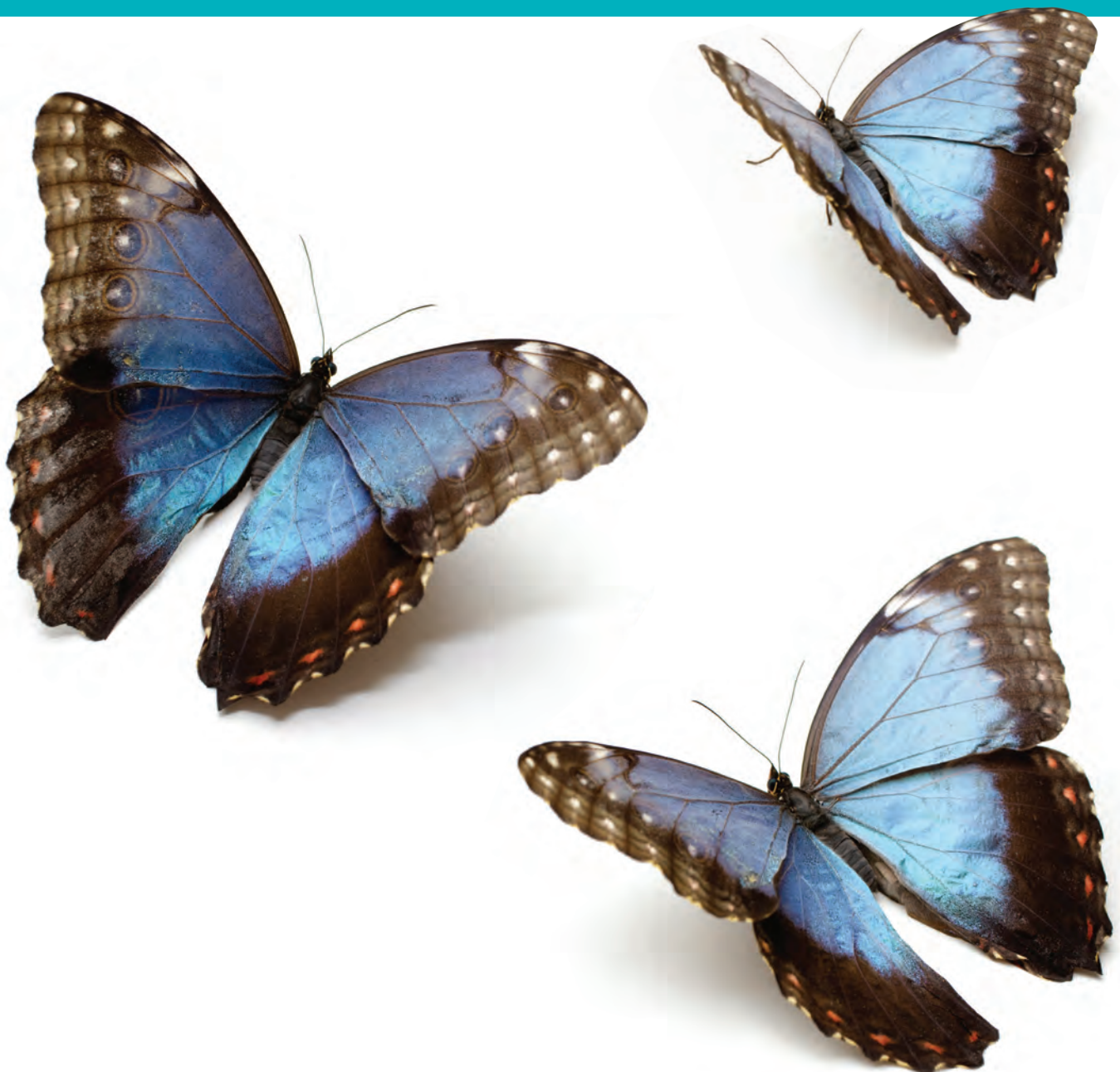


**The Actuarial Profession**  
making financial sense of the future



# Handling uncertainty

– the key to truly effective Enterprise Risk Management





The Institute and Faculty of Actuaries provides support and services to members throughout their careers, so that they have the skills, attributes and knowledge necessary for quantitative risk professionals.



The Institution of Civil Engineers (ICE) strives to promote and progress Civil Engineering. Civil Engineers are at the “heart of society” delivering sustainable development through knowledge, skills and professional expertise.



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## Contents

4. Executive Summary
5. A new approach to ERM
6. Managing Uncertainty
7. Thinking of a business as a system
8. Focusing on situations rather than just events
10. New techniques
11. Bringing it all together
12. Common practice, good practice and recommended future best practice
14. Action points for Senior Leadership to consider (a checklist)

## Introduction

The actuarial and civil engineering professions have jointly sponsored this booklet, as a contribution to thought leadership and in the public interest, as well as for the guidance of our own members.

We do not regard it as the last word on the subject and we would appreciate your feedback on the concepts and ideas which will be taken into account in preparing an updated version.

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## Executive Summary

The recent financial crises and ongoing economic volatility have increased the need to deliver value and many organisations face challenges over confidence in their business forecasts and strategic risk management. As a result, senior management is often wrestling with adjusting corporate strategy and the balance between achieving short-term advantage, and focusing on an uncertain, longer-term future.

We believe that there is much to be gained by applying rigour to the assessments of risk and future uncertainty facing the enterprise as a whole. Organisations that do so, as part of their core processes, will tend to be those which succeed in the longer term.

This booklet outlines a significant new approach to Enterprise Risk Management (ERM), adding value from the systematic management of uncertainty.

- It is designed to maximise value resulting from improved performance or new opportunity; and to ensure that organisations are well positioned to handle the uncertainty and risks that arise from the external environment over which they have no control;
- It addresses how businesses can manage the future better by concentrating on uncertainty, the overall variability of business outcomes, the connections and correlations between risks, and the scope for new business opportunities, within an ERM framework;
- It outlines new techniques now becoming available to handle the complexities involved.

It has been developed by a working party sponsored by the actuarial and civil engineering professions, based on experience of managing risks in the commercial and public sectors for over 15 years.

We are continuing to research and develop our thinking and we would welcome the opportunity to explain our ideas and to receive your feedback.

## A new approach to ERM

The key task of ERM is to ensure that in a highly uncertain world desired results for the whole organisation are made most likely, and achieved, by proactively addressing the different outcomes that may result from combinations of recognised strategic risks and unknowns.

Our approach to ERM differs fundamentally from many others because it is firmly based on the premise that the great uncertainty about the future which exists should be actively considered and influence corporate strategy and operations. It takes a systematic and holistic approach to managing that uncertainty, looking at situations that create risks and not just projecting experience of events that have impacted the organisation.

### Our approach to ERM –

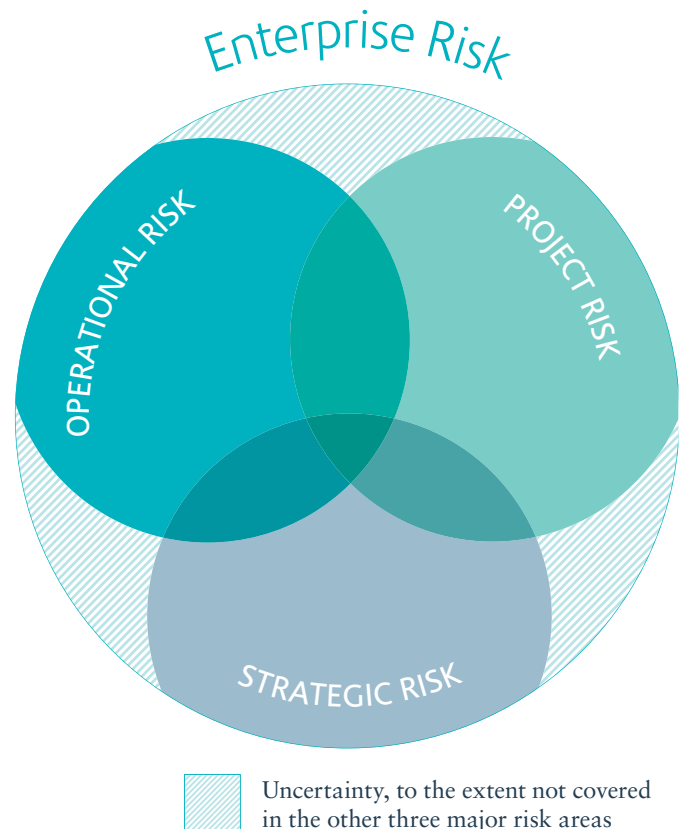
- ensures that strategic risks are studied and managed, not only in isolation but as an integral part of the whole pattern of uncertainty, threats, opportunities, pressures and external interactions facing the business;
- continually seeks to reduce uncertainty about the future, by systematically acquiring additional knowledge and by gaining a deeper understanding of the pressures and opportunities which may result from the interactions of the business with the changing outside world;
- ensures that strategic, project and operational risks are effectively identified and managed holistically, not only by understanding their underlying causes and their linkages, but also by providing cost-effective risk mitigation for the business as a whole;
- gives greater control, and directly influences project development, by supplying additional relevant information on which to base decisions with more confidence in a rapidly changing world;
- embeds risk management and consideration of uncertainty in corporate planning and development, so that the business acquires sufficient robustness and flexibility to survive future threats and pressures, and take future opportunities, even if they are currently unknown or uncertain.

Ultimately, the effectiveness of ERM is about people, their motivation and behaviours so we emphasise that risk management:

- requires inspirational risk leadership from the Board, and people devoted to monitoring and managing overall risk; and
- needs to be embedded throughout the organisation, involving all staff within a risk-aware culture, so that they think and communicate about emerging threats and opportunities as part of their everyday activities.

### DIAGRAM 1

How strategic, project and operational risk fit together



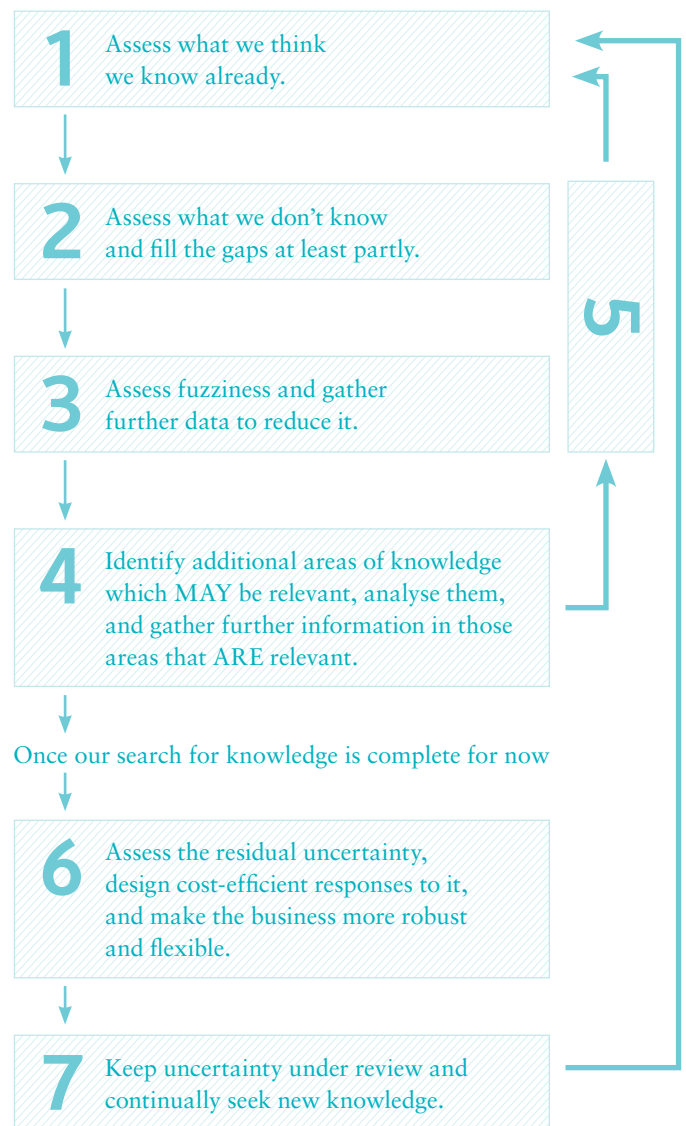
# Managing Uncertainty

Uncertainty is a lack of certainty i.e. lack of sufficient relevant knowledge for a particular purpose.

- Our approach to ERM explicitly recognises that there is great uncertainty about the future in today's fast changing world, and we aim to reduce this uncertainty, through methodically acquiring and refining extra relevant knowledge, by a practical and iterative systematic process;
- The aim is to use the extra knowledge as a firmer basis for management decisions about the very structure and strategy of the business, with a view to making it more robust and flexible, and hence better able to withstand adverse developments;
- Not all the additional information which can be obtained may be definitive, and some may be supposition, insights, tendencies, comments, or inferences – but still very useful. The temptation to close down the search for knowledge prematurely should be avoided, and available knowledge should be processed in a way which is focused on the key activities and future prospects of the business.

DIAGRAM 2

Our approach to Managing Uncertainty



## Thinking of a business as a system

- It is helpful to think of a business as a complex system of people and assets, which operates within the even more complex system of the outside world. Pressures sometimes build up between these two systems, and the eventual release of these pressures may result in sudden, serious and irresistible outcomes. Identifying and exploring such pressures in good time can enable strategic changes which avert major threats;
- Applying thought to the changing relationships between the business and the outside world may also identify unexpected new business opportunities;
- It is therefore worth devoting time, effort and resources to the development of deeper thinking about the purpose of the business, how it interacts with its environment and the wider world, and how it can be adapted to cope better with a wide range of uncertain future possibilities – such as political upheavals, new laws or taxes, economic recessions, energy discontinuities, internet interruptions, natural disasters, wars, terrorism, new technologies, etc.

DIAGRAM 3

Interacting with the outside world

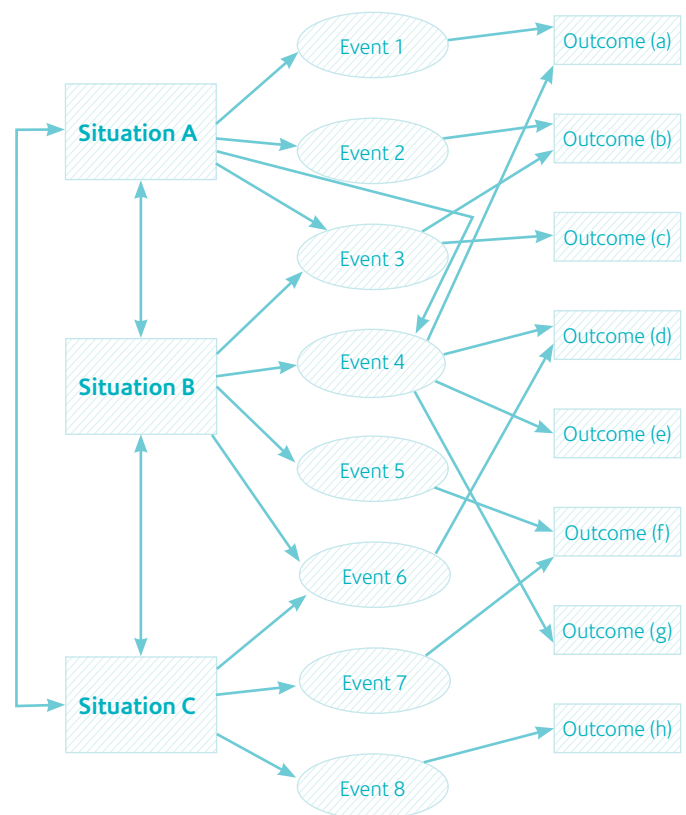


## Focusing on situations rather than just events

- Whereas traditional risk management tries to identify future events which may affect the business adversely, and to attach probabilities and impacts to them, our approach is much more focused on the underlying situations (or combinations of external and internal circumstances) which may give rise to risk and opportunity;
- Risk responses can then usefully be directed towards such situations, and their underlying causes, as well as the events and outcomes which flow from them;
- Diagram 4 illustrates simplistically how different underlying situations (which may have connections with each other or common causes) can give rise to events of various magnitudes, which otherwise might not have appeared to be connected, resulting in outcomes with differing impacts (desirable or undesirable) on the business.

DIAGRAM 4

Situations and outcomes





The table below outlines examples of the unexpected outcomes resulting from the combined occurrence of individually unlikely events developing from underlying risk situations.

<b>Situation 1</b>	<b>Situation 2</b>
<ul style="list-style-type: none"> <li>• Japan is in earthquake zone and subject to tsunamis</li> <li>• Japan relies significantly on nuclear power</li> <li>• Japan has located nuclear power stations on the coast facing tsunami threat</li> </ul>	<ul style="list-style-type: none"> <li>• Infrastructure systems (power/water/sewage/road/rail) are interconnected</li> <li>• Flood defences based on historic weather patterns</li> </ul>
<b>Events 1</b>	<b>Events 2</b>
<ul style="list-style-type: none"> <li>• Major series of earthquakes and tsunamis occurs</li> <li>• Nuclear plants collapse</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme weather results in major flooding in Gloucestershire in 2007</li> </ul>
<b>Outcomes 1</b>	<b>Outcomes 2</b>
<ul style="list-style-type: none"> <li>• Japanese manufacturers' production reduced significantly due to energy shortage – short-term negative impact on manufacturing globally – short-term working at UK car factories of Honda and Toyota due to interruption of supply chain and shortage of components from Japan</li> <li>• Pollution of land/air around Fukushima nuclear power station adds to complexity of task of recovery and rebuilding after damage from tsunami</li> <li>• Energy policies impacted worldwide due to concerns about safety of nuclear power</li> <li>• Consequential impact on global climate</li> </ul>	<ul style="list-style-type: none"> <li>• Government GCHQ threatened with being out of action – a major risk</li> <li>• 500,000 homes without power and many damaged</li> <li>• Major short-term interruption and financial damage to local economy</li> </ul> <ul style="list-style-type: none"> <li>• It is by studying such patterns (some probably very complex) that attention can be focused on appropriate responses, either to encourage or prevent certain underlying situations from existing where you have control, or to change the impact of the events and outcomes which may flow from them;</li> <li>• Another complex risk is damage to the reputation of a business from, say, criticism by a regulator, or poor handling of a major, unexpected incident which could give rise to the loss of major customers. This could in turn lead to a substantial reduction in business – but happening to a key competitor might create an opportunity.</li> </ul>

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## New techniques

New techniques are now starting to emerge, which will help in gathering additional knowledge and making the connections which may be vital for business, as well as in modelling future scenarios and inter-relationships with the outside world. To develop the best understanding of the risks, their causes and their connections, forward-looking organisations are considering future uncertainty and how different external situations could impact their business directly, or indirectly.

**Adverse external events** – thinking about how the business would respond to possible major events or developments in the outside world, including global financial crises, natural catastrophes, political change, pandemics etc. Analysis goes well beyond projections of past events and considers the possibility of impacts greater than previously seen, as well as entirely new situations.

**Interfaces with the outside world** – thinking about the business as a complex system with changing interfaces with a changing outside world. The aim is to identify early incompatibilities between the business and its environment that may result in the rapid emergence of hidden pressures, or opportunities. Insights are sought from pattern recognition in events and near misses plus less obvious but related issues such as customer gains and losses, staff turnover or competitor actions.

**Horizon scanning** – adopting a methodical, wide ranging approach to the identification of opportunities and threats that are starting to emerge. The process recognises that new developments may be seen first by staff outside the centre of the organisation (in the market, working with customers etc.), and includes channels to capture trends and new issues from all relevant parts of the business.

**Managing uncertainty** – taking the view that while great uncertainty about the future exists, it can be reduced through systematic efforts to obtain additional knowledge and informed opinion. Going through an iterative process to improve knowledge, and recognise what cannot be known, enhances risk management thinking and can transform the selection, structure and outcomes of projects. Some uncertainty will always remain and the business needs to be robust and flexible enough, particularly in terms of financial resources, to be able to cope with unexpected adverse circumstances.

### Adding these to good processes around:

- Individual risk identification and measurement;
- Modelling risk interactions;
- Scenario analysis and stress testing for overall risk exposure; and
- Assess the overall level of risk in relation to the risk appetite and the capability of the business to bear risk;
- Determination of risk capacity, tolerance and appetite, leading to more holistic thinking about risk and opportunity and hence more informed decision making at senior management level;
- Cost-effective risk mitigation.

## Bringing it all together

New techniques are now starting to emerge, which will help in focusing on the risks in the business as a whole, whilst still being in touch with the multitude of smaller risks which may escalate into strategic threats. It is not sufficient to think of the risks for the enterprise as a whole as the sum of the individual risks in various parts of the business, as this ignores the potentially large overall impact of common causes of risk which might affect the different parts simultaneously.

Nor is it sufficient for each business area to manage its own risks without reference to other areas of the business. Similarly, if risk management is fragmented among several different functions without co-ordination it is likely to be sub-optimal and may not be addressing adequately some major overall risks.

It is therefore important to have in place a process to bring the risks and uncertainties together in an integrated manner.

The diagram illustrates the activities that need to be co-ordinated effectively. This may be done through a “Business Risk Leader”, or “Risk Champion”, such as a senior member of management, or a board member, supported by a small expert group who will:

- Integrate risks holistically and assess their inter-connections;
- Understand and communicate the complexities and uncertainties;
- Oversee the technical work of analysing causes of risk and uncertainty, modelling, stress testing and quantifying financial impacts;
- Review the robustness and flexibility of the business to respond to emerging risks;
- Review the flexibility of business to respond to unforeseen risks;
- Facilitate decisions by senior management and the Board.
- Support business operations to manage their specific risk responsibilities;
- Continuously develop risk management procedures, including those to determine whether proposals for risk mitigation are cost-effective.

DIAGRAM 5

The role of a Business Risk Leader



## Common practice, good practice and recommended future best practice

The following table gives a broad indication of what we observe to be common practice in risk management and the good practice that is still more the exception than the rule. The final column shows our recommendations on the best practice that we anticipate will start to emerge over the next few years.

Risk Management Issue	Common Practice	Good Practice	Recommended Future Best Practice
Purpose of ERM	Comply with statutory requirements	Put management in a position to proactively manage the current business	“Good” plus allows Board to identify and implement an opportunistic corporate strategy
<b>Leadership and organisation</b>			
Board leadership	Poor – limited engagement	Good – active engagement	Recognition this is a core accountability and that ERM is central to Board decisions and corporate strategy
Stakeholder management	Reactive – CEO/ Board do their best	Recognition that this is essential to facilitate proactive management	“Good” plus recognition that change to the business context depends upon proactive engagement with stakeholders
Company culture	Top-down – limited sense of shared responsibility	Led from top but reasonable process to engage throughout business	Open, strong top-down plus bottom-up communication channels with RM embedded and staff empowered as the business’s eyes-and-ears
Intellectual effort devoted to ERM	Little	Significant	Major effort – understood to be central to the corporate endeavour and its effectiveness
Responsibility for risk management	Top management	Ultimately the Board for overall corporate and inter-silo risks; managers for their divisions/ departments.	“Good” plus fully informed Board responsible for ensuring development of an ambitious and realisable corporate strategy based on holistic risk assessment
Responsibility for identifying emerging risks and making sense of them	Top management	All staff for identification of downside risks A small expert group to assimilate and make sense of overall risks	“Good” plus including opportunities and Board actively engaged in strategic forward looking assessments Management formally exchanges views on key emerging risks with leading companies

Risk Management Issue	Common Practice	Good Practice	Recommended Future Best Practice
<b>Risk management process</b>			
A process?	No formal RM process	Formal embedded RM process. Focused on event-based downside risks	Organisation wide process overseen by small expert group; ERM is an integral part of the corporate strategy process
Considers opportunities?	No	To a limited extent	Yes – at least as much as threats
A developed project risk management process?	No	Yes	Yes – with uncertainty a core consideration
Impacts corporate strategy?	No	To some extent	A major determinant of this and to its modification over time
Based on understanding the future challenging external environment?	No	Partly	Yes – with considerable effort devoted to understanding this and its potential impacts (good and adverse)
Informed by major effort to obtain new information to reduce uncertainty?	No	Little and not done systematically	This a central process, conducted systematically, until extra information becomes counter-productive
Considers situations, or scenarios, not just prior events?	No	Partly	Yes – including systematic horizon scanning with diverse inputs and analysis of how situations lead to types of risk events
Review and improvement of the existing RM process?	Reactive to external requirements, or major surprise	Regular review in light of experience	Continual, seeking to learn from own experience and from others
<b>Output of the RM process</b>			
A risk map that formally identifies 'top-10 threats and opportunities'?	No	Yes – based on event-based downside risks	Yes – based on a holistic appraisal of all risks – threats and opportunities – and the implications for corporate strategy
An ambitious, opportunistic but realistic and implementable strategy?	No	No	Yes – with the appropriate risk management culture embedded throughout the organisation and its management processes
A good appreciation of how external situations may lead to a combination of impacts	No	Limited	Yes – based on detailed consideration which is part of the ongoing process



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## Action points for Senior Leadership to consider (a checklist)

1. Review existing risk practices in the organisation.
2. Ensure a suitable ERM Framework is in place which includes the study and management of possible future variability of business outcomes, both upside and downside.
3. Ensure that the organisation takes a proactive, continuous and unbiased approach to the management of uncertainty. Adopt a methodical, iterative and holistic approach which involves deep thinking about many aspects of uncertainty and the impacts which they may have on the business, to obtain greater understanding of overall and individual risks and their causes and inter-connections.
3. Require particular attention to be paid to areas of incompatibility between the business and the changing outside world, with a view to identifying pressures which may build up and not be recognised.
4. Using techniques such as horizon scanning, establish appropriate early warning systems of emerging risks and opportunities, so that responses can be developed before it is too late.
5. Consider the introduction of quantitative approaches to “modelling” the business, which will enable the level of risk taken to be matched to the overall level of risk which the business can bear, through the exploration of various possible future scenarios.
6. Make arrangements for ERM to be interwoven with corporate strategy and the business development process, and taken fully into account as an important input to them, with the aim of achieving enough robustness and flexibility in the business, as well as a suitable risk-reward balance. Pay special attention to the achievement of sufficient financial flexibility to enable the business to survive setbacks which may be more severe than anticipated.
7. Organise risk management so as to achieve and maintain a holistic and focused approach to the risks for the enterprise as a whole.
8. Ensure that there are adequate methods in place for identifying, analysing and managing strategic, project and operational risks and opportunities, and that these methods properly consider uncertainty and are integrated with each other and the ERM process.
9. Ensure that there is a system for adequate and continuing engagement with external stakeholders, to manage their expectations and to obtain their perceptions about the business and its place within the world.

## The Actuarial Profession

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