" model of regulation whereby companies with OHSMS

would be subject to less regulatory attention. This model would enable those companies which had demonstrated effective OHSMS to be in a track where there was less regulatory effort applied. Regulatory resources would then be concentrated on those companies which were not systematically managing occupational health and safety effectively.

OHMS can be seen as providing evidence that the general duty of care is being exercised[10]. This move towards safety management systems has emerged from the background of other less comprehensive approaches, such as hazard management, statutory compliance, and statutory requirements for health and safety committees or representatives. It must be emphasised that OHSMS are not intended to replace these more traditional and fundamentally important activities. OHSMS are intended to provide a framework for managing OHS activities in a systematic way which also encourages continuous improvement. The Australian/ New Zealand Standard AS/NZS 4804:1997 defines OHSMS as follows.

"Occupational health and safety management system (OHSMS)-that part of the overall management system which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the OHS policy, and so managing the OHS risks associated with the business of the organisation." p 4.

Despite the increasing level of interest in occupational health and safety management systems there have been few formal evaluation studies published. There is a relative paucity of information about how these systems work and how effective they are in preventing occupational injury and disease[11]. Similarly, Glendon & Waring (1997) have identified a "severe shortage of systematic research evidence" on risk management in Australian organizations. The Club Zero research project was designed to provide evidence about how companies can implement OHSMS and how effective OHSMS are in preventing occupational disease and injury.

Small and Medium Size Enterprises (SMEs).

SMEs are economically important because they are the major source of employment in Australia. From an occupational health and safety point of view SMEs are also important because in most cases they do not have specialist occupational health and safety personnel. A number of studies have found that SMEs do not

have a high level of awareness about their occupational health and safety obligations[13,14,15].

There is a substantial body of research to highlight the particular problems that small businesses pose for occupational health and safety. There are studies to suggest that injury rates are higher than for larger companies[16,14] and that legislative compliance is lower[17]. Overall the literature on small business and occupational health and safety paints a picture of a range of problems with few unambiguous successes[15,18]. These problems are often contrasted with the more systematic approach to OHS found in many larger companies.

Large companies which have exemplary occupational health and safety performance also have access to sophisticated management systems, specialist resources and development capital. The objective of achieving zero injuries has been embraced by a number of multinational companies, for example, Dupont (1997). Much of the evidence for the positive effects a systematic approach to managing occupational health and safety comes from the experience of large multinational companies. Club Zero is designed to help answer the question how can small to medium enterprises (SMEs) implement and improve the management of occupational health and safety?

Role of Networks

The development of a network (club) of companies committed to zero occupational injuries and diseases provided a way for companies to share resources and experience. In the Entec (1998) study of factors influencing OHS in SMEs it was found that people in SMEs often had very little direct experience of a serious safety incident. The authors thought that this lack of experience was one of a number of factors which contributed to general lack of awareness about the importance of occupational health and safety. The Entec (1998) study also identified lack of specialist occupational health and safety knowledge as contributing to a lower awareness of OHS in many smaller companies. Club Zero was designed on the assumption that the establishment of networked relationships around occupational health and safety can assist sharing knowledge about potential injury and diseases, as well as share knowledge about legal and technical issues.

Study Design

A before - after study design was used. This means that the changes in each individual company are tracked over time. In this way each company becomes its own control through time.

Two groups of ten companies were assembled to participate in the study. One group was located in the Ingleburn/Minto area and the other in Bankstown/Milperra area. Companies were recruited to the study by various methods, including mail outs, word of mouth and 'cold calling'. About 60 companies were contacted to eventually find 20 who were willing to participate. One group of companies around the Ingleburn/Minto area were largely contacted through the local knowledge of the Industry Development Officer employed by the Macarthur Regional Organisations of Councils. The Bankstown/Milperra group were generally recruited from membership lists provided by the Australian Industry Group. All companies signed a Memorandum of Understanding (MOU) in which they agreed to cooperate with the project researchers. The MOU also bound participating companies and the University of Western Sydney to respect the confidentiality of the information gathered in the course of the project. The University of Western Sydney ethics committee was also involved in the design of the MOU and acted as the contact point for any concerns about confidentiality. All the companies in the project volunteered to participate. At this stage there has not been any analysis of how representative these companies are of other metal companies in the geographical area.

Company size*	Range of employee numbers	Number of companies
Small	5-19	6
Small	20-99	4
Medium & Large	100+	7

* The Australian Bureau of Statistics 20 defines small manufacturing companies as employing between 1& 99 employees.

Table 1: Employee numbers of participating companies

Table 2. provides a broad outline of the study steps. At the beginning of the study baseline information was collected by a self administered survey. This survey had 32 closed questions which could be answered as either "yes" or "no". Provision of this baseline information together with a confidentiality agreement was a condi-

tion for participation in the study. The questions for the baseline study were drawn from SafetyMAP (1997).

Step	Activity
1.	Recruit participating companies
2.	Establish network
3.	Baseline survey
4.	Produce OHSMS Guidelines
5.	Implement OHSMS
6.	Conduct OHSMS Audits
7.	Develop and implement action plans
8.	Conduct follow up OHSMS audit
9.	Assess effectiveness of OHSMS
10.	Evaluate project interventions

Table 2: Outline the Club Zero Project.

The next step was to develop Occupational Health and Safety Management System Guidelines (OHSMS Guidelines). The Guidelines were written as a practical guide to assist companies to implement OHSMS. Companies then used the Guidelines to assist them in introducing OHSMS. The Guidelines were based on the principles outlined in the Australian and New Zealand Standard 4804:1997. Occupational health and safety management systems. General guidelines on principles, systems and supporting techniques. The OHSMS Guidelines were prepared specifically for the project and were tailored for small to medium metal manufacturing companies. This meant that they contained information about particular hazards and safety management issues encountered in the metal manufacturing industries, as well the more generic elements of safety systems. The Guidelines were developed around eight system elements which are outlined in Table 3.

1.	Management Commitment and Policy
2.	Responsibility & Accountability
3.	OHS Hazard Management
4.	Purchasing and Contractors
5.	OHS Training and Education
6.	Emergency Planning
7.	Performance indicators and records
8.	Workplace Injury Management

Table 3: Elements of an OHS Management System

Following the development of the OHSMS Guidelines participating companies had about 6 months to implement and develop their OHSMS before the audit phase. Occupational health and safety management system audits were then conducted for each company. The audit tool was based on the Guidelines produced for the companies. Audit reports for each company contained recommendations for improvement. Companies then produced action plans designed to improve OHSMS.

A Network of Companies

Networking between firms has attracted interest, especially from academics and policy makers seeking to explain the reasons for the economic success of particular regions. For example, Silicon Valley in the USA and regions of Italy have used networking to generate world competitive businesses. The question arises, "could networking be a useful way of exchanging and generating OHS information?" Networking was seen as being particularly valuable for SMEs which did not have personnel assigned to full time safety responsibilities.

An important and distinctive feature of the Club Zero project was the formation of a network of participating companies. Network activities included site visits to each company and sharing of information about OHS management. Meetings of network members were also held to discuss the implementation of OHSMS. Of the original 20 companies there were 17 remaining after 18 months. One company left the study because of relocation, one left because of a takeover and one for an unspecified reason.

Preliminary Results

The results of the baseline survey for the remaining companies are shown below in Table 4. The percent score for each company was calculated by assigning a value of one for an affirmative answer and a value of zero for a negative answer. To keep the scoring process simple weightings were not used. A 100 percent score would indicate an affirmative answer for each of the 32 questions. The results of the first survey indicated that the survey instrument was able to distinguish between companies and levels of achievement in terms of implementing occupational health and safety management systems. The survey results demonstrated that there was scope for improving management systems for occupational health and safety.

Company	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Percent score	97	94	90	87	87	77	71	71	61	58	52	52	48	45	45	39	29

Table 4: Initial survey company score

Results from the initial survey were also analysed to see if any particular aspects of OHS management were weaker than others when the companies were considered in aggregate. These results are shown below in Table 5. The results in Table 5 indicate that control of hazards is undertaken fairly well in most of the companies. The weakest area included a range of aspects such as; training, emergency planning and allocation of responsibilities.

	Percent score			
Element	Hazard management	Work processes	Management commitment	Other
Average value	72	70	57	53

Table 5: Initial survey aspects of OHS management

About 9 months after assembling the companies the first OHSMS audits were conducted.

External auditors conducted these audits. The audit tool consisted of 80 questions which derived from the OHSMS Guidelines for fabricated metal products, developed for the project. The audit questions were developed by following design rules

listed by Waring (1996 p.184). The questions were constructed to be closed, simple, and unambiguous. Scoring was based on a three part score; a yes answer to question scored 1, a no answer scored 0 and in cases where there had been a partial conformance with the audit criteria then 0.5 was allocated. For purposes of simplicity weightings were not used for individual questions. Table 6 shows the percent score for each company. The identifying letter used for each company in the initial survey remains the same.

Company	D	B	A	I	M	C	E	G	H	P	N	O	J	K	L	Q
Percent score	85	75	72	71	69	65	61	60	44	44	43	42	41	36	31	12

Table 6: First audit company score

System element	**Percent score**
Injury management & rehabilitation	74
Management commitment	66
Hazard management	65
Records & performance indicators	62
Training	54
Emergency planning	47
Purchasing & contractors	44
Accountability & responsibility	36

Table 7: First audit system element score

The element score from the first audit in Table 7 is not strictly comparable with the results in Table 5 because different questions were used, although the same general areas were covered. There were also changes in the wider environment in the time between the self administered survey and the first audit.

Discussion

Baseline survey

The results of the baseline survey provide a snapshot of where the companies were at the beginning of the project. In general, the weaker areas were found in those aspects of the safety management which were dependent on policy or formal arrangements for accountability and responsibility. It is not surprising that smaller businesses would not generally have written OHS Policies yet the adoption of an OHS Policy is relatively easy and helps clarify aims and objectives. Similarly the articulation of safety responsibilities and accountabilities in job descriptions would not normally be found in smaller companies. In the baseline survey weaker areas were those not subject to regulatory control, for example, management arrangements for accountability, training and purchasing.

First audit company scores

Table 6 shows the range of company scores expressed as a percentage of the total possible score. It is worth noting that the range of scores suggest that the audit tool is actually able to discriminate between various levels of OHSMS implementation. The simplest explanation for the range of scores is that the larger companies have more developed systems and have devoted more resources to implementing aspects of OHS management. When the audit scores are compared with company size there is a relationship between the first audit score and the number of employees, (see Table 8 below).

Company size	Range Of employee numbers	Number of companies	Mean score on first audit	Confidence Interval , 95%
Small	5-19	6	33	(24.6 -41.8)
Small	20-99	4	45	(34.3 -55.7)
Medium & Large	100+	7	55	(49.4 -60.6)

Table 8: Comparison first audit score and company size

The results of the baseline survey and the first audit are not strictly comparable because different questions were asked in each case. A comparison of the company scores indicates that the baseline survey was an easier test than the first audit. In

addition, the first audit did not reflect the same rank order of companies as the initial survey. This result would suggest that self assessment is not as rigorous as external third party assessment. This finding accords with the views of Waring (1996:173).

"A safety audit conducted by mangers on their own operations would be of limited value. The need is for fresh eyes, whether from another part of the organisation or from an external source such as insurers and safety consultants".

System element scores

When the results of system element scores were compared for the initial baseline survey and the first audit, the trends were similar in a number of ways. The element of Injury Management and Rehabilitation emerged as the best managed area in the first audit probably because there were widespread government campaigns at the time to alert people to the regulatory changes. The element of management commitment was ranked higher in first audit and this reflects the changes which the companies introduced such as OHS Policies.

In both the baseline survey and the first audit one of the strongest areas of OHS management was associated with direct control of hazards. This aspect of the results was not entirely unexpected. Many of the known hazards are the subject of regulatory control. For example, power presses, spray painting, cranes, fork lift trucks, hazardous substances and welding are all known hazard areas and all subject to regulatory control and industry standards. Other factors which may explain the level of control of physical hazards relate to the type of industry. Metal product fabrication generally requires a relatively high level of skill and capital investment when compared to many other small to medium businesses. One other important factor to keep in mind when interpreting these results is that the companies in Club Zero have a higher than average commitment to safety as demonstrated by their self selection into the project.

Management commitment and worker participation

At a more general level Quinlan (1999) has raised a number of issues, which need to be considered when assessing the utility and effectiveness of OHSMS. In summary, Quinlan (1999) reminds us that the underlying key principles need to be given attention. He argues that senior management commitment and worker participation are the essential prerequisites for effective OHSMS. For example, he

asks, "what is precisely meant by senior management commitment and even more critically, how can it be secured?" The experience to date of the Club Zero project confirms these views and the fundamental importance of these questions. At this stage there are no clear results which would provide quantitative evidence to demonstrate the importance of management commitment and worker participation. However, I would argue that an effective OHSMS can strengthen aspects of the management commitment and worker participation by building in activities which encourage and develop management commitment and worker participation as elements of a system.

Aspects of management commitment can be measured by OHSMS audits. A company which has adopted a planned approach to occupational health and safety and has invested time and resources to it could be counted as demonstrating commitment. This is especially true if the company has taken an approach which aims for continuous improvement not just legislative compliance. However, there is an additional component to management commitment. To have a high level of commitment to occupational health and safety, management needs to seen as committed by all employees. Auditors can ask employees how they think the company management visibly demonstrates commitment.

Audit questions which encourage a company to review arrangements for consultation can be very effective in improving consultation and participation. The conduct of the audit is also important in finding out how deeply embedded are arrangements for consultation and participation. To accurately gauge the effectiveness of arrangements for participation auditors need to discuss audit questions with a range of people in an organization including shop floor employees. The Trisafe audit tool developed by the Queensland Government explicitly encourages companies to consider worker views by having questions specifically for shop floor employees. Occupational health and safety management systems can enhance management commitment and participation by offering practical guidance for arrangements for consultation and participation. Nevertheless, if a company management is antagonistic to worker involvement an OHS management system will not overcome this basic problem.

Much of the opposition to worker involvement comes from models developed during the heyday of mass production. The hierarchical and disciplinary focus of traditional work organization derives from management practices espoused by people such as Frederick Taylor and Henry Ford. Today, many of the worlds leading companies are seeking to increase employee participation in all aspects of

the production process, not just occupational and safety. There is a general move for increased workforce involvement to help companies become more competitive and responsive to customers. Newer forms of work organization such as cellular and team based models of production depend on a greater participation of the workforce. These emerging forms of work organisation emphasise flexibility, enlargement of responsibility, task integration, and employee skills[21].

There is also the issue of representational participation[22,23]. There is a world wide trend for increased worker participation in the production process in many industries. However this form of participation does not necessarily extend to representational participation by workplace trade union delegates. It is for this reason that some authors have suggested that the development OHSMS may be seen as undermining the role of shop floor union representation[23]. It is certainly true that a number of proprietary OHSMS do not take account of existing consultative arrangements for health and safety. On the other hand publicly available system audit tools such as TriSafe (1998) and SafetyMAP (1997) do acknowledge the role of representative consultative arrangements. Therefore the aim should be to develop OHSMS which encourage both direct participation and representational participation. There is no fundamental reason why an OHSMS should not include representative arrangements for trade unions. The experience with the Club Zero project indicates that implementing OHSMS can encourage worker participation and if the OHSMS has any effect on the overall industrial relations climate, it is usually positive.

Company networks for OHS

There is a growing interest in networks and collaborative solutions for small business in other countries. In his review of small business initiatives Kogi (1995) argues that networking to promote occupational health and safety in small businesses has been effective in a number of Asian countries. He also highlights the importance of local participation and demonstration of practical improvements to secure occupational health and safety improvements. Kogi (1995) argues that networks can provide vital support for the dissemination of practical solutions and information.

Eight network meetings have been held since the beginning of the project. These meetings involved site visits and discussion of issues raised during the site visit, as well as more general discussion about the progress of the project. In particular, there is exchange of information about how best to implement certain aspects of

OHSMS. About 15 people, representing about a third of companies, attend each meeting. Some companies have more than one person attending. In some cases companies encourage OHS Committee worker members to attend. Informal feedback indicates that the network meetings are useful for the companies. Information is also exchanged outside the meetings. For example, companies have exchanged OHS policies, safe working procedures and action plans arising from the first audits. The network of companies is reinforced by cross membership of other organisations and supply chain relationships. During the network activities a high degree of trust has developed between many of the participants and although some are direct competitors they are still willing to share information about occupational health and safety.

Next steps

The next steps of the project involve a second round of audits. These audits will focus on those areas which were identified as requiring improvement in the first audits. The extent to which companies improve will be an indicator of the effectiveness of the approach taken in the Club Zero project. The final evaluation will also include an analysis of the injury and disease experience of the employees in the companies. Measures of injuries have a number of limitations as performance measures. These limitations include the lack of validity and predictive power when the company is small. In SMEs injury statistics often represent rare or infrequent events. Reliance on injury statistics also encourages a reactive approach to OHS management[27,28]. Furthermore, an undue emphasis on lost time injury frequency rate can also "blind" companies to the potential for catastrophic risk[29]. Because of these limitations associated with using injury and disease rates as performance measures, the project is also developing positive performance measures. These measures include measurements of the time taken to rectify reported hazards, the results of routine inspections and levels of housekeeping.

Conclusion

The preliminary results indicate that the Club Zero project methods used to facilitate the implementation of OHSMS are effective. It is debateable how generally these methods could be applied because only companies which had prior commitment to change joined the project in the first place. Nevertheless, if there is commitment, the use of networks and OHSMS audits can be an effective way of facilitating OHS improvements in companies.

The study has demonstrated that the methods of building a network of companies around health and safety issues is a very useful way of sharing scarce resources and maintaining interest in occupational health and safety. The fact that the networking is popular with companies can be judged by the continued participation by companies in the network activities. The value of the network activities to the members will be formally evaluated at the completion of the project.

Networking between companies can build a high degree of enthusiasm and shared commitment for improving occupational health and safety. Networks seem to work best if there are other links between the participants. These links include geographical, business and cross membership in organisations.

SMEs can implement the type of management system which is envisaged in the Club Zero project. The Club Zero system is more focussed on participation, organisational relationships and feedback than many other systems. The OHSMS outlined in the Guidelines is also not overly reliant on documentation.

Finally OHSMS developed for the Club Zero project can provide a framework for increased worker participation and does not replace worker representational arrangements.

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Producing Risks : Creating Safety - How is Product Safety Addressed in Management Systems?

Liz Bluff

Address for correspondence:
Liz Bluff
Program Director, Occupational Health and Safety,
International Graduate School of Management
University of South Australia, Adelaide 5000.

Introduction

Occupational health and safety legislation imposes duties on a range of people whose actions in designing and making products have the potential to impact upon health and safety. Despite these legal obligations health and safety issues are often not effectively addressed in the design stage. Management systems for OHS and for quality are important business strategies, which might be applied to the enhancement of product safety. To this end some prominent OHS and quality management standards and guidelines are examined to identify how they deal with product safety issues. It is concluded that these issues are not well developed in these contemporary models. Some principles for improving the integration of OHS into product design and development are discussed.

In most workplaces we can encounter situations where "if only" someone creating the workplace, work environment, plant, equipment, material or process had considered health and safety, a better outcome might have been achieved. In the key life cycle phases of products , there are many opportunities to address occupational health and safety (OHS) issues, beginning with the early phases of product design and development. For simplicity (and consistency with quality management[1]), the term product is used to encompass hardware, software, services or processed materials. The hardware includes plant and equipment as well as buildings and structures, or parts of any of these. Processed materials include hazardous substances and materials. The term "product safety" is used to refer to that aspect of health and safety which is concerned with minimising risks in the design, development and making of products which comprise workplaces and are used at work.

The rationale for giving priority to product safety is that whenever possible risks to health and safety should be eliminated or controlled at source. Passive ("safe place") countermeasures, which eliminate or mitigate exposure to hazards, are believed to be more effective because they function regardless of the people involved [2,3,4]. In contrast, active control measures require people to behave appropriately or follow safety procedures in order to avoid risks (the "safe worker" approach). The latter are prone to failure due to human error and fallibility. While passive countermeasures can be introduced in the operational phase, within a workplace, it is believed to be more cost effective to incorporate controls in the design, manufacture or creation of workplaces, work environments, plant, equipment and other goods. [5,6] Indeed there is some evidence to suggest the earlier in the design process the better, as once designs have been detailed or made up into particular products, there is less opportunity to address health and safety and more costs are involved to make design changes.[7]

If there is any doubt about the importance of this issue, some examples presented in Table 1 provide practical illustration of the problem.

Table 1 : Some product safety problems

The supermarket pod

In some supermarkets a particular "pod" device is used to transfer excess notes from the cash register to the cash office. The checkout operator places a bundle of notes into the pod, places the pod into the opening of a chute and the pod is carried by high suction along the chute to the cash office, some distance away. Through poor design, the suction was made strong enough and the chute opening large enough, that an operator's whole hand could be sucked into the chute. In several incidents operators' hands became lodged in a chute, causing disfiguring indentation on the hand, swelling, pain and bruising, quite apart from psychological trauma to the operator about using the pod again. When problems like this arise, the owner of the system must resort to costly adjustments or appeal to the workforce to take care not to put their hands into the chute.

The falling cupboard

A designer and manufacturer of catering facilities produced and installed a shelving unit made from solid wood and glass doors; weighing 60 kg. The unit was designed to be located above the work area in a cafeteria. Through poor design of location and the mechanism for installation of the wall unit, it fell and struck a young worker. She landed on the floor with the cupboard on top of her and subsequently required emergency surgery for broken bones and ribs, damage to cervical vertebrae, a punctured lung. She also suffered concussion and various cuts requiring stitches. Incidents like this are preventable only by those designing and manufacturing work environment fixtures and fittings, effectively addressing safety.

Climbing frames

Heavy mobile plant used in mining, civil construction and other areas of industry is frequently designed for function without consideration to the operator. Although a human operator is required, access to the operator workstation frequently presents a climbing challenge without steps or other aides to assist access and egress. The operator is an afterthought who may or may not have any kind of shelter from sun and weather when they do manage to climb aboard. Falls from mobile plant are a major cause of strains and sprains frequently experienced by the operators of such plant.

Strategic Directions

A vital area of concern then in occupational health and safety is how attention to product safety can be promoted and motivated. There are various strategies, which might be employed including:

- OHS authorities working with industry to develop safe product solutions or standards for the improvement of particular products and work environments;
- legal action by an injured or sick worker against the designer/manufacturer of an unsafe product;
- educational development of relevant professionals, eg engineers, architects and industrial designers;
- promotion by user groups or OHS authorities of products that are well designed and meet good standards of safety;
- enforcement blitzes directed at unsafe products and publicity to shame risky products and their producers;
- supply chain pressure created by employers and worker representatives demanding that products supplied are assessed against and that they meet standards of safety prior to purchase and acceptance into the workplace.

Undoubtedly it is important to apply a range of strategies both within organisations and through pressure applied externally. The primary purpose of this paper is to explore the relevance to product safety of one particular strategy, the contemporary approach to improving performance intra-organisationally through occupational health and safety management (OHSM). To this end three primary questions are considered. How does OHSM deal with product safety? Can OHSM deal better with product safety? If so, how can this be done?

Overview of OHS Legislation

Some, but not all of the products that might comprise a workplace or be used at work are the subject of requirements under occupational health and safety legislation in Australian states and territories. Legal obligations typically apply to parties responsible for different activities impacting upon product safety including designers, manufacturers, suppliers and importers (of plant and substances) and those erecting, installing or constructing plant or structures. There are jurisdic-

tional variations with regard to both the type of products covered and the duty holders. [8] Responsibilities are established in three main types of legal instruments:

- OHS statutes establish general duties of care on duty holders (eg designers, manufacturers) within the context of what is (reasonably) practicable. For plant and substances the duty typically incorporates some reference to proper design/manufacture, testing and information provision.
- Regulations generally impose performance or process based requirements on duty holders (eg requirements for hazard identification, risk assessment and control, and information provision).
- Approved codes of practice, which have flexible legal status, enable the duty holder to achieve an equivalent or better standard of care.

The OHS statutes limit the products to which obligations apply in the early life cycle phases. Plant and substances are comprehensively addressed in each jurisdiction, being reflected in general duties of care [9] as well as regulations and/or codes of practice, typically based on the National Occupational Health and Safety Commission's standards in these areas. [10, 11] However, it is less common for designers of buildings to have obligations under OHS legislation (South Australia is one exception). [12] Design of services is not specifically covered although in Queensland and Victoria an employer's duty of care requires that others not be exposed to risks to health and safety arising from the business. Services supplied by an organisation are potentially embraced by this duty. [13]

For some years technical standards issued by Standards Australia/Standards New Zealand have also provided benchmarks for the safe design, manufacture or construction of a wide range of plant, equipment, buildings and structures, amongst other items. These provide more detailed guidance. In some instances they have been established as mandatory standards by reference within regulations or they have been given advisory, evidentiary status as approved codes of practice. [14]

Other legal considerations

Building Code of Australia

In regard to buildings and structures the Building Code of Australia [15] provides important direction to designers (principally architects) and constructors. The code sets performance standards, enabling flexibility, but also incorporates

deemed to satisfy provisions, thereby providing clearer guidance for those who seek it. Building practitioners can either follow the deemed to comply solution or take alternative action, provided it meets the performance standard. Unlike the Australian OHS legislation, the Building Code of Australia does not incorporate processes for hazard identification, risk assessment and control.

Trade Practices

Although product safety is often regarded as an area of trade practices, the Trade Practices Act has limited application to OHS. [16] This is because it focuses on the rights of the consumer whereas a person placed at risk from a workplace product is often not the purchaser/consumer. Thus this legislation is unlikely to provide significant leverage in regard to the control of risks in products used at work, except perhaps in the case of the self-employed, outworkers or contractors who are the direct purchasers of the items.

Common Law

Common law actions can be taken where negligence is involved. Although the right of a worker to pursue a common law action against his or her employer has been restricted in most Australian jurisdictions, a person suffering injury or damage due to the negligence of a designer, manufacturer or supplier can still sue for damages [17]. This provides some incentive to address issues of unsafe design, careless production, inadequate product testing or examination, and insufficient safety information for products. To prevent common law liability a duty holder must take whatever reasonable and practicable precautions are necessary to avoid exposing employees, their customers or clients to a foreseeable risk of injury. Precautions might include redesign of products to remove unsafe aspects, inclusion of safety features, provision of information and warnings, or withdrawal of unsafe products for which risks cannot be controlled by other means. [18]

Implications of legislation and common law for health and safety management

Organisations and individuals engaged in the design and development of products that comprise workplaces or may be used at work will need to address the relevant provisions of OHS statutes, regulations, approved codes of practice and other deemed to comply standards, including those in building legislation. While these legal requirements are most concerned with particular types of products (at

least in relation to the design phase), common law obligations are potentially more far reaching. Accordingly, there is a need for designers and manufacturers (or constructors) to take steps to ensure health and safety in relation to their products. Risk management (hazard identification, risk assessment and control) is a core process for complying with legal duties. There is a preferred hierarchy of measures which gives preference to elimination, substitution and engineering controls rather than behaviour based safe work practices or personal protective clothing and equipment (PPE). For designers and manufacturers this will require the removal or control of hazards at source, rather than relying upon instructions emphasising safe behaviour or the use of PPE. It will be necessary to take steps to test or otherwise examine products to verify their safety. Information material will need to include health and safety advice (covering safe use as well as foreseeable misuse).

It follows that designers and manufacturers will need to establish systematic and proactive processes to manage risks and ensure product safety. While legislation requires action in this area it does not identify how an organisation is to manage these activities. This is much the same problem as confronted employers faced with the duty to ensure the health and safety of employees and others, in the context of self-regulation. [19,20] This led, in Australia and other nations, to increased attention to OHS management as a strategy to enable a more proactive, concerted and holistic approach to risk management. It is interesting then to consider whether OHSM as conceived in contemporary performance standards and guidelines, also provides suitable processes for addressing product safety.

Of the work that has been done in this area, much has focused around the health and safety of an organisation's workforce. Indeed, incident rates or workers compensation claims are often used as an indicator of whether a system is effective or not. This approach has been widely recognised as limited, even when considering the system's performance in regard to protecting the immediate workforce [21,22]. It is manifestly inadequate for evaluating the effectiveness of management arrangements to address safety in the design and manufacture of products.

A brief review follows of some prominent OHSM performance standards and guidelines to identify if (and, if so, how) they deal with product safety. Quality management standards are also considered to identify whether they provide useful processes for ensuring product safety.

Standards and Guidelines for OHSM

The organisation as employer

Some performance standards and guidelines for OHSM are focused on the protection of worker health and safety by the employer. For example, SA WorkCover Corporation has issued two sets of performance standards for OHSM. [23,24] They are specifically linked with the South Australian workers compensation. The Safety Achiever Bonus Scheme was introduced to provide an incentive scheme for employers to more effectively manage OHS, rehabilitation and workers compensation claims. A discount on workers compensation levy can be earned on the basis of health and safety and injury management systems implemented and reduction in claims costs. The performance standards for self-insurers are one component of the requirements that must be met by self-insurers. The standards' relationship with workers compensation and particular provisions of them, focus the attention of participating organisations upon the OHS responsibilities of employers in relation to their workforce, within their workplace(s). Although nothing in these performance standards precludes attention to product safety, it is not highlighted. Arguably this is an oversight in performance standards, which are widely applied by larger and medium sized organisations in this state, including major manufacturers, construction firms and providers of services.

The organisation as consumer or producer?

The guidelines for OHSM produced by Standards Australia/New Zealand aim to provide "... a systematic management approach that can assist in both meeting legal requirements and lead to sustained improvement in occupational health and safety (OHS) performance". [25] Moreover, planning and procedures for hazard identification, risk assessment and control are to apply to all activities, products and services over which the organisation has control or influence. [25] This suggests that the scope of OHSM envisaged might be broad enough to encompass consideration of product safety.

However, if it is intended to cover product safety, this aspect is not well developed. Reference to design and development is confined to particular provisions and it is somewhat ambiguous whether the intention is to cover the organisation's products or only the design and development of facilities and equipment for use in the organisation's own operations (ie the organisation as consumer rather than producer). Nonetheless, if an organisation is supplying goods and services to others it should have procedures covering hazard identification, risk assessment and

control of risks to its customers as well as its employees. [26] It is also recommended that health and safety should be considered at each stage of the design cycle to build in risk controls, in order to minimise "the number of reactive add-on procedures required to manage hazards". [26]

The companion standard AS/NZS 4801[27] provides criteria for the audit and assessment of an organization's OHSM arrangements. There is nothing in this standard to further detail the application of OHSM arrangements to product safety. However, the importance of a life cycle approach is emphasised in the discussion of hazard identification which is to encompass, amongst other things, the design of workplaces, work processes, materials, plant and equipment[27].

Product safety as an additional element

The Victorian WorkCover Authority's SafetyMAP[28] identifies 12 elements of occupational health and safety management. A number of these have general application to improving OHS performance and might have relevance to product safety. This includes (amongst others) the allocation of responsibilities imposed by health and safety legislation; development of policies and procedures; identification of health and safety legislation, standards and codes of practice; and the development of health and safety skills and competencies for defined operations. Product (and service) safety is specifically addressed in arrangements for contract review and design control (Element 3 of SafetyMAP). This requires that organisations that design products or sell services need to have a systematic process for reviewing health and safety issues at the design or tender development stage. Risk management, product safety information, design verification and tracing of unsafe products are required.[28] In summary, the intention to address product safety is clear even if the arrangements for doing so are not developed to those for managing risks to the workforce arising in workplace operations (Element 6).

Integration of product safety

After consideration of some prominent Australian performance standards for OHSM it appears that attention paid to product safety is limited. It is somewhat ironic, in view of the persuasive arguments for integration of OHS with other aspects of management of an enterprise that product safety, an important aspect of OHS, is not well developed or integrated. A more integrated approach is provided by the British Health and Safety Executive's *Successful health and safety management*.[29] Although there is not substantial elaboration of processes specific

to product safety, the Health and Safety Executive does provide a clearer representation of the need for more holistic OHS management to incorporate this aspect.

A model is presented in which risk control systems are to be applied to the input, process (operations) and output stages of an organisation's business. The output stage is concerned with preventing "the export of risks off-site, or in the products and services generated by the business".[30] Some of the specific activities identified as requiring risk control activities in the output stage are product and service research, design, packaging and labelling, storage and transport, installation and setting up, and product information. The general arrangements for managing health and safety are to be applied to all aspects of the risk control system including the output (product safety) stage. Thus the key elements of policy, organising, planning and implementing, measuring and reviewing performance are to be applied to risk control for products.

The relevance of quality management systems

The new International Standard 9001 (AS/NZS 9001)[31] specifies requirements for quality management. The companion standard AS/NZS 9004[32] provides guidance on improving an organization's overall quality management performance. The standards explicitly exclude requirements for OHSM, indicating that all OHS matters are to be dealt with elsewhere. As discussed, product safety aspects are not comprehensively addressed in OHSM standards.

It is hard to imagine a customer being satisfied with a manifestly unsafe product, or one that has been poorly designed in regard to ergonomics. It would seem logical that meeting customer needs as well as regulatory requirements should encompass OHS. Indeed, while AS/NZS 9001 makes only passing reference to health and safety, AS/NZS 9004 encourages organizations to "demonstrate responsibility for health and safety".[33] Resources necessary to ensure risk control are to be identified along with those to ensure quality. Responsibilities and authorities for design and/or development activities should include health and safety and system processes are to be established to assess and control risks. Health and safety should also be addressed along with quality considerations, when verifying products, validating design and development processes, and in product information. Moreover, customer feedback and complaint mechanisms should incorporate hazard identification and incident reporting to the designer/manufacturer and processes are needed for identification and traceability of products and components for the purposes of risk control and mitigation.

In summary, although the quality standards are not intended to cover specialised systems such as OHS, their focus on product design, development and realisation place them in an ideal position to promote attention to product safety. AS/NZS 9004 in particular provides some guidance.

Management Systems for Product Safety

None of the performance standards for OHS and quality management reviewed provide sufficient insight into arrangements to manage risks in the design and development of products. However, individually they incorporate strategies of a generic or specific nature that could be applied to product safety. A basic framework for integrating product safety management with other aspects of the management system is presented in Table 2 (derived by combining relevant provisions of OHSM and quality standards and guidelines).

This composite framework for managing product safety provides some direction. Nonetheless, even aggregation of provisions in all these standards does not provide specific guidance for managing risks in design and development of products. It does little more than extend the general principles of OHS management to the product safety area. It is important then to consider whether there are special requirements and, if so, how they might relate to the management system. Some further insight can be gathered from research and experience of addressing OHS issues in the design and development of safe products. The following review is preliminary and requires exploration of additional sources as well as examination and evaluation of principles suggested, through further research.

Table 2. A preliminary framework for managing product safety

Commitment and Policy

- The organisation's OHS policy identifies that health and safety is integral to all operations,[34] including design and development of products.

Planning & documenting strategy

- Plans set objectives, priorities and allocate resources and responsibilities[35] incorporating the management of risks arising products, processes or services.[34]
- Relevant health and safety legislation, standards and codes of practice are identified,[35,36] including those relevant to products and services.

Responsibilities

- Responsibilities are identified and allocated to individuals within the organisation,[35] including OHS legislative and management responsibilities re design and manufacture.

Practices and Procedures

- Documented procedures require hazard identification, risk assessment and control (risk management) in relation to products and services.[34,35]
- Documented procedures enable product sold to be traced where there is the potential for public health and safety concerns.[35,36]

Resources

- Resources necessary to ensure risk control for products and services are identified.[36]

Skills and competencies

- Competency of personnel is developed in relation to hazard identification, risk assessment and control for products designed, developed, manufactured (etc).[35]
- Competency of personnel is developed in relation to OHS requirements for verification of designs and modifications.[34,35]

Risk management

- Risk management is integrated into all stages of product planning, design, development, manufacture/construction/fabrication, supply, transportation, storage, installation.[34,36,37,38]

- Products are verified against requirements,[36] including health and safety.[35]
- Products are inspected and tested.[37,38]
- Processes for safe handling, packaging and labelling are implemented.[36,37]

Product information

- Information is provided in relation to the safe use/operation/application of products.[35,36,37]

Reporting and correcting deficiencies

- Reporting and investigation of incidents and customer complaints[35] includes OHS problems arising in products and corrective action is taken.[35,36]
- Design and development methodologies and decisions are reviewed with reference to potential hazards or failures in product use.[36]
- Faulty and hazardous products (and component parts) are identified and for the purposes of risk control and mitigation.[36]

Auditing and review

- The system is regularly audited by competent personnel to evaluate its capacity to achieve OHS performance standards.[34,35,37,38] (This will require to include expertise in relation to product safety.)

An Approach to Integrating OHS into Product Design and Development

The risk management approach is a cornerstone of contemporary Australian OHS legislation and a vital part of product safety. Some form of risk assessment is actively encouraged by the new style regulatory standards as part of design and manufacture of various workplace products.[39,40]Simple models of risk assessment have been developed with the aim of providing practical guidance.[41,42] More technical approaches to the assessment of risks have been applied in high risk industries.[43,44,45,46] In complex, technological systems this typically involves the

use of structured risk analysis methods (for example preliminary hazard analysis, HAZOP). Whether complex or simple these processes assess risk by considering:

- What are the hazards ?(the potential sources of harm to health or safety)
- What can go wrong ? (the adverse outcomes, events or scenarios in which hazardous exposures could occur)
- How likely is it that this will happen? (the probability of a particular adverse scenario)
- What are the consequences of this going wrong, with reference to some form of measurable loss (injury, disease or damage to property)?

The aim is to identify contributing factors before things go wrong, to evaluate the risk induced by them and to find ways to lower these risks by elimination or risk control strategies.

Through collective experience in this area there are many tools and techniques that can be used. The challenge is to select or refine those most suitable for design and development of new products. If product types are being redesigned there is the potential to apply experience from previous applications. Risk assessment could be facilitated by improved reporting of incidents involving particular products, product types and component parts, including more specific information about contributing factors.[47,48] There is a role here for national and state based workers compensation data sets.[49] However, workplace systems can also encourage this reporting through customer feedback strategies. For more innovative products assessment will require information, techniques and procedures that enable hazards to be predicted and "what if" scenarios to be explored. It will be necessary to go beyond traditional hazard identification methods, which often concentrate, on what is known, has been experienced or can be directly observed. Protocols will be needed that enable adverse outcomes to be anticipated for different products in different settings. Techniques will also be needed for anticipating, the effectiveness of designed in safety features, which will often need to address combination of hazards (eg attention to noise and entanglement hazards plant).[47]

With these considerations in mind Table 3 outlines some principles for integrating OHS into product design and development which are suggested by research and experience in this area. This is a preliminary review and it is emphasised that further research is needed. The intent is to provide an initial basis for considering the features of a management system that might be needed to promote product safety.

Table 3 Principles for integrating OHS into product design and development

Preparation

- Develop a thorough understanding and description of the design/product before assessment begins.[50,51]
- Identify design methods that will efficiently represent the behaviour of the product and enable it to be subjected to risk assessment. [50]
- Develop in-house or contract in personnel with suitable expertise and competency, by qualifications and/or experience (innovation and OHS expertise is needed).[51,52]
- Develop systems and software to collect, keep up to date and feed safety information to designers at key points in the design process.[53,54]
- Establish communication mechanisms between end users and designers to exchange important information (designers to seek information; end users to input lessons learned from past experience and provide accurate project requirements).[55,56]
- Establish mechanisms to integrate different knowledge and skills, including user/customer requirements in design and assessment process (eg coordinated joint project teams).[53,55]

Baseline Information

- Collect incident records from past use of this or similar product types.[50,57]
- Survey similar products to identify safety problem areas, safety features incorporated and any test results available.[57,58]
- Conduct search of published information and databases to identify OHS information for the product type.[50,57]
- Carry out operational survey to gain practical understanding of the operations of the system/product.
- Obtain input from (potential) users/customers about requirements and past problems.[50,56,57]

- Conduct physical survey of environmental conditions, spatial and functional interactions within the system (observing the product in use – if it is an existing product type and the work environment in which it will be used, installed etc).[50,57]
- Review specifications, standards, codes, and relevant OHS regulations.

Risk Management

- Undertake hazard identification and risk assessment in each phase of the design/development process (ensuring that each stage of the product's life cycle is considered, eg designing for safety in installation, use, operation, maintenance etc).[50]
- Select or develop methods that enable prediction and anticipation of hazards in new designs (qualitative methods are simpler and require less time and resources but structured methods of risk analysis (eg HAZOP) are needed for more complex systems).[50,51,52,57]
- Consider intended use and foreseeable misuse of the product.
- Develop checklists and other tools to guide identification of risk exposures for particular types of products (this may reduce time and resources by drawing on experience of previous product design processes).[50,59]
- Use a combination of assessment methods to focus on different types of health and safety problems (eg human factors and ergonomics, technical hazards, task and organisational factors, work environment). [50,57]
- Apply a semi-quantitative risk ranking method, for the purposes of prioritising problems for development of countermeasures, in preference to informal judgement alone.[50]
- Design in risk elimination and control measures and detail in product specifications (ie the full product description including safety features).
- Consult with main and/or potential customers for feedback on suitability, acceptability and unresolved OHS problems.[56]
- Test and/or evaluate product to identify residual hazards, operating limits and whether each hazard is reduced to the required level. [57,60]

Product Information

- Identify OHS matters for incorporation in user information, including procedures for different life cycle phases, and safe use and foreseeable misuse.[50,61]
- Produce, trial and evaluate product information for content, accuracy, completeness, structure, presentation, user friendliness (a comprehensive checklist may assist in ensuring these).[50,61]

Conclusions

Product safety is integral to OHS legislation but has not been well developed in OHS management standards and guidelines intended to promote and facilitate legislative compliance and enhancement of OHS performance. If health and safety is to be the domain of OHS management standards (as quality standards suggest) then these systems need to more comprehensively address product safety. Organisations will need to be concerned both with the health and safety of their workforce and with the risks they create and pass on to others. In all of this it is recognised that changing product design and development practices is not purely a matter of achieving commitment to product safety, although this will be needed. There are real constraints to be tackled including tight timeframes, limited resources, competitor pressures, and specialised processes of design quite apart from learning how to integrate safety into established design practices.[62]

It will be necessary to clarify the knowledge and experience of those involved. OHS professionals have knowledge of processes as well as interpretation of legal and technical standards. Their expertise is a vital input to the design and development of safe products, as well as the development of the systems to facilitate this. The design professions of engineering, architecture and industrial design are in a pivotal position and warrant education and professional development in OHS requirements and their implementation. [63,64] However, such professionals are unlikely to be able to operate effectively unless organisational systems foster and facilitate product safety initiatives.

It is concluded that further research is needed to explore existing design and development practices and strategies to enhance product safety. An important aspect of this is consideration of the relevance of management. Are there systematic processes that will improve product safety outcomes and complement innovation; if so, what are they? Or is there a risk that structured processes may stifle

the innovation fundamental to the design process? These are questions that deserve further research and examination.

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Accurate Assessment of OHSMS Performance: Impact of Auditor Skills

Jenny Barron

Address for correspondence:
Jenny Barron.
Director, Practical Work Solutions and Director, JBA Audit Training
29 Binning St., Erskinville 2043.

Introduction

Organisations may undergo an Occupational Health and Safety Management Systems (OHSMS) audit for a variety of reasons and hence have a variety of objectives. For example, they may wish to improve their internal performance, they may be seeking certification or they may need to meet requirements imposed by a client. Regardless of the reason, an OHSMS audit is a complex activity. If it is to achieve its stated objectives, a large number of factors need to successfully combine. One of these factors is the individual auditor's knowledge and skills, and his/her approach to the audit.

How deficiencies in auditor performance impact on the results of the audit is generally unknown. While some research has been done on this topic in the financial sector, very little (if any) research has been done to assess the influences of auditor practice in the OHS, quality or environmental areas. However, my

personal experience suggests that individual auditor impact is often under-estimated. The ideas outlined in this paper are primarily based on my personal auditing experiences and are supported in some areas by research undertaken into auditing skills in the financial sector. My experience includes:

- training approximately 150 OHSMS auditors
- conducting and being 'on the receiving end' of quality, injury management and OHS management system audits
- training approximately 150 quality auditors in healthcare and
- assisting with the management of the 350 auditor workforce at the Australian Council on HealthCare Standards (including on going training and dealing with feedback from customers about their performance).

This paper highlights some areas where auditor performance may negatively impact on the audit and suggests some strategies that may help to address these concerns.

Background

OHSMS auditors are currently affected by a number of factors within the broader Australian OHS Auditing industry. Addressing these issues is not a simple matter and it is not within the scope of this paper to explore how this may be done. They are raised to provide some background to the discussion of individual auditor performance.

In order to help set a minimum standard for OHS auditors, a number of certification programs have been established. However, as a result of the acknowledged shortage of certified auditors, (1). Those conducting OHSMS audits are not always certified and may not even be OHS professionals, for example, they may be quality or environmental auditors. In addition, being certified is not a guarantee of auditor effectiveness for two major reasons. Firstly, there is no current nationally accepted set of competencies for OHSMS auditors (although the National Occupational Health and Safety Commission (NOHSC) is beginning to address this issue (2). Secondly, during the certification program, individual auditor competencies are primarily assessed through review of documentation. This does not allow for a detailed assessment of auditor 'on-site' performance.

My experience is that the majority of auditors do an admirable job. In view of the importance of this area and the legislative framework that governs OHS, even

small errors can have significant impact on organisations. Accordingly, auditor performance issues should be addressed. Some of the possible problems are identified below.

Factors Impacting Upon Auditor Performance

Lack of Knowledge of Auditing Standards

Some auditors appear to lack knowledge of the basic requirements for conducting management system audits; ie they have no knowledge of available auditing standards (eg International Standards Organisation (ISO) quality or environmental management system auditing standards, ISO 10011 series and ISO 14010/1/2). This can lead to inconsistency in approach and inadequate preparation. However, perhaps one of the most worrying issues relates to the sourcing of evidence is that while most auditing standards emphasise the need to gain evidence from three sources; documentation, observation and verbal reports, there is a tendency for auditors to rely primarily on documented evidence. This gives little assurance that the system is being appropriately implemented. For example, an auditor may gather strong evidence of non-conformance from worker interviews and from observation and yet rate the system highly because the apparent gaps are addressed in the documentation.

Lack of Knowledge of Management Systems

Problems can arise during audits because the auditor does not possess the basic knowledge of what a management system should include. In particular, some auditors do not look for evidence of integration of programs. For example, the purchasing policy may include assessment of OHS issues, but auditors need to look for evidence that this criterion is actually given priority in the selection of equipment/materials and that it is consistently implemented across the whole organisation.

Hazard Spotting Versus Systems Analysis

An auditor needs to differentiate between an inspection and an audit, ie the difference between 'hazard spotting' and 'systems analysis'. To do this an auditor needs to be able to see a particular hazard and concentrate on 'why' and 'how' the hazard has been ineffectively managed rather than 'fixing' the hazard. This can be a particular problem if it is one of the auditor's areas of

particular knowledge. While it is acknowledged that the hazard should be rectified, a management systems audit is trying to identify the cause of the occurrence.

Unclear Audit Purpose

Lack of attention given to ensuring that everyone is clear about what the audit is to achieve can also create problems. Often, organisations being audited will be unclear about what can be covered during the limited time of the audit, or they expect that they will have a detailed action plan outlined in the report. This will inevitably lead to disappointments and may lead managers to undervalue the audit itself. Therefore, the auditor must ensure that the audit brief and terms of the audit are carefully negotiated. Being clear about what the organisation wants to achieve will also help to ensure that a manageable part of the organisation is audited and an appropriate audit tool is selected.

Tight Timeframes

Defining what constitutes a 'manageable' amount for an audit is usually difficult to determine, even for the most experienced auditor. However, many auditors tend to try to address too much and this leads to issues being addressed only narrowly and/or superficially. Braun found in the financial sector that short time frames led to auditors concentrating on the documented (quantitative) findings at the expense of verbal (qualitative) statements from staff (3). Thus the credibility of the findings could be questioned and may lead management to devalue the report and employees to mistrust findings.

Poor Industry Knowledge

Poor understanding of the risks associated with the industry and the organisation being audited can create major problems as high-risk activities may be overlooked or inadequately reviewed. Analysis of major accidents (disasters) has often revealed that not enough effort was put into controlling serious-consequence/low probability events (4). While it is generally an advantage for an auditor to be familiar with the industry, it does not mean that those familiar with the industry will always recognise these risks. For example, an auditor may be very familiar with the industry as a whole but be unable to understand the risks associated with a particular organisation.

Selection of Audit Tool

Auditors may appear to have limited knowledge of the variety of OHSMS audit tools available. Therefore, an audit tool may be selected, which is less appropriate for the industry or that will not assist with achieving standards that meet audit objectives. For example, more rigorous tools will assist an organisation to head to 'best practice' but may not be the best option for an organisation that is seeking to meet minimum requirements for a client.

Communication skills

One of the more frequent client complaints is about poor communication skills displayed by auditors (rather than about auditor knowledge or technical skills). Excellent communication skills are therefore critical skills for a successful auditor, particularly when trying to elicit information from a wide variety of people and when 'marketing' the importance of effective OHS management systems. However, many auditors remain unaware of how their behaviour impacts on the audited organisation.

Auditor Bias

It is inevitable that auditors display some form of bias from time to time. Mostly the bias can be acknowledged and strategies put in place to minimise its impact. However, some auditors are not aware that they are susceptible. For example, in the financial sector, auditors who obtained evidence from managers who were perceived as 'competent', in turn perceived this evidence as more reliable, even if there were contradictions in evidence (5). Auditors may find it difficult to shift their opinion from their initial impression.

Mechanisms to Improve Auditor Performance

Auditors do not necessarily demonstrate deficiencies in all of these areas, but individuals may display one or more of these deficiencies. Unless we wish to emulate the performance report of a naval officer that stated "He has carried out every one of his duties to his entire satisfaction" (personal correspondence), we need to try to address these issues and minimise the negative influence of these issues on audits.

Some possible strategies to improve auditor performance are outlined below.

1. Initially, there needs to be an increased acknowledgment that management systems auditing is a complex activity that can not necessarily be conducted effectively by every OHS professional.
2. Development of national competencies that cover issues such as application of OHS legislation, requirements of an OHSMS, awareness of the audit tools available and their relative strengths and weaknesses, and auditing standards. Moreover, competencies need to address many of the issues raised in this paper. Such things as information seeking and analysis skills, interpersonal skills, negotiation and persuasion skills also need to be included in these competencies.
3. More 'on the job' training or mentoring may be useful. Team auditing can be particularly useful to facilitate this. There is some evidence from the financial sector that increased training can assist with improved performance (6), that more experienced auditors select more relevant information (7) and that recall and accuracy is improved if more than two auditors conduct the audit (8). However, it is not always easy to find suitable mentors/trainers. How important it is for auditors to have a formal professional development program is also not well understood and/or valued. Again, in the financial sector, one study found that both managers and staff ranked 'development of auditors' as a very low priority (9).
4. There is also some evidence from the financial sector that increased use of decision aids (ie more detailed evidence guides/rankings) can assist with improved performance (10). However, Boatsman, Moeckl and Pei (11) found that when decision aids were used their 'predictions' would often be ignored if the prediction did not agree with the auditor's initial 'gut reaction'. It is therefore unclear how effectively they are used, or could be used, in OHSMS audits.

Conclusion

This paper has highlighted some areas of potential concern in OHSMS auditing. The lack of research available on how auditor competencies/actions can impact on management system audit findings is of real concern. OHS professionals, through such bodies as the NOHSC and state and territory OHS authorities, as well as through OHS professional forums, must determine progress from here. There is no doubt that these issues need to be addressed if the judgements made

by OHSMS auditors are to be trusted and capable of more effectively ensuring the health and safety of the working community.

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OHSMS Performance Measures That Add Up

Bryan Bottomley

Address for correspondence:
Bryan Bottomley, Principal, Bryan Bottomley and Associates
33 Mountain View Parade
Rosanna, Victoria 3084.

Introduction

Measures of occupational health and safety management performance are genuinely difficult to construct and manage given the multi variate nature of the dimensions being measured. Despite considerable debate about the inadequacies of traditional lost time measures and the need for "positive indicators" the greater use of an Occupational Health and Safety Management System (OHSMS) does not seem to have been accompanied by any qualitative shift in the type of measurement used.

In this paper themes in performance measurement are discussed and applied to OHS management systems. Particular attention is given to process type measures derived from the operation of an OHSMS and the way in which they motivate improved OHS outcomes. Outcome measures are also examined to see how directly they can be linked to the interventions generated by the OHSMS.

By their nature OHSMS should be more closely integrated with other business processes and performance measures. This is examined by looking for proxy measures of risk exposure within an organisation and trying to construct links between OHS and mainstream business measurement.

A new performance measurement orientation is suggested for OHSMS that is designed to motivate change rather than describe past performance.

Overview of OHSMS and Measurement

For the purposes of this paper an OHS management system is a planned, documented and verifiable method of managing hazards and associated risks,[1]. An OHS management system can be simple or complex, it can be highly documented or sparingly described, and it can be home grown or based on an available model.

At the most formal and complex level is the definition of an OHSMS as found in a certification standard like AS/NZS 4801:

> *"that part of the overall management system which includes organisational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing and maintaining the health and safety policy and so managing the health and safety risks associated with the business of the organisation".*[2]

Very few OHS system models actually define a system by what it is, but rather by what it is comprised of (key elements), or by what it seeks to achieve (objectives).

There is a high level of agreement about the essential elements of an OHS management system. Gallagher's study of OHS management summarises the elements considered essential for an effective system. These elements are outlined below in Box 1 below.

Table 1. Elements of an OHS management system.

ORGANISATION, RESPONSIBILITY, ACCOUNTABILITY

Senior manager/involvement
Line Manager/supervisor duties
Specialist personnel

Management accountability and performance measurement
Company OHS policy

CONSULTATIVE ARRANGEMENTS

Health & safety representatives - a system resource
Issue resolution - HSR/employee and employer representatives
Joint OHS committees
Broad employee participation

SPECIFIC PROGRAM ELEMENTS

Health and safety rules and procedures
Training program
Workplace inspections
Incident reporting & investigation
Statement of principles for hazard prevention and control
Data collection and analysis/record keeping
OHS promotion and information provision
Purchasing and design
Emergency procedures
Medical and first aid
Monitoring and evaluation
Dealing with specific hazards and work organisation issues[3]

Apart from the typical elements that make up OHS systems what makes it a *system* is the deliberate linking and sequencing of these elements to achieve specific objectives and to create a repeatable and identifiable way of managing OHS. Corrective actions and system improvements flow from the cycle (characterised by Plan, Do, Check, Act in the quality literature) of monitoring, audit and review.

What makes it a *management* system is the allocation of accountabilities, responsibilities and resources from senior management through to all employees to enable decisions to be made on OHS matters. It is one aspect of the overall management system used in the organisation.

Both these defining characteristics distinguish this sense of system from the natural or organic concept of a system. An OHS system has no natural equilibrium or momentum, it is the result of aligning effort and resources and is maintained by the people who work within it. It is these characteristics of an OHS management system that need to be the focus of a measurement model.

Performance Measurement is primarily the process of assessing progress towards achieving objectives.

Performance measures are quantitative or qualitative representations of that progress towards achieving objectives.

There are multiple reasons for measuring and the role of measurement may vary from ensuring compliance to stimulating strategic analysis and review. As some have observed measurement is not the answer but rather provides the *clues* for further action.

Neely says that a performance measurement system:

> *"enables informed decisions to be made and actions to be taken because it quantifies the efficiency and effectiveness of past actions through the acquisition, collation, sorting, analysis, interpretation and dissemination of appropriate data"*[4].

In an OHS management system there is considerable emphasis on monitoring, measuring and reviewing both processes and outcomes. This approach is consistent with many measurement models that derive from the same system loop schemata.

There are generally four aspects that any performance measurement system covers; Inputs, Processes, Outputs and Outcomes. **Inputs** are the resources that are applied to a process. **Processes** describe what is done with the inputs to produce outputs. Outputs are the services or products produced by the processing of inputs. **Outcomes** are the results, or in the longer term the impact, of the outputs produced and delivered.

This model has been applied by Brown[5] into a measurement framework that is shown in modified form as Figure 1. Input measures are about the quality and quantity of the input, process measures address cycle times and characteristics, outputs indicate quality and reliability and outcomes track the impact of outputs.

Thus when we look at what to measure it might be one or all of the above aspects. For each aspect there is a performance indicator that could be defined.

Using these concepts as a basis then we can begin to assemble the parts into a cohesive performance management system as depicted in Figure 1 using the working at height example.

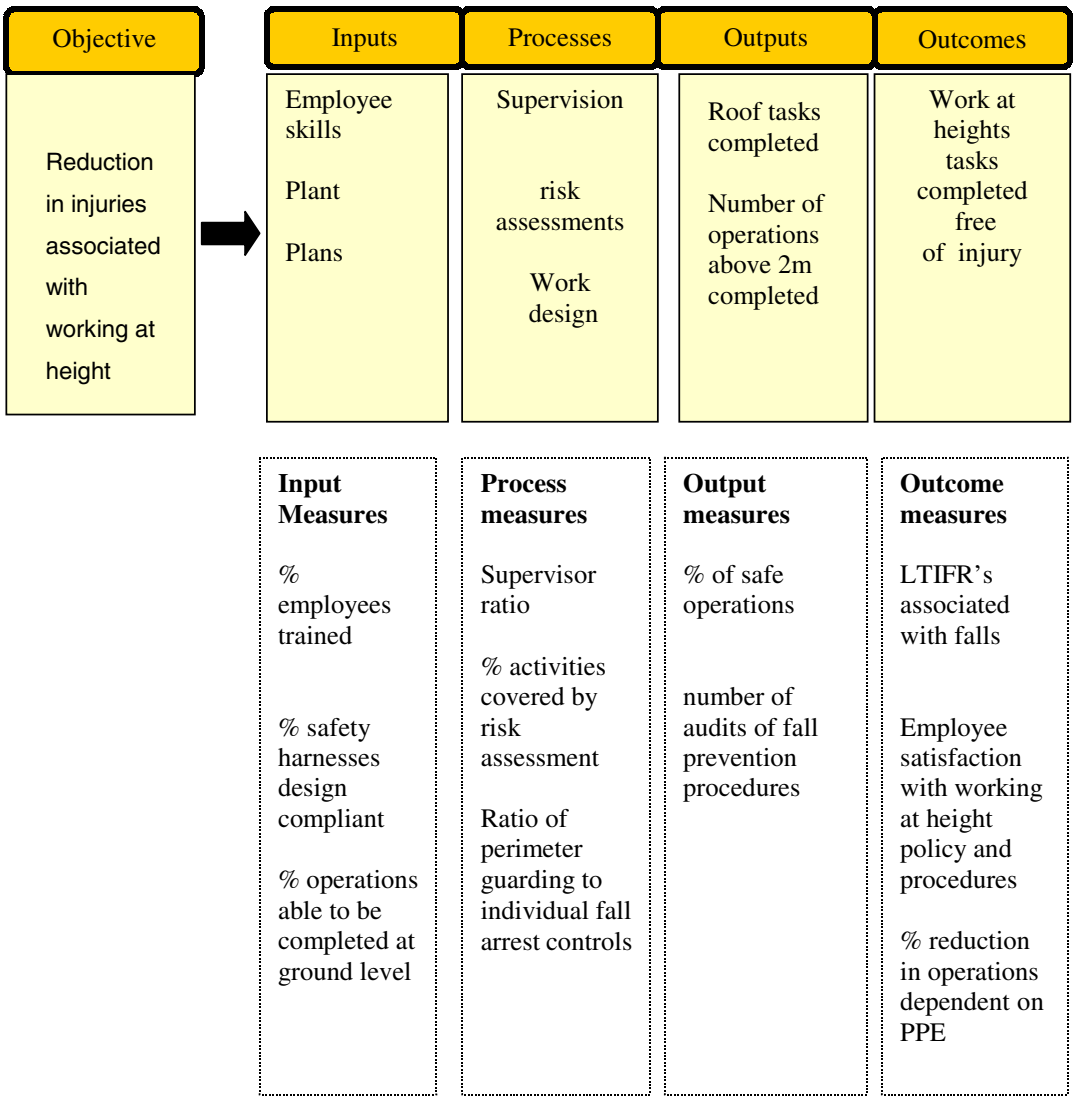

Figure 1: Measurement Model (based on Brown)

These measures are only examples and would need to change according tho the nature of the hazards being measured. The example illustrates that an OHS management system should be able to capture the degree to which the principle of designing and planning out hazards is the dominant approach and how dependent the system is on the less reliable and effective "safe person" risk control strategies.

The above example is a traditional visible safety hazard with immediate and traumatic consequences and thus presents a manageable measurement task. By contrast measurement of illness and disease may present different problems, especially at the outcome end. This is important in the context of OHSMS as it is many of the larger companies using such systems that exposure to hazards that

cause illness and disease is greatest. This is examined in more detail in the following section.

All of the concepts about performance measurement apply to smaller employers (defined for these purposes as 20 or less employees) but the likelihood that such employers have, or indeed need an OHSMS is low. Consequently the application of these models is limited to the small business sector. However they may have more utility than traditional claims or lost time indicators because of the statistical credibility issues associated with small data sets.

If smaller employers used the operational focus suggested in this paper and developed specific risk measures this may be more relevant and meaningful to them than the mistrusted compensation data[6] that they currently use.

Application of Concepts to Measurement of Performance in an OHSMS

As noted above the input, process, output and outcome loop is central to the structure of OHSMS yet there has not been much attention to how these different elements might be the source of measures. Figure 1 above gives some examples of how this might work but a more detailed analysis is required.

a. Input indicators and system protection

It is generally agreed that upstream or hazard at source interventions are desirable in improving OHS outcomes. This means ensuring the inputs to any process are assessed and risks designed out if possible. This idea is embedded in legislation where suppliers and manufacturers have responsibilities to the end users of products or processes.

Surprisingly this has not been an area where measurement or reporting has been targeted. The fundamental measure for an OHSMS is the extent to which the system filters out imported hazards.

The basic concept of an OHSMS is that it affords protection to those inside the system and those who may be impacted by its operation (eg. suppliers, contractors, local residents). It is therefore important that part of the measurement package addresses how effectively external or imported hazards are screened out and

contained. The nature of measures will necessarily be lead indicators, or some might say, positive performance indicators.

The following examples of input indicators illustrate what an OHSMS should be able to measure:

- Contractor management is an upstream issue in which management of the tender and contract specification process can reduce the importation of hazards to the principal's workplace. OHS management systems have specific procedures that address this issue and should be able to generate measures about these assessment processes as well as longer-term outcome measures of individual contractor performance.
- Purchasing of plant and substances is a fundamental stage at which inputs can be assessed and managed to ensure they import the lowest possible hazard levels to the workplace. This is a point at which the potential for illness and disease consequences can also be measured. The rate of reduction in use of substances classified as hazardous substances (or of the level of harmful ingredients within a harmful substance) would be a measure of system protection.
- Project planning in industries like construction are critical to the input stage. A study of quality and OHS on construction sites found that two thirds of the fatal accidents were due to shortcomings in design, decisions on materials/equipment and patterns of work scheduling. That is, about 60% of the fatalities arose from decisions upstream of the construction site.[7] Measurement of the proportion of project tasks subject to risk assessment would be an indicator that could be used.

The level of performance in filtering out imported hazards should be one of the key elements of an OHSMS measurement suite.

b. Process indicators and critical pathways

The process dimension has been increasingly the focus of recent discussion of OHS performance measures.[8] Using the quality paradigm the idea has been that good processes will lead to good outcomes over time. Process measures certainly are a step away from the negative or failure measures that still dominate the field. Process measures are also related to the concept of a lead indicator and are also described as positive performance measures.

The recent NOHSC report on OHS Performance in the Construction Industry describes positive performance measures thus:

> *"Positive performance indicators focus on assessing how successfully a workplace or enterprise is performing through monitoring the processes which should produce good OHS outcomes. Positive indicators can be used to measure relevant OHS systems, processes management and compliance with OHS practices in the work-place".* [9]

The report goes on to construct a range of performance indicators beginning by identifying the factors that influence performance. This approach is consistent with the idea that measurement must influence change otherwise it is of marginal value. The factors initially identified were:

- commitment by management to safety;
- an effective OHS management system;
- risk management and control of hazards;
- auditing of both management systems and physical hazards;
- training and education;and
- communication and consultation.

Following input from case studies and further elaboration of the model the report identified 22 positive performance indicators that covered planning and design, risk management, management processes, psycho-social working environment and monitoring. Most of these measures could be described as process measures and many were based on a rating by appropriate personnel. Several of the indicators were upstream or lead indicators that focused on the inputs to the management of risks on construction sites

This study is a helpful guide to the way meaningful process measures can be developed for an OHSMS as it highlights that one of the measurement objectives of an OHSMS must be the effectiveness of processes.

To further enhance the relevance of these process measures it may be necessary to apply further rigor to the notion of process measures. As well as focusing on the things done in the system to control risks we need to look at processes in the traditional process safety sense and establish critical points at which we should measure.

The prevention value of process indicators will depend on how long the process sequence is. If the steps in an operation are detailed then there may be a number of critical intervention points that become the source of indicators and allow actions to be taken. Conversely, the sequence may be short and the opportunity to intervene limited. For longer cycles, process indicators will be useful but for short cycles input measures may be more appropriate. This may also reflect of the difference between large and small businesses, suggesting small businesses with shorter, simpler processes hit the danger zone with less warning and we should promote input indicators for this group.

This is also a reminder that the ability of an OHSMS to detect on its process based radar screen incidents that may have the potential for greater damage is a strength, but one that needs to be qualified. The advantage of an OHSMS is that through its monitoring, measurement and corrective action cycle preventative steps can be taken before near misses become hits. However it is equally important to understand that the hits may result from critical sequences rather than from a probability equation that states that after so many incidents one will result in injury.

Research undertaken for the Industry Commission inquiry in 1995[10] made the point that we need to understand the specific sequences that culminate in failure rather than assuming that the Bird pyramid actually is to be applied in specific circumstances. Performance measures that track incidents are potentially good lead indicators but they are more powerful if they identify critical sequences that result in failure. Many process indicators do not capture the importance of these sequences.

To know the number of people trained, the number of audits conducted, and the number of corrective actions taken are all pertinent to measuring the positive investment being made in OHS but we need to look at the potential connections. For example, if we know that certain operations depend on a combination of skill, equipment and scheduling then we should be monitoring and measuring for the presence of all three.

c. Outputs and links to mainstream operations

In relation to outputs the key point is to relate OHS performance measurement to the business operations that create risks. In this sense there are no OHS outputs that mean much except in relation to the operational task being performed. It is

the number of patients moved, cars serviced, pallets moved or roofs tiled that needs to be incorporated into this part of the measurement equation.

By looking at mainstream business outputs we can develop better measures of risk exposure and better proxy measures. The OHS profession seems much more reluctant to use proxy measures than other disciplines. Economic health indexes for example, are constructed from a diversity of sources from consumer sentiment surveys to the number of housing loans approved in a quarter.

In OHS, worker's compensation data is used as a proxy for both performance (rate and type of claims) and exposure (payroll as a proxy for hours worked). The deficiencies of claims data has been well documented but one must also ask how relevant a measure of exposure is the number of hours worked as measured by payroll.

We can accept these traditional denominators as gross denominator data that enables some comparisons but if we have gone to the trouble of developing an effective OHSMS we should be able to generate more meaningful data.

The number of hours worked can be relevant to exposure to a variety of hazards like substances, noise or manual handling. Fatigue is probably one of the few hazards that hours of work is directly relevant to, but any examination of the issue demonstrates how inadequate this is as a basis for performance indicators.

Studies of fatigue have identified a number of factors that contribute to fatigue beyond the length of time spent on task. The influence of circadian rhythms, the opportunity for restorative sleep and the time of day factors are considered to be critical in understanding the onset of acute and chronic fatigue.

A road transport company with an OHS management system can link mainstream business measures like the number and length of trips to the evidence about fatigue to create a better basis for measurement. The percentage of trips that require driving through circadian troughs (eg. night), the opportunities for night sleep in a week or the average length of trips all would be examples of measures derived from business operations.

A more detailed illustration of this point can be drawn from an aged care sector case. The general performance measures used in the sector include:

- Dependency levels of residents in residential care as measured by the single classification instrument.

- Client satisfaction with services provided as measured by ad hoc evaluation studies.
- Number of managers and staff of aged care services trained in dementia care.[11]

These measures are system wide, but if we applied them to an individual aged care facility with an OHSMS then they could serve as reasonable proxies for risks. The dependency rating is used to establish the care needs of a resident, the satisfaction survey covers all services and the training measure is specific to managing challenging behaviour.

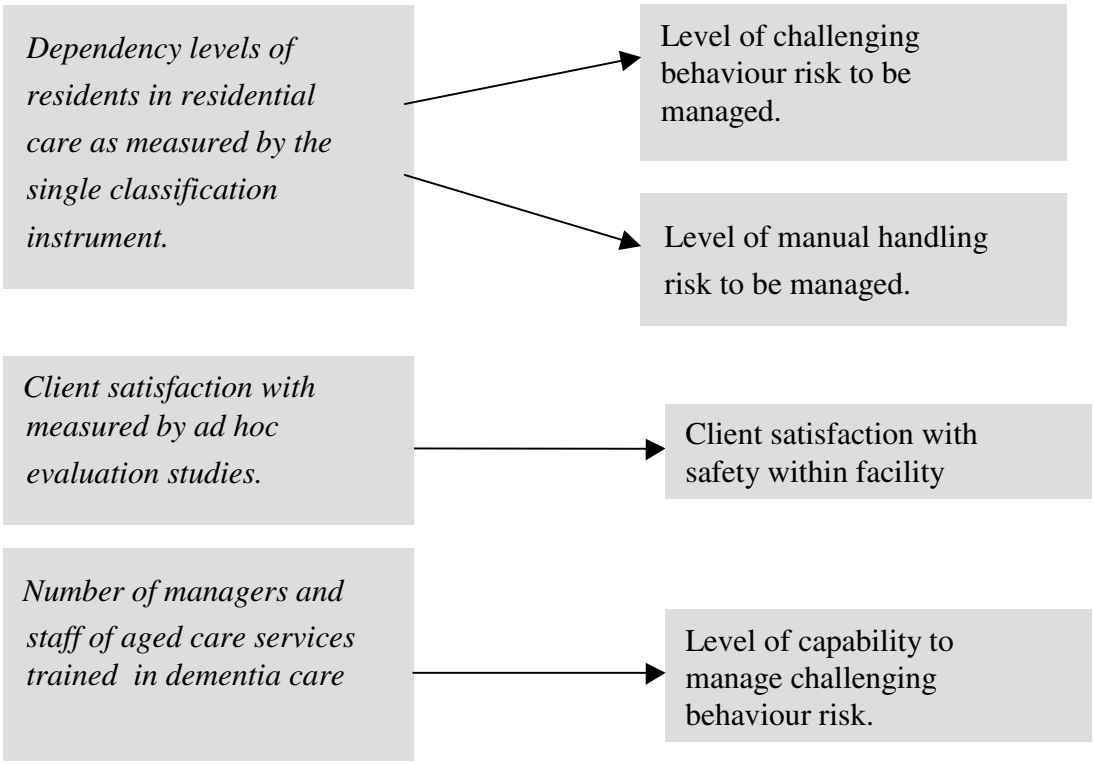

Figure 2: Examples of Proxy Measures

This example illustrates that general non-OHS data may be a good proxy for both estimating current and future risk exposure and current and future capability of managing that risk. Another example from a different industry takes the point a little further.

An energy company that has as one of its health and safety concerns the entry to confined spaces. It normally enters these spaces to pull cables and undertake maintenance on cables. It has developed specific procedures to manage confined

space entry and these sit within its overall OHSMS and within the measurement model outlined in Figure One the following would apply:

- **Inputs:** trained operators and supervisors, appropriately maintained access equipment, calibrated air monitoring equipment
- **Processes:** risk assessment on site, entry permit process, atmospheric monitoring on site
- **Outputs:** metres of cable pulled, number of confined space entries conforming with procedures
- **Outcomes:** level of injury, illness or disease attributed to confined space entry

To report on performance the company has a number of options that include input and process measures related to training and monitoring and these sorts of measures are increasingly used. However it is not difficult to establish measures that are output and outcome oriented. The following indicators could be developed:

- Risk exposure level = Number of entries to confined spaces/Number of confined spaces
- Risk exposure rate = Number and length of entries to confined spaces per 1,000 working hours
- Confined Space incident rate = Incidents per 1000 entries or per 1000 hours spent in confined spaces
- Safe and healthy entry rate = entries free of risk per 1000 entries or per 1000 hours spent in confined spaces
- Confined Space prevention rate = number of non-conformity free audits per 1000 entries

This can be taken a little further to use the actual business output as the denominator. The number entries free of risk per 1000 metres of cable pulled could be one way of expressing it.

An organization with an OHSMS should be able to generate meaningful, statistically valid data to use these sorts of proxies. They are not proxies for performance but of risk exposure.

d. Outcomes that relate to the system

The deficiencies of commonly used outcome measures like claims data and LTIFR have been frequently noted but they still remain the dominant way of measuring OHS performance.[12]

Claims data and measures like Lost Time Injury Frequency Rates have weaknesses that include:

- They measure failure rather than success
- They underestimate illness and disease
- They are subject to under reporting
- They do not inform about causes and motivate improvement

These traditional measures can be used more strategically but usually they are presented as gross indicators of past performance and even more regularly have no statistical relevance to defining future targets. Their role in influencing behaviour is very marginal.

A recent major national report prepared by the Workplace Relations Ministers' Council (*Comparative Performance Monitoring: Occupational Health and Safety and Workers' Compensation Report*[13]) uses this traditional approach to outcomes.

This report by comparing jurisdictions is seeking to show what outcomes are being achieved by the different government approaches and to be measures of high level objectives.

The measures are generated from the National Data Set for Compensation Based Statistics.

The OHS performance indicators used are *the incidence of traumatic injuries and the incidence of traumatic fatalities to measure performance against the objective of effective prevention of workplace injury and disease.*

In light of the discussion above, this link between objective and indicator is tenuous. Firstly, the measure does not capture illness and disease data and secondly, the relationship to the source of the injury is so abstract that the value of the data in motivating change is negligible.

In the compensation section measures are related to *cost effective workers' compensation*.

Using Workers' Compensation costs as a percentage of total labour costs the report compares jurisdictions and industries.

This measure could be described as an outcome based efficiency measure. What it really measures though is debatable. Does it measure the efficiency of compensation schemes, industry competitiveness, prevention programs or return to work practices?

If this data were being used by an organization to describe its performance or as a basis for comparison with others the same criticisms would apply. Unfortunately organizations with well developed OHSMS still use this data to set targets and compare performance.

To restate a point made earlier, if an organization invests resources and commitment to developing and maintaining an OHSMS it is entitled to expect more intelligent and influential performance measures to be generated. As an example the diversity and breadth of measures used by fund managers to rate the performance of companies and their capability for future growth is instructive. These measures cover traditional indices like earnings per share but range into measures of technological sophistication, management competence and market penetration. If the same intellectual effort used to describe prospects for profit went into developing system based outcome measures then OHS performance measurement would improve dramatically.

Some organizations are moving in this direction. The use of customer satisfaction measures in business models as key outcomes can also be replicated in OHSMS indicators. The level of employee satisfaction or confidence in the OHSMS is an important way of influencing decision making. Similarly the ratings of suppliers can provide external feedback on the outcomes of an OHSMS.

The NOHSC Construction industry study noted earlier has several indicators that are satisfaction based outcome indicators and a recent study of safety culture in the mining industry[14] points to the value of understanding values, attitudes and perceptions in assessing the effectiveness of systems.

For these satisfaction type outcome measures to be reliable employees, suppliers or contractors would need to be able to express their views in an independent and shared forum if the restrictions of organization and its culture are to be minimised.

Employee ratings of safety performance may be a reflection of traditional safe person/behavioural that are at odds with the safe place orientation of an effective OHS management system.[15] The use of groups of OHS representatives or other forums may be the best way to gather robust and independent assessments of the OHSMS.

Nevertheless this is an aspect of OHSMS outcomes that needs consideration. This orientation is very much influenced by the Balanced Scorecard model pioneered by Kaplan and Norton.[16] This model proposes that organisations will be interested in measuring:

- financials
- customer satisfaction
- internal business processes
- employee satisfaction
- community and shareholder/stakeholder satisfaction

Figure 3 illustrates how this might apply. The measures in the measures boxes could be made up of a variety of input, process output or outcome measures. Similarly the critical success factors will vary and this should be reflected in the measures.

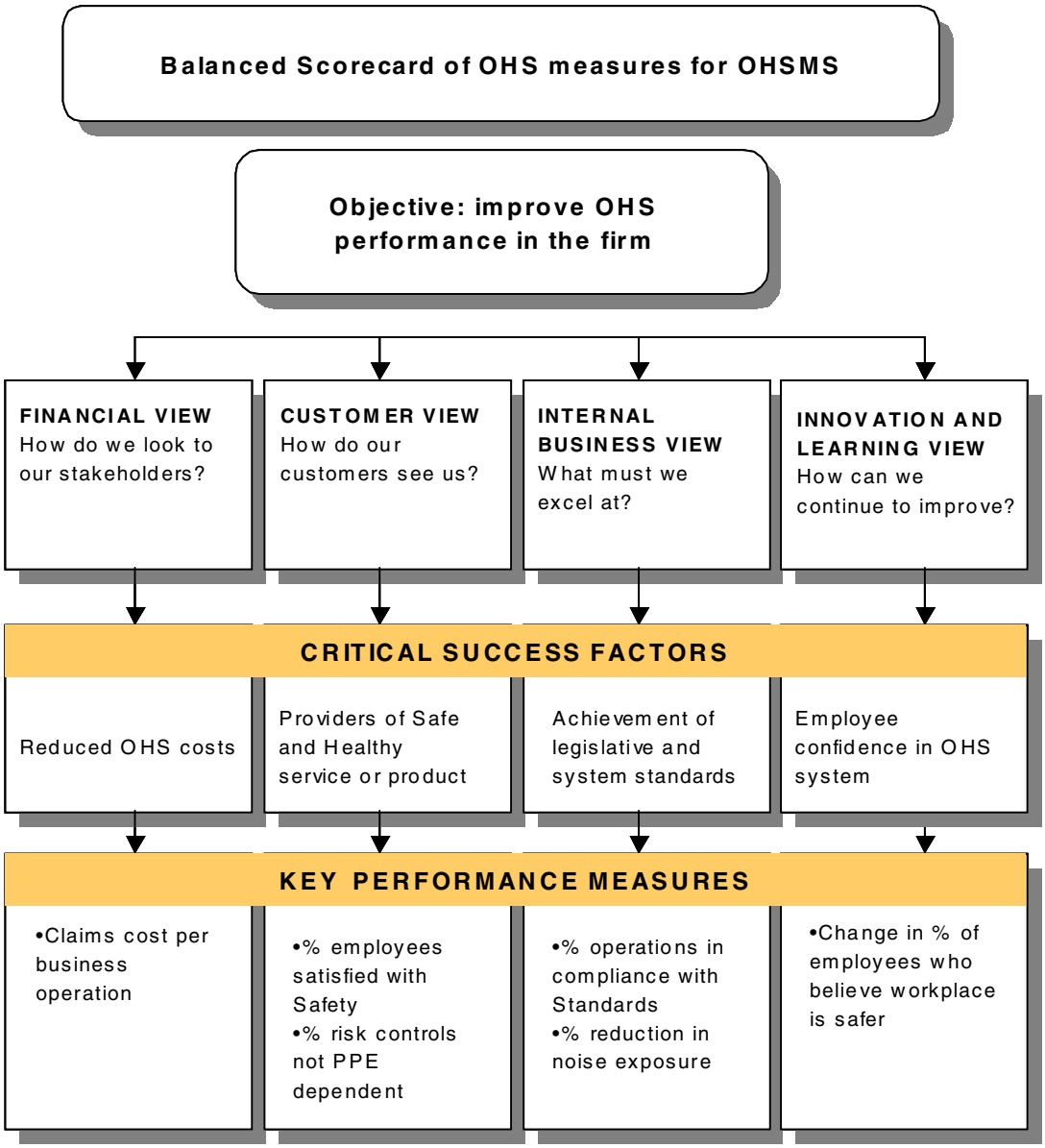

Figure 3: Balanced Scorecard for OHSMS

Another step to linking outcomes to system performance is to address the reduction in risk achieved by the operation of the OHSMS. Too often the outcome is an injury measure whereas the purpose of the system is to continually minimise or eliminate risks.

A measure of reduction of risk in a hospital might be the level of implementation of a "no lift" policy, or on the construction site an increase in the number of working at height operations in which perimeter protection is provided.

Reduction in risk can also be measured by using the results of the monitoring and surveillance undertaken in an OHSMS. The under emphasis given to health related exposures can be redressed by using the many reliable techniques for measuring the quality of the working environment (noise, atmospheric contaminants, heat, cold etc). In an OHSMS this monitoring should not be reactive but be part of a sampling strategy to monitor progress in improving the quality of the working environment.

An organization could combine a range of risk exposure measures to create a simple index of the overall risk managed by the company. This also has a planning function as needs to meet defined risks can be predicted. In the case of aged care we know the demographics and incidence of illnesses like dementia and can thus predict future risk exposures in the sector. In the construction industry the type of project and contracting out complexities also allow the future risks to be estimated.

The lesson for outcome measures is to use the information contained within the system loop to generate meaningful links from inputs through to outcomes.

Conclusion: Measures of Influence

Whilst the question of whether OHSMS generate superior levels of performance is still subject to debate the means to better measure OHSMS performance is also at a developmental stage. There is no doubt that an OHSMS affords the opportunity for more appropriate and influential measurement.

All the different ways of describing and formulating measures are important but the intention is in an OHSMS is to develop measures that can drive or influence decision making. One way of addressing this would be to start from the perspective of the person or position to be influenced within an OHSMS.

The key target in an OHSMS is senior management and recent research on what motivates senior executive to address OHS suggests loss of corporate image and public credibility can be a factor.

A British study[17] concluded that there are two factors that motivate both Small Medium sized Enterprises (SMEs) and large organisations to initiate health and safety improvements. They are:

- Fear of loss of credibility
- Perceived duty to comply with health and safety regulations

Other factors included the avoidance of costs of injury and ill health, the wish to improve staff morale and productivity and integration of OHS with quality systems. The fear of loss of credibility includes the fear of adverse publicity, loss of confidence from the regulator and business interruptions and dislocations subsequent to a serious incident. These fears were greatest amongst firms in high risk industries.

If we were to apply these findings and ask what sort of information might influence a senior executive in a larger company the following measures might result:

- The risk of non-compliance resulting in public exposure of corporate neglect based on an index of system measures
- The risk and cost of business dislocation resulting from failure to correct identified non conformance with system procedures

There is little or no evidence to guide what might motivate middle managers, front line supervisors or operators but they all need to be included in the measurement model. The relevance of system performance measures to decision makers should be considered in the suite of measures that are developed.

In this discussion a number of conceptual pathways to generate more relevant measures have been proposed. These include:

- Utilising a suite of input, process, output and outcome indicators.
- For organizations with short cycles, focus on input and system protection measures. For organizations with more complex process cycles identify critical points at which multi dimensional measures should be taken.
- Create new operational and risk based denominators to make output and outcome indicators more meaningful and influential.
- Identify better proxy measures than compensation data.
- Create measures that are specifically targeted at influencing decisions and decision makers.
- Measure what those exposed to risks think about the system of protection

It is common place for the investigation of incidents to conclude that the causes were complex and multi-factorial. It should thus be common place to establish multi dimensional measures designed to motivate action that minimise such incidents.

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Seeing the Wood from the Trees: A systems approach to OH&S management

David Borys

Introduction

The term "system" has found its way into the language of occupational health and safety (OH&S), particularly through the rise in popularity of OH&S management systems (OHSMS). However, the term "system" as a label is of little practical relevance unless the richness of the concept is understood. Organisations could benefit from thinking systemically whilst acting systematically. However, to think systemically, people within organisations need a shared framework or "picture" that helps organise their thinking. Systems thinking can help provide this framework and allow for the integration and interrogation of existing OH&S knowledge and accumulated wisdom. The "Systems Model of Risk Control" (SMRC) is a framework that assists organisations to become learning communities. The SMRC allows everyone in an organisation to share a common picture of how OH&S is managed and how risk is controlled. OHSMS are one component of a systems approach to risk control. Over-reliance upon OHSMS when implemented out of context may not represent the best use of resources available for risk improvement or enhance OH&S performance. The SMRC allows organisations to move beyond the "one-size fits all" approach to OH&S management and to develop and share an approach that best suits organisational needs. Individual organisational needs may or may not be best served by an OH&S management system.

Over the past decade, a range of approaches to improving occupational health and safety (OH&S) has confronted organisations. This includes cultural change, teamwork, benchmarking, integrated management systems, quality management, risk assessment, behaviour modification programs and OH&S management systems. Often, these are collectively known as best practice but which approach or combination of approaches that an organisation should select is unclear.

The use of OH&S management systems has emerged as a particularly popular approach to reducing injury and illness in the workplace.[1] A systems approach to OH&S management is currently the preferred language of OH&S professionals, OH&S researchers, governments, standards bodies and organisations. According to Hale and Hovden,[2] the use of OH&S management systems in the 1990's represents the *third age of safety*. The first age was a technical age that lasted from the start of the century to post world war two, whilst human factors and the 1980's characterised the second age.[2]

In Australia, the 1995 Industry Commission[3] inquiry and report into OH&S recognised that *best practice* organisations, measured in terms of OH&S outcomes, have enterprise *safety management systems.* The Commission recommended that OH&S legislation in each jurisdiction recognise safety management systems as a means for managing risk.[4]

Internationally, despite the International Organisation for Standardisation (ISO) decision in 1997 not to proceed with an international standard on OH&S management, there remains a strong global trend towards the development of specification and guidance standards for OH&S management systems by both government and non-government bodies.[5]

OH&S Management Systems Defined

This enthusiasm for the adoption of OH&S management systems has resulted in a plethora of propriety products becoming available to organisations. Many prospective purchasers are not only unsure of their needs but also unaware of the benefits that than an "off the shelf" system may offer. Defining 'OH&S management system' would help alleviate this uncertainty.

Waring[6] provides what he refers to as a *working definition*, that is:

> A structured systematic means for ensuring that both general and particular aspects of what the organization does are effectively managed to meet high standards of safety.

Standards Australia[7] define an OH&S management system as:

> That part of the overall management system which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the OHS policy, and so managing the OHS risks associated with the business of the organization.

Both definitions focus upon the purpose of the system, that is, to effectively manage OH&S risks within organisations. In his definition, Waring[6] describes an OH&S management system as a *structured systematic* means for managing risk. This is construed to be similar to Standards Australia's[7] approach that describes such activities as planning, developing and implementing. It can thus be inferred that both definitions are referring to systematic approaches to risk control.

There are, however, differences between a *systematic* and *systems* approach to risk control that need to be recognised. It is possible to have a *systematic* approach without fully understanding the risk control *system*. Waring[6] argues that this *confusion between system and systematic explains why some so-called systems often fail to meet expectations* Waring[8] defines systematic as an *organized way of doing something*. OH&S management systems represent an organised way for controlling risk. OH&S management systems contain some but not all of the ingredients of a *systems* approach.[6] Such misunderstanding and confusion over the use of language may result in organisations over-looking significant opportunities for risk improvement.

To capture the significant opportunities for risk improvement that arise out of an understanding of the risk control system, those who work within organisations would benefit from having systems understandings before engaging in systematic improvement. In particular, a systems framework would enable leaders and managers to learn from system failures and organise their thinking in relation to systems approaches to managing risk.

Several writers have already identified the need for such a framework. For example, Cox and Cox[9] have argued that:

> ... for organisations to develop a vision and a strategy for managing any particular function, it must have a way of thinking about it. The organisation must a have a conceptual framework for managing that function.

Hale et al.[10] following a review of the literature on safety management systems (SMS), came to a similar view:

> ... there have been few attempts to produce coherent and comprehensive models of an SMS ... there is increasing literature in the area which is difficult to interpret and use without some framework which indicates how the results might be linked together. There is a need for a framework to represent that complexity and dynamics of management in this area.

Viner[11] provides an even deeper insight:

> ... we have no internationally recognised set of concepts (and consequently terms to use in speech) nor a uniformity of approach to the subject which assists professionals from the diverse interested fields to communicate with one another.

Therefore, a systems framework for risk control should at least meet the following criteria. It should:

- define terms;
- be both simple and comprehensive;
- be practical;
- unify existing accident causation theory and OH&S management knowledge;
- promote a shared understanding;
- promote a common language; and,
- allow for description, analysis, synthesis and improvement.

Consequently, this paper has two aims. It will:

- apply the ideas of systems thinking leading to the development of a systems framework for accident causation and risk control; and,
- unify contemporary OH&S theories within the framework.

The development of a systems framework for accident causation and risk control allows for OH&S management systems, together with the range of other ap-

proaches to OH&S, to assume the context and purpose identified as necessary for the effective, systematic control of OH&S risk.

A Review of Systems Thinking as a Framework

The term *system* has become a fashionable label in Western society to such an extent that Flood and Jackson[12] argue that it has been rendered useless. The way the term has found its way into use in popular OH&S language is evidence of this generalised labelling. Flood and Jackson[12] argued for a return to the richness of the concept *system* as a means to enhance its practical relevance. Systems thinking or treating organisms as *whole* entities, which cannot be understood from examining their parts, emerged in the 1940's in response to the failure of mechanistic or reductionist thinking. Therefore, systems thinking is a particular way of organising thoughts about the world, organisations and problems.[12] Waring[8] defines the concept of a *system* as a *recognizeable whole consisting of a number of parts [called components or elements] that are connected up in an organized way*. Senge et al.[13] illustrate the concept of a *whole* in the following way:

> ... you won't be able to "divide your elephant in half" ... you can't redesign your system (the elephant) by dividing it into parts; everyone must look at the whole together.

Checkland and Scholes[14] described the purpose of systems thinking as the construction of abstract systems models against the perceived real world, in order to learn about and improve some aspect of the real world. In this instance, the aspect of the real world to be learnt about and improved is OH&S.

Systems theory and systems thinking is, however, a labyrinth of abstract terminology, methodologies and system types. For example, Jackson[15] identifies and analyses five methodological approaches to systems thinking - organisations as systems, hard systems thinking, organisational cybernetics, soft systems thinking and critical systems thinking. Carter et al.[16] argued that a particular system may be made up of a range of system types, for example, natural systems, abstract systems, designed systems and systems of human activities. Waring,[8] drawing upon the work of Carter et al.[16] presents three types of systems thinking that are also similar to Jackson's;[15] hard systems thinking, soft systems thinking and systems failures thinking. By comparison, in a discussion of system types, Mant[17] uses a frog and a bike as metaphors to differentiate between system level (context

and purpose) and component level (operations and function) solutions to problems. Mant[17] argues that:

> ... You can disassemble a bicycle completely ... and reassemble it confident that it will work as before. Frogs are different. The moment you remove any part, all the rest of the system is affected instantly ... for the worse ...

Before systems thinking can be used as an organising framework for unifying existing OH&S knowledge, it is useful to have a deeper understanding of organisations as systems. According to Jackson,[15] systems theory has competed with scientific management and human relations theory as the prominent management model within organisational theory since the 1930's.

Although the idea of organisations as systems is underpinned by a number of theoretical approaches, contingency theory and sociotechnical systems theory are discussed here as they are relevant to the use of systems thinking as an organising framework for unifying existing OH&S knowledge.

Contingency theory came into prominence in the 1970's and views organisations as *consisting of a series of interdependent subsystems, each of which has a function to perform within the context of the organization as a whole.*[15] Contingency theory assumes an open systems view. That is, the system interacts with its external environment (through a management sub-system), comprises inputs, processes and outputs (through a technical sub-system) and relies upon feedback to keep the system in a stable state.[15] Jackson[15] identified four hypotheses upon which contingency theory rests, the essence of which is that there is not one best way to manage an organisation in all circumstances.

Sociotechnical systems theory is associated with the empirical investigations in the Coal Mining Studies of the Tavistock Institute of Human Relations from the 1940's onwards. Sociotechnical systems theory argued that organisations will only achieve their purpose if the *social, technological, and economic dimensions are jointly optimized, and if they are treated as open systems and fitted into their environments*. Sociotechnical systems theory focuses upon the alignment of work groups and technology.[15]

It is possible to be lost in the labyrinth that is systems theory and systems thinking. However, Flood and Jackson[12] provide some degree of clarity when describing the general conception of a system (see figure 1) in terms of it having a boundary, an environment within which it operates, feedback loops, inputs, processes and

outputs; and, comprising elements and relationships between the elements. Senge et al.[13] describe this relationship between elements in terms of links and loops:

> ... from any element in a situation ... you can trace arrows ("links") that represent influence on another element. ... links never exist in isolation. They always comprise a circle of causality, a feedback "loop" ...

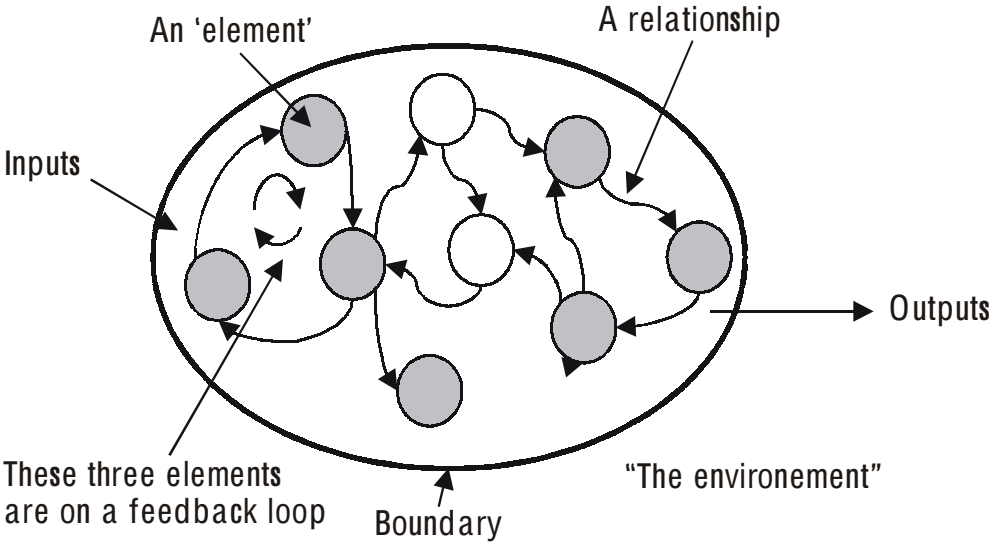

Figure 1. Flood and Jackson's General Conception of a "System"'

Together, system elements form sub-systems, which in turn form systems operating within an environment. Finally, *there is a hierarchy of possible system descriptions* ranging from broad scope and coarse resolution to limited scope and finer resolution.[16]

Systems thinking and OH&S

The application of systems thinking in relation to OH&S evolved during the 1960's when trial and error approaches were *no longer adequate for systems that had to be first-time safe*, for example aviation.[18] This led to the emergence of a new discipline - system safety - particularly within the weapons and aerospace industries, and the application of such methodological approaches to system safety as fault tree analysis. This new approach to system safety identified that risk control must be a life-cycle effort spanning the concept, design, production, operations and disposal phases of the life-cycle, with every attempt being made to design out risks in the first instance.[18]

Stephenson[18] defines a system as the *composite of people, procedures, and plant and hardware working within a given environment to perform a given task* (see figure 2). He defines system safety as the *discipline that uses systematic engineering and management techniques to aid in making systems safe throughout their life cycles*.

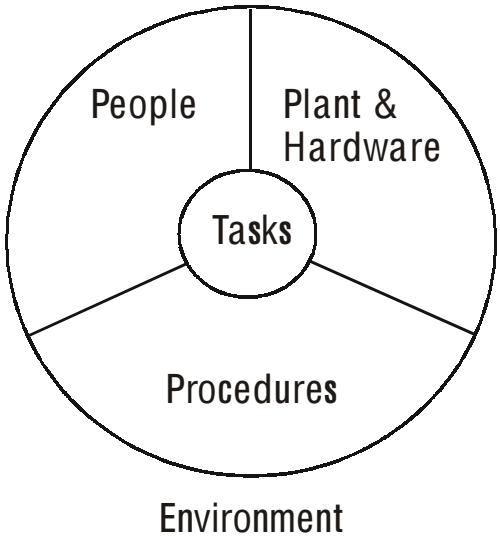

Figure 2. Stephenson's System Safety Model

In the early 1970's, Johnson and Lowman[19] applied systems concepts to OH&S when they developed the Management Oversight and Risk Tree (MORT) as part of their research conducted for the United States Atomic Energy Commission.

More recently a number of authors have called for the application of systems ideas to learning from failures and managing and improving OH&S.[9,20,21,22,23,6,7] Additionally, as previously discussed, there is a global trend towards the development of OH&S management systems.

To take a specific example, Reason[24] argued that there have been three over-lapping ages of safety. In the 1990's, OH&S moved into the third age of safety – a sociotechnical age, a move away from the technical and human error ages of previous decades. Reason's view provides an interesting counterpoint to that of Hale and Hovden[2] who argued that the 1990's, as the third age of safety, are characterised by OH&S management systems. In drawing upon systems theory Reason[25] argued that:

> Although general systems theory and the notions of sociotechnical systems theory have been with us for quite some time, decades passed before most of us began fully to realise their implications for accident prevention and safety, namely to recognise that the major residual safety problems do not

belong exclusively to either the technical or the human domains. Rather they emerge from as yet little understood interactions between technical and social aspects of the system.

Rasmussen[22] also acknowledged the relationship between sociotechnical systems theory and risk management but raised the debate to the level of a cross-disciplinary convergence of ideas at all levels of the system for a particular hazard. Rasmussen[22] argued that this requires *a system-oriented approach based on functional abstraction rather than structural decomposition*.

A Review of Key OH&S Theories

Theories of accident causation and risk control have developed in depth and scope throughout most of the twentieth century as is evidenced by the work of Viner[11], Culvenor[25] and Reason.[26,24,27,28]Over the past decade, each has contributed significantly to the understanding of the processes that lead to damage, and each have developed and published their own models for understanding risk control.

The occurrence consequence model

In 1991, Viner published *Accident Analysis and Risk Control* in which he reviewed a range of OH&S theories and models. In this work he argued strongly in favour of the application of scientific method to the study and understanding of the processes that give rise to damage and their control. He further argued that hypotheses are difficult to prove in OH&S and suggested alternative criteria.[11]

- The ability to define terms in a non-judgemental way; and,
- The utility of the concept in terms of satisfying our needs for a useful analytical tool which will stimulate research and be of value to practitioners.

Viner dispensed with the word accident. Instead he referred to the process leading to damage as the *occurrence* and the injury and ill health that results from this process the *consequence*.[11] The models he reviewed were selected on the basis of their *intrinsic or historical interest and significance*.[11] The range of models reviewed illustrates how different models suit different circumstances.

A summary and short commentary on each model is shown in table 1.

Table 1. A summary of OH&S models reviewed by Viner.

Category	Author	Model
	Heinrich (1959)	The Domino Model: Models the causes of accidents and asserts that 88% of injuries are due to *unsafe acts*, 10% to *unsafe conditions* and 2% are simply unpreventable. Eliminating unsafe acts can reduce accidents.
Cause –Effect Models	The Swedish Information System	Accidents occur as a series or sequence of events.
	Compes (1979)	A chain of multi-causal events occurring sequentially in time.
Psychological Models	Waller and Klein (1973)	The Task-Demand Model: Focus is upon the individual worker and their performance relative to the demands placed upon that performance by the task. Keeping the task within the limits of human performance can reduce accidents.
	Surry (1974)	Decision Model: Focus is upon the cognitive processes of the individual worker in their environment and their capacity to perceive, process and respond to danger.
	Corlett and Gilbank (1978)	A detailed analysis of the human as an information processor.
	Wigglesworth (1972)	Injury Causation Model: Focus is upon the individual worker and hazards. Injury occurs when errors (*a missing or inappropriate response to a stimuli*) are made in the presence of a hazard (*a source of potentially damaging energy*). Reducing errors can prevent accidents.
Energy Based Models	Gibson (1961) and Haddon (1973)	Energy Damage Concepts: Focus is upon the need for energy to be present for injury to occur. Preventing unwanted energy transfers can prevent accidents.
Uncertainty and Probability Models	Rowe (1977)	The Risk Estimation Model: Uncertainty is an inherent part of the damage process.

In his analysis of these models, Viner[11] concluded that there are three basic principles that arise:

1. Energy is required to produce injury and damage
2. The process develops sequentially in time

3. That the process involves uncertainty

Viner[11] used these principles as the basis for the development of three related models shown at figure 3.

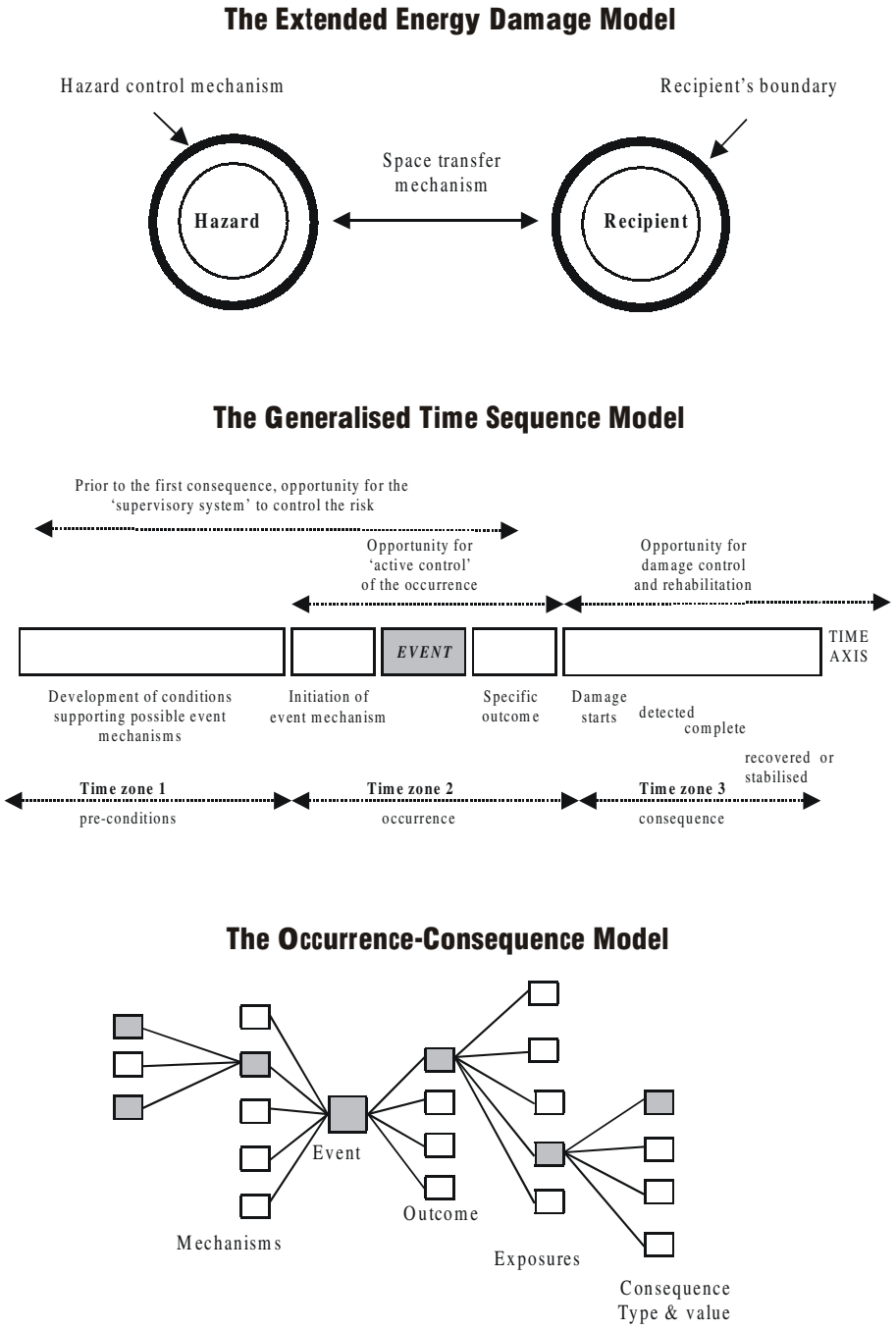

Figure 3. Viner's Models: Top – The Extended Energy Damage Model, Middle – The Generalised Time Sequence Model, Bottom – The Occurrence-Consequence Model.

Viner[11] defines the terms used in each model. For example, *hazard* is defined *as a source of potentially damaging energy* and *event* as *that point in time at which control is lost over the potentially damaging properties of the energy source*.

The ergonomic hazard management model

Culvenor[25] reviewed the history of OH&S theory. Like Viner, Culvenor reviewed the pioneering work of Heinrich and the subsequent development of the safe person versus safe place ways of thinking about safety problems and the classification of accident causes. Culvenor[25] stated that recent surveys conducted in Australia found evidence that in Australia today, *the role of unsafe behaviour remains entrenched* and that worker carelessness was the cause of accidents.

After dispensing with the role of unsafe behaviours as a case of *mistaken identity,* Culvenor turns his attention to the concept of control at source. Control at source is based upon the occupational hygiene principle of *hazard -> source -> pathway receiver*.[25] Culvenor goes on to draw upon the earlier of work of Gibson (1961), Haddon (1963) and Viner (1991) by defining the hazard source in terms of energy. At this point, Culvenor's thinking converges with Viner's in that the process leading to damage is understood in terms of the *energy source -> pathway -> receiver*.[24]

Culvenor's thinking diverges from Viner's through the application of ergonomic thinking and models as means of identifying opportunities for control. Culvenor[25] reviewed the work of Birmingham and Taylor (1961), Taylor (1957), Chapanis (1965), Kuhlmann (1986), Hammond (1978) and Grandjean (1982) and concluded that:

> ... the study of ergonomics has shown the importance of the interaction of system elements. It is not only good human skills, good equipment, and good environment conditions or systems that are important for good design, it is the quality of the interaction between these elements.

In consolidating the various approaches (see figure 4) Culvenor argues *that the classic person-equipment-environment ergonomic model can be combined with the traditional* hazard source pathway receiver model *to show more clearly the relationship of the ergonomic elements in the action of control*.[25]

Figure 4. Culvenor's Ergonomic Hazard Management Model

The organizational accident causation model

James Reason has long been involved in research into human error. Reason[26] defined human error as a:

> ... generic term to encompass all those occasions in which a planned sequence of mental or physical activities fails to achieve its intended outcome, and when these failures cannot be attributed to the intervention of some chance agency.

Reason[26] developed a conceptual framework (*the generic error-modelling system [GEMS]*) as a means for locating the origins of various error types. According to Reason,[25] the purpose of GEMS is to integrate *slips, lapse* and *mistake* type errors into Rasmussen's *skill-rule-knowledge* classifications of human performance to arrive at three basic error types:

1. Skill-based slips (and lapses)
2. Rule-based mistakes
3. Knowledge-based mistakes

Over the past decade, Reason has shifted his focus to organisational errors. He argued that human error is *a consequence not a cause* and that human errors are *shaped and provoked by upstream workplace and organizational factors*.[28] Prevention depends upon an understanding of the organisational factors that provoked the

error. These organisational factors have variously been termed *latent errors*[25], *latent failures*[24] and most recently - *latent conditions*.[28] Reason[26] defined a latent failure as:

> ... an error or violation that was committed at least one to two days before the start of the actual emergency and played a necessary (though not sufficient) role in causing the disaster.

Reason[27] described the influence of organisational factors upon human error in the following way:

> Management decisions regarding, say, training, the allocation of resources, cost-cutting, reduced manning levels, and the like can increase error likelihood in the workplace by creating error-enforcing and violation-promoting conditions at the 'sharp end' (e.g. poor provision of tools and equipment, high workloads, time pressure, inappropriate or unavailable procedures, lack of knowledge and experience, fatigue-enhancing shiftwork patterns, low morale, etc.)

Reason argued that latent conditions are spawned by those distant in space and time from the worker work interface and may lie dormant in the system for many years.

He further argued that latent conditions follow two interrelated pathways to the workplace.

1. An active failures pathway *that originates in top-level decisions* and which manifest itself in the workplace as error promoting conditions.
2. And a latent conditions pathway *that runs directly from organizational processes to deficiencies in the system's defences*.[27] These pathways are shown in figure 5.

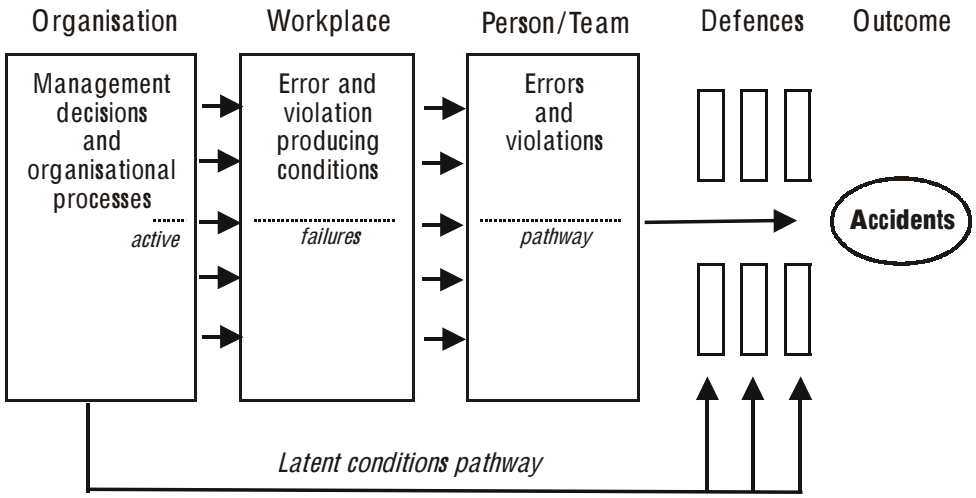

Figure 5. Reason's Model of Organizational Accident Causation

Discussion of models

Each of the contemporary thinkers discussed above has made valuable contributions from their particular perspective. Viner contributed an understanding of the role energy plays in the damage process and how this process develops sequentially over time and is inherently uncertain. Culvenor, by combining ergonomic thinking with the concept of control at source for a particular hazard. Finally Reason unravels human error and organisational error, identifying the limitations of the former in favour of the opportunities of the latter for prevention.

The differences between, and the limitations of, each model are compensated for by the synergy between the models. As an example, Viner's *development of conditions supporting possible event mechanisms* under the control of the *supervisory system* within time zone one are closely related to Reason's development of *latent conditions* at the organisational level of the system. Both Viner and Reason sequentially build up the process leading to damage. While Culvenor's model does not provide for this sense of time, if it is located within time zone one of Viner's occurrence-consequence model, then it does identify the points of intervention for risk control by the *supervisory system* at the organisational level. Both Culvenor and Reason acknowledged the limitations of focusing upon the behaviour of the individual worker at the workplace, in favour of upstream system approaches to prevention.

Models tend to stand alone reflecting the interest and discipline of the researcher. The challenge for the next generation of thinking is to achieve consilience. Wilson[29] suggests that:

> The greatest challenge today ... in all of science ... is the accurate and complete description of complex systems. Scientists have broken down many kinds of systems. They know most of the elements and forces. The next task is to reassemble them ...

The next section takes on this challenge and attempts to reassemble and unify OH&S knowledge using systems theory as an organising framework.

Systems Models of Accident Causation and Risk Control

In drawing the threads of this discussion together, the first steps towards consilience are taken using systems theory. This will supply the organising framework for the development of a new systems models of accident causation and risk control and allow for the unification of the ideas of Viner, Culvenor, Reason with systems safety/systems failure thinking.

Wilson[30] defines a model as:

> ... the explicit interpretation of one's understanding of a situation, or merely one's ideas about the situation. It can be expressed in mathematics, symbols or words, but it is essentially a description of entities and the relationships between them. It may be prescriptive or illustrative, but above all, it must be useful.

In the first instance, formal systems models of accident causation and risk control (SMAC/SMRC – hereafter referred to as "the models" and shown in figures 6 and 7 respectively) will be described. The same ideas are then simplified into a systems model of OH&S management (figure 8).

The models use a recognisable and memorable symbol[30] to represent the boundary of the risk control system - a five point star. Each point of the star represents a critical sub-system for analysing failure or understanding risk control. Polygons (pentagons) are used to illustrate the organised interconnectedness of these sub-systems consistent with systems theory.

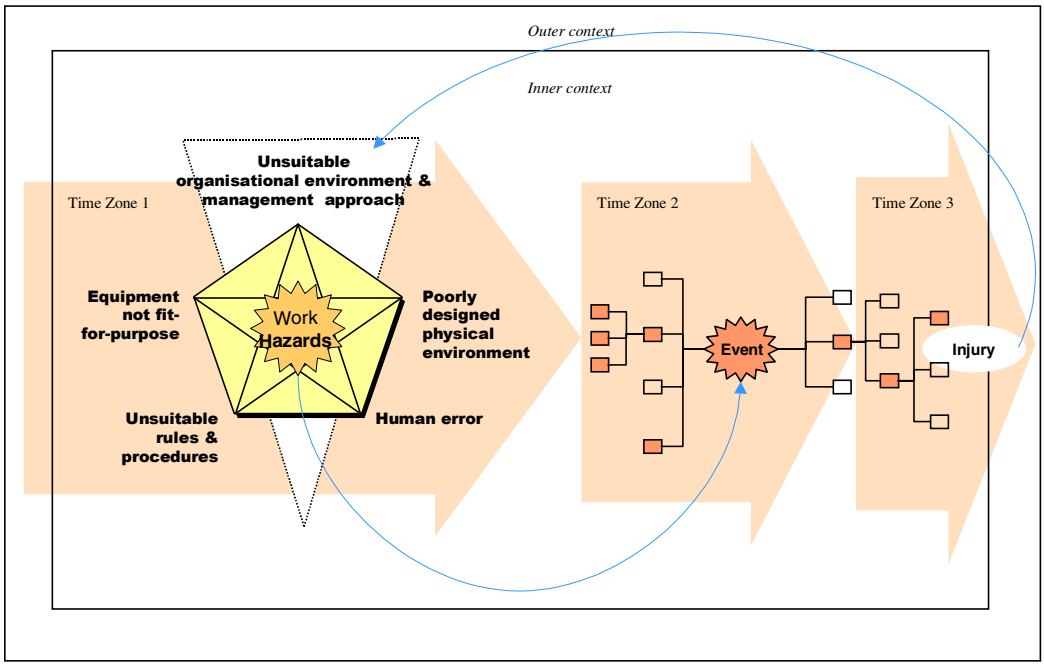

Figure 6. A Systems Model of Accident Causation

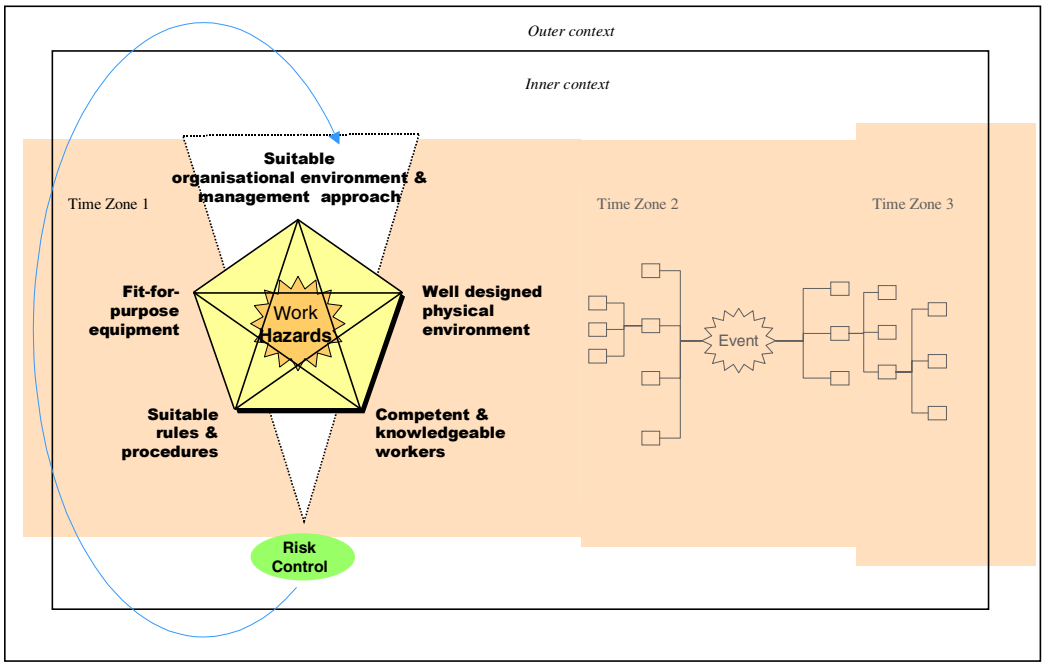

Figure 7. A Systems Model of Risk Control

At the centre of the star is work and hazards. The bottom four points of the star represent the workplace and represent a combination of Stephenson's[18] systems safety model, Culvenor's[25] ergonomic hazard management model and the ideas of sociotechnical systems theory. 'Hazard' is defined as *a source of potentially damaging energy* in accordance with Viner's models.[11] There are no limitations to what can be thought of as work. What constitutes 'work' will be defined by the practical interest of the analyst. At the coarsest level of resolution 'work' may refer to all of the operating sites of a multi-national company, conversely, at the finest level of resolution, a person typing a paper using a word processor.

The inverted triangle behind the star is an abstracted version of Reason's model. It picks up the idea that management decisions and organisational processes may lead to the development of *latent conditions* in the risk control system - the precursors of *active failures* (human error).

The inverted triangle serves three other analytical and descriptive purposes:

1. It illustrates that the points of the star are organised from the top down to form a hierarchy of risk control:
   - safe organisation (top point of the star)
   - safe place (middle two points of the star)
   - safe person (bottom two points of the star)
2. It illustrates that the area of focus for prevention is at the top of the star
3. It indicates the direction of influences in the risk control system using a vertical inputs-process-outputs concept from systems thinking. System outputs may be either risk control (the preferred system state) or an event with outcomes which may lead to injury. Both outputs feedback into the system at the organisational level and bring with them influences from the outer context.

The incorporation of Viner's generalised time sequence model adds a temporal dimension to the framework. The objective of any organisation should be to maintain the reliability of the risk control system in *time zone one* and across the *life cycle* of the business. The framework provides organisations with a picture of what lies in store if the reliability of the risk control system is not maintained – a move into *time zones two* and *three* and their associated losses. From the vantage point of time zone one, organisations are able to peer into *time zones two* and *three* through their risk analysis binoculars. What they will see is Viner's occurrence-consequence model as a structured means for analysing risk.[11]

The models are embedded within an organisational (inner) context. In turn the organisation operates in and interacts with an external environment or outer context. For example, the political, social, economic and industrial elements of the outer context are likely to influence the inner context of the organisation that in turn will influence the system for risk control.

The models also allow for deeper interrogation and analysis of any the five sub-systems whilst retaining an understanding of the whole. For example, it is possible to break the organisational environment down and speculate on its constituent elements and their relationships as well as the relationship between these elements and the role they play in influencing the level of risk in the system. According to current OH&S and management thinking these elements could include:

- Leadership, the influence of leadership on culture and the influence of culture on performance[31,28,32,6]
- The age of the organisation[28]
- The 'type' of organisation[10]

Management approaches may be broken down in a similar way – possibly into two categories: generic and OH&S specific approaches. Generic approaches could include quality management and its application to OH&S through the development of integrated management systems and the use of teamwork. Specific OH&S approaches, for example, safe behaviour programs, could be analysed in the context of the whole system and underpinned by an understanding of human and organisational error.

The benefit of the models is that it enables those who are interested in accident analysis and risk control to develop a deeper understanding and ask informed questions and make informed decisions. Organisations could use the models as frameworks against which they could evaluate their existing paradigms and mental models and select an approach or combination of approaches to risk control that best suits their needs. This approach is similar to the hypothesis underlying contingency theory that there is no one best way to structure the activities of the organisation in all circumstances - in other words "one size does not fit all", different approaches may well apply in different circumstances.

The models may be simplified to provide a memorable systems view of OH&S management (see figure 8). Such a view or picture provides context and purpose for OH&S management "systems". Organisations that operate from a shared

picture or mental model of OH&S management and risk control may achieve better OH&S outcomes.

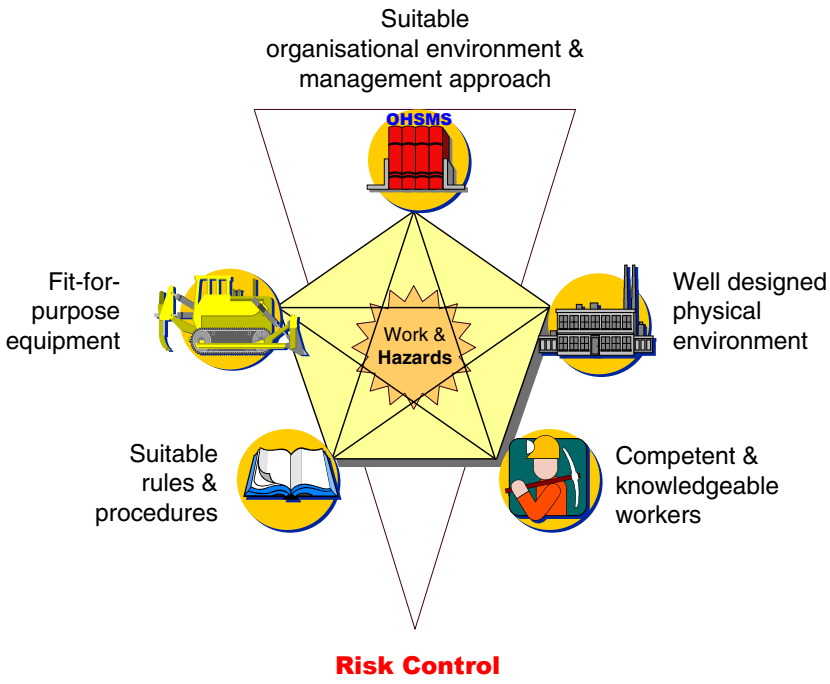

Figure 8. A Systems View of OH&S Management.

Conclusion

To date, the approach or combination of approaches that an organisation should select to improve OH&S has been unclear. Arguably, organisations must benefit from a framework that enables them to see the various approaches available, in the context of a whole. Such a framework is the systems models of accident causation and risk control. The models use systems thinking as an organising framework for unifying existing occupational health and safety knowledge. Its potential benefits will enable organisations to learn about, and organise, their risk control thinking leading to a better-informed selection of approaches to OH&S risk improvement.

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Organisational Behaviour and Adoption of OH&S Management Systems: Preliminary Findings

Neale Jackson & Diane Mead Niblo

Address for correspondence:
Dr Neale Jackson
Lecturer in Occupational Health and Safety
RMIT University
Melbourne Victoria

Dr Diane Mead Niblo
Lecturer in Organisational Psychology
RMIT University
Melbourne Victoria

Introduction

In this paper we will discuss the factors that influence organisations to either implement their own OHSMS or adopt a proprietary system such as the NSCA 'Five Star' system or the Victorian WorkCover Safety MAP system. The experiences of nine organisations will be examined. The major variables to be assessed include industry type, organisational size, geographical locations, previous OHS culture, complexity of OHS requirements, organisational OHS expertise, management commitment to OHS and availability of capital resources. The success or otherwise of the adopted OHSMS was determined by factors such as cost, safety

culture, commitment of management, LTIs and PPIs and other perceived organisational benefits. Implementation issues and requirements will be explored for different OHSMS systems within different industries. Guidelines are provided for organisations on the type of OHSMS they should adopt in light of the experience of other organisations within their industry sector. Implementation recommendations and advice on which performance measures were most effective will also be made for different organisations within industry sectors.

Over the past decade there has been an increasing focus on the management of Occupational Health and Safety (OHS) within different enterprises. This trend has occurred throughout the Western world countries which have Robens' style OHS legislation [1]. The management approach is thought to lead to better OHS outcomes, lower Lost Time Indicators (LTIs) and more Positive Performance Indicators (PPIs) by providing systematic organisational risk assessments, self audit tools and a variety of other features to allow organisations to have a better approach to OHS [2]. The underlying theme of the management approach is to try and move organisations from a reactive to a proactive OHS strategy.

The connection between systematic OHS management and safe systems of work performance can only be viewed with the experience of hindsight. This connection was made more apparent as OHS inspectorates devised more comprehensive ways of developing workplace assessments with limited resources. It was hoped that self-audit tools would be developed as a means for organisations to embrace the need for comprehensive self-regulation. The growth in the interest in Occupational Health and Safety Management Systems (OHSMSs) developed in a number of countries not just those that embraced comprehensive self-regulation [1].

Gallagher (1997) stated that the key principles for the success of OHSMSs were that:

- OHS (including rehabilitation) was integrated into normal production and service activities;
- Commitment and leadership were demonstrated from senior management; and
- The system:
    - Addressed work organisation, equipment, the environment and behaviour;
    - Identified and assigned responsibilities at all levels of the organisation (with appropriate training powers and facilitation)

- Recognised and addressed change with a view to enhancing OHS over time;
- Utilised an appropriate mix of performance indicators and an effective auditing regime; and
- Valued worker input into designing the system identifying risks, planning remedies and auditing [3].

There are now numerous examples of enterprise environmental obligations being integrated with Health and Safety Management [4]. Examples include at least two major mining conglomerates such as North Ltd and numerous manufacturing organisations. There is evidence to show that whilst the management requirements are similar, the technical requirements are somewhat different. Major industrial enterprises are known to employ professionals who manage both OHS and environmental systems. It is recognised by many industrial organisations that the integration of OH&S and environmental systems leads to an optimisation of the management effort required in systems implementation. The strain on resources for establishing and controlling systems and the amount of training and documentation needed are also areas of concern [5]. The aims of the study were to identify factors that influence implementation and to develop a series of guidelines that will help organisations in implementing their OHSMS.

Methodology

The intention of the current study was to survey a range of enterprises within different industry groupings and to identify the factors that have influenced organisations in implementing their OHSMS. The factors that have been chosen to study were organisational size, influence of geographical locations, previous OHS culture, complexity of OHS requirements, organisational OHS expertise, management of OHS expertise, management commitment to OHS, availability of capital resources and measurement of OHS performance.

This is part of an ongoing investigation in which at least 100 organisations will be surveyed. There were nine organisations in this initial study. Those organisations consisted of: three from the transport industries, two from extractive industries, and four from manufacturing industry. They vary in size from small to major international companies.

Organisations were contacted by phone and appointments were made with the individual(s) responsible for the implementation of the OHMS within that organ-

isation. Ethics approval was given by RMIT University and a plain language statement used that stated exactly what the study entailed. Organisations were guaranteed total confidentiality. During the interview a series of detailed questions was asked and the responses were recorded. After each response the interviewee was read back his/her response and asked if this represented exactly what he/she communicated.

Results and Discussion

Tables 1 and 2 present the results from nine different organisations three from the transport industry, two from extractive industries and four from manufacturing organisations. These tables provide summaries of more detailed responses. Note should be made of the differential demographics of the organisations under study and it may not be possible to generalise to other similar organisations. The major limitation of the research was that only nine organisations were surveyed.

There were eight major factors that influenced the adoption of OHSMS:

Cost

Eight out of nine organisations found the cost of implementing OHSMSs and ongoing maintenance to be prohibitive. Six organisations surveyed took the initiative and developed their own enterprise specific OHSMS; three have stayed with the more proprietary based systems. From the available data there appears to be no strict delineation with respect to which organisation or which industry type uses which OHSMS. One pattern is evident and that is the fact that many enterprises have taken the initiative and designed their own OHSMSs. The main reason given for this is cost. More specifically, enterprises report there is a prohibitive cost associated with the introduction and ongoing maintenance of systems such as SafetyMap or NSCA FiveStar. During the interviewing process it was found that organisations were concerned about the health and safety of their workers but some baulked at the costs involved in the introduction and maintenance of an OHSMS. As a consequence six out of the nine organisations surveyed have taken the initiative and developed their own enterprise specific OHSMS whereas three have stayed with the more proprietary based systems.

Safety culture

All organisations reported an increase in perceived 'safety culture' within their organisation due to the implementation of the OHSMS. When organisations were asked to describe their safety culture they all described something different, however, they described a culture that was more aware of safety issues. This showed that it is very difficult to compare organisations in terms of 'safety culture'. In future more probing questions need to be asked with respect to an enterprise's perception of 'safety culture'.

Management commitment

All organisations reported that one of the most important aspects of success in introducing OHSMSs was management commitment. If this commitment of management was missing then the organisations found implementation difficult if not impossible. If commitment was present then this massively eased successful implementation. One organisation specifically reported many difficulties due to the lack of support from off-site management even though there was support from site management.

Non acceptance

Six of the organisations surveyed reported that contractors and specific groups of workers were not accepting of the need for an OHSMS. These groups of workers or contractors who were not accepting of the need for a system were barriers to the implementation of OHSMSs. Various remedies were attempted by enterprises to try and commit these different groups to the implementation of the OHSMSs. Ultimately some organisations had to change contractors or employees in order to ensure the viability of the OHSMS. Organisations with these problems had to have strong resolve and commitment towards the OHSMS above and beyond other organisational demands.

Size of organisation

Two of the larger organisations with multiple sites reported that they had problems implementing OHSMSs over the different sites. The inter-organisational site politics appear to have been the major contributor to these problems. Ultimate

success or failure in terms of implementation depended on the commitment of top management to the OHSMS.

LTIs and PPIs

Eight organisations were found to measure their OHS performance in terms of LTIs or PPIs with only two having developed their own specific performance measure(s). It is likely that these are the most commonly accepted measures of OHS performance and that enterprises get used to a specific performance indicator and find no reason to change it to an alternate measure. As a consequence even though organisations have introduced an OHSMS they find it hard to change to a different OHS performance measure.

Level of expertise

All nine organisations reported that they required a specific level of expertise in order to implement OHSMSs. In fact eight of the nine organisations in the survey reported that they had to use some type of OHS professional either tertiary qualified in the field of OHS and/or an external consultant in OHS in order to implement their OHSMS. The other organisation reported that they already had the correct level of expertise within their organisation to implement their OHSMS.

Conclusion

The study indicated that if management was committed to OHSMSs there would be an increase in safety performance as measured by LPIs and PPIs. However, this initial study indicated that implementation will be influenced by several key factors: cost, safety culture, management commitment, acceptance, size of the organisation, and level of expertise.

Seven enterprises surveyed indicated that they observed an increase in safety performance due to the introduction of the OHSMS. The performance was generally measured by increased PPIs or lower LTIs. Two organisations reported that there was no difference in OHS performance after the introduction of the OHSMS. Organisations reported many reasons for implementing an OHSMS. The reasons included were reduced WorkCover/insurance premiums, need to develop proper reporting systems, perceived organisational need for a better 'safety culture' and moral considerations to the workers.

Guidelines for successful implementation of OHSMSs require commitment of management, professional expertise, a designated budget and a proactive OHS culture from management to first line supervisors. The requirements of each organisation are different as organisations vary in size, industry type and the number of work sites. This research will be further developed by increasing sample size. Although it was only a small snap shot of a group of companies from a number of industries it has indicated some important factors about the introduction of OHSMSs into different organisations.

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Table 1 OHSMS data from transport and extractive industries

1) Industry type	**Transport (Organisation No1)**	**Transport (Organisation No2)**	**Transport (Organisation No3)**	**Extractive Industries (Organisation No4)**	**Extractive Industries (Organisation No5)**
2) Brief Description of Activities	International Airline, major carrier for Australia	Small coach hire firm, specialising in aged care hire trip	Mini van hire company, specialising in hire to local primary and secondary schools	Primarily mining and some forestry operations	Open cast mining
3) No of Operational Sites in Australia	200+, in Australia	2, in Australia	1, in Australia	4/5, in mining operations and 5/6 in forestry operations in Australia	1, in Australia
4) No of Operational Sites in Victoria	20+, in Victoria	1, in Victoria	1, in Victoria	1, in Victoria (management operations)	1, in Victoria
5) Total Number of Individuals Employed in Australia	31,000	15-17 including office staff	7 of which 3 are permanent (including owner), and 4 casual	2,000-3,000 in Australia	15, including casual, permanent and contract
6) Average **or** median number at each site	Varies greatly	2 office staff based in Sydney 2 office staff based in Melbourne. 11=13 drivers, could be stationed at either site	Usually 1 person operates office rest are out driving on rounds etc.	250-500 depends on site	15 all based at the same Victorian site

7) Description of Overall Safety Culture (within your realm of responsibility)	Very positive, employee responsive. Flight safety culture extends to whole organisation	Reasonably positive at both sites because of commitment from senior management	Now reasonably positive, one worker was severely injured two years ago led for motivation to change poor OHS culture	Fairly strong culture, driven by the main board, have an overall system but also one for each site	Reasonably strong developed from organization almost being shut down about 5 years ago due to severe workplace injuries to a number of staff
8) Number and Type of OHSMS's employed	Safety Map (Initial level)	Designed own system based on 20 years transport safety experience with a major company	Designed own system in consultation with OHS professional	Management system is and OHSE system each site has to perform to a certain level. Many sites also have their own system	Designed own system, did not get professional advice. Owner took advice from a friend who worked for a high safety culture organization
9) Date and Level of Certification Achieved	Failed first certification on minor points awaiting re assessment	System implemented, invited WorkCover to audit, gained individual certificate of approval	System implemented invited outside auditors, no problem passing first time equivalent of initial level SafetyMap	Certification level is not important to us. Performance against our own internal standards is important to us	Certification not important, more interested in better outcomes (lower injury rate and LTI)
10) Major Barriers to Implementation	Lack of higher management support for implementation	Several employees not committed to strong safety performance	Casual workers not really interested in safe work practices	Diversity of group led to lack of a central focus. No cultural problem	Poor response from a number of the older workers who had problems changing culture

11) Major Factors that Eased Implementation	Having a safety professional involved in the process. Support from local management Strong support from employees	Push by management within the organization to produce strong safety responsive culture	Owner is also the major force behind implementing the system. Push from the top means all have to comply	Having a discussion forum to get employee involvement. Giving each site as much autonomy as possible	Proprietor gained “free” advice from a friend who works in an organization with a high safety culture
12) Major Influencing factors for OHSMS implementation	Economic, reduced WorkCover premiums as self insurer	Commitment of senior management to strong safety culture. Lower WorkCover premiums (significantly below industry rate)	Wanted to demonstrate to the outside world an improvement in safety culture	Get proper reporting systems in place for all incidents reporting including minor injuries and fatalities	Moral, wanted to overall improve the safety record of the organization Financial reduced WorkCover premium
13) How is OHS Performance Measured	Positive incident reporting to line management. Tracking of incidents from start to finish. NO LTIs and NO PPIs	PPIs and strong reporting systems	Mixture of LTIs and PPIs	LTIs and major incident reports	LTIs and Injury rates, trying to introduce some PPIs but organization has difficulty understanding them
14) Increase / Decrease in OHS Performance (OHSMS)	Increase due to more sensible and systematic reporting systems. Implementation led to measurable increase in safety awareness	Noticeable increase in performance due to increased safety awareness of all individuals throughout the organization	No serious incidents since implementation of OHSM system. Also shown greater awareness of some of the minor hazards.	Reduced injury rates and LTIs. No impact on major injuries or fatalities. Disappointed with level of improvement	Definite improvement observed in both LTIs and injury rates

15) Level of Commitment (or not) to OHSMS	At this site in this state very committed higher management, lack commitment from other sites	Strong and ongoing	Company is now strongly committed, still have occasional problems with casual workers	Extremely high level of commitment driven by main board. Time effort and money put into the system	High management commitment has meant system has been totally pushed through the company
16) Level of External Expertise Required to Implement OHSMS	Employed external consultants with motivation and knowledge to drive the system through	Employment of Safety professional with experience to help implement the system	Used a friend who is an OHS practitioner to gain correct level of expertise for implementation	Two consultants groups, one in risk engineering and one hygiene group	Proprietor took advice from a friend who has some experience in organisational OHS
17) Perceived Benefits gained due to Implemented OHSMS	Financial, maintained self insurers license, relationship improved with WorkCover	Competitive edge in an increasingly difficult market place. Better relationship with WorkCover	Lower WorkCover premiums after demonstrated a safe system of work to insurance company	Consistency in approach and application of standards of risk management performance	Financial lower WorkCover premium and better relationships between management and workers

Table 2 OHSMS data from manufacturing industries

1) Industry type	**Manufacturing (Organisation No6)**	**Manufacturing (Organisation No7)**	**Manufacturing (Organisation No8)**	**Manufacturing (Organisation No9)**
2) Brief Description of Activities	Manufacturer of Optical cable and associated activities	Small plastics manufacturer	Metals wire products fabricator	Manufacturer of a wide range of rubber based products
3) No of Operational Sites in Australia	1, in Australia	1, in Australia	1, in Australia	16, in Australia
4) No of Operational Sites in Victoria	1, in Victoria	1, in Victoria	1, in Victoria	6, in Victoria
5) Total Number of Individuals Employed	40-50	8-15 varies with orders, four permanent staff, rest are casual	20-35, fifteen permanent rest are casual as work is seasonal	5000 between all sites
6) Average **or** median number at each site	40-50	8-15 varies with orders, four permanent staff, rest are casual	20-35, fifteen permanent rest are casual as work is seasonal	3-800 per site
7) Description of Overall Safety Culture (within your realm of responsibility)	Very positive, employee and management commitment	Worker and management driven positive but only after one employee was seriously injured and WorkCover threatened us with prosecution	Medium-good, still a large number of issues despite the full implementation of the OHSMS	Good and improving all the time, pockets of excellence audited against advanced SafetyMap criteria
8) Number and Type of OHSMS employed	NSCA Five Star System	Contracted OHS professional to design our own system after rejecting others as unsuitable	NSCA Five Star Equivalent System	Internal system called “Core Standards” internationally recognised standard. Also working towards safetyMap

9) Date and Level of Certification Achieved	Five Star rated since 1998, regularly reaudited and have to work to keep this performances level	Externally audited June 1998, passed at outside auditors required level of achievement	Four star (equivalent) rated by both internal and external auditors. To get to five star would effect work rate performance	Core Standards since 1995 and initial SafetyMap in June 2000
10) Major Barriers to Implementation	Lack of support from some contractors and suppliers	We had to change two of our contractors who were not OHS aware and were not committed to our system	Casual workers not really interested in safe work practices	Disconnection between the sites, have to disseminate information to each site. Internal politics a problem
11) Major Factors that Eased Implementation	A staff member is a qualified safety professional, his knowledge and expertise contributed greatly towards implementation	Employer and employee drive to change whole organisational culture	Management team and permanent staff allowed easy implementation by providing the required commitment	An awareness of moral and legislative requirements, to show an organisation could be responsible towards OHS even at a high cost
12) Major Influencing factors for OHSMS implementation	We wanted to be recognised as an industry leader in organisational health and safety Cost of WorkCover premiums has significantly reduced	Commitment of all Management and employees to produce a changed organisational culture involves OHS in all its activities	Reduced WorkCover premiums and increased organisational safety culture	Sense of responsibility and duty from senior management and line management
13) How is OHS Performance Measured	PPIs and LTIs, however we recognise the limitations of the later	PPIs only	System based reports which includes LTIs and PPIs	LTIs but looking at introducing PPIs in the second half of 2000
14) Increase / Decrease in OHS Performance (OHSM)	Increase measured by lower LTIs, higher PPIs and reduced WorkCover premium	Increase due to large number of PPIs implemented as a result of introduction of the OHSMS	No noticeable difference.	Hard to measure because OHMS's putting in will not change cultural problem. Unionisation is a problem

15) Level of Commitment (or not) to OHSM	All individuals in organisation totally committed to maintenance of good safety record	Strong and Constant	Company has suffered in terms of 5% lost productivity which can be directly related to OHSMS	As a whole highly committed but major problems in some parts of organisation
16) Level of External Expertise Required to Implement OHSMS	No external expertise required. In house staff covered all competencies	Availability of an OHS professional at a reasonable cost	Employed OHS professional, proved to be very expensive and not value for money	We use external auditors from a number of organisations. Now training our own auditors
17) Perceived Benefits gained due to Implemented OHSMS	Strong organisational sense of achievement and commitment to maintain this	Competitive edge in an increasingly difficult market place. Better relationship with WorkCover	Slightly lower WorkCover premiums but not reduced to level expected	Raised level of organisational awareness but is unlikely to reduce our WorkCover premiums

Part Two

OHSMS in Australian Industry

(non-refereed presentations)

OHS Management Systems in the Meat Industry

South Australia's approach in partnership with the National Meat and Livestock Australian OHS Continuous Improvement Model for the Meat Industry

Janice Quarrie, SA WorkCover Corporation
OHS Consultant for Meat Industry
and
Margie Mahon, Best Practice OHS Project Leader,
Meat and Livestock Australia

OHS management systems in the meat industry

The Australian Meat Industry is a consistent poor OHS performer. In 1997 the SA WorkCover Corporation recognised the SA meat industry as one of its top ten worst performing industries. Of particular note was the livestock processing category of the meat industry, which had the dubious distinction of being the worst performing industry group in South Australia in terms of claims costs per payroll. Of particular concern were the rate and costs of manual handling injuries and the number of cuts, lacerations and amputations from various tools of trade used within the industry.

Figure 1. bandsaw operation.

How do you improve OHS management systems in the meat industry?

In 1998 The SA WorkCover Corporation allocated an industry OHS consultant to the meat industry. The consultant conducted statistical research within the industry to identify the main problems, then set about consulting widely with all industry representatives to engender commitment and involvement. A forum was convened attended by over 50 representatives of the SA meat industry. Attendees at the forum were strongly motivated by a realisation that the SA meat industry's very viability was threatened by it's rising costs. At the forum a tripartite OHS Meat Industry Committee was formed to represent employers and employees in the industry. The consultant then facilitated strategic planning with industry representatives and committee members. The committee has continued to be supported in it's aim of achieving continuous improvement in OHS performance across the Meat Industry in South Australia by the WorkCover Corporation's *SAfer Industries* strategy.

"SAfer Industries"

SAfer Industries involves a strategic partnership program between high cost industries and the WorkCover Corporation, with the aim of reducing injuries and illness in the workplace. The strategy was brought about by an increased recogni-

tion that occupational health and safety is the responsibility of employers and employees in the workplace, and that WorkCover's role was one of support. The industry approach was linked to the recognition that there was a greater onus on industries to determine their own work practices and meet the requirements of legislation. While WorkCover was committed to supporting industry, the strategy had to be industry driven for it to succeed.

The SAfer Industries program involves:

- gaining long term commitment from the industry to a partnership arrangement, which reflects industry level commitment to improve OHS performance (in collaboration with unions, and other bodies as appropriate)
- fostering industry-wide ownership of OHS
- facilitating a strategic industry-wide approach to OHS based on best practice
- assisting the industry to identify key issues affecting their OHS performance and to develop plans to address them
- supporting industry action to improve OHS by providing or facilitating access to a range of OHS services, including access to WorkCover Corporation resources (eg grants) and other resources.

The selection of industries for inclusion in SAfer Industries was based on workers compensation claims costs over the three year period 1994 - 1997. The Meat Industry was identified for inclusion in SAfer Industries because high claims cost have resulted in the highest levy rate chargeable (7.5%) which still involves cross subsidisation from other industry sectors.

The concept utilises the industry consultant as the conduit for resources within the Corporation to support the industry committee (See Figure Two). Membership of the committee reflects existing representative bodies and the make-up of the industry. The consultant's role is to facilitate the establishment of an industry committee, establish a strategic planning process, assist with grants submissions to fund projects, coordinate WorkCover resources, and provide some one on one OHS consultancy services within the industry.

Once the committee and various working parties are established, the consultant acts as a broker for OHS services provided by the Corporation as well as supporting the committee and the working parties in the role of executive officer and providing other services as required.

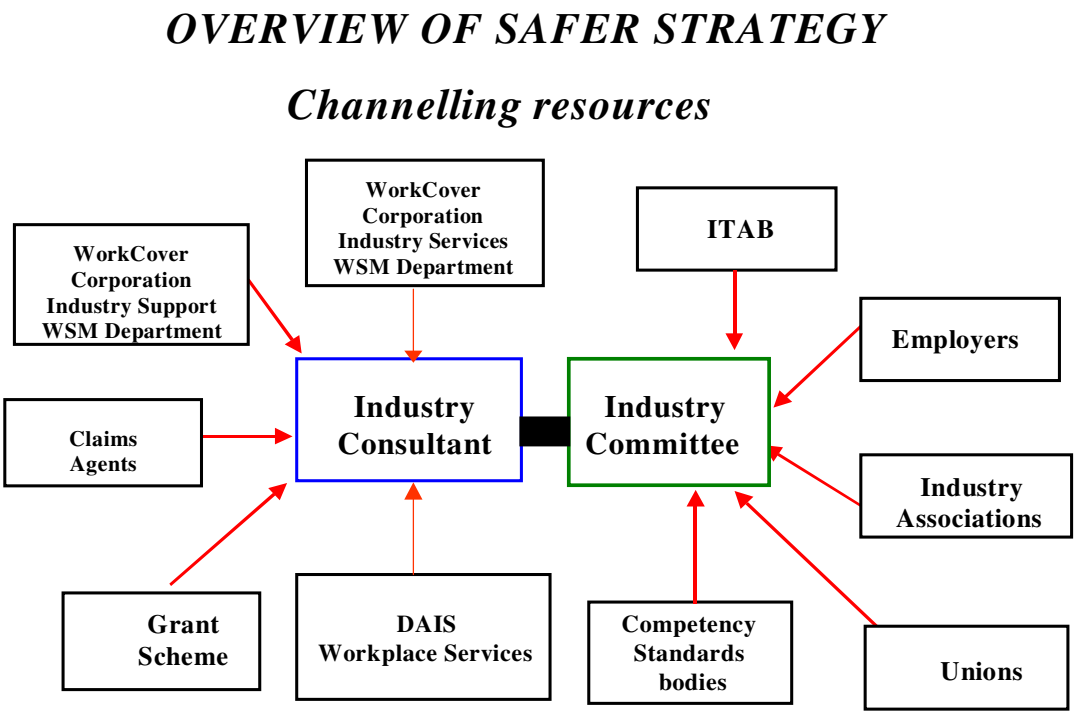


Figure 2. The industry consultant as the conduit for resources within the Corporation to support the industry committee

Strategic planning and committee achievements

Over 30 industry representatives attended strategic planning and developing a strategic plan that identified the Meat Industry OHS Committee's vision, mission, principles and values, six strategic directions and short, medium and long term goals. All are outlined in the Strategic Plan, available for viewing on the committee website (workcover.com/safer/meat.html).

The four main objectives that underpin all activities are as follows:

1. Hazard Management
2. Information and Advice
3. Establishing our representative role
4. Guidelines, Training & Shared Solutions

Since Strategic Planning in 1998 the SA Meat Industry OHS Committee has:

- consulted with industry over the draft plan
- launched the Strategic Plan with Hon Rob Kerin, Deputy Premier, Minister of Primary Industries in Nov 1998
- successfully applied on three separate occasions to WorkCover Corporation for targeted grants to fund three hazard management projects (cut resistant gloves, ergonomics and safety culture)
- met every two months and established three working parties linked to the four main objectives
- undertaken several major projects with some already completed, including:
    - setting up an industry web site (workcover.com/safer/meat.html)and providing other information and advice services
    - researching the use of cut resistant gloves and developing guidelines
    - developing an ergonomic hazard management kit
    - implementing the National meat industry OHS best practice & continuous improvement model in participating red meat plants
    - linking in with the SA Department of Communicable Diseases for strategic planning on Q Fever
    - commissioning an employee award
    - marketing the strategic plan and other products.

Figure 3. Cut Resistant Gloves Trial

Most recently the committee has commenced an OHS safety culture survey, due for completion early in 2001.

Information about projects and completed products can be downloaded from the web page. (workcover.com/safer/meat.html).

A summary of the committee achievements can be seen in Figure 4.

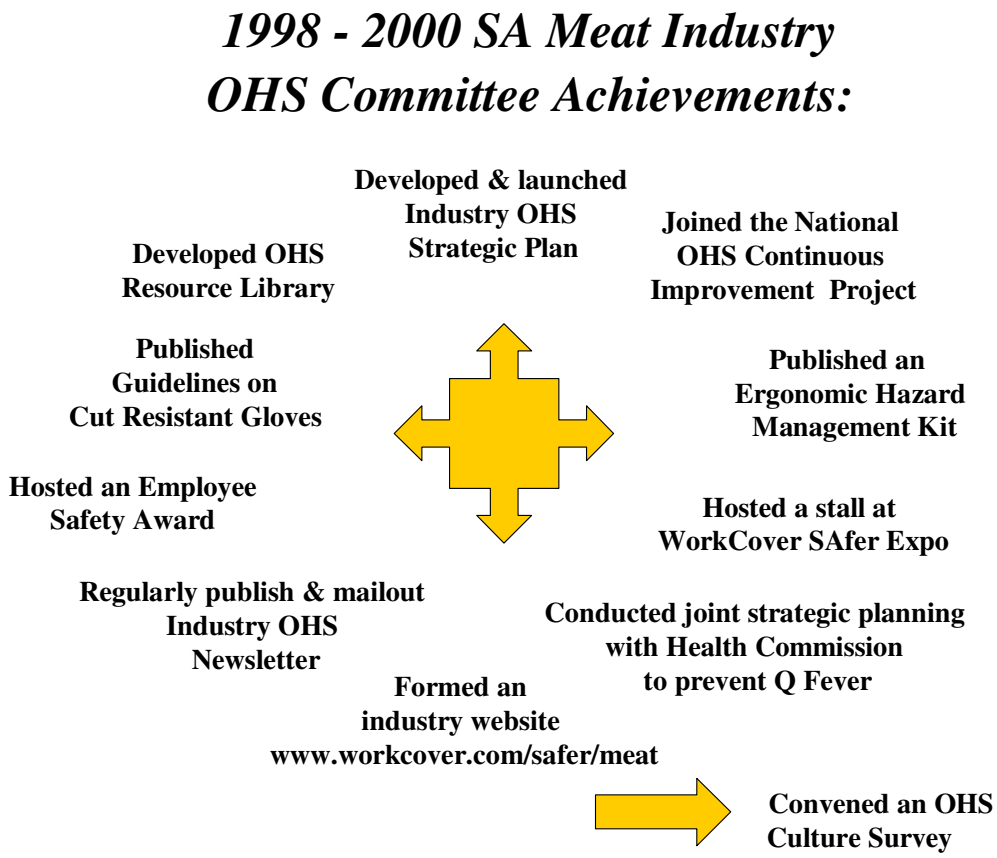


Figure 4. SA Meat Industry OHS Committee Achievements.

National best practice and continuous improvement model

The strategic plan recognised that effective integrated OHS management systems were vital to the ongoing viability of the meat industry. The committee linked in with National Meat Industry OHS professionals to assess models that were already in existence, developed by the meat industry for the meat industry. The SA Meat

Industry OHS Committee considered then embraced the Meat & Livestock Australia Best Practice and Continuous Improvement strategies.

The meat industry OHS continuous improvement framework

Introduction to the Meat Industry

The Australian Meat Processing Industry is an important component of Australia's manufacturing industry. In 1998, the Productivity Commission reported that the industry directly employed 27 500 people and that meat was Australia's seventh largest export commodity[1]. The industry exports to over 100 countries and earns more than 4 $billion per annum[2]. Research on the industry reports that the Australian Meat industry performs poorly in OHS. Historically, the reasons for this are complex and have included:

- Lack of commitment to OHS
- Industry working arrangements
- Poor task design
- Fragmented and ad hoc management

Responses to performance issues in the Meat Processing Industry have traditionally been technology driven. However recognition of the limitations of this approach saw the development of the Work Related Key Issues Program of the MRC. This program aimed to develop competitive advantage through its human resources.

In 1993, the industry developed a formal strategic response to the issues surrounding its poor OHS performance. The 'Australian Meat Industry Best Practice Program' (Best Practice Program) espoused a central theme of controlling hazards supported by OHS management and business systems, leadership, managing people and monitoring improvements. Forty organisations drawn from every State participated in the project. An evaluation was completed in 1996, and the recommendations were promoted throughout the meat industry.

The meat industry OHS continuous improvement framework

The evaluation of the Best Practice Program revealed that the gains made in that program needed to be consolidated and further developed. In 1997, the Meat Industry through its Research Corporation (now known as Meat and Livestock Australia) commissioned a report that in part aimed to develop an OHS continuous improvement framework, consistent with the approach of state jurisdictions, quality assurance & ISO quality certification[3]. This report provided the theoretical foundations for the industry to implement an OHSMS.

The Meat Industry OHS Continuous Improvement Framework entitled "Making MISCHIF" was developed to:

- Focus management attention on OHS by providing an alternative to how they were managing their health and safety. A consistent approach to OHS management across Australia was sought.
- Demonstrate that the industry was addressing its health and safety issues and taking responsibility for their management. A spin off would be that the image of the meat industry as a poor performer would improve.
- Ensure improved resource allocation to OHS within the industry so that it was addressed as one of the issues affecting the long term sustainability of the industry
- Provide a motivational lever through benchmarking opportunities based on positive and negative performance indicators
- Provide an opportunity for the development of general managerial skills and the recognition of these skills within the industry

A model for the industry

In the industry, every processing plant has a management system. However, these are ad hoc, fragmented and marked by competition between different elements. The nature of the industry is such that there is constant competition between quality, food safety, OHS and production. There are also a large number of regulatory and other requirements that affect the management systems of each enterprise. Meeting the requirements of these bodies represents a significant portion of an enterprise resources. The result is that greater energy is exerted in

managing the paperwork required by the different agencies than in managing and improving the process.

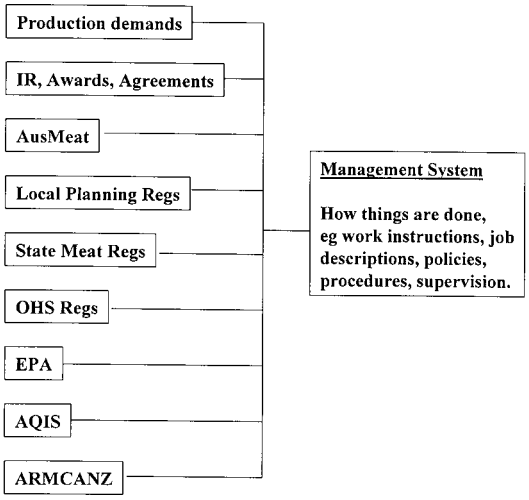


Figure 1. Main regulatory and other requirements which affects meat processing plants management systems

The adoption of the Model was also seen as a framework to support the development of effective management systems that consolidate continuous improvement as shown by the following figure. As the figure suggests, the management system's role is to support continuous improvement by preventing deterioration in performance. It is imperative that the "chock" does not become more important than the continuous improvement that it is consolidating.[4]

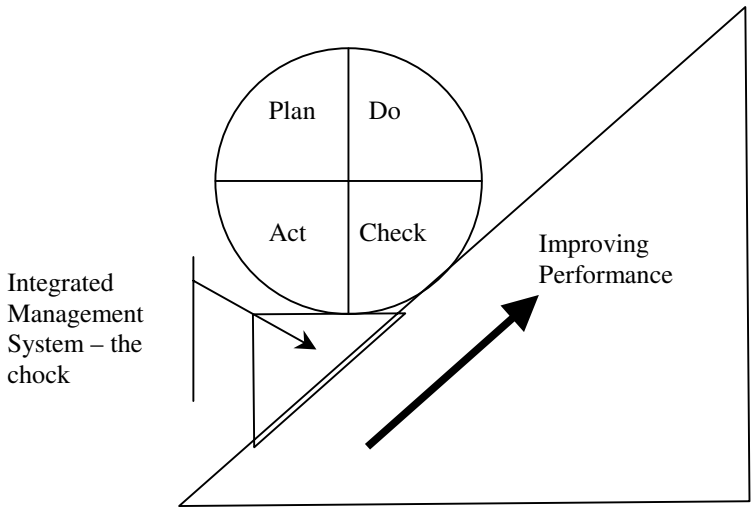


Figure 2. The role of the integrated management system. Adapted from the NIES QA/ TQM diagram.

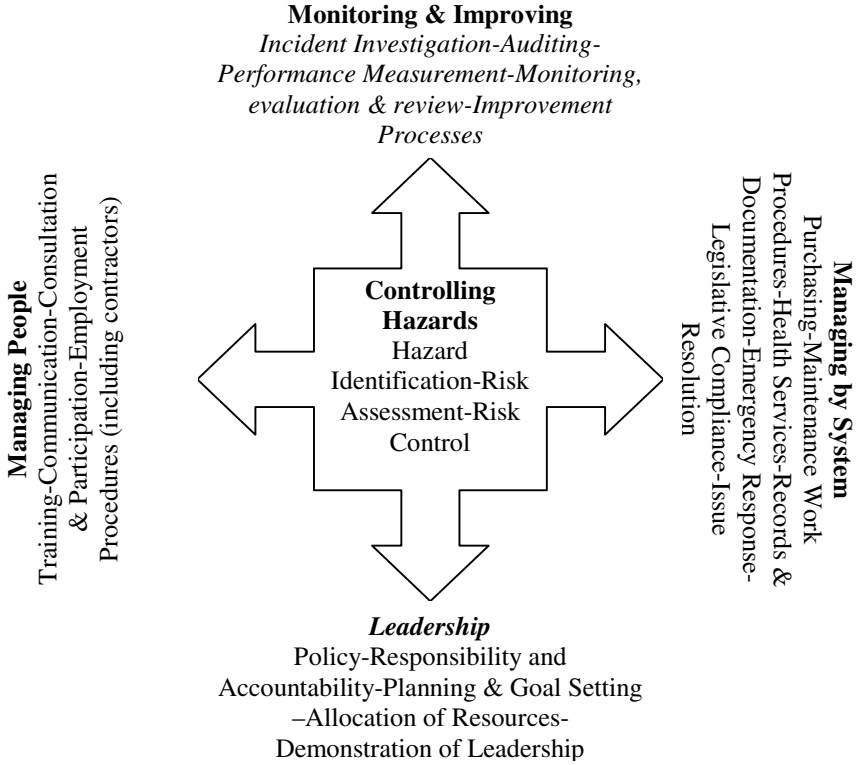
The Model

A model for a meat industry OHSMS was developed by Andrea Shaw, Shaw Idea Pty Ltd and Sharon Murray, Turning Point Pty Ltd for Meat and Livestock Australia (MLA) during 1997/98. The consultants reviewed AS 4804, proprietary frameworks, international standards, other industry models and those of the state jurisdictions. It was agreed that for the meat industry there was value in developing a national industry specific framework that was consistent with the approach of the state jurisdictions and was readily adaptable to the needs of individual organisations.

Shaw and Murray (1998) stated in their final report to the industry that continuous improvement should be a process that

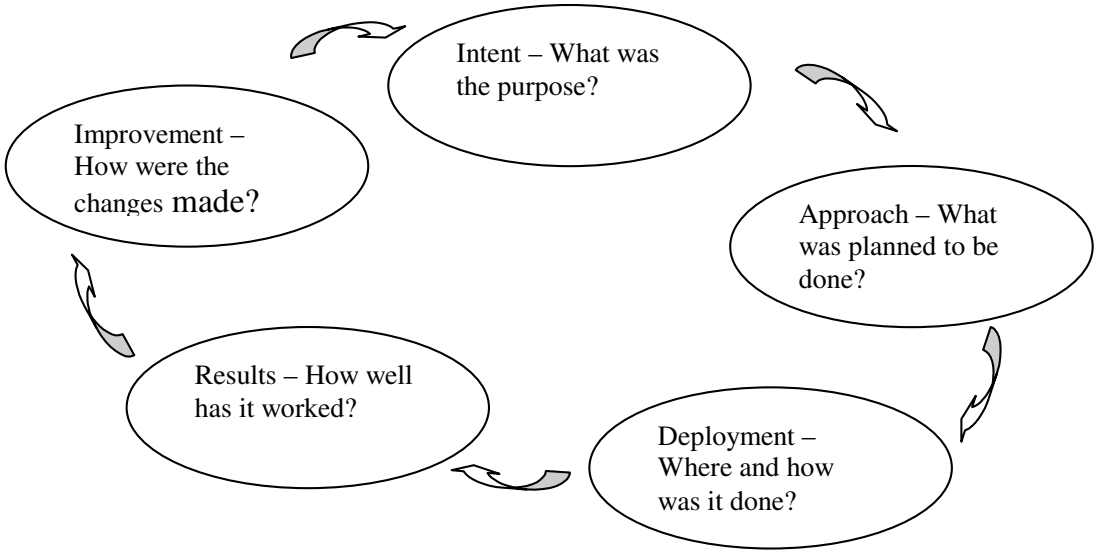
- Allows for the different levels of OHS performance found across the industry
- Is outcome oriented rather than procedures oriented
- Focuses on people rather than compliance

The framework that was developed was based on three principles of participation, prevention and responsibility. The following were the elements selected:



The IADRI model gives a framework for analysing how effectively an enterprise is setting up the system described. It allows enterprises at different levels of development to compare their implementation processes. The steps of IADRI form a continuous improvement loop.

IADRI loop



INTENT – outlines the purpose of the improvement . What was the enterprise aiming for?

APPROACH – describes the way the enterprise decided to address the element. Was the approach innovative, related to the intent, planned and preventive?

DEPLOYMENT – deals with the way the approach was put into practice. Did it happen according to plan? Did it happen consistently in the enterprise?

RESULTS – covers how effectively deployment worked. Did the enterprise get the outcomes aimed for?

IMPROVEMENT – refers to how the lessons of the previous steps have been used to improve intent, approach, deployment and hopefully results. Were the activities changed as a result of what has been learned?

Implementation of the OHSMS

MLA was responsible for the implementation of the OHSMS through a project entitled the "OHS Continuous Improvement Project". The project was delivered through South Australia and Queensland as these states had a tripartite approach through a state committee to address their OHS issues. They were seen as the appropriate vehicle to assist in the delivery of this framework. Industry funds that were managed by the MLA were available for participating sites to assist in implementing the model. This provided for a state consultant to be employed to implement the model.

The following are the stages of the project.

- Development of Project Steering Committee
  Tripartite committee was selected to be involved in selection of a consultant and screen the applications of enterprises seeking to be involved in the project.
- Entry criteria
  Criteria were set by MLA to screen enterprises for the project. This was to ensure there was management commitment and employee participation during the project. Those sites that did not meet minimum criteria at the beginning and throughout the project were not allowed to continue in the project
- Gaining enterprise commitment from those involved
  In order to participate in the Project the site CEO and union representative had to sign the project application. Sites were then visited at the commencement of the project to confirm their application. Sites were also required to form a continuous improvement team as part of the project.
- Provide technical support
  One consultant in South Australia and two in Queensland were recruited to the project. They had a very active start up phase to assist the sites and by the end of the nine months this had wound back to minimal support.
- Systems development
  Since the model was developed, meat processors have had the opportunity to consider models such as SafetyMAP in Victoria, Safety Achiever Bonus Scheme in South Australia and Tri Safe in Queensland. The sites involved in the project have found that the meat industry model supports these and does not duplicate them.

- Implementation on an element by element basis
  Sites involved in the project worked through the elements on a one be one basis as it became clear that to do anymore seemed impossible for the site teams. By focusing on an element they could achieve noticeable wins which convinced the site management/employees to keep on with the project.

This activity was linked into the South Australian Safer Industries Meat Industry Committee and it was also implemented through processors in Queensland. In total 33 enterprises were involved in the project. Technical support funding was provided for a 12 month period from June 1999 to June 2000.

It is clear 12 months after the commencement of implementation that full implementation of all elements will take most participants at least 24 months. Also, it is becoming clear that those sites that embraced the first round of best practice initiatives and developed the underlying capacity to implement an OHSMS are most likely to successfully implement the OHSMS.

Evaluation of the model

A formal evaluation will be undertaken of the 12 month implementation process. Currently consultants involved in the project are submitting their final report on the process and activities undertaken. However, interim results indicate the following about the enterprises involved:

- The elements selected have focused the sites on their area of greatest need
- The sites have selected an element to commence with that will give them recognition in the organisation
- The continuous improvement team members have learnt new skills
- Sites have requested the industry to set aside more funds to assist in ongoing implementation of the OHSMS
- The activity has helped focus achievements on OHS which are acknowledged by management and employees
- Difficulties continue with competition between production and OHS. In particular time being allocated for team meetings during production time
- The IADRI loop has been embraced by the organisations
- Some organisations have applied the IADRI across other management systems

- The sustainability of the organisations to continue to work on their OHSMS is unknown
- Role of state steering committee needs to be strengthened although the members are also the participants and this created difficulties
- Differing philosophies of the consultants to the model has achieved differing outcomes which are yet to be analysed for their impact on assisting enterprises adopt and build a management system
- Benchmarks are difficult to evaluate

The future

The meat industry has embraced the opportunity to implement an OHSMS. Technical support has been provided to assist them implement the system. An evaluation is to be carried out to determine the impact and sustainability of the approach undertaken. This evaluation will go back to the core principles of the project which were focused on people, outcomes and not procedures oriented and allows for the different levels of OHS performance found across the industry.

The implementation of the industry OHSMS has kept the industry focused, provides them with the opportunity to share and learn lessons from each other and improve their OHS performance. All these outcomes ensure the viability of this most important Australian industry.

References

1 Productivity Commission 1998, Work Arrangements in the Australian Meat Processing Industry, Research Report, AusInfo, Canberra

2 Towards OHS Best Practice in the Australian Meat Industry, Meat Research Corporation, 1997

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4 Shaw, A and Murray, S Introducing the Meat Industry Safety and Health Continuous Improvement Framework. Final Report on Project RPDA.212 Meat Research Corporation 1998.

A Small Business Perspective

Jamie Clapham
General Manager
K J Clapham Metal Spinners Pty Ltd

About K.J Clapham Metal Spinners

- Founded by Ken Clapham 1968.
- Currently industry leader.
- Employs 17 People.
- Core business is Metal spinning.
- Diversifying into associated metal industries.

Products

- Industrial & Commercial lighting components.
- Heritage Lighting.
- Dog bowls.
- Telegraph pole caps.
- Dampers for Air Cond
- Machining components for aluminium Truck bodies.

What is metal spinning?

- Metal spinning is a process of deep drawing metal product into various profiles.
- Most metals can be spun. (alum/brass/copper/ mild steels & Stainless steel)

How does the process work?

- By clamping the Blank between the spinning mandrill and a live centre.
- Then whilst rotating the metal, begin the forming process.
- The operator uses his hand tool to pass over the metal, gradually forming the item to its desired shape.
- Depending on this shape and the metal being used, to the number of stages or draughts required.

Striking a balance

- A successful business big or small will balance safety with production.
- **Ingredients:** Management commitment, culture, resources.

What do get in return?

- Low incidence rates.
- A happier workforce, which compounds towards a safer environment, Quality and efficiency.
- Profit ??????

Facts

- Metal spinning and associated work is hazardous.
- Incidence rate:
    - 95/96 was 18.75.
    - 96/97 was 37.5.
    - 97/98 was 6.6.
    - 98/99 was 5.88
    - 99/2000 was 0.

How did K.J Clapham's achieve this?

- Step one.
    - Recognition.
- Pull your head out of the sand and recognise that injury can and probably will happen.
- Step two.
    - Plan your safety strategy.(Even if it is informal)
    - Include your worker in this development.
- Step three.
    - Communicate your strategy so that everybody is aware of your intentions and expectations.
- Step four.
    - Provide the resources.
    - Provide support.
- Step Five.
    - Monitor and feedback.
- Step Five.
    - Refine by going back to step one.

What systems did K.J Clapham's employ or develop?

- 96/97 - No formal systems but a strong culture of safety supported by good houskeeping and general practices.
- 97/98 - Firm financial commitment by moving premises. Communication with staff critical to layout of new facility.
- 98/99 - Strong commitment to training. Monitoring of injury and feedback. Development towards formal safety procedures through involvement in Club Zero.
- 99/2000 - Refinement and strengthening of culture, commitment and formalisation.

Implementing OHSMS in the Health Care Industry

By Ray Cooke
Manager, Occupational Safety and Health Unit
Health Department of WA Perth Chest Clinic
Occupational Safety and Health Program

Introduction

In 1998, following the release of State Treasury Instruction (TI)109, the Occupational Safety and Health (OSH) Unit embarked on a project to review and improve current occupational safety and health management practices adopted throughout metropolitan and rural health services. Occupational health and safety is an integral part of the development and production of goods and services and the success of both requires the integration of business management systems and risk management (Emmett, 1998).

The OSH Unit identified the need for consistent, uniform standards that meet the occupational safety and health risk management requirements of Treasury Instruction 109 and also established a need for a framework and tools to manage all risk. An integrated health industry risk management approach that meets the requirements of TI 109 Risk Management was recommended to health services.

The OSH Unit embarked on a practical two-year program funded through a special 'top slice' funding grant to assist public sector health services in meeting their occupational safety and health obligations under the proposed framework. The

program aims to avoid and reduce losses from occupational incidents and workers' compensation claims.

Background

The project aims to develop and provide the tools required by health services to manage occupational safety and health and other risks within the workplace. These tools include:

- OSH documents (guidelines) for the identification of hazards, risk assessment and control
- OSH training needs analysis and training programs
- Continuous improvement action plans
- Internal auditing of OSH performance.

The guidelines provide practical guidance for health services to implement OSH strategies that address major industry hazards (eg. manual handling, aggression, and chemical safety).

Management systems

The Australian Standards that address quality, environment and safety systems have common elements and these common elements provide for the successful integration of these three disciplines into one management system. Common elements include leadership and commitment, planing, implementation, document control, purchase control, review and monitoring of performance, continuous improvement and consultation. These are key elements of all management systems.

The OSH Unit has been working towards completing the OSH components of the Health Industry Risk Management System (HIRMS). Due to current issues addressed by the OSH Unit's interim report on HIRMS, the OSH Unit had been reviewing its approach to promoting OSH components of the HIRMS. Organisations who have successfully implemented an integrated approach confirm the Unit's view to move away from promoting a too strictly defined risk management system to integrating occupational safety and health programs into the existing health services' management systems.

The management system focus for health services is on improved quality standards to provide "quality of care" to clients. Currently, within West Australian health services, the need for certification makes quality assurance systems the major driver for the implementation of management systems. It would benefit the OSH unit to integrate OSH management system elements into existing quality management system elements (i.e. EQUIP, QIC models). These models could be utilised to measure health services' OSH performance for common management system elements.

The limitations of integrated management systems should also be discussed. Integrated management systems still need to incorporate specific controls required for the OSH and environment disciplines. These two disciplines have specific legislative and industry requirements and are risk – based disciplines; therefore, integrated management systems that include environment and safety should address specific issues and programs that meet these requirements.

Specific OSH programs and issues, relating to the health industry, have been identified by the OSH Unit. Although they form part of the HIRMS model they can be applied within any management system model.

OSH guidelines

OSH documents and operational instructions previously developed by the OSH Unit were updated and used to develop guidelines. In addition, new guidelines are being drafted. The guidelines provide practical guidance for health services to implement occupational safety and health strategies that address major industry hazards (eg. manual handling, aggression, chemical safety).

These documents are currently being circulated throughout the health industry for comment. Once finalised these documents are ready for endorsement and adoption by the health services.

Due to the time required to obtain feedback by external circulation of the documents, final drafts have been made available to Health Services for immediate implementation.

Implementation strategy

The project is being implemented in three stages.

The first stage of the project was completed in '98/99. The OSH Unit conducted an initial "snap shot" survey of the twenty rural health services in Western Australia to determine the status of existing occupational safety and health processes in place. Health services have been provided with a Continuous Improvement Action Plan that addresses the exposures to loss identified in the survey.

The objectives of the first stage were:

- To market the OSHU and its resources to Public Sector Health Services
- To identify main exposures to loss within each health service unit
- To determine the status of OSH controls in place
- To provide initial Continuous Improvement Action Plan (CIAP)

Stage two of the project includes training on hazard management and workshops on the integration of OSH elements into the individual health services. Twenty of these workshops have been completed. The remainder of these workshops will be completed by December 2000.

The objectives of the second stage are:

- To introduce guidelines that address OSH issues within health services
- To provide training on hazard management and implementation of OSH programs
- To conduct workshops on the integration of OSH programs into the individual health services' management systems

Stage three of the project is for the OSH Unit to conduct internal auditing of occupational safety and health performance. The OSH Unit aims to ensure compliance with new national OSH system standards (AS/NZS 4801) and quality management systems used by public sector health services (eg. ACHS and Quality Improvement Council) thereby ensuring the success of OSH programs through integration within existing quality management systems.

The objectives of the third stage are:

- Measure internal OSH systems against ASNZS 4801
- Measure internal OSH performance to policy and procedures
- Identify successful OSH initiatives
- Identify OSH opportunities for improvement

The aims of the project was to reduce health services' costs by providing the tools to manage OSH exposures rather than each health service developing individual programs and working in isolation.

An index for the OSH Manual has been developed which will be made available to all public sector health services through the intranet and as a hardcopy. The metropolitan health services and one regional health service have not participated in the OSH project, however, they will still have access to the OSH Manual through the Intranet. Other services are also still provided to health services through the continuation of the OSH Unit's core functions (eg. workstation evaluations, hygiene assessments, training, etc.).

Current trends in occupational safety and health management systems are to move towards the integration of quality, environment and safety. New Australian Standards (4801 and 4804) on OSH management systems have been released and are able to be integrated with the existing quality and environment standards.

Workers' Compensation

The OSH Unit is promoting a proactive approach to Workers Compensation by implementing, in consultation with the Insurer, a Computerised Incident Management Reporting System, which will be statewide. This will allow us to identify trends quickly and thus alert other Health Services of possible problems. The long term effect on employees moral will be significant and will help to ensure prompt, accurate reporting of hazards within the Health Service. The unit is also encouraging better claims management, particularly for those long-term claims, to help reduce premiums. The overall strategy is to reduce premiums for WC across the public health industry.

Current trends suggest that manual handling injuries are responsible for 51% of the current claims. In the last year stress claims have increased to 20.5%.

Conclusion

Risks exist whether they are acknowledged or not. The most effective method of managing risk is to integrate occupational safety and health strategies at every level of the organisation and process management.

Integration extends to optimal rehabilitation and to dealing with the impact of problems as they occur (i.e. injury management). Integration also allows the maximisation of the strategic role that OSH can play. The OSH Unit encourages the management of workplace safety and health as a strategic management function rather than simply a means of cutting workers' compensation and accident costs. An organisation's focus on the health and safety of the workforce can be the vehicle for cultural change, positive relationships, creativity and productivity.

Building Your Own OH&S Management System – Workcover's D-I-Y Kit

By Michael Costello
Co-ordinator Industries Strategies Unit
OH&S Division
WorkCover NSW

Peter Merrett
Manager
Industry Reference Groups
WorkCover NSW

WorkCover has been engaged in a project to develop a set of tools to assist the workplace to approach OHS management in a more systematic and effective way. This paper will discuss this project under the following headings: -

(1) Background
Why has WorkCover embarked on a project to promote systematic management of occupational health and safety?

(2) Implementing the Systematic Approach
What are the processes and tools that comprise the Systematic Approach?

(3) Trialling the Systematic Approach
Does the Systematic Approach work in practice?

(4) Producing and Promoting the Systematic Approach
What products will result from the project and how will they be promoted?

1. Background

Over the past decade WorkCover has embarked on a program of major reform to its Occupational Health and Safety legislation. Major elements of this reform have been the Manual Handling Regulation, the Hazardous Substances Regulation etc.

These regulations have introduced significant changes to the legal requirements for managing workplace health and safety. They require employers to adopt a risk management approach to managing health and safety. This has meant a significant move from prescriptive requirements (especially for manual handling) to a requirement that the risks posed by these hazards are assessed and effective control measures are put in place to eliminate or minimise the risk.

This program will culminate with a new OHS Act and an OHS Regulation. The OHS Bill 2000 which has just been passed by the NSW Parliament rewrites the present OHS Act in plain English and amongst other provisions requires employers to consult with their employees on matters which may effect their health and safety. The OHS Regulation, which will be re-released later this year, will contain the general obligation for employers to adopt a risk management approach to all their workplace occupational health and safety risks.

While the aim of this shift from preservation to risk management is designed to deliver better health and safety outcomes, WorkCover is aware that many employers will find it difficult to adjust to the requirements of a risk management approach. Therefore, a strategy needs to be in place when the Regulation is commenced to provide information and support to industry to make this adjustment.

The development of set of processes and tools to enable workplaces to develop their own risk management strategies is seen as a practical way for them to meet their OHS responsibilities. This is particularly true for small organisations that may find the issue of risk management daunting.

The project to develop these processes and tools is not designed to produce a WorkCover health and safety management system. It is far less ambitious: it is merely a means of assisting workplaces to ensure the following questions about health and safety management: -

(1) Where do I start?
(2) What policies and procedures do I need to have in place for my work-place?
(3) How can I develop these policies and procedures
(4) What do I need to do to ensure these policies are implemented and re-viewed?

The answers to these questions will vary from workplace to workplace and the outcome of answering these questions will be a more systematic way of managing health and safety. The systematic approach that is discussed in the following sections is designed to help workplaces answer these questions.

A major factor in the development of the project has been the active involvement of the Industry Reference Groups (IRGs) established under the *Workplace Injury Management and Workers Compensation Act 1998.* The IRGs comprise union and employer representative with particular industry, OHS, injury management and workers compensation knowledge and experience.

The aim of the IRGs is to develop industry specific solutions for significant workplace occupational health and safety and injury management problems, so as to reduce the frequency and severity of workplace accidents, improve return to work rates and reduce the cost of workers compensation.

There are thirteen IRGs and three of them - Consumer Manufacturing, Industrial Manufacturing and Government Administration & Education - have been enthusiastic supporters of the project as they realise the need for industry to be more systematic in the way OHS is managed if injury prevention and injury management are to be more effectively addressed. Union and employer IRG representatives have organised companies and workplaces to participate in the project and have been actively involved in workplace visits and have provided support to those participating. The success of the project is largely due to this industry involvement and support.

2. Implementing a systematic approach

The Tools

The model uses a number of instruments to organise the activities that underpin a systematic approach to managing OH&S.

The first tool *(Expectations Instrument)* starts the systematic approach by requiring the organisation or workplace to generate:

1. The interlocking set of responsibilities and accountabilities for all the levels of the organisation or workplace from shop floor employees to the owner/manager or senior management;
2. The basic hazard management activities that comprise the set of responsibilities and accountabilities.
3. The training needs of all levels of the organisation or workplace.

The second tool *(OH&S Policy Instrument)* translates the identified responsibilities into the OH&S policy that gives expression to the organisation's commitment to OH&S.

The third tool *(Hazard Management Activities)* enables the workplace or the organisation to organise their basic hazard management activities, identified with the *Expectations Instrument,* into the workplace activities of employees, supervisors and managers. This tool, while primarily concerned with implementation of workplace hazard management, is easily modified to incorporate monitoring and reviewing the hazard management strategies.

This tool is supported by a variety of tools to facilitate the implementation of these basic hazard management activities – eg

- *Safe Operating Procedure Tool* – how to develop safe operating procedures from the job/task design or review process
- *Checklist Tools*- to support workplace inspections
- *Purchasing Tool* – to support the development of purchasing procedures.
- *Emergency Tool* – to enable the development of evacuation procedures

All these tools adopt a risk management approach to hazard management and can generate the appropriate documentation to support the hazard management activities,

The outcome of the application of these tools will be a systematic approach to managing OH&S that will encompass the basic elements of an OH&S management system.

1. **Commitment**
   Developing a coherent set of responsibilities and accountabilities for all levels of the organisation or the workplace;
   Expressing the these responsibilities and commitment in an OH&S policy
2. **Hazard Management**
   Identifying the appropriate opportunities in the organisation for hazard management activities;
   Determining the roles and tasks of employees, supervisors and managers in hazard management;
   Adopting a risk management approach to these hazard management activities through the use of a variety of tools;
   Determining the training needs of the organisation or the workplace incorporating monitoring and reviewing in the hazard management process.
3. **Consultation**
   The tools can be used by an individual or a group. Consultation can be built into the process by ensuring all those affected by an instrument (or their representatives) are involved in its application.

Appendix 3 shows the process in schematic form, how the tools are related and how commitment hazard management and consultation underpin the process.

Using the tools

Expectations Instrument

This is a simple but powerful tool. It is comprise of the following matrix:

Employees	Expectations Needs
Supervisors	Expectations Needs
Managers	Expectations Needs
General Manager	Expectations

The tool can be varied to meet the varying management levels in the organisation or workplace. For example if a workplace only has a few workers and a supervisor plus an owner/manager then the instrument can be modified to accommodate this.

The aim of the tool is to structure and organise the way an organisation or workplace determines what are the various levels of responsibility for OH&S matters. It does this by interrogating the various expectations the organisation has of its management levels in terms of the corresponding needs these generate and how these needs are to be met. To do this it is necessary to proceed in sequence, starting with what is expected of employees.

Therefore the first question to be addressed is what the organisation or workplace expects of its employees in regard to safety. The reason for starting with employees is that it is usually easier for people to identify what is expected of employees than any other group because of the "safe person" perspective, which prevails generally in industry. These expectations are to written down. There are about three levels of responses that can be given. These need to be tracked to the third level.

Exhortations	**Warnings**	**Specific Behaviours**
Be safe Take care Use common sense	Don't cut corners Don't take off guard Don't muck around	Follow directions Follow procedures Use equipment in the prescribed manner Wear ppe Report problems

Therefore, what needs to be recorded, where possible, are the specific behaviours that are expected.

When these have been recorded the next task is to identify what employees need to be able to meet these expectations.

For example:

Expectations of employees	Follow procedures	Wear ppe	Report safety problems
Needs of Employees	Procedures to follow	Ppe supplied	Reporting mechanism

Appendix 1 is an example of the tool generating a set of expectations and needs for a small manufacturing plant.

From the expectations and needs that have thus been generated it is reasonably easy to extrapolate a coherent and related set of responsibilities for every level of the organisation.

In most cases determining responsibilities will involve rebadging the expectations as responsibilities. For example, the responsibilities of the machine operators in the plastics factory in Appendix 1 would be:

- Follow procedures
- Wear the ppe that is supplied
- Report injuries and hazards
- Keep work area clean

Similarly, the same process can be done for the supervisor and owner.

It is also possible, from the expectations and needs, to tease out the basic elements of hazard management. To do this we need to identify the hazard management activities that are imbedded in the expectations and needs.

In the case of the plastics plant these are:

- Operating procedures
- Using ppe
- Safe equipment/maintenance
- Hazard reporting
- Accident/incident investigation
- Training

The fact that these have been identified as hazard management activities that are expected or needed does not presume that some or all of them actually exist at present. Some might be being done informally without being recognised as a safety

activity. The next Hazard Activity Tool is designed to assist organisations or workplaces to formalise their hazard management activities and identify the deficiencies and gaps in these activities and lead them to further tools to address these problems.

In summary, by using this tool 2 critical tasks in implementing a systematic approach to OH&S have been accomplished:

1. **Responsibilities and Accountabilities have been identified for all levels of the organisation or the workplace**
2. **Basic hazard management activities have also been identified.**

Hazard Management Activity Instrument

The objectives in using this instrument are:

1. Identify the hazard management activities that are required to meet the expectations and needs in relation to managing workplace safety.
2. Determine the roles of all levels of organisation (eg. managers, supervisors, and employees) in these activities.
3. Identify current activities and roles.
4. Identify the deficiencies and gaps that need to be addressed

The tool does this by unpacking the identified activities into WHO does WHAT and WHEN.

This is how the tool can be used.

Step 1
Identify hazard management activities

List all the hazard management activities identified with the *Expectations Instrument* in the **Activities** column and against each activity provide a space for each of the levels of the organisation. For the Plastics Company it would look like this:

Hazard management chart

ACTIVITY	WHO	WHEN	HOW	RECORDS
Operating Procedures	Owner			
	Supervisor			
	Operators			
Safe Equipment	Owner			
	Supervisor			
	Operators			
Hazard Reporting	Owner			
	Supervisor			
	Operators			
Accident/ Incident Investigation	Owner			
	Supervisor			
	Operators			
Training	Owner			
	Supervisor			
	Operators			

Step 2
Specify roles for each activity

Again, using information in the *Expectations Instrument* enter the specific activities identified for each level of the organisation. To take toe example of operating procedures in the Plastics company it would look like this:

ACTIVITY	WHO	WHEN	HOW	RECORDS
Operating Procedures	**Owner**		• Ensuring procedures are developed • Develop training	
	Supervisor		• Ensure procedures are followed • Provide training	
	Operators		Follow procedures	

Step 3
Integrate roles into workplace activities

The next question to ask is "When should these activities be undertaken.

For example "When should the owner ensure procedures are developed?" The answer is "When jobs or tasks are being devised or significantly changed".

This should generate the following table using our example form above:

ACTIVITY	WHO	WHEN	HOW	RECORDS
Operating Procedures	**Owner**	Devising or changing jobs	• Ensuring procedures are developed • Develop training	
	Supervisor	While supervising	• Ensure procedures are followed • Provide training	
	Operators	Undertaking tasks	Follow procedures	

Step 4
Compare with current activities and identifies deficiencies and gaps

In this step the organisation or workplace compares its current activities both formal and informal with what has been identified as what is required to meet expectations and needs.

In the case of the Plastics factory it may well be that the only current operating procedure is the wearing of ppe. This would then raise the issue of what the organisation needs to do concerning operating procedures to meet the expectations and needs that have been identified. This issue resides at the owner level because there is where the need to develop operating procedures has been identified.

This same process would be undertaken for all the identified hazard management activities

Step 5
Address deficiencies and gaps

To assist the organisation or the workplace to address these identified gaps and/or deficiencies a number of tools will be developed. All these tools would incorporate a risk management approach. For example, the Safe Job Procedures tool would enable the user to:

- Identify hazards associated with the tasks that comprise the job
- Assess the risks
- Determine the appropriate control strategies that need to be incorporated into the task
- Develop a set of safe operating procedures
- Determine the training the job requires

The objective of this tool is to focus on the task as a means of dealing with the hazard. So rather than consider hazards discretely and separately such as noise hazards, plant hazards, manual handling hazards, the hazards should be addressed in relation to the job or task. Therefore if there are noise and plant hazards associated with the job they should be dealt with together to resolve the health and

safety issues associated with the job. These tools should be able to generate appropriate documents for the organisation to manage its OH&S.

There are similar tools for such activities as purchasing, hazard reporting and accident/incident investigation. Again risk management is built into these tools. For example, the purchasing tool requires the organisation to address the risks posed by any potential purchase and determine what control measures need to be in places to eliminate or minimise these risks. Thus the issues of risk management are addressed before the equipment or material is introduced into the workplace. As with the other tool, the purchasing tool builds in workplace consultation as part of the decision making process.

These tools will be the mechanism to assist organisations and workplaces to develop a systematic risk management approach to hazard management. At the completion of the exercise the Activity Instrument for the Plastics Company would look something like the Chart in Appendix 2.

Step 6
Promoting the system

The Hazard Management Chart describes the basic OHS management system that has been developed by the organisation to ensure a safe and healthy workplace.

The immediate advantage of doing this is that it enables the organisation to readily identify the processes it has in place to manage safety and the responsibilities of all levels in the organisation in implementing these processes. The clarification of roles and processes is a major achievement of this approach to OHS management.

A second advantage of this approach is that it enables the organisation to identify the training needs of every level of the organisation. Training can be developed to enable all levels of the organisation to understand what the system is, what procedures are in place and to develop their competence to participate efficiently in the system. Thus the process generates a training need: once the system has been articulated through the various process and procedure tools there is then a need to ensure that this is communicated to everyone in the workplace and the rest that they are trained to meet the tasks and responsibilities required by the systems.

Step 7
Reviewing and improving

The focus of the model so far has been to develop and implement a systematic approach and we are now only starting to extend the model to cover reviewing and improving. However, it is a very straightforward process to do this.

At the procedure tool level, reviewing can be integrated into the tool. For example, in the Making the Job Safe tool it is easy to build in a review requirement in the Job Safe Document. It could be as simple as placing the following at the bottom of the document:

Procedure to be reviewed: -

(a) Specific date

(b) Change in process

(c) Change in equipment or materials

The consultative framework also provides a vehicle for reviewing and improving the system. The Occupational Health and Safety Committee is the appropriate consultative group to undertake the process of developing the systematic approach through using the process and procedure tools. One outcome of the process, once the various system elements are in place, can be to develop an action plan to monitor and review the various elements of the system such as reporting system, purchasing procedures etc to ensure they are being implemented and are effective. This provides the opportunity to consider ways of improving the system. This has the added advantage of giving the committee an OHS management focus and not just a hazard focus.

Many committees spend their time addressing specific hazard or risk issues such as a faulty piece of equipment or such house keeping items as blocked passageways and not looking at the underlying system which should be in place to address such issues. Having a system, which is articulated into a set of sub-systems and procedures with a monitoring and review roles assigned to the committee gives it a framework to address issues coming before it from a systems perspective.

3. Trialling the systematic approach

As mentioned earlier, since October 1999 WorkCover has undertaken trials of this approach in 13 organisations from the public and private sectors of varying sizes

and complexity and ranging across various industry groups. The purpose of these trials was to determine the usefulness and practicality of the approach and to refine the tools to meet the needs of the people in the workplace who would eventually use them. The results of the trials are discussed under the following headings: -

(1) *Generating an OHS System*

In 70% of the organisations there were few system elements in place before the trial. One of the interesting aspects of the trial is that the Needs/Expectations Tool combined with the Hazard Management Chart Task provides a very simple and effective audit tool. It requires the organisation to determine its system requirements and then identify the gaps and deficiencies in the various system elements. The consistent results of this process were: -

(a) No organisations had clearly defined roles and responsibilities for occupational health and safety. Even those few organisations, which had policies and procedures in place, had not effectively integrated these policies and procedures with responsibilities and roles. A major outcome of the trial was to enable these organisations to do this. For the other organisations it enabled them to develop policies and procedures in accordance with the defined roles and responsibilities.

(b) Only three organisations had any developed safe operating procedures. Two others were in the process of undertaking the development of such procedures but were overwhelmed and confused by the complexity of the instruments they had acquired to help them.

A major task of the trial was to develop a tool that would give organisations a simple and straightforward process for generating such procedures. This is a critical issue for this approach because it attempts to address the majority of hazard identification, risk assessment and control through activities such as jobs and tasks rather than through a hazard specific approach such as focusing on manual handling, noise, chemicals etc. The aim is to get risk management integrated into normal work processes such as job design or redesign. This tool has gone through significant refinement during the trial period and has proven to be particularly successful in organisations that have a small number of jobs or tasks performed. Most of the other organisations are in the process of using the tool in accordance with an action plan drawn up on the ba-

sis of the risk associated with a job or task. We will have a more definite evaluation of the tool when we review their progress over the next six weeks.

All the organisations had incident and injury reporting systems. For most of the small organisations these were quite informal but nonetheless quite effective. One of the advantages of the process was to enable them, for the first time, to articulate what they had in place and make minor adjustments to make them more effective.

The process enabled them to match the actual procedure with the reporting documentation within the organisation and make the appropriate changes.

One issue that came up in about half of the organisations was the lack of integration between incident and injury reporting systems. Because of the requirements of the Workers Compensation System, injury reporting is usually formalised and documented. Thus, injury reporting is often considered as a workers compensation matter and handled administratively and not as an occupational health and safety matter and handled operationally. This can lead to the occupational health and safety issues (ie what caused the injury) not being addressed. The process was able to highlight this deficiency and provide an opportunity to integrate incident and injury reporting.

(c) In using the tool with small organisations it became obvious that they had no emergency procedures even though the workplaces because of their operation or location had significant risks warranting emergency procedures. Therefore a tool was developed to enable the organisations to develop such procedures. This is probably the only system element that is not generated by the Needs/Expectations Tool and needs to be an add-on to the process.

(2) Consultative Processes

A requirement of the tools and the tools in that they are undertaken through consultation with employees. Where they existed, the trials were conducted using the Occupational Health and Safety Committee, otherwise with representatives from all levels of the organisations.

For the majority of participants, this was the first time that management had sat down with its supervisors and employees and discussed the **management** of occupational health and safety. Discussions may have taken place about specific OHS problems but not issues such as responsibilities, reporting methods or how safety procedures should be developed and who should be involved.

The major benefit most managers get out of the process is that it provided simple and effective process for discussing safety issues with employees. It also enables managers to appreciate that employees can contribute to safety management issues.

(3) Management Commitment

Not surprisingly, the key element to the success of the process is the commitment and involvement of senior managers. The project was undertaken by managers or owners who volunteered to participate in the trial. The prevailing motivation was that they either knew their OHS management needed to be addressed or, in a couple of cases, to test out how effectiveness of their OHS management.

Even with the commitment and involvement the trials revealed a number of barriers to managers addressing the management of OHS: -

(a) Confidence

The model requires the organisation to work its way through a process and with the aid of the various tools generate our OHS system that suits its needs. There was a general expectation that with WorkCover involved, they would be told what to do. However, the process involves them making the major decisions on what they need and what their system should involve with WorkCover providing a facilitation role.

Many managers feel they do not have the OHS expertise to do this. Moreover, there is a concern that what they develop may not meet their OHS responsibilities. A major task in the trials was to convince the managers that the processes and tools do not require significant OHS knowledge or expertise and the basic OHS responsibilities are built into the tools.

(b) Safety is Safe Behaviour

For many of the managers in the trial their initial approach to safety was that it is all about getting the employers to understand that

they have to work safely. While the model doesn't ignore that safe behaviour is an essential element of safety in the workplace it demonstrates that this can only be achieved if there is a safety system to develop and support this behaviour.

The success of the process depends on managers in the organisation grasping the significance and logic of the proposition that safe behaviour is primarily an outcome of the OHS system and not a prerequisite and it is the responsibility of management to provide this system. This conceptual shift in approaching health and safety management is probably the most important element in the success of the model.

4. Producing and promoting the systematic approach

This project is now at the stage where the trials are almost completed and the structure and content of the model and its accompanying resources are finalised and ready to be developed into a resource kit for industry. The current thinking is there will be a package on developing a systematic approach to OHS management comprising: -

(a) A General Guide to Risk Management

This guide will explain health and safety management; what the general legal requirements are and what organisations need to do to implement health and safety risk management into workplace activities.

(b) Facilitator's/Manager's Guide to Implementing Risk Management

This will be a guide to implementing the processes and tools that constituted the systematic approach to OHS management. It will be designed to give managers the confidence and skills to guide this organisation through the various tasks contained in the tools.

(c) Manual/Workbook

The aim of the manual/workbook will be to take the organisation through the process, use the tools and generate the various documents which record the process and describe the system such as an OHS Policy, Reporting Procedures, Safe Job Procedures, Purchasing Policy etc.

The project plan is to have these products developed by the end of the year. Early in 2001 a major implementation program will be under-

taken to inform industry of the resources, how they can be used and their significance in assisting industry to meet its OHS responsibilities.

APPENDIX 1
Case study

Small manufacturing plant producing plastic products - 6 Operators of injection moulding machine, 1 supervisor, Manager (owner) plus 1 office worker

Factory Area

Machine operators	Expectations: • Follow procedures (Don't cut corners – ie disable lockout on machines) • Wear ppe – hearing and gloves • Report injuries, hazards – faulty machines, leaks • Keep work area clean
	Needs: • Safe machines • Operating procedure for machine • Effective ppe provided • Procedures and equipment (eg bin, brushes) for cleaning work area • Reporting method • Training re hazards and procedures reporting
Supervisor	Expectations: • Ensure operating procedures are followed • Ensure machines are safe and properly maintained • Ensure ppe is worn • Record and investigate injuries • Fix hazards that are reported or identified or take remedial action and report to manager • Provide training to operators on hazards and procedures • Ensure work areas are clean and cleaning materials are provided
	Needs: • Operating procedure • Cleaning procedures • Maintenance schedule • Reporting mechanism • Authority to ensure compliance • Procedures/ budget for repairs, maintenance and provision of ppe and cleaning equipment • Training on role, Expectations and information and skills on how to meet Expectations
Manager/ Owner	Expectations: • Ensure operating procedures are developed and implemented • Ensure cleaning procedures are implemented and developed • Ensure supervisor has adequate authority to meet Expectations • Ensure employees and supervisor receive training • Ensure resources are allocated to maintain equipment in a safe condition

APPENDIX 2
Hazard management chart

ACTIVITY	WHO	WHEN	HOW	RECORDS
Operating Procedures	Owner	Devising or modifying a job	• Ensure OH&S risks identified and assessed • Identify control strategies that need to be incorporated into job • Consult with supervisor and employees	• Safe operating procedures • Maintenance procedures
	Supervisor	Supervising	• Provide training • Ensure procedures followed • Consult employees about problems	
	Operators	Undertaking tasks	• Follow procedures (including wearing ppe)	
Purchasing	Owner	Purchasing equipment or substances	• Ensure OH&S risks associated with intended purchase are identified • Ensure control strategies are factored in to purchasing decision • Consult supervisor and employees	• Purchasing procedures
	Supervisor	Purchase proposal	• Ensure OH&S risks and control needs are brought to owner's intention • Consult employees	
	Operators		• Provide advice re purchasing proposal	
Hazard Reporting	Owner	When hazards reported by supervisor	• Assess risks • Implement appropriate risk control strategy	• Hazard report and action form
	Supervisor	When hazards reported by operators	• Assess risks • Take action to eliminate or minimise hazard and/or • Report to owner	
	Operators	When hazard encountered in workplace	• Assess risk • Eliminate or minimise hazard • Report to supervisor	

Accident/ Incident Investigation	Owner	When anyone in the workplace sustains a significant injury or an incident occurs, while not causing significant injury, has the potential to do so	• Identify the hazards • Assess the risks • Implement appropriate risk control strategy • Notify WorkCover if required • Notify workers comp insurer	• Accident investigation report • WorkCover Accident Notification form • Workers comp claim form • Register of injuries
	Supervisor	When anyone in the workplace sustains a significant injury or an incident occurs, while not causing significant injury, has the potential to do so	• Ensure first aid/medical assistance • Take immediate (interim) action to prevent further injury • Notify owner • Identify hazards • Assess risks • Implement appropriate risk control strategy	
	Operators	When witnessing an incident or sustaining an injury	• First aid • Report incident/injury	
Training	Owner	New or modified job, new equipment or substances introduced, new employees	• Develop and ensure training for all hazard management activities • Train supervisor	
	Supervisor	New employees, changes to work procedures, problems in work performance	Train employees in: • Operating procedures • Hazard reporting	
	Operators	As required	Undertake training	

Introducing OHS Management Systems – A Great Leap Forward or Just the Latest Fad?

Dr Maggie Goldie
General Manager,
Occupational Health and Safety Service
Boral Limited

Introduction

Effective management of health and safety makes sound business sense beyond reducing costs from losses and non-compliance. By applying the principles of systematic management to this function, managers can explore opportunities to improve performance. This paper explores the advantages and barriers associated with introducing OHS management systems and describes a way of overcoming some of the barriers for small to medium sized businesses.

Advantages of OHS management systems

Providing a Framework

A system for any aspect of business management provides a framework which enables a well defined and consistent approach to the function. Managers then have a set of guidelines that give them direction to establish and maintain good procedures for managing the subject.

OHS is no different from any other aspect of the business and a management system gives structure to the way this is dealt with across a business.

The Australian Standard 4801-2000 has now given industry a common template on which to build an OHS management system.

Objective Setting, Planning and Performance Measurement

Historically the approach to OHS management has been ad hoc. A safety committee meeting may be held when time can be made available and recommendations are implemented when maintenance or other schedules permit. A management system on the other hand incorporates objective setting and planning as an integral component which leads managers to consider OHS aspects during the business planning cycle. This in turn encourages performance measurement which is based on achievement of actions planned to meet the OHS objectives and not just on the traditional negative outcomes such as number of injuries and severity.

Proactive Approach

For far too long health and safety has been managed in a reactive way by focusing on taking corrective action when something has already gone wrong. By adopting the principles of risk management that are espoused in AS 4801-2000 hazards are identified before they cause harm and the risks are assessed so that the appropriate controls can be determined and implemented.

People Involvement

One of the cornerstones of good management is involvement of the people that are doing the work. They know what the problems are and they generally have the solutions providing they are given the opportunity to provide input. An OHS management system addresses this and emphasises the need to establish mechanisms for employee consultation.

Continual Improvement

The book on workplace OHS can never be closed as there are always aspects that can be improved. New technology can provide better solutions, legislative changes require a response, plans for new plant or processes provide the opportunity to engineer out previous problems. A management system includes a process for review which enables a thorough examination of current arrangements with a view to making modifications where required.

Cost Reduction

Significant benefits can be gained from business improvement and risk reduction which are the outcome of successfully implemented OHS management systems.

Business improvement can be achieved by eliminating duplication of effort and resources, for example:

- Clarifying responsibilities and accountabilities
- Maximising the deployment of personnel across business units
- Documentation
- Auditing and review processes
- Barriers across departments and functions.

OHS risk can be managed in a coordinated manner instead of having a proliferation of information and potentially conflicting instructions which can confuse managers and employees alike and put the company at risk. We can stop reinventing the wheel and benefit from other businesses' OHS initiatives.

Common Elements Shared by H&S, E & Q Systems

Standards and legislation relating to health, safety, environment and quality assurance share many common elements which can be effectively integrated. A significant number of companies are attempting to move towards integrating these functions. AS 4801-2000 *Specification for OH&S Management Systems* and ISO 14001 *Environmental Management Systems Specification with Guidance for use* share a common framework and ISO 9001 includes the same elements. Adoption of an OHS management system based on the Standard will assist this process where it is desired.

Barriers to introducing OHS management systems

Traditional Management Approach

The traditional approach to managing businesses has tended to regard the different functions as separate entities and OHS has frequently been viewed as an add on to the way the business is run. It has not been integrated into the planning, purchasing, production, packaging, distribution, sales and financial aspects of the business. This barrier has to be overcome before managers see the advantage of a management system approach to OHS.

Time and Resources

Many managers see the advantage of a systems based approach to OHS but at the end of the day it is just too hard. Resources are required and problems can be encountered which can be summarised as follows:

- Not enough time - stretched resources
- Multiplicity of other management initiatives and priorities
- Changing personnel
- Lack of leadership
- Lack of expertise

Too Bureaucratic

Some managers see the introduction of an OHS management system as an imposition and an unnecessarily prescriptive approach to a function that should be left to business unit managers to determine. They feel that an overall corporate directed system is eroding their prerogative to control their own business outcomes.

One Size Does Not Fit All

In large diverse companies it may be very difficult to introduce a system that is going to suit every business unit or site precisely . A very prescriptive system could be hard to adapt to local situations where statutory requirements, business resources and industry risks may differ.

Too Complicated

Small to medium sized businesses may view OHS management systems as far too complicated for their operations and cannot see why seemingly complex processes have to be implemented when resources and expertise may be lacking. Many would not know where to begin.

What is the answer?

Advantages

For all the reasons outlined in the first section of the paper there are significant advantages in having a consistent approach to OHS management across a com-

pany no matter the size. It gives a common framework, it saves costs and maximises resources.

OHS Management systems provide a structure for planning for improved performance and for measuring and evaluating progress through auditing. Performance benchmarking across business units and across like industries is a more valid exercise when the criteria being evaluated are coming from the same basic system.

A systematic approach to managing any aspect of the business makes sound sense and OHS is no different.

Overcoming the Barriers

A management system approach to OHS is not likely to go away given that there is now an Australian specification Standard on the subject. Many companies have already based their OHS management systems on the Standard and some have already been audited against it and been awarded accreditation. These companies generally have professional in house resources to assist with the process of development and implementation.

It is a different matter for small to medium sized enterprises, but it still makes good business sense for these entities to adopt a systematic approach to OHS management.

The answer lies in using the framework of AS 4801-2000 and customising it to the size and risks of the business. The system does not have to be complex and be supported by thick and indigestible manuals. An assessment of what is already being done to manage OHS will yield surprising results and indicate that many of the components of a system are already in place informally. These existing elements can be documented and collected into a manual which is practical and appropriate for the business concerned. Outside assistance may need to be sought to help management to gather and document the facts but with the right approach and training of personnel to understand their OHS roles and responsibilities, the business will become self sufficient.

Conclusion

The advantages of implementing OHS management systems are clear but the potential barriers have to be recognized if they are to be overcome.

It is good business to develop a systematic approach to managing all aspects of the business process and OHS is no exception. By customizing an OHS management system to suit the size and complexity of the organization, it need not be an overwhelming task. The benefits will be a planned and proactive approach to making workplaces safer and healthier with input, and hence ownership, from all the stakeholders in the business.

The Role of Auditing in Measuring System Effectiveness

By John Curran
National Program Manager
Occupational Safety and Health
Quality Assurance Services Pty Ltd

Heather Mahon
OHS Pathway Coordinator
Quality Assurance Services Pty Ltd, Melbourne
and an OHS Auditor

The purpose of an OHS audit

Let's consider the purpose of an OHS audit. An OHS audit is a generic term that may encompass a wide range of auditing approaches. The OHS audit may have a primary function of determining OHS compliance to legislative requirements or specific Codes of Practice, or particular industry codes or tenderer requirements.

An OHS audit may have a primary function to determine the effectiveness of a particular OHS field such as an "ergonomic" or an "occupational hygiene" audit.

Another OHS audit may consider hazards and risks in a particular organisation with a view to developing and implementing control measures or contingency plans for uncontrolled circumstances.

OHS management system audit

An OHS audit related to management systems has a wider scope than hazards and risks. Inevitably, the OHS auditor will have consideration during the conduct of the audit towards potential hazards and risks. However, the aim of the OHS management system audit is not simply to identify uncontrolled or inadequately controlled hazards and risks. Instead, it is to identify the strengths and opportunities for improvements in the occupational health and safety management systems that are operating at the time of the OHS audit. This type of OHS audit encompasses a broader scope than hazards and risks, and will be the focus of OHS audit within this paper.

OHS management system audit tools

In the Australian context, there are a number of effective OHS management system audit tools that an organisation can consider.

- ISRS
- 5 star rating system
- Du Pont

State based jurisdictional products such as:

- SafetyMAP
- Tri-Safe OHSMS (Qld)
- WorkPlan (WA)
- SA OHS Performance Standards

During April 2000, a new and inaugural Australian Standard has been released on OHS Management Systems – AS 4801.

How does an OHSMS audit provide for measurement and improvements in an organisation's OHSMS?

An audit allows an organisation to examine its documentation against existing practices. As a result of this examination a number of issues may be identified which may include:

- The "good news" stories. The good practices that exist.
- Deficiencies in the existing OHS management system.
- Opportunities for personnel to effectively communicate issues with the system.
- Gaps in OHS legislative compliance.
- Opportunity to improve organisational morale
- Management may review existing OHS plans
- Establish that training has been successfully implemented across the entire organisation
- Identify OHS training needs

As a result of identifying these issues management can plan to correct issues, spread the "good news" stories and thus improve the OHSMS.

How will an organisation use the OHS audit findings?

The value of the OHS audit findings will reflect on the organisational motivation to establish and conduct the OHS audit in the first place. There is a range of different motivational roles that an organisation may decide to conduct an OHS audit. Some of the possible reasons could include:

- Seeking prevention measures to address workers' compensation claims within the organisation;
- Meeting the OHS requirements of a tender specification;
- A OHS requirement for working towards self-insurance for the organisation;
- Meeting industry standards for OHS performance outcomes, e.g CPSC OHSMS standard;
- Recognition by the Regulator (WorkCover) that the organisation has effective OHS management systems in place;
- Use as a mitigating factor in the defence of OHS legislative breaches in a court jurisdiction;
- A marketing tool that the organisation can use to promote their products or services;

- Improved community reputation- a signal of good corporate citizenship

Whatever the reasons for motivating an organisation to conduct an OHS audit, the findings of the audit may be viewed as a measure of the success of the management system in place. For some organisations, there may be a culture of disputing the non-conformances – for some, these may be viewed as personal insults and are aggressively defended or denied. However, for other organisations, non-conformances are the "gold medals" that provide feedback on "opportunities for improvement" in the OHS management system and are welcomed in a constructive manner. They can help in setting priorities or identifying future health and safety issues, including establishing budgetary requirements within the organisation.

An organisation that has an effective OHS Management System in place will have a regular system of OHS Internal Audits. The findings of these OHS Internal Audits will be reviewed and strategies and recommendations established that would be discussed and approved by the organisation's "top" management. These findings may impact on OHS policies and procedures, OHS consultative and communication structures, work instructions, OHS responsibilities and accountabilities within the organisation. They will assist in developing an objective measure of the OHS performance outcomes against the organisational goals and objectives of the OHS management system.

Accreditation and certification – what's the difference?

We often hear discussions, even amongst the OHS community of the interchange of the term's "accreditation" and "certification". However, can they be so readily interchanged? The answer is that in OHSMS audits, they have quite different connotations

- JAS-ANZ provides accreditation to Certification Bodies such as Quality Assurance Services (QAS)
- Certification Bodies provides certification on OHSMS audits to client organisations.
- Organisations receive an OHSMS Certificate for their achievements.

Experience with OHSMS audit tools

It is important to remember that audits can be of limited scope and depth and audit duration. Therefore audits of the OHSMS can provide a snapshot of the OHS management system "on the day of the audit".

For example, there have been some issues that were subsequently raised on the role of SafetyMAP that related to the Esso Longford explosion (in Victoria) on 25 September 1998. The accident resulted in two fatalities, injured eight others and cut Melbourne's gas supply for two weeks.

The Victorian WorkCover Authority carried out a SafetyMAP audit of Esso in 1996, two years before the Longford explosion. This SafetyMAP audit was at the Initial Level Achievement. At this level, the SafetyMAP audit does not contain audit criteria that require an organisation to have an internal assessment of the OHS management systems. This particular SafetyMAP audit was conducted for the purposes of renewal of self-insurance.

An OHSMS audit requires both paperwork verification and fieldwork verification through discussions and observations. The OHS auditors on an OHSMS audit are not necessarily in a position to evaluate in detail the entire the hazard identification methodologies. The SafetyMAP audit at Longford was never a guarantee of safety. This was not its purpose. Furthermore, the time interval between the SafetyMAP audit and the subsequent explosion was two years.

In Australia, there seems to be a move towards a "safety case approach" following work on a model by the National Occupational Health and Safety Commission (NOHSC) for major hazard facilities. In essence, this requires an operator of a major hazard facility to make a case to the relevant regulatory authority that safety is being effectively managed at the facility.

SafetyMAP as an OHSMS audit tool has been 'outsourced' for certification purposes from the Victorian WorkCover Authority to JAS-ANZ accredited Certification Bodies. This transition occurred during 1999 of SafetyMAP Certification from the Regulator to JAS-ANZ accredited Certification Bodies. The role of the Regulator is one of "Technical Advisor" to JAS-ANZ.

Launch of the new Australian Standard on OHS management systems: AS4801

In an Australian first, Quality Assurance Services Ltd (QAS) has been accredited by JAS-ANZ to certify to the new Occupational Health and Safety Standard.

QAS have achieved JAS-ANZ accreditation for both AS 4801 and NZS 4801 and can now begin to certify organisations across Australia.

Mr Keith Ketheeswaran, Managing Director, QAS said: "we are the first Australian/New Zealand certification body to achieve this significant endorsement of an OHS certification program. Our accreditation shows that we continue to be the certification industry leader. It also is the first time there is a truly national standard which enables businesses to demonstrate that they're serious about the health and safety of their employees."

Certification of AS 4801: 2000 by a JAS-ANZ accredited body allows organisations to develop an effective OHS management system that is tailored to manage the risks that apply to individual organisations. Equally, it can be applied to any industry or business, from a small office-based concern to retail outlets and major manufacturing, heavy industry or mining operations.

The release of AS4801 now means that the landscape has changed. That is the standard allows organisations to examine its processes, activities and determine its:

- Ability to meet OHS legislative compliance;
- Methodology for OHS risk management;
- OHS Consultative and communication processes;
- Develop its own plans to manage OHS risks in line with identified legislative requirements;
- Develop OHS training needs analysis that reflects the needs of the organisation;
- Develop and implement OHS policy, objectives and targets;
- Monitor and measure OHSMS performance.

Pathway to OHSMS certification

There are a number of steps an organisation can take towards achieving OHS certification. This is dependent on the maturity of the OHS management system and the level of implementation.

Gap analysis

This is a good starting point for organisations that are unsure of where they are at in relation to AS4801 or SafetyMAP. A Gap Analysis looks at full scope and limited depth. An auditor will examine the documentation in the existing OHSMS for compliance to the standard. A Gap Analysis provides an organisation with:

- The opportunity to benchmark;
- Identify what exists in the OHSMS;
- Identify what the gap is between the existing OHS management system and the requirements of the standard;
- Allows an organisation to determine actions and develop OHS plans and allocate resources as required;

This method is very popular with organisations that are unsure of what to do themselves.

Preliminary audit

- Carried out prior to conducting a certification audit
- Examines documents and records to establish whether an organisation is ready to proceed with certification audit
- Is a more in-depth examination than a Gap Analysis as it assesses implementation
- Based on the findings of the preliminary audit, a decision can be made to proceed or make further improvements to the system;

Certification audit

- Auditing for measuring the effectiveness of the OHSMS to the standard
- Scope of the audit is clearly defined

- All documents examined to determine verification and implementation
- Verification is determined by examining documentation, observation and discussions
- Independent audit and objective evidence considered

Surveillance audit

- Ensures continued measuring to ensure verification to the requirements of the Standard
- Allows the OHS auditor and auditee to focus on any areas of concern
- More importantly, examines continual improvement in the OHS management system

OHS auditor competency

SafetyMAP Standards (SMS 14) and the "Certification Criteria for OHS Auditors" utilised by the Quality Society of Australasia (QSA) OHS Auditor Certification Panel have a set of OHS Auditor competencies, education and training requirements, and also OHS auditing experience against acceptable management system standards. The SafetyMAP Standards provide for an OHS Auditor's Code of Conduct.

There is clearly a need to ensure that OHS competencies can be demonstrated with justification against OHS hazards such as biological hazards, chemical hazards, dangerous goods and hazardous substances. Also, the OHS Auditor must be able to demonstrate relevant knowledge, experience and skills, particularly in high risk industries such as petrochemical or mining industries.

Training

A competent person is defined in the standard as someone who:

> *"has acquired through training, qualification, or experience, or a combination of these, the knowledge and the skills, including OHS knowledge and skills, qualifying that person to perform the task required."*[1]

Both audit tools, SafetyMAP and AS4801 place requirements on employers to provide competent staff. The competency requirements not only include the ability

to be able to perform tasks adequately but include OHS training. OHS training is expected to permeate all levels and functions of an organisation. It is the experience of this auditor that companies tend to ensure that coal face staff have the appropriate competencies but neglect supervisors, middle management, senior management, contractors and visitors. National Guidelines for Integrating OHS Competencies into National Industry Competency Standards [NOHSC:7025 (1998)] details the following:

- The Role of OHS legislation, regulations and codes of practice;
- Fulfilling the duty of care for those in the workplace;
- Identifying hazards, assessing and controlling risks in accordance with the hierarchy of control
- Contributing to participative procedures of the management of OHS.

The National Guidelines go onto to suggest that there are three different units of competence:

- Employees without managerial or supervisory responsibilities;
- Employees with supervisory responsibilities;
- Employees with managerial responsibilities.

There are a number of elements for each unit of competency with underpinning knowledge and skills. For example an employee with supervisory responsibilities would have the following skills and knowledge:

- Provisions of relevant legislation;
- Principles and practice of effective OHS management;
- Organisational OHSMS and policies and procedures needed for legislative compliance.

The standard requires that internal OHS audits are carried out by competent personnel. OHS auditors can be broken into two groups, those who will conduct internal audits and those who will ensure that the existing management system meets the requirements of the external audit tool.

Internal auditors require the skills and knowledge of the internal audit tool/management system, auditing skills and communication skills such as those offered QAS's internal auditor course which offers training in the above skills. Training should include the following:

- Scheduling internal audits;
- Planning and preparing internal audits;
- Performing internal audits;
- Reporting and presenting the results of internal audits; and
- Conducting follow-up internal audit activities.

OHSMS (external auditors) require more advanced training such as that offered in the OHS systems auditor course, which meets the requirements of QSA (Quality Society of Australasia).

Training should include the following:

- Understanding audit methodology;
- Understanding the relevant OHSMS standard (ie. SafetyMAP or AS4801);
- Understanding of the documentation that supports the OHSMS;
- Understand the relationship between the OHSMS and the business;
- Awareness of the 3rd party certification process;
- Awareness of the relevant OHS legislation; and
- Understanding of the different OHS audits.

Staff who represent management and employees in the consultative process are also required to receive training. The competencies required may included:

- Meeting procedures;
- Making policy recommendations;
- The basics of OHS; and
- How to find information.

Awareness

Awareness training is an important part of the implementation process. For employees to fully embrace OHS management system it essential that they understand the benefits of the system, their role and the importance of compliance with the system. Personnel need to know that they have a key role to play in the successful implementation of the OHS management system. To facilitate this understanding awareness training could include:

- The issues which led the company to introduce an OHS management system;

- The OHS risks in their department;
- The current OHS performance of the company;
- The OHSMS which is being implemented
- Their role in the implementation and maintenance of the OHSMS;
- Duty of care and due diligence;
- Roles and responsibilities; and
- The benefits of improved performance as well as the consequences of nonconformance.

Awareness training is just one aspect of the implementation phase.

Benefits of an effective OHSMS

- potential for reduced worker's compensation premiums
- more efficient method of conducting work
- improved staff morale
- improved communication
- well trained staff
- reduced incidents
- lower staff turnover
- good corporate citizenship
- assists with legislative compliance
- competitive advantage for tendering

Continual improvement

One of the chief outcomes of an effective OHSMS is that it is subjected to constant auditing. An OHSMS that is certified provides assurance that the system will be subjected to constant auditing that ensures that the system constantly improves. The improvement in the system results from top management examining and evaluating:

- The results of workplace inspections
- OHSMS audits
- Monitoring of the workplace environment and health surveillance
- Incident data

- OHS legislative changes

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Is Your Company Too Small To Have A Formal OH&S Management System Program?

By John Wisby
Managing Director
Wisby & Leonard Pty Ltd

Wisby & Leonard

- John Wisby Toolmaker, Diploma, AIG, Rotary.
- Began operations in 1980 manufacturing special purpose stainless steel fasteners.
- Three premises in Moorebank, each move to a larger factory, then to Minto 18 months ago.
- Employee numbers have gradually grown to 20 people now.
- Employees 10 tradesmen, 2 apprentices and 8 administration/technical support in the office.
- Turnover this year about $2.5m, our first year's turnover about $40,000.
- Currently the company makes precision machined and laser cut components and materials handling ? and special purpose m/c.
- Mostly on CHC m/c but also manual/conventional m/c together with welding and fabrication.
- We have a clean and healthy work environment and maintain a safe attitude towards the workshop.

How and why we became involved with Club Zero

- Through the Industry Liaison Officer in Macarthur. I was approached to join in the pilot programme of Club Zero.
- I was a little hesitant at first however, I believed that within the next couple of years a lot of pressure would be applied by Workers' Compensation. Insurance Companies would dramatically increase premiums for companies with bad track records in workplace safety.
- I wanted to save money – reduce premiums – long term.
- Unsafe companies will eventually pay.
- Safe companies – with good OH&S policy.
- No claim bonus – brownie points.
- Compare to Greenslip – costs have risen.
- Production downtime – no backup for absent workers.
- Improve morale – staff trust the management if they feel management cares about their welfare.
- Traditional base – low incident of accidents from November 1991 to May 2000. 53 entries in book.

No	Year	Comment
1	1991	
1	1992	5 had to go to the Medical Centre
4	1993	1 serious – lost time
2	1994	
0	1995	
6	1996	
1	1997	
11	1998	
17	1999	
10	2000	

Employee numbers risen from 4 in 1991 to 12 in 2000 - workshops

How did we go about the implementation

- Must have Management commitment.
- Through Club Zero – and talking to interested companies.
- Did a stocktake of issues.
- Identified hazards.
- M-S-D-S Register.
- Workshop committee – get people to commit.
- Get staff on side and think safety.
- Set-up emergency evacuation plan.
- Installed button to activate manual siren.
- Appoint person in workshop to monitor accident book.
- Tell people where signs are for Medical Centre contact.
- Record the severity of accidents.
- Most attention to be paid to cost time incidents.
- One full shift lost = lost time accident.

What were the outcomes and did it work?

- Higher level of awareness at all levels.
- Staff attitudes changed.
- Cleaner, tidier workshop.
- Staff more aware of safety issues.
- Come up to me and complain about electrical lead.
- Would not have happened in the past.
- Wear glasses without being told – not mandatory - or hearing protection – earplugs available.
- Understand the machine must still be operated.
- Don't guard it out of use.

OH&S Management System Self-assessment Case Study

By Bruce Towill
Director, Safety and Environmental Affairs
Asia Pacific Area
Otis Elevator Company

EH&S policy objectives

- Workplace safe from hazards
- Employees injury-free
- Safe products and services
- Protection of the natural environment
- Compliance with performance standards
    - World Wide Job Site Safety Standards
    - UTC Standard Practices
    - Local Codes and Standards
    - Otis EH&S Procedures

Otis workplace environment

- Manufacturing and Warehouse facilities
- Building Construction Sites - (NE installations)

- High Rise Commercial and Apartment buildings - (Maintenance and Modernisation)

Management rating system and self assessment

- Numerical assessment of a company's overall management of EH&S
- Evaluation criteria has been developed for each of the 12 elements. These are considered fundamental for an effective EH&S management System
- Each element of the system is scored based on the assessment of how well the operation meets the evaluation criteria

Self-assessment elements

1. ***Policy and Leadership***
2. Organization
3. Planning
4. Accountability
5. Assessment, Prevention and Control
6. Education and Training
7. Communications
8. Rules and Procedures
9. Inspections and Audits
10. Incident Investigations
11. Documents and Records Management
12. Program Evaluation

1. Policy and leadership

- Three major components
- Policy – Management's EH&S philosophy; guide for the organisation
- Leadership – visibly demonstrate commitment and involvement
- Written Program – how the operation will implement each element

2. Organisation

Each operation shall have a formal organisation to direct its Environment, Health and Safety Program

- Management review - EH&S committee program oversight
- Technical staffing - program co-ordination; technical support
- Roles and responsibilities of line and staff - develop and implement in area

3. Planning

- Each operation shall establish an annual plan - incl. Goals , objectives and supporting actions, financial and technical resources
- Development and implementation of plan is the responsibility of line management
- Plan to be component of operation's business plan and developed in conjunction with business planning cycle
- Plan to cover 3 years and define timing and responsibility for completion

4. Accountability

- Each operation shall establish a formal accountability system for all levels of the workforce including:
    - Holding all employees accountable for implementing responsibilities and activities and complying with EH&S policy, rules and procedures eg, disciplinary procedure
    - Holding operations and functional management at all levels accountable for EH&S goals, objectives and activities and management practices implemented in their area.
- Recognising superior EH&S performance and incorporating as a part of management's "pay for performance" program – "ROAR" Program
- Incorporating EH&S as key element of all job descriptions, part of performance appraisals, management by objectives, and compensation

5. Assessment, prevention and control

- Every operation shall identify and assess hazards and

- Implement prevention and control strategies to minimise risks:
    - Establish and document (in writing) a process
    - Continually identify and prioritise EH&S hazards and risks
- Develop and implement methods to prevent, manage and control all significant hazards and to meet compliance requirements
    - Design of products and services
    - Business and property transactions
    - Contractor and supplier relationships
- Employee health programs; Emergency plans

6. Education and training

- Each operation shall establish and implement an education and training program to address EH&S issues.
    - Provided to all employees
    - Integral element of the job
    - Link to goals and objectives
- Training to include:
    - Initial orientation
    - Job specific training
    - When employees transfer to new jobs
    - When operation or process changes
    - Appropriate refresher training

7. Communications

Each operation shall establish a written communication plan.

Plan shall include:

- Content - e.g goals, results, incidents
- Intended audience - employees, contractors, public
- Communication methods - toolbox talks, newsletters Safety Alerts,Safety videos,Safety awareness days
- A process to address concerns/complaints - meetings, surveys etc

8. Rules and procedures

Written rules and procedures shall be established based on EH&S hazards, risks, regulatory requirements and company standards

- Integrated into business and operation work instructions
- Reviewed with all affected employees
- Compliance enforced by management
- Disciplinary action

9. Inspections and audits

Each operation shall establish and implement a written inspection, audit and corrective action program.

- INSPECTIONS: Evaluate physical conditions and acts of people
- AUDITS: Evaluate the effectiveness of the operation's internal controls (programs, procedures, policies)

10. Incident investigations

Each operation is responsible for:

- Reporting and investigating all EH&S incidents - in depth investigations for serious/reportable cases
- Identifying root cause(s), and
- Implementing corrective actions

11. Documents and records management

Each operation shall design and implement a system for creating, distributing, controlling and managing documents and records prepared in support of the EH&S program

- Documents - written policies, procedures, etc., that describe intended actions
- Records - written documentation of activities that have taken place

12. Program evaluation

Each operation shall evaluate the implementation and effectiveness of the EH&S program.

- How the evaluation was conducted
- Status of compliance with the elements of all
- Standard Practices and regulatory requirements
- Assessment of intent, implementation and effectiveness of management systems
- Analysis of trends, incidents and inspection/audits
- Progress to established goals and objectives

Summary

- Management system is now part of the way we do business
- EH&S is given priority by management and employees
- Self-assessment model has evolved and been strengthened, notwithstanding the impact of radical change
- Consistent trend of performance improvement achieved in key indicators
- Principles can be applied across all types of organisations.

Achieving a Safety Culture Transition

By Clive Blunt
Northeast Region Manager
DuPont Safety Resources
(DuPont Australia Limited)

Current safety concerns

Ergonomics
Repetitive stress disorders
Psychosocial disorders
Chemical dependency
Government regulatory standards that increase the level of employer responsibility
Infrastructure & Process Safety Management
Contractor Safety
Management Leadership

Safety concerns 2000 & beyond

Scientific developments
Pace of joint ventures/acquisitions
Sustainable growth
Biology

Knowledge-intensive operations
Increased regulation
Increased public awareness / exposure

Truth is

"Safety is the responsibility of the senior management" *E.I. DuPont - 1802*

"Safety is a Line Management competency, and is equal in every respect to productivity, quality, service and value" *Chad Holliday – CEO, DuPont - 1999*

Model components for managing safety excellence

Vision
Assessment
Objectives & Metrics
Action Plans
Training & Development
Implementation
Re-evaluation
Recognition & Rewards

Achieving a safety culture transition ...

From	Towards
'Told' to be Safe	Accepted Common Cause Ownership
Safety Records/Reporting	Total Prevention Focus
Safety Certification	Safety as 'a Way of Working'
Safe Processes	Safe Behaviour
Safety 'Policing'	'Brothers Keeper'
An OH&S Safety Commitment	A Condition of Employment
"I am Held Accountable for it"	"It's my Responsibility"
Enforcing Safety Standards	Testing for Improvement
Hoping Nothing Happens	Planning for Nothing to Happen
"A Practice we Observe"	"A Principle that guides our Actions"

Defense / Blame Orientation	"How Can I Help?"
'Local Heroes'	A Competency of Line Management

Our approach to cultural transformation

Assessment

- Analysis
- Strategic Planning

Solution Design

- Recommendations
- Action Planning

Implementation

- Training
- Coaching / Counselling
- Shared Best Practice

You will achieve the level of Safety Excellence that you demonstrate you want to achieve ...'Felt Leadership'