Proceedings of the Water Contamination Emergencies: Enhansing Our Response conference,
12-15 June, 2005, Manchester University, pp70-80.

RISK MANAGEMENT CAPABILITIES – TOWARDS 'MINDFULNESS' FOR THE INTERNATIONAL WATER UTILITY SECTOR

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ABSTRACT

Public health protection must be the primary goal of a drinking water utility; delivered through supplying safe drinking water. For complex multi-utilities, this goal may come under pressure from the need to manage a plethora of business risks. We describe a risk management maturity model for assessing the capacity of utilities to manage business risks and comment on the importance of 'mindfulness' as a prerequisite for effective risk management.

1 INTRODUCTION

1.1 A risk management imperative

From embedding corporate governance, through to the management of individual assets, the ability to understand, communicate, assess and manage risk has become a mainstream business activity. Many of the larger water utilities have begun integrating their responsibilities for financial control alongside their risk management programmes, including those that exist for asset management and regulatory compliance (Figure 1).

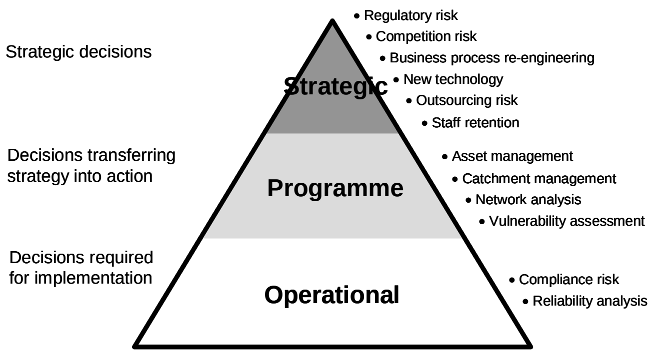

Figure 1 The risk hierarchy applied to the water utility sector (after Prime Minister's Strategy Unit, 2002).

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The water industry is witnessing a significant shift in the approach to risk management to one that is increasingly explicit and better integrated with other business processes. This is clearly, in part, a response to the asset management (financial and environmental regulation), public health (drinking water safety) and environmental protection (*e.g.* catchment management) agendas but may also represent a growing recognition that the provision of safe drinking water deserves to be treated as a 'high reliability' service within society and subject to the sectoral and organisational rigours and controls inherent to operations in the nuclear, offshore and aerospace industries. These sectors have learned important lessons and developed significant literatures on the implementation of safety cultures, much of which is transferable directly to the water sector as it progresses with the implementation of risk management.

This paper deals with the application of maturity models within the international water utility sector. The research is relevant to the subject of water emergencies because it explores the preparedness, or resilience, of organisations to foresee, prevent, manage and withstand adverse risks. Our research has been conducted as part of a larger study for the American Water Works Association Research Foundation (AwwaRF) on risk analysis strategies for better and more credible utility decision-making (Pollard *et al.*, 2005).

1.2 Risk analysis in the water sector

Notwithstanding the increasing application of risk assessment tools in the water utility sector (Colbourne, 2004; MacGillivray, 2005), there are many approaches to managing uncertainty in organisations (UKOOA, 1999) ranging from the use of standards, engineering judgement and good practice through to embedding company values and corporate cultures to safety and risk. Risk analysis plays an important function in decision-making where the probability of a hazard being realised is significant and uncertain and where the outcomes, or consequences are reasonably well understood (Figure 2).

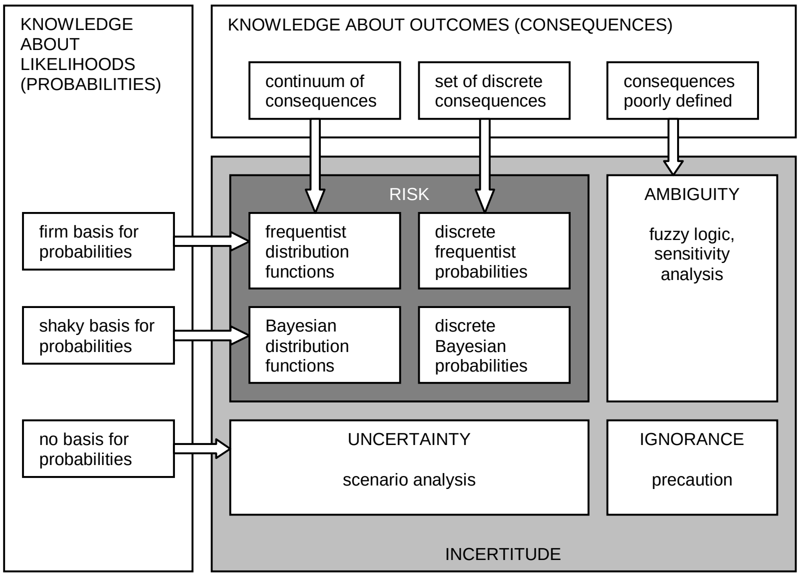

Figure 2 Approaches to addressing uncertainty, risk and ignorance in decision-making (redrawn from Stirling, 2001)

The water sector has made excellent progress towards setting its goal of "providing wholesome, safe drinking water that has the trust of customers" within a risk management context, most recently through the preparation of revised WHO drinking water guidelines that promote a risk management approach (WHO, 2004). There remain challenging implementation issues to be addressed, however. For example, following the types of incident reviewed by Hrudey and Hrudey (2004), it is becoming accepted that risk analyses need to extend their reach beyond engineered systems and view management (system) and human (people) factors as equally central to effective risk management (Hurst, 1998; Pollard *et al.*, 2004).

2 CAPABILITIES IN RISK MANAGEMENT

2.1 Risk assessment is not enough – developing capabilities in risk management

Risk assessments do not guarantee risk reduction. Left with their recommendations not implemented, they are a hollow gesture that may only serve to increase legal liability after failures occur. Managing risk competently, wisely and by targeting the risk critical elements of a system for maximum risk reduction is what counts. To understand the organisational competency in risk management, we must look to the *capability* a utility possesses in risk management. Because most water companies manage risk by virtue of the routine provision of safe drinking water, we are generally concerned then with the relative *maturity* of their capability (Sharp *et al*., 2002) in risk management, rather than its presence or absence *per se*. Practically, we are concerned with their ability to act wisely and to anticipate when things might go wrong and act quickly in a preventative fashion.

A capability maturity model (CMM) is a management tool used to assess the degree of wisdom with which an organisation competently performs the key processes required to deliver a product or a service (Table 1). The degree of wisdom is represented by levels of maturity. Level 5 (high) organisations exhibit ‘best practice’. They are capable of learning and adapting and they use experiences to correct problems and change the nature of the way they operate. Level 1 (low) organisations are learner organisations with non-standard and largely uncontrolled processes.

N	maturity	mode / style	process characteristic and effect
5	Optimised	Adaptive, double loop learning	The organisation is ‘best practice’, capable of learning and adapting itself. It not only uses experience to correct any problems, but also to change the nature of the way it operates.
4	Managed	Quantified, single loop learning	The organisation can control what it does in the way of processes. It lays down requirements and ensures that these are met through feedback.
3	Define	Measured, open loop	The organisation can say what it does and how it goes about it but not necessarily act on its analyses
2	Repeatable	Prescriptive	The organisation can repeat what it has done before, but not necessarily define what it does.
1	Ad hoc	re-active	Characterises a learner organisation with complete processes that are not standardised and are largely uncontrolled
0	Incomplete	Violation	Incomplete processes, criminal or deliberate violation tendencies

Table 1 Interpretation of maturity levels

CMM has its roots in the field of performance measurements (Kaplan and Norton, 1996: Phelps, 2004) and quality management developed in the 1970s (Crosby 1979; 1996). The most widely referenced CMM is that developed by the US Software Engineering Institute to assess the software design capability of software houses (Paulk *et al*., 1993). One of the strengths of the CMM approach is its broad applicability and this is leading to increasing numbers of CMM models in other sectors (Fraser *et al*., 2002: ISO, 2000). Capability maturity models can be used both as an *assessment* tool and as an *improvement* tool. Both approaches are used in practice.

Risk management (there are various paradigms; Figure 3 indicates one such approach for environmental risks) can be viewed as a ‘service’ most organisations undertake on behalf of their internal and external stakeholders to ensure business continuity and the delivery of corporate objectives is not adversely threatened.

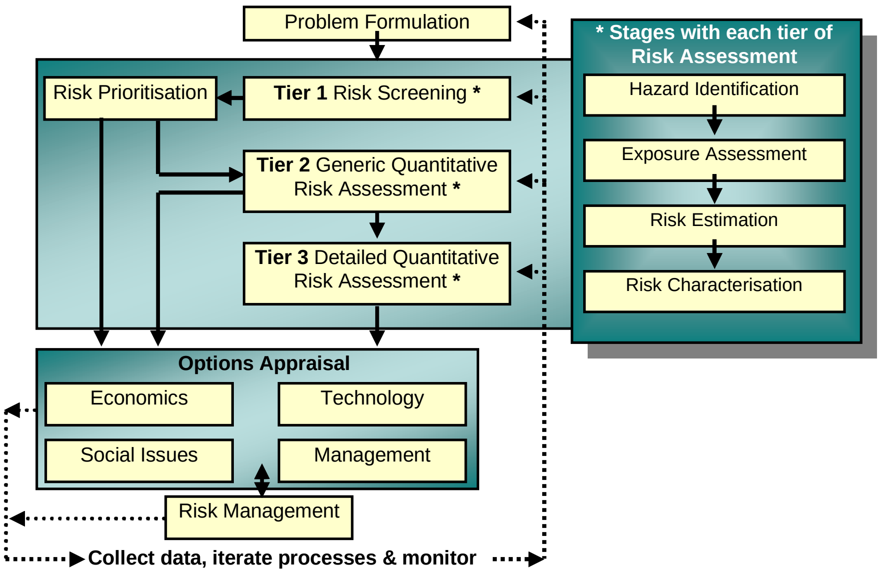

Figure 3 Example risk management paradigm (after DETR *et al.*, 2000)

Many water utilities seek to improve the processes involved with managing their risks and see this as an effective means of reducing exposure and improving risk-based decision making within their organisations. Understanding one’s own risk management maturity has value in that it may (i) assist organisations in formalising their appetite for risk; (ii) help formalise and make more explicit the role of the group risk manager; and (iii) provide the opportunity for a ‘climate’ check on the implementation of risk management procedures on the ground within the organisation; thus acting as a check on corporate level statements on risk.

Our research at Cranfield University (Strutt *et al*., 1998; 1999; 2005) has developed and piloted a risk management capability maturity model (RM-CMM) for the international water sector (Figure 4). There are 5 levels of capability that build on ideas from the theory of action and the concept of single and double loop learning (Argyris and Schön, 1974). Single loop learning occurs when risks are detected and the product or service is amended, thus permitting the organisation to carry on its present policies or achieve its present objectives. Double-loop learning occurs when risks are detected and managed in ways that involve the modification of an organisation’s underlying norms, policies and objectives. Being able to manage the risks to your organisation extends beyond the ability to perform the risk analyses and options appraisal set out in Figure 3. There are key processes such as the ability to establish the organisational appetite for risk through setting risk acceptance criteria, and the ability to integrate risk management across business functions that are also important and reflect the wisdom (maturity) of approach (Figure 3).

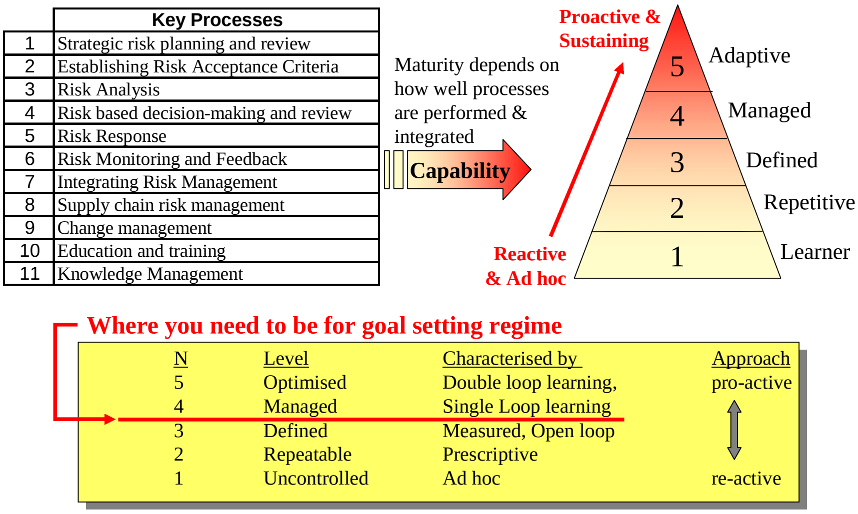

Figure 4 Overview of the risk management CMM (after Strutt *et al.*, 2005)

The practical value of codifying this into an assessment model for water utility risk managers is in establishing the basis for risk improvement plans – structured and targeted action plans for better risk management within companies. The RM-CMM approach seeks to elicit where, on the ladder of improvement a utility wishes to be by reference to the importance of the risks it manages, and then to identify through critical analysis where the utility is on the ladder. An organisation's maturity in risk management can be schematically represented as snapshots of their current status (Strutt *et al.*, 2005). The requirements to move between 'rungs of the ladder' (*i.e.* the levels of Table 1) provide the basis for risk management improvement plans within individual companies.

2.2 Applying the tool in practice

A preliminary RM-CMM framework has been developed and piloted within a number of water utility companies collaborating in the AwwaRF project for self assessment and review. The framework remains to be refined on the basis of initial responses from users. However, the initial responses offer insights into the risk management practices and cultures within the water utility sector. In summary, there is a growing capability, generally characterised by Level 3 of the RM-CMM. The pilot capability profiles returned by six organisations are summarised in Figure 5.

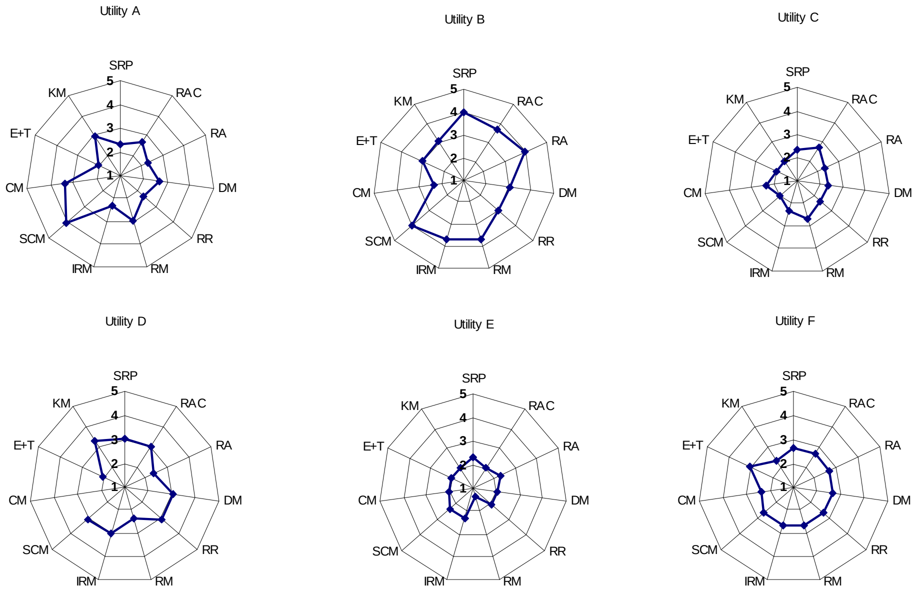

Figure 5. Capability profiles for 6 water utility companies (after Strutt *et al.*, 2005)

Key for risk management processes:

SRP	Strategic risk planning and review of business goals	RM	Risk monitoring and feedback
RAC	Establishing risk acceptance criteria	IRM	Integrating risk management
RA	Risk analysis	SCM	Supply chain risk management
DM	Risk based decision-making and review	CM	Change management
RR	Risk response	E&T	Education and training
		KM	Knowledge Management

Our initial observations indicate:

1. That most of the risk management processes reported are at a Level 3 or below, with most organisations at or becoming defined (Level 3) in terms of their risk management processes.
2. The transition to Level 4 capability is difficult because it implies that key management practices must influence decision making. This in turn implies that analysis is carried out early enough for it to influence decision making and that companies invest effort in effective response to risk. There appears to be widespread difficulty in transforming risk analysis and monitoring outputs into formats that inform decision makers.
3. The range of different methodologies used for risk analysis by water companies is limited, suggesting that there is a need for training in assessment methods and competency improvements.
4. Verification of risk management processes (the monitoring of residual risk) is often weak and validation activities often absent.
5. Risk monitoring is a core process but its practice appears surprisingly weak. One reason may be that organisations do not consider monitoring as a process in its own right but rather as validation of prior decisions (see 4 above, however).
6. The true integration of risk management with other core business processes appears some way off. It would appear that the interfaces are not fully understood, perhaps because of disciplinary barriers among technology, health and financial managers.
7. There appears to be only limited engagement of stakeholders in the risk management process, both internal (*e.g.* cross functional groups) and external (*e.g.* regulators).
8. An inability to measure and communicate the value (both tangible and intangible values) of risk management processes appears to have restricted corporate buy-in.

9. In many cases, organisational appetites for risk, in terms of tolerances, are weakly defined, often cited as a 'Board level issue'. Lack of risk acceptance criteria can adversely impact on risk response decision making.
10. An emphasis on individual business units 'owning' the processes has in some cases led to a proliferation of what are often disparate risk management initiatives, creating a barrier to integrated risk management.
11. Although senior and executive management have generally 'bought in' to the central role of risk management in utility operations, communicating its status throughout the company is proving somewhat difficult. 'Making it [risk management] part of the mindset' is often cited as the core function of the risk management team.

These are valuable findings. They suggest that most organisations have moved beyond the reactive state of Level 2 maturity for the range of risk management processes. However, the three core constraints they face in attaining full Level 3 status and beyond are:

- reaching the appropriate level of definition of their processes, *i.e.* identifying the tasks, activities, inputs and outputs of which they are comprised;
- the ability to enable these processes, *i.e.* establishing procedures for their initiation and providing the necessary resources;
- absence of a 'learning culture', which often proves to be the key constraint in proceeding beyond Level 4. On current performance this appears to be largely beyond the immediate control of corporate risk management teams.

3 DEVELOPING A RISK MANAGEMENT CULTURE

3.1 Getting the culture right – towards 'mindfulness' in the water utility sector

Much has been written on safety culture in the light of organisation accidents since the 1970s, much of it coincident with good risk management practice. Developing a risk management culture that is sustaining and continues to learn and improve in face of the inevitable peaks and troughs of organisation performance requires (Taylor, 2005): leadership, procedures, an appetite for conservative decision-making where safety it put first even under pressure; a culture of sharing reported close calls [*near misses have been described as inaccurate, more like "near hits", we use close calls later*]; good communication at the appropriate level, an open, learning organisational culture able to benchmark itself against the best-in-class, systematic competency checking, effective management of organisational change and the ability to prioritise.

Disasters and incidents have deeply-rooted causes (Reason 1999; Hurst, 1998) that are often a combination of technical failures, an incapacity to manage change and of the underlying values within, or market forces acting on an organisation; as catalogued for waterborne outbreaks by Hrudey and Hrudey (2004). They are often a failure to convert hindsight into foresight and typically occur (Taylor, 2005) when there is a loss of institutional foresight and corporate memory, in the face of strong market pressures for efficiency gains, when there are considerable elements of outsourcing, where organisations fail to maintain their status as an 'intelligent customer', with loss of internal technical expertise and particularly during, or following periods of business re-engineering. Cost pressures, priority-based working and changes that are rushed are all circumstances that can generate accidents. For organisations to become resilient and mindful, they must be able to anticipate and circumvent threats to corporate objectives and manage severe pressures and conflicts between performance and the risks that threaten it. Modern management culture sets a strong impetus on doing more for less ('lean') and on maintaining business continuity, and middle managers may find it difficult to challenge this philosophy in 'managing up' risk issues to the executive management or Board. When they do, risks that are not easily quantified in monetary terms may receive restricted air time at Board meetings and lie dormant within the organisation as latent causal factors (Reason, 1997). It is clear from the prior art that leadership and management are key to establishing the right culture in terms of the expectations and example that are set, or not.

But how do organisations to develop a risk management culture without having first to suffer a major accident? How do we force ourselves to ensure risk issues are treated seriously? And how can we usefully process the volumes of risk information gathered by risk managers so as to make sense of it for accident/incident prevention? When should executive managers listen to the challenge from below? Above what threshold should they act? And are risk managers arguably an additional source of risk because, in taking institutional responsibility for coordinating risk assessment and management, they absolve others of their individual responsibilities for risk management? These are critical organisational questions germane to the organisation practice of risk management and requiring additional research. They remind us that managing risk requires wisdom and reflection, and that preventive approaches are creative and forward-looking. Best in class organisations are mindful about risks to their operations.

Weick and Sutcliffe (2001) characterise 'mindfulness' in organisations that (i) are preoccupied with failure and the root causes of it; (ii) are reluctant to (over)simplify; (iii) are sensitive to operations; (iv) committed to resilience; and (v) are deferential to expertise. We propose that for water utilities seeking to develop mindfulness (Hrudey *et al*., 2005):

- informed vigilance is actively promoted and rewarded;
- there exists an understanding of the entire system, its challenges and limitations is promoted and actively maintained;
- effective, real-time treatment process control, based on understanding critical capabilities and limitations of the technology, is the basic operating approach;
- fail-safe multi-barriers are actively identified and maintained at a level appropriate to the challenges facing the system;
- close calls are documented and used to train staff about how the system responded under stress and to identify what measures are needed to make such close calls less likely in future;
- operators, supervisors, lab personnel and management all understand that they are entrusted with protecting the public's health and are committed to honouring that responsibility above all else;
- operational personnel are afforded the status, training and remuneration commensurate with their responsibilities as guardians of the public's health;
- response capability and communication are improved, particularly as post 9-11 bioterrorism concerns are being addressed; and
- an overall continuous improvement, total quality management (TQM) mentality pervades the organisation.

4 CONCLUSIONS

Our conclusions are drawn from a series of extended interviews with risk managers within the utility sector and our initial piloting of the RM-CMM.

(1) Risk analysis is widely applied within asset management for assessing the likely condition, lifetime and projected management costs of asset maintenance and replacement. At the strategic level, however, risk and values are intimately linked and there appears to be little explicit expression of the risks utilities are prepared to accept and statements on those consequences that will not be allowed to occur. This is complex territory for many organisations and for water utilities depends, in part, on their private, public or corporatised legal status and corporate objectives.
(2) The promotion of water safety plans under revised World Health Organisation guidelines (2004) is driving a more integrated approach to risk identification and analysis from catchment to tap (Colbourne, 2004). Implementation will require sound and effective knowledge management.
(3) Along with many sectors, their remains a tendency to view risk assessment as an end in itself, rather than as the evidentiary analysis and input to a management tool for identifying company exposure and opportunities for innovation – the value of risk management requires greater advocacy in organisations.
(4) The provision of safe drinking water has not been historically viewed as a high reliability sector (as has aerospace and the nuclear sectors). This said, failure to adequately manage risk in a climate of 'efficiency gains' and 'optimisation', with risk analysis often being used to justify such actions, may leave the sector exposed to the types of organisational disasters we have witnessed with the fatal outbreak in Walkerton, for example – attention to the *implementation* of risk management culture is required.

Acknowledgements - This work has been part-funded through an American Water Works Association Research Foundation (AwwaRF) award (RFP2939). BHM is co-funded through an EPSRC Doctoral Training Account award. The paper summarises themes addressed at the AwwaRF International Workshop "*Risk analysis strategies for better and more credible decision-making*", 6-8th April, 2005, Banff, Canada. The views expressed are those of the authors alone.

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