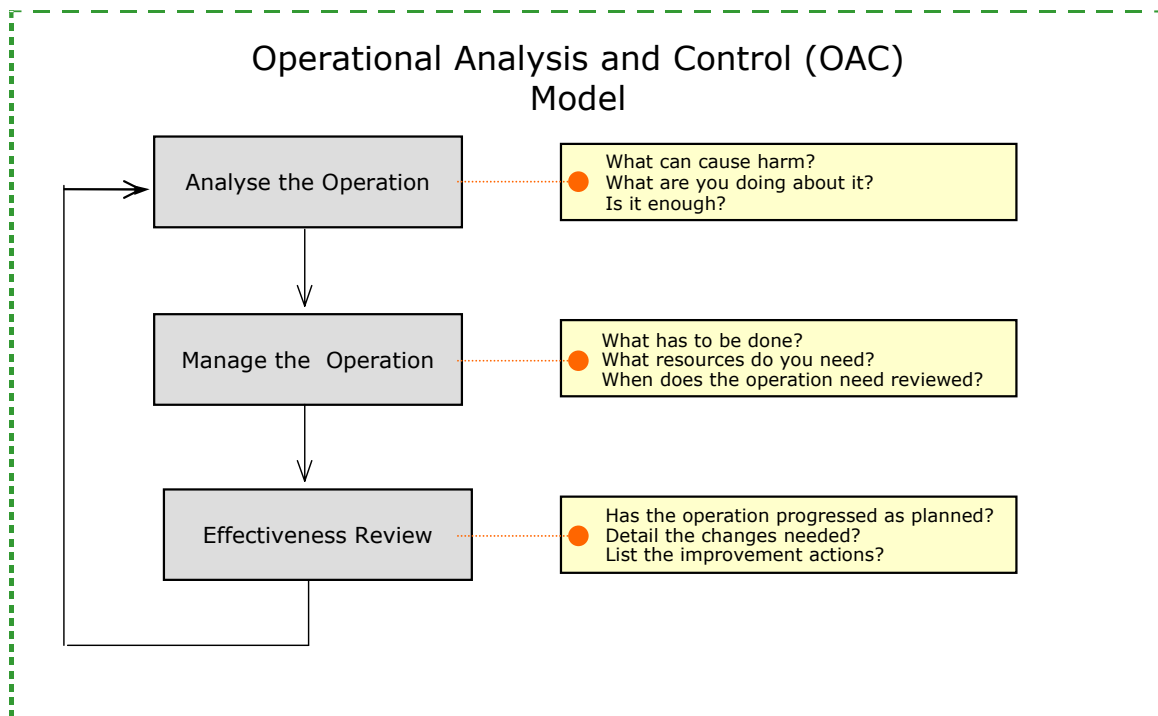


A Different Approach – Operational Analysis and Control



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Abstract

Risk Management has failed to achieve an acceptable level of workplace safety and it is time to rethink the strategy. It has failed because the management of risk implies that there is a degree of acceptable risk, consequently for management the task is fundamentally to determine what that degree is and to ensure that activities can be undertaken within acceptable parameters. In this regard risk management is, at best, an inexact science based on the premise that it is neither practicable nor feasible to have knowledge of the particulars of a process to control the outcomes sufficiently. Alternatively it is viewed as the product of a misconception about the inevitability of unplanned and uncontrolled incidents.

Workplaces are hazardous environments. Some hazards can be eliminated or contained through good engineering design solutions and others, inherent in the process, have to be worked around. The Risk Management model starts off its analysis by looking at the hazards, trying to determine the likelihood of the hazards being realized [accidents], and quickly loses sight of what is important because the focus is too narrow. Whereas the Operational Analysis and Control model does not start with the identification of the hazard, rather it goes to the real starting point; the work operation, and determines from the outset what is needed to achieve a safe outcome. The safety professional and the business manager's objective must be 'a safe outcome to a successful work operation' and in that there is a need to start to look at anything that will thwart the achievement of that aim.

Some safety practitioners argue that, "there are always going to be injuries and deaths in the workplace". However accepting this fatalistic approach to safety as an inevitable outcome sets the expectations and limitations. It is only possible to get closer to an acceptable standard of safety if it is defined at the outset and the operation is properly managed to allow it to be achieved. There can only ever be one standard, no matter how you dress it up, namely that the product or service is produced in a manner that will not injure workers or others who come into contact with it. That straightforward position, extended, includes no damage to the environment or to profitability. In other words it is not unreasonable to consider all the potential losses and put the proper controls in place prior to commencement. Proper management of the entire operation requires that you define your operational outcome, provide the resources and review to consider the possibility of failure, prior to commencement, during the process and at various other stages. Operating to any less a standard will only guarantee a negative outcome and ensure that accidents continue.

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If the safety, not the risk, is managed and we can control the safety of the operation then it does not matter how hazardous the environment is since the operation itself is non-hazardous and the outcome will always be non-injurious.

This paper challenges the concept of risk management itself and argues that although techniques may improve, risk management inevitably relies on subjective judgments that cost the United States billions of dollars annually, as a direct result of safety, health & environmental failures. This paper argues for a paradigm that shifts the onus from managing risk to managing the operation. It presents a model of operational management where control of the operation flows from the essential foundations of knowledge and understanding of each of the integral elements of the overall operation.

The paper also examines the relationship between the core participants in the production process, worker, contractor, client and legislature, and argues that effective operational management necessarily requires each to adopt a perspective that acknowledges and acts upon the duties and obligations each owes to the others. These obligations extend to their need to be fully cognizant of the operation and competent in the exercise of their particular role.

Introduction

In the UK construction workers are five times more likely to be killed and twice as likely to sustain a major injury or ill health than their counterparts in other industries.¹ In the 1999/2000 period there were 86 UK construction industry fatalities and in excess of 5000 non-fatal major accidents.

In south Florida, in a typical year in the late 1990s, as many as 70 construction workers a year died on the job.² Although this figure is decreasing OSHA's area director, Luis Santiago, acknowledges that, "South Florida remains amongst the nations most dangerous places to work in construction". (Ibid.)

In Northern Ireland (NI) the construction industry fatality rate per 100,000 workers is 13.2, in the UK it is 5.3 and in the US the 'three year' average rate for fatalities is 14.2. The all industry figures for NI are 1.95 and 0.7 for the UK.

Worldwide, the 'all industry' figures for workplace accidents and fatalities do not make good reading.

- Between 1996 and 1998 there were 15,250 unintended work-related fatalities in the USA,
- Between 1998 & 1999 there were 7.7 million disabling injuries,³
- In the UK, new cases of assessed disablement are highest in construction for asbestosis and mesothelioma – (between five and six times the average for all industries),
- More than 1.2 million working days were lost in the UK construction industry during 1995/6, as a result of work-related ill-health and over 0.6 million as a result of work-related injury, totalling almost 1.9 million days
- In the USA, half of the 8.5 million work place accidents in 1997 resulted in 185 million lost days,
- In 1998 the cost to the US economy as a result of accidents at work was \$127bn.,⁴ the UK economy, £20bn., and Australia, A\$27bn.

Although the \$127bn cost of accidents in the USA represents only 1.8% of the country's GDP it is the equivalent of:

- an annual cost to each small business of \$21,167, or

¹ New Civil Engineer (Professional Engineer's magazine), January 2001

² Palm Beach Post, June 22nd 2002

³ Hoskin, Alan F, Safety & Health, 1998 - 1999

⁴ Karr A, Safety & Health, 1999

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- the profit on over \$700,000 production / sales per business (based on a 3% margin), or
- \$1,082 from the wages of each employed worker.

Put into a global perspective, the major western economies are expending more per year on accidents and compliance failures than the GDP of most countries in the world.⁵

In the US, the National Institution for Occupational Safety and Health (NIOSH) refers to accidents as ‘preventable injuries’⁶, a useful definition to bear in mind when considering dynamic safety management. The question for industry is;

- Why do we accept all these deaths, injuries and incidents of ill health when we have the technological and intellectual capability to prevent accidents?

Legislation – The Intent

The core legal requirement for employers on both sides of the Atlantic is to provide work places and environments that are free from recognized hazards that cause or are likely to cause death or serious physical harm to employees. The parent law is then supplemented by regulations, approved codes of practice and guides that provide more specific details on how the fundamental duty may be met in regard to specific work operations and industries. Thus, in Europe for example, the basic premise in construction safety legislation is that projects should be designed, built, maintained and demolished in a manner that does not cause harm to the workers or others who come in contact with them. For many years now legislators have been intent upon creating the conditions whereby risk in the workplace would be eliminated. In 2000, the UK’s Health & Safety Executive [OSHA equivalent] issued a discussion document on regulating higher hazards in the workplace. Principal 2 stated,

“Permissioning regimes require operators to describe how they plan to achieve and maintain control, and to demonstrate active commitment to the effective management of risk. The overall objective is to secure an integrated and coherent approach to *eliminating hazards* (our emphasis) and managing residual risks that would work without the intervention of the safety regulator”.⁷

However despite the existence of our present laws, the introduction of new laws, and the continuing implementation of supplementary regulations and codes of practice, workplace

⁵ In 1998, only 30 countries in the world had a GDP greater than \$127bn., Economist.

⁶ Becker P, Lecturer WVU, private conversation with author (ISSA Paris December 2001).

⁷ HSE Books, DDE15

accidents continue to occur unabated, albeit with a decreasing rate of incidence, in many instances. What those who assess the situation and call for new laws and tighter controls fail to appreciate that it is not the standard of the law that causes accidents in the workplace. The state aims to eliminate workplace hazards and many safety professionals understand that intent behind risk management. Yet the mistaken notion has grown up around safety that risk management means the reduction of risk to acceptable levels. This is far from being the intent of legislation. If the fundamental legal requirement is to provide safe working environments and products, then we do not need additional laws to control industry, rather we need to reappraise, work with what we have and manage it better.

What is called for is a dynamic management model, focussed on elimination of or control of hazards rather than risks, that can yield significant results.

Effective Management

Good management is concerned with controlling the operation/ process/ system in order to achieve its objectives. The extent to which it is achieved is directly linked to the degree of management effectiveness. Management must be focussed on the outcomes, rather than simply the process and methodologies if it is to achieve and maintain effectiveness. It must recognise and respond appropriately to factors that impinge upon the outcomes and ensure that the desired outcomes are maintained. Effective management is dynamic.

The principal that management is concerned with outcomes falls short if the outcomes are defined purely in terms of product. Outcomes must be defined in the wider quality assurance terms that include quality, quantity, cost effectiveness of production, safety of operators, safety of customers, environmental issues, profitability etc. In other words, the right outcomes must also be established. That is effective management.

The efficacy of management is in no way accidental. It requires thought and planning from the outset. Having established the outcomes of an operation, how they are to be arrived at and the necessary steps to successful achievement must be considered. Additionally the project management team have to keep the potential barriers and the influence of internal and external changes in the market, technology etc. under constant review. If required, the team has to be willing and ready to alter their activities, change or drop their planned outcome to meet new challenges.

When management focuses on the procedure or prescribed process, on doing things “the right way”, the likelihood is that it will pay little or no attention to the system failures since whenever outcomes fail or go other than as planned the natural tendency is to assume that the problem rests elsewhere since things are being done “right”. This is rigid management or non-effectiveness in principal, even if on occasions it achieves the set outcomes. Effective management is about doing the “right things” not just about doing things right.

The conditions therefore are, the right outcomes plus the right activities to achieve success.

Risk Management Approach – The Negation:

The right activities are those that control the operation properly. However, where risk exists, control is lost because risk means that there is a possibility that harm may result, and this in turn implies that the operation is not being fully controlled. In essence, there are no risks in an operation, only hazards that need to be eliminated or controlled. Risk exists only where there is ignorance of some or all of the facts, that is that you don't know whether you will succeed or fail. Every action will therefore have an outcome that is either desired or undesired. In effect every action has only one desired outcome but a multitude (theoretically infinite) of undesired outcomes. A managed operation, by contrast, is one in which all of the hazards have been considered and the controls have been put in place so that the operation itself is free from risk. Either you will achieve your objective or you won't. If risk continues to exist it can only be because there are insufficient controls and that may be for a variety of reasons. Therefore, by managing the operation, concern can then be focused on the reliability of the control mechanisms rather than the probability of exposure to the hazard itself.⁸

‘Risk’ is a subjective measure of the possibility of danger being realised, used where there is an absence of certainty. In any absence of certainty you only have ‘chance’ to rely upon and it is chance that determines which of two outcomes are likely in the workplace; incident or no incident.

Management, on the other hand, is the authoritative control of operations. Where there is control of an operation the ‘chance’ element is removed and the only possible outcome is that which has been established at the outset. If the outcome cannot be determined with certainty then chance exists and any action taken is a gamble that the achieved outcome will be the desired one.

⁸ Gerry Ayers, Safety Professional, February 2002, private correspondence to authors.

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In practice risk management posits an acceptable level of risk and proceeds to manipulate the circumstances to increase the odds in favour of a non-injurious outcome. This fact was recognised by the US armed forces when they adopted Operational Risk Management (ORM) as a decision making tool in the early 1990s,

“ORM is ... used by people at all levels to increase operational effectiveness by anticipating hazards and reducing the potential for loss, thereby increasing the probability of a successful mission”.⁹

(Note that the [ORM] procedure is not designed to eliminate loss or to guarantee success, merely to reduce loss and increase the probability of success, (though if hazard elimination is possible it is to be taken)).

The acceptable level of risk concept is reinforced by the requirement to accept the risk when the benefit is greater than the risk. By the very nature of combat, this is probably the only approach open to the decision makers, but in non-combatative situations, whether in the military, and certainly in the industrial and work environments, this approach has the potential for some very callous decision making, e.g. where it may be cheaper to compensate injured workers than incur the costs of introducing safety measures.

Ultimately, by accepting and acting on any level of risk we are gambling with the safety of workers. In a recent article in ASSE's professional journal Dominic Cooper commented; “Taking a more relaxed viewpoint has enormous practical implications. For example, in the UK, aiming for a 99.9% success rate would mean accepting that each day;

- 10 trains would crash on the rail network,
- 15 babies would be dropped on the floor at birth,
- 125 surgical operations would go wrong,
- 27 people would be wrongly prescribed dangerous drugs,
- 72,000 cheques would be deducted from the wrong bank accounts,
- 88 missed heartbeats would be experienced by each citizen,
- 96,000 items of mail would be lost by the Royal Mail, and
- Hundreds of people would be injured at work. “

Had this analysis been applied to the US the figures could be five times greater. “These statistics” Cooper continues, “ support the goal of aiming for zero incidents rather than accepting 99.9%”.

But not every safety professional will accept this. In a debate last year amongst members of the UK's Institution of Occupational Safety Health (IOSH) one contributor stated;

“Risk management is about determining what risks require managing to what level. Determining the level of acceptable risk is just as important as managing the risk itself.

Looking at larger organisations, some accept a level of fatality! The rail industry accepts 1 trackside fatality per 100,000 employees as the target. If this is achieved then everyone will be happy and give themselves a pat on the back”.

The authors, however, don't see the dead employee, his family or his friends cheering. The idea of multiplying one number by another to give a risk score and thus an action priority will not wash in court when the grieving widow is sat in front of the jury.¹⁰ In that respect how many managers would like the task of choosing and informing one of their employees that statistics demand that he is to die today?

Risk management, by definition, cannot be anything but self-contradictory and as practised accepts that an injurious outcome to some work activities is unavoidable such that it merely seeks to reduce the likelihood. Accepting this as an inevitable outcome sets expectations and limitations. Risk management supports a fatalistic approach to safety and seeks to limit the likelihood of injury rather than to eliminate it totally. Another contributor to the IOSH debate made a statement about accepting the application of the "reasonably practicable risk/ sacrifice equation", i.e. an equation whereby the risk is taken if the benefits are greater than the loss, Taken together with the point regarding the rail industry figure of 1 death in 100000 employees being acceptable substantiates the position that risk management accepts failure.

What happens when the odds are remote; is the risk worth taking?

The problem with risk, no matter how remote the probability, is that the occurrence of the uncontrolled event could be the next time (and it could always be the next time). Bear in mind that a risk is basically the element of chance in an activity, whether it is 50:50 or 1:1,000,000. Every week millions of people put their money on lesser odds in their national lotteries and most weeks one or more come up "trumps". Work environments, where the element of chance is retained, for whatever reason, are environments where every week someone's number comes up. That is why risk costs the USA more than \$127bn and the UK more than £20bn every year.

⁹ US Marine Corp, "Introduction to Operational Risk Management"

¹⁰ Contribution to an IOSH debate, November 2001.

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Furthermore, there is nothing in the theory that states that a 1:1,000,000 event could not occur on 2 (or more) consecutive occasions. No matter what the odds are, no matter how well "managed" the activity, the next time could be that one in a million time because there is no chance rule that says the activity has to be done a million times before the accident. In fact every time could theoretically be that one in a million time.

"Risk Management" simply tries to improve the odds. However, if safety, not the risk, is managed and we can control the safety of the operation then it does not matter how hazardous the environment is since the operation itself is non-hazardous and the outcome will always be non-injurious.

Operational Control - Certainty of outcome

The purpose behind the Operational Analysis and Control (OAC) model (below) is to ensure that work operations are carried out in strict accordance with all relevant 'safe working' procedures. In this way we can make sure that people, plant and property are protected from harm prior to, during and after the work operation, regardless of the nature of the hazards faced.

Planning any project without reference to the safety requirements means that the project will fail, certainly and spectacularly. Effective management requires that safety is considered as an integral aspect of the project, not an after thought nor a discrete element, but central to and fully integrated with the project objectives. What planning does is consider the objectives, the means and the methods of achieving them. By definition planning leaves nothing to chance. All elements of the projects and every eventuality are considered, in advance and appropriate steps, actions developed and scheduled. Anything that is left out, by accident or by design exposes the project and the company to risk and consequently the likelihood of an undesirable outcome.

Absolute control = absolute certainty of outcome

In defining the outcomes, and all the relevant considerations, the Operational Analysis and Control model requires the identification of the principal actors necessary for the establishment, development and successful achievements of the project. The competence and expertise of a wide range of personnel are needed to input to the various aspects of the project, to establish the parameters of what is achievable within the constraints of;

- finance,
- engineering & technical capabilities,
- environmental management, and
- human interaction,

during and after the project. There will be contradictions between the demands of the various elements that will require expertise to not only resolve them effectively, but to identify and define them in the first instance. The occupational safety and health (OSH) input will not solely be derived from OSH professionals, but must also come from experienced and competent managers and supervisors, engineers, specialist experts and of course the workers own representatives.

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Effective management and the OAC model advocates that those who are involved in the project at whatever stage, will have a contribution to make to the elimination/ control of hazards (i.e. those factors that will negatively impact upon any element of the project, not just the safety). This applies equally where a client engages a contractor. The client needs to ensure that all relevant OSH information is made available to the contractor and that time and resources have been suitably budgeted for. Similarly for the contractor, he must demonstrate competence to carry out the work; such competence extends to have adequate funds, time and other relevant resources. The OAC process lends itself to the contract tendering process.

The OAC model does not advocate the minimisation of risk, as this perception of safety accepts the possibility of accidents and hopes, 'with fingers crossed', that the probability is so low that they will not occur. However with 1,220 deaths and 470,000 disabling injuries annually in the US construction industry costing the economy \$billions crossing fingers is definitely the wrong route for management. The correct option is to go for elimination of hazards, or hazard control when elimination is not possible, so that accident probabilities are removed not minimised.

Case Study

The OAC model was introduced to an Northern Ireland Government department in 1998 and at the end of Year 3 of it's '3 year bedding in period' reportable accident rates had reduced by 49%, or 22% on the 3 year rolling average. The resultant reduction in the reportable accident rate was more than double the performance target set by the CEO at the time of introduction.

Further improvements are anticipated as the managers become more familiar with the concept and become more competent in the process. A target for the achievement of a further 20% reduction has been set for the year 2005.

The OAC has been audited each year since it was introduced and 85% to 95% compliance is being reached consistently.

To date the organisation has received two prestigious awards for it's safety management (one across the UK and the other across Ireland). The CEO and the management Board are delighted with the results and enthusiastic about the flexibility built into the process.

Operational Analysis and Control Model

The operational analysis and control model is the way forward. The model integrates all aspects of the work operation including occupational health. This emerging model is in three stages as follows;

A. Stage 1 – Analyse the Operation

1. What can cause harm? (Look for the harm factors in the work operation itself, the workers, the materials, the machinery and plant, the public & visitors and the environment).
2. What are you doing about it? (Once you know what can cause harm you look for the controls¹¹ that are needed to prevent that harm from occurring).
3. Is it enough? (At this stage, before embarking on the work operation, consider whether you have done enough to prevent harm. If necessary seek specialist advice e.g. from trade or professional associations, manufacturers, your National Statutory Safety Body [OSHA], other safety professionals etc). Things can go wrong and it important to try and anticipate that as early as possible. Ask;
 - What could go wrong?
 - How could it happen? and
 - How would you deal with it?

Asking the questions at the outset focuses the mind and ensures that you have considered all the foreseeable incidents and planned for them. You are also being prompted to consider what emergency plans you need to have in place prior to starting an operation.

B. Stage 2 – Manage the Operation

1. What has to be done? (Having carried out the analysis you must list what has to be done to ensure a safe outcome to the work operation. E.g. have you made your employees aware of what can cause them harm and what they must do? do you know what training they need?, are there written safety instructions? Does

¹¹ For example this could be safety programs, permits, manufacturer's guidance, safety and personal protective equipment etc.

everyone know who is responsible and for what? etc).

2. What resources do you need? (Material, human, financial, timescale). It is important that, having identified the resources, you make them available. (Some will be needed well in advance of any work operation. Build your controls into your budget and your business plan).
3. When does the operation need to be reviewed? Believing that you have a safe workplace is a sure way of ensuring that you do not. Like every aspect of your work safety needs to be continually managed and improved, as necessary. It is important therefore that a time or circumstance is set for reviewing the effectiveness of the management controls. The review period could be;
 - When new processes or new equipment is introduced to the operation,
 - When new techniques have been developed,
 - When statutory obligations require it,
 - When resources inputs are set to change,
 - When an accident or incident occurs, or
 - At regular intervals (determined by the nature and complexity of the hazards present).

Note: The above list is not exhaustive. Carry out an effectiveness review at any other time, should you feel it is warranted.

C. Review the Effectiveness of the Operation

1. Has the operation progressed as planned? Things change or things can go wrong. You need to be aware of the effects of any change and try to anticipate how they will need to be dealt with. Ask yourself the following questions;
 - What has changed since the last operational analysis?', 'What effect will it have on operational management?', and 'How will it be dealt with?',

If nothing has changed then note that the review has taken place and set the next review date.

Where things have gone wrong ask the following;

- 'What went wrong?', 'How did it happen?', and 'How did you deal with it?'

Note: We do not always get it right but if an accident does occur that is no reason to give up or to accept lower standards. Accepting accidents as inevitable is fatalistic. The objective of integrating the highest standards of health and safety with improved business performance means that the end product/ service must be achieved in a manner that protects employees and the public from harm. Operating to any less a standard will only guarantee a negative outcome and ensure that accidents continue.

2. Detail the changes needed. If changes have occurred then itemise them and consider how they will affect the operation.

3. List the improvement actions. Draw up an action plan, identifying the resources implications, managers responsible for completing the actions and the timescales for completion.

Way forward

Mike Gutierrez, a safety expert at Gables Residential Trust, a Boca-Raton based apartment developer, stated...“there’s so much competition when you bid. A lot of companies tell us “We can’t afford to work safe””.¹²

This is one by-product of viewing safety as an add-on rather than an integral element of the business, with the result that the callous decision-making that can result from the risk management approach manifests itself in safety being cut from project costings in the effort to win contracts. But as Philippe Faure stated, “If you can’t afford the safety control measures then you can’t afford to do the job”¹³.

This basic thought cuts across all levels and all industries.

- In product manufacture the total cost needs to include the safety costs and in turn this will influence the market price. This is what is demanded in the European essential safety requirement¹⁴.
- When a client is buying work they need to insist that contractors include safety measures in their methods of working, however their estimate for the work must allow the contractor to put safety measures in place. The client allowing for adequate resources needs to include a realistic timescale for the completion of the work as well as suitable recompense.
- Likewise, with the service industry, schools, hospitals, government etc., there can be no cut backs on safety measures in the delivery of the services. This is particularly important when the desired outcome is the improved quality of life of millions of customers.

The partnership approach where the client, the designer, contractor, employee and end user are all working towards an agreed end is the way forward. In Ireland, in the construction industry, employers and industry federations, major clients, the regulators and the safety professionals came together recently to introduce 'Safe T Cert' to the industry.¹⁵ Although still in it's infancy, it brings the need to establish a management system and audit protocol to the contracting firms. Many of the contracting firms are being encouraged to adopt OAC as the means of competing for this certification. Audited annually and independently verified, the process is designed to record a level of safety and monitor continual improvement. As the 'Safe T Cert' program rolls out it will raise the

¹² Palm Beach Post, June 22nd 2002

¹³ ISSA Paris, Dec 2001

¹⁴ Under normal, controlled or reasonably foreseeable conditions of use the products do not present a risk of death or personal injury to anyone keeping, using, assembling or dismantling them.

¹⁵ The 'Safe T Cert' scheme is supported by IOSH and the International Register of Certified Auditors (IRCA)

awareness of and establish a level of competence in safety management across the industry. Since it is based on international best practice there is no reason why it should not work in other industries and other countries across the world.

Conclusion

OAC takes the industry back to first principles in an effort to clear away the clutter that has built up with years of risk management. The model builds upon what we all know, particular to our industry, and allows the architect of the management system the flexibility to design a program that will fit with the business and be robust enough to withstand any legislative changes or technological advances.

Within OAC the opening three questions, although simple in style are extremely powerful and probing in nature. The answers will invariably lead to a heightened awareness of the hazards and assist with the development of the management solutions. Any good safety management system relies upon quality information. There are always many competing factors that make it is easy to be swayed by a crisis or the issue of the day. Often the reaction is for managers to work to demonstrate how well they are geared up to deal with it. However the danger is that this will not achieve the desirable position of properly managing the safety of the operation on an equal basis with all the other important business areas.

An organisation's safety policy needs to reflect the nature, scale and impact of its activities across the entire spectrum of its activities. Therefore not only is it correct to customise safety policy to fit the needs of the business it is expected of any quality organisation.

This is achieved by a thorough examination of the company's present position using OAC. The first question, 'what can cause harm?', prompts the company to examine what it does and what affect it has on its workers and its surroundings, regardless of the regulatory position. This is always a good starting point in safety management since it allows the organisation to deal properly with current legislation and prepare for future requirements. Similarly the follow on question, 'what are you doing about it?', provides the opportunity to detail the actions being taken to mitigate the harm. In essence, having answered the first two questions, a hazard analysis has been carried out. Depending on the nature and the scale of the project it may be necessary to carry out a more formal or more complex hazard analysis. The opportunity can then be taken to check the regulatory position.

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The concept of continual improvement is introduced into OAC with the, 'is it enough?' question. This is fundamental to good safety management since public acceptability, technical knowledge and engineering practices are in a state of continual development. By using OAC a company will easily establish the current state of its control activities.

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