TOTAL RISK INDICATORS FOR MANAGING OCCUPATIONAL HYGIENE PROGRAMS

Cherilyn Tillman, Michelle Wakelam and Alan Wilson

Introduction:
The three stages of any occupational hygiene program are hazard identification, risk assessment and risk control. The last of these, implementation of risk control measures, is the most important component of any occupational hygiene program, unfortunately the program is often viewed as complete once the risk control options have been identified (Figure 1).

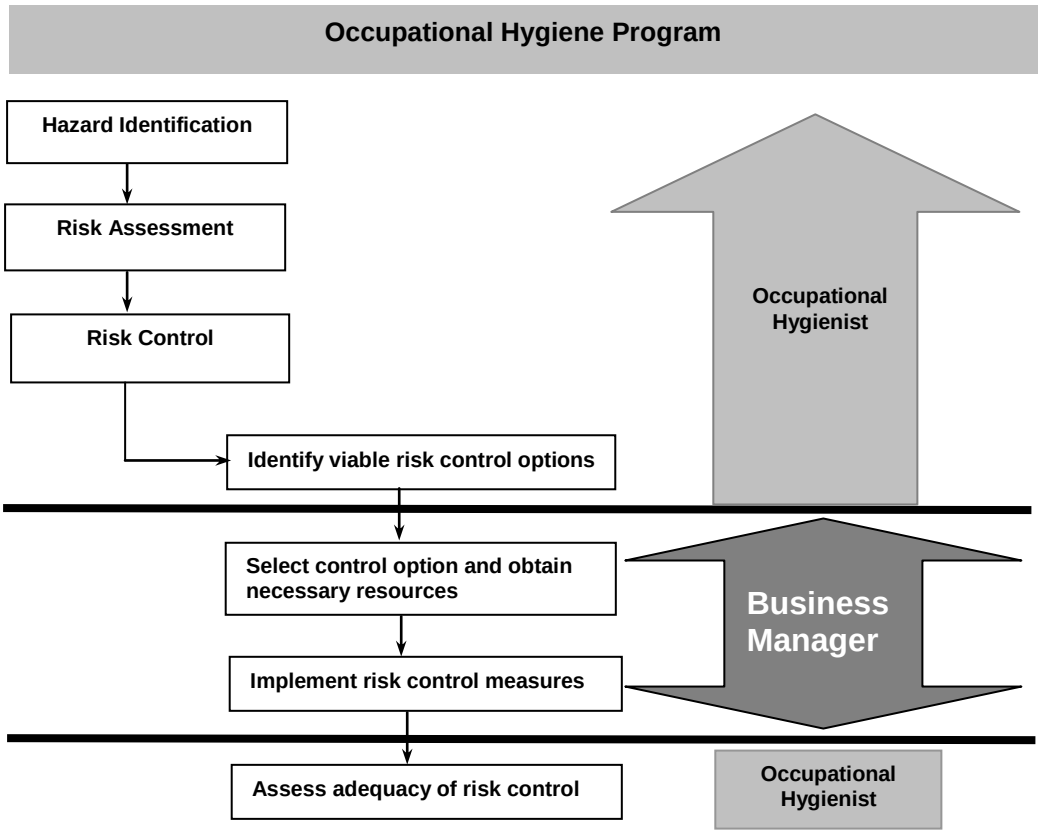


Figure 1: Stages Of An Occupational Hygiene Program

The control implementation stage is normally in the hands of the business managers as resources are generally required. Frequently only limited resources are allocated to the implementation of risk controls, especially when regulatory pressures are minimal. Many managers view expenditure on occupational hygiene risk control measures as non-essential add-ons to normal business operations and subsequently do not consider that the expenditure is justifiable. The blame for this misunderstanding is generally directed at the business managers and their lack of understanding of the science of risk assessments.

The financial reality of any business is that limited resources must be shared between many competing interests in addition to the occupational hygiene control programs. The idealistic approach is to argue that resources must be allocated to all of the hygiene controls as all of them are equally important to the well being of the employee. Another view is to consider that an organisation will have a dramatic effect on the life of it's employees when it does not maintain financial viability. Thus the commercial viability of the business is also important to the well being of employees.

Occupational hygiene programs must be able to be shown to be an integral part of the business operation rather than a separate function to maximise resource allocation. In addition an effective

method for allocating limited risk control funds needs to be identified. The use of a total risk index model, as developed by the University of California, San Diego, will be discussed. A specific example of use of the model for occupational hygiene programs and other health and safety programs within the framework of a large Australian University will be discussed. The advantages and disadvantages of the model for allocation of resources to risk control programs will be detailed.

Methodology – Risk Model

A holistic view of the business risks must include a multitude of risks, other than health and safety risks. The challenge for occupational hygienists is to define risk ranking methods that illustrate the relative potential impacts when various control programs are not implemented. The impacts must be demonstrable in terms of damage to business performance, i.e. negative indicators must be available.

The Total Risk Index Model:
There are many risk ranking tools in use around the world for prioritising control of occupational health and safety risks, however many of these do not acknowledge all of the needs of the business. A model called the total risk index model, developed by the University of California, San Diego, attempts to take account of all the business needs as shown in Figure 2.

Figure 2: Total Risk Index Model

The approach used in the model takes account of business drivers in addition to those normally used as OHS drivers. It utilises a range of factors including intangible items, such as loss of public image, in addition to traditional OHS ranking factors, such as statutory compliance and worst probable injury outcome. The total risk is defined as being the summation of adverse risks associated with seven components. To allow relative quantitative ranking a numerical score of 0 to 3 was allocated to each component and the following descriptors were associated with each risk score: 0 = None; 1 = Low; 2 = Medium; 3 = High. Summation of the component scores yields the number which is defined as the total risk index in relation to the total potential adverse business risk associated with OHS management issues.

Customising The Model:
There were some changes that were needed so that the total risk index model could be used within Monash University. The main changes to the system used by the University of California, San Diego, were superficial. Firstly, the subject categories were altered for a number of reasons. Some of the subject categories were removed because they did not match the risk areas at Monash University. In addition, some of the categories needed to be altered so that they were more reflective of the current Australian legislative system. All of the subject categories needed to be harmonised with existing risk management programs already in place at the University.

The risk score was altered from a scale of 0 to 3 to a scale of 0 to 60 to provide a wider range of scores. This allowed more scope for differentiation within the scoring system and achieved a greater diversity within the ranking.

Assigning Risk Scores to Risk Components:
A team of specialist OHSE staff jointly assigned the component risk scores. Initially definitions for the risk components were reviewed and an agreed set were determined as detailed in Table 1.

Table 1: Description Of Risk Components

Risk Components	Description
OHS Regulatory Liability	Based upon the likelihood that a regulatory authority would prosecute the University based on the current compliance status. Note that this score is not a direct measure of the OHS regulatory compliance.
Accidents & Incidents	The score is based on worst probable injury as detailed in table 2.
Business Loss	This ranking is based on the probable disruption to the Universities operations that could occur as detailed in table 2.
Property Damage	This ranking is based on the probable property damage that could occur as detailed in table 2.
General Liability	This component is an estimate of the likelihood of legal action being taken against the University, other than by OHS regulatory bodies.
Environmental Release	This component is an estimate of the potential for an incident or emergency to result in an environmentally detrimental release. No attempt was made to take account of the total environmental detriment associated with the normal operational conditions.
Damage to Public Image	This is an estimate of the likely level of adverse media attention resulting from an issue within a particular subject risk category.

The specialist team included individuals with responsibilities and expertise in different OHS programs which was considered to be necessary to ensure that personal bias was minimised. In addition a set of guidelines was developed for each risk component to ensure consistency in the allocation of risk scores (Table 1 and 2).

Table 2: Scoring guidelines

Risk Score	Risk Descriptor	Accidents and Incidents	Business Loss and Property Loss
0	None	No injury	No loss
20	Low	Minor injury	Minor disruption to operations
40	Medium	Serious injury (excluding fatality)	Affects a single department or floor of a building.
50		Single fatality	Affects a whole building or multiple departments.
60	High	Multiple fatalities	Affects multiple buildings or a whole campus.

Discussion

There are definite advantages associated with the use of this model, but there are also some limitations, both of which are discussed below.

Advantages:
The science of risk assessment is defined as determining the probablity of harm eventuating as a result of the existence of a hazard, i.e. pure risk. Once the probability of an adverse outcome is determined, a judgment on the level of risk that is acceptable must be made and the objective scientific risk is of little value as the term "acceptable" is subjective. So scientific risk is of little value when attempting to allocate limited funds across a diverse range of hazards as this allocation must take account of inherently subjective factors such as the perception of acceptable.

The major advantage of this model is that it provides a structured approach to the inherently judgmental activity of ranking the value or acceptability of scientific risks and perceived risks for a diverse range of hazards. It can provide a level of objectivity once the subjective levels are determined and subsequently can be used to allocate limited funds to control programs. The total risk index allows an approach to be used in allocating funds that is both practicable in terms of cost expenditure and justifiable in terms of risk and perceived risks.

The model also provides a system for justifying allocation of funds to the control of risk even where the hazard is not formally or specifically regulated. This provides more balance to risk control expenditure than can be achieved if allocation of risk control funds is based solely on regulatory compliance.

The total risk index model allows senior management and the non-OHS practitioner access to simple comparative risk measures that can be presented either numerically or graphically. It also provides the OHS practitioner with a useful tool to integrate the OHSE function into the mainstream business and to obtain stronger justification for allocation of funds to OHSE programs.

Limitations:
There are a number of limitations associated with the total risk index model which impact upon it's robustness and power as an objective ranking tool. The major limitations are:

- The allocation of risk scores is still open to subjectivity
- The lack of objective risk ranking tools at the subject category level also compromises the objectivity of the model.
- An "averaging" effect can occur within a subject category when there is significant variation between risk score components for different campuses, departments or buildings.

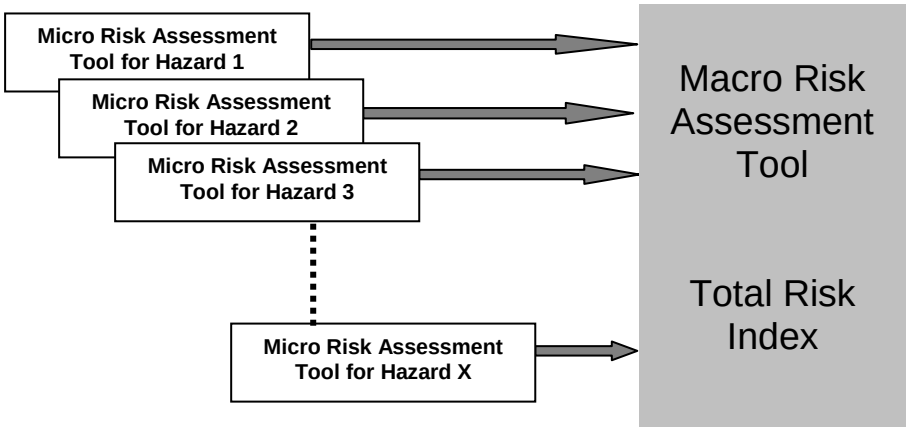
Current Investigations:
There are a number of changes that we are investigating to improve the objectivity and robustness of the total risk index model.

1. ***Multidiscipline Team:***
   The team responsible for allocating the component risk scores should include individuals with expertise beyond occupational health, safety and environment, especially in the areas of financial risk management, legal liability and media liaison. This will ensure appropriate allocation of scores for all of the risk components. In addition inclusion of these groups will promote understanding, and hopefully use, of the model

2. ***Micro Risk Assessment Models***

Development of objective risk ranking tools at the micro level would effectively underpin the total risk index model through provision of consistent risk score allocation at the risk component level (Figure 3). The outputs from these micro assessments must be able to be readily integrated into the macro model.

Figure 3: Interfacing Micro And Macro Risk Assessment Tools



3. ***Micro Risk Assessment Endpoints***

There are a multitude of endpoints or adverse outcomes that can be used as measures of consequence. To use the outcomes of the micro assessments we need to define an appropriate indicator or measure that can be used across the full range of hazards that exist in our workplace. Alternatively agreement must be reached on the relative equivalence of each indicator in terms of the acceptibility of the adverse risk.

A potential method is to define adverse consequences in terms of total detriment. An example where this method has been used is the detriment due to ionising radiation in terms of a total population, which was developed by the International Commission of Radiological Protection. Recently, the Health Physics community have questioned the relevance and usefulness of this indicator due to the complexity and level of abstraction that it entails.

An approach that is being trialled at Monash University is to use consequence vs likelihood risk matrices, which are in common use for risk assessments. The worst probable consequences related to each hazard are being aligned with a set of specific generic descriptors for objective risks.

4. ***Homogeneity Vs Complexity :***

There will always be areas within an organisation that have a higher risk of adverse outcomes then the remainder of the organisation. Thus treating the whole organisation as a single entity inevitable results in a loss of sensitivity. Allocation of total risk indexes within homogeneous groups may help to address this issue, however this would result in an additional layer of complexity to the calculation of the total risk indices. An alternate strategy that could be investigated is to utilise the micro risk assessment models to identify and manage the variation in risks within a hazard category. This latter approach is likely to be of the most effective way of maintaining sensitivity whilst avoiding unnecessary complications to the total risk score model.

Conclusions

There are a number of disadvantages associated with the total risk index model. Firstly, the lack of objective risk ranking tools at the subject category level can lead to instability in the macro model. Secondly, loss of detail or sensitivity can occur, especially where there is a significant variation between the expected risk between different campuses, departments or buildings.

The objectivity could be improved through use of appropriate micro risk assessment models. These micro models could also be used to effectively manage the sub-organisation variation within specific hazard categories.

The use of a macro risk index model has some significant advantages especially in regards to the potential for use to improve communication of risk control priorities to senior management. It also provides an objective approach to resource allocation and minimises the potential for the special interest areas to receive the majority of the resources. Further refinement of the methods used to allocate risk scores to risk components at the micro level is needed to improve the objectivity of this macro risk assessment tool.

If risk assessment outcomes are to be used for allocation of funds within the business environment then they must take account of the perceived risk in addition to the scientific risk.