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Directing risk management in organizations
Guidance from the Centre for Risk Research

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University of Southampton

About the Centre for Risk Research

Since the Centre for Risk Research (CRR) was established in 1990 its members have developed and fostered a unique interdisciplinary approach to risk and decision-making research, consultancy, and education. In particular, the Centre aims to encourage a deeper appreciation of the nature of risk, to develop approaches to its analysis, and to help individuals and organizations make better decisions and effectively manage risk and uncertainty.

The Centre for Risk Research is based in the Southampton Business School at the University of Southampton.

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Foreword

Over the past few decades, the understanding of risk analysis and management has continued to develop, despite some vigorous controversies.

More and more people are realizing that the behaviours that contribute to successfully analysing and managing risk are varied and pervasive. Risk management is not just a bureaucratic process, but a theme that links a multitude of improvements in organizations.

The varied and multidisciplinary work undertaken at the Centre for Risk Research is an ever-present reminder to me of the astonishing wealth of opportunities to improve via appropriate risk analysis and management.

There is also an increasing realization that risk analysis and management are more than just a way to reduce the impact of nasty surprises. Uncertainty makes the impossible, possible, and effective risk management aims to secure opportunities that uncertainty affords.

Partly to encourage these trends, we have developed this guidance for directors and others who must oversee the development of risk management in organizations.

The guidance aims to be practical and reliable. It is illustrated with cases from our own experience and elsewhere.

We trust you will find this guide helpful and welcome your feedback.

Professor Johnnie Johnson
Director of the Centre for Risk Research

Contents

Introduction and overview

This guide provides criteria and associated recommendations that allow rapid evaluation of risk management. It is designed to support those responsible for overseeing risk management in organizations. This includes board directors, partners, council members, senior civil servants, politicians, and everyone else who oversees risk management in an organization.

The guidance should be useful to anyone who is interested in risk management when seen from that top level. This also includes middle managers, risk managers, auditors, and authors of regulations, standards, and other guidance.

The evaluation criteria focus on the big choices about scope and approach that make most difference to the overall value provided by risk management and by initiatives within organizations intended to develop their risk management.

Although the criteria are uncontroversial common sense, they cover all of risk management, not just those aspects that are currently regulated, and they focus on common weaknesses. Consequently, many organizations will find they trigger valuable insights and changes.

Those overseeing risk management often receive advice from risk management specialists and are expected to be appropriately sceptical and challenging while still supportive of the goal of managing risk well.

In doing this, they should understand that risk management is a difficult and controversial area. Experts do not yet agree on many important points, such as the meaning of the word "risk", the scope of risk management, and the value of commonly used and recommended techniques. Very few initiatives to improve risk management are evaluated scientifically and general guidance and regulations on risk management by organizations are not yet evidence-based. The evidence that does exist shows that some familiar methods have serious logical flaws, are confusing to users, and produce poor results.

Proposals for developing risk management within an organization may not lead to initiatives that are effective and worthwhile, even if they have been designed by experts and are consistent with leading guidance and applicable regulations.

Consequently, those overseeing risk management need to evaluate proposals critically, ask for improvements where appropriate, and then monitor progress and results objectively. The overall evaluation criteria in this document are designed to support this important role. They focus on the big choices about scope and approach that are important and relatively quick to assess.

Sometimes the big issues – including the big gaps – are harder to see than the details.

The remaining sections of this guide provide:

- A realistic perspective on what those overseeing risk management can do, and what they can expect.
- Scope evaluation criteria that can be used to rapidly detect gaps in the coverage of risk management development work as a whole.
- Approach evaluation criteria that can be used to quickly find weaknesses in particular risk management initiatives.
- Additional recommendations on how to apply the evaluation criteria and then make sure action is taken and results are objectively assessed.

The topics covered by each set of criteria are shown in the following boxes.

Scope Criteria: applied to risk management development initiatives as a whole

1. Outcomes sought
2. People
3. Types of decision
4. Broad risk management approaches
5. Key processes
6. Techniques used
7. Skills

Approach Criteria: applied to each risk management development initiative

1. Flow of ideas
2. Focusing resources
3. Adaptive, incremental, measured approach
4. Focus on behaviours
5. Efficient assurance and compliance
6. Technical quality assurance

"...those overseeing risk management need to evaluate proposals critically, ask for improvements where appropriate, and then monitor progress and results objectively"

Influencing risk management in an organization

Risk management is pervasive, with a surprisingly broad scope and a range of potential benefits for organizations. Those at the top of organizations can powerfully influence the development of risk management, but need to think critically and focus on what matters most.

The broad scope of risk management

The scope of risk management is controversial. There are debates about the meaning of key words like "risk" and "uncertainty".

This guide takes a broad approach, encompassing most sensible, modern views. Consistent with most recent guidance, it takes risk management to be a broad discipline that tackles all that is important and hard to predict, not just potentially harmful events.

Risk management can involve a wide range of techniques that help to manage uncertainty. It is not defined by any one approach.

Its scope includes **all** important decisions in organizations, not just decisions on actions seen as responding to individual risk concerns.

Consequently, the behaviours that contribute to risk management are distributed throughout organizations. These behaviours are varied and often not identified explicitly as risk management. There are differences in ability to manage risk between individuals and between organizations. Managing risk poorly is often at least a contributor to disappointing outcomes and sometimes the main cause.

Tightly controlling all actions that affect risk in an organization is not feasible, but it is possible to control some important actions and to influence others usefully.

The contributions of risk management

An organization can obtain a variety of benefits from better risk analysis and management. Deliberate choices should be made because some of these benefits involve trade-offs.

For example, an organization may aim to:

- reduce the likelihood of very serious negative outcomes from existing operations and projects;
- execute more ambitious initiatives successfully;
- improve operational performance in the short term by better management of individually small but frequent events (e.g. shop lifting, billing errors, products broken in transit, parking fines); or
- accelerate opportunities (e.g. by trialling products more quickly and efficiently, or by spotting growing niches more quickly).

Opportunities to contribute from the top

Company board members and those in equivalent roles in other organizations have two particularly important roles in risk management:

- If those senior people oversee the development of risk management within their organization in a strong, well informed, and intelligent way then this should contribute to the success of risk management efforts throughout the organization.
- If they manage risk better in their own deliberations and conversations then this is likely to contribute to the outcomes of the whole organization directly, and through its influence on the risk-managing behaviour of other employees.

A more detailed itemization of the opportunities to contribute is provided in the box titled **Opportunities to contribute**.

The role that is the main focus of this guidance is that of overseeing the development of risk management.

The need for a critical approach

A suitably critical approach is needed when overseeing the development of risk management. This is because even advice from experienced risk specialists that is based on leading guidance and complies with regulations may still lead to ineffective initiatives and even result in a false sense of comfort.

Risk management is a controversial area where experts do not yet agree on many important points. Very little advice on risk management is evidence-based and risk management initiatives and techniques are rarely evaluated scientifically.

When scientific assessment is eventually carried out, what might be found? Scientific assessments of programmes to improve management, education, healthcare, and so on typically report limited success or no success at all, with some programmes making matters worse. Compelling ideas and inspiring case histories can create expectations that are not met when a programme is attempted by others.

This history should shape our expectations of risk management initiatives.

Also, there have been instances in recent times of organizations that failed to manage risk well despite following authoritative advice.

Consequently, those overseeing risk management in organizations cannot assume that advice they receive on how to manage risk in their organization is good advice.

However, by applying sensible criteria that allow rapid evaluation of risk management initiatives, it is possible to identify and correct many common-sense reasons for disappointing results. By insisting on objective monitoring and assessment of results it is possible to identify when risk management initiatives are not helping or are not efficient.

Overview of the evaluation criteria

The Centre for Risk Research at the University of Southampton's Business School has developed this guidance, including the evaluation criteria, to support people in overseeing the development of risk management in their organizations.

This provides an opportunity to make major improvements relatively easily by checking the big choices of scope and approach and, if necessary, asking for changes to proposed and ongoing work so that they better meet the criteria.

The seven **Scope Criteria** can be applied at any time and address the scope of all risk management development work in an organization. If large areas of potential improvements are overlooked then highly worthwhile opportunities for specific improvements are likely to be missed. By ensuring that all major areas are considered it is possible to increase the returns from investments in developing risk management across an organization.

Also, if large areas of risk management activity are overlooked then information provided to satisfy regulations on risk management will tell an incomplete story. Potentially helpful risk management work will be missing from the evidence provided.

The six **Approach Criteria** should be applied when current or proposed initiatives to develop risk management are reviewed. They cover aspects of the approach taken by the initiative, again at a high level.

Both sets of evaluation criteria are designed to identify important common weaknesses.

The criteria are illustrated by a small selection of examples, some based on work by members of the Centre for Risk Research.

Opportunities to contribute

The opportunities for board directors and people in equivalent roles to drive risk management in their organizations, even if they are not specialists in risk management, may be elaborated as follows:

- Evaluate, challenge, and inspire proposed and ongoing work to develop risk management within their organization.
- Participate in monitoring the progress and outcomes from this work.
- Carry out their role within separate risk management exercises, supporting what works and encouraging continued improvements.
- Carry out their role within key management, design, and decision activities that involve them personally, supporting what works and encouraging continued improvements.
- Try to manage risk diligently and skilfully, even outside formalized management processes. In doing this they can do the following:
  - Be open-minded, objective, willing to think, encourage the collection and use of data, and to ask for more analysis.
  - Prefer plans and designs that are flexible, robust, and generate information, so that progress can be made even when much information is missing.
  - Think through alternative potential outcomes, not just one estimate or desire.
  - Recognize when dysfunctional behaviour is likely or is already happening and act to reduce and eliminate it.
  - Talk to people and give them instructions and guidance in such a way that those people are encouraged to manage risk well themselves.

Criteria for evaluating the overall scope of risk management development

The collective scope of ongoing and proposed initiatives to develop risk management is crucial and should be carefully considered. This is true regardless of how those initiatives are organized.

The development of risk management within an organization – maintaining, adapting, and improving it – may be organized as one or more programmes, one or more ongoing activities, or some combination. Also, it may be part of a broader effort to improve the way work is done that is not focused exclusively on managing risk. In this guide, the phrases "risk management development initiatives" and "risk management development" encompass all these arrangements.

Looking at a wider scope does not necessarily mean doing more work, but should lead to better results from whatever resources are invested. Within the chosen scope, the initiatives individually and collectively should focus their resources on the most worthwhile specific improvements.

The search for those improvements should have a broad scope because the wider the scope the better the chances of finding specific improvements that are highly worthwhile. Conversely, ignoring large areas of potential improvements could result in very worthwhile improvements being missed.

No area for potential specific improvements should be excluded from consideration other than as a result of well-informed decisions that deliberately defer consideration until later.

The specific improvements resulting from an initiative need not be all possible improvements within the scope considered. Improving risk management does not need to involve more resources if there are still opportunities to use existing resources on more worthwhile improvements.

The overall scope of existing and proposed risk management development initiatives should be reviewed against criteria designed to reveal common gaps, and any gaps found should be considered carefully.

The Scope Criteria

The following seven Scope Criteria and supporting points of focus are designed for this purpose. Collectively, they ask the question: Have we overlooked any important area for managing risk?

1. Have the **outcomes** sought from risk management development been considered broadly?
   - Do these outcomes reflect the legitimate interests of all stakeholders, or just some?
   - Is all the risk management development work directed at just one or two types of outcome, such as financial effects, or health and safety?
   - Are the intended improvements all about avoiding disaster?
   - Is the combination of objectives (e.g. disaster avoidance, operational performance improvement, better execution of ambitious initiatives) for risk management development acceptable?
2. Are all the **people** involved with the organization within scope?
   - Are there any units of the organization that are excluded from the scope (e.g. departments, divisions, subsidiaries)?
   - Within included organizational units, are there any levels in the hierarchy that are excluded from the scope?
   - Are there people outside the organization but still involved who could be influenced to participate in managing risk better, such as contractors and customers?
3. Are **all significant decisions** within scope, or is consideration limited to just decisions on actions seen as responses to individual risk concerns?
4. Are all the following **broad approaches** within scope?
   - *Standalone:* This involves risk management activities (e.g. workshops, databases, modelling exercises) that are separate from other work activities and dedicated to risk management only, such as reviews and remedial exercises.

Redesigning trading decisions

One type of risk management project CRR researchers have undertaken relates to financial services companies (e.g. a market maker) that decide to review the way they take key trading decisions. In one such project, the goal was to see if decisions to refuse or immediately hedge particular transactions from particular traders could be improved using machine learning techniques. These might support or replace the human judgement previously relied upon.

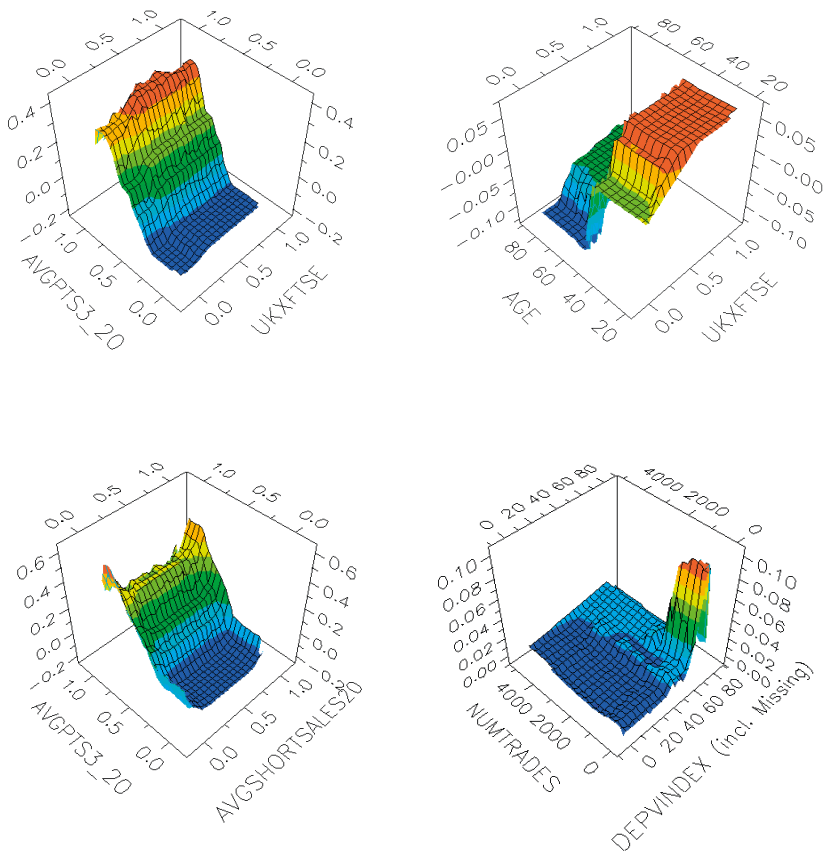
This illustrates an initiative to redesign a key decision process.

In one recent example, the research involved analyzing around 20 million transactions using a variety of machine learning techniques (SVM, Random Forest, and deep learning neural networks).

The performance of the machine learning approach was tested by simulating its use on the previous several years of actual transactions. The results showed the machine learning led to better decisions because, although the company employees knew the factors to focus on, they were not as effective at combining information on several factors into a judgement.

This is a typical finding and companies usually react with initial surprise but often go on to implement machine learning in parallel with human judgement as a cautious step towards full automation.

This type of project also illustrates the importance of testing ideas for better risk management, in this case by backtesting followed by cautious implementation, carefully monitored.



Machine learning tools can uncover complex relationships between variables in risky decisions

A narrow programme

An overall programme to develop risk management that is based solely on creating and maintaining a risk register has narrow scope. It will tend to focus on risk response decisions, may not have any effect on the way key management, design, and decision processes are done, and may have no effect on the risk management skills of individuals.

It will probably focus on listing specific risk concerns and overlook ideas that do not involve thinking about possible futures, such as policies to promote general resilience to a wide range of potentially unanticipated threats.

A programme with wider scope might still include a risk register process, but continued development of this process is unlikely to remain the most cost-effective improvement to risk management in the longer term.

- *Integral to key processes:* This involves work to review, revise, improve, and adapt the way key management, design, and decision processes are done so that risk is well managed as a consequence. (These are the processes where it is worthwhile deliberately designing the way work is done, documenting it, training people to follow procedures, and so on. Examples include: annual planning, longer-term planning, project management, system design, product development, lending decisions, investment decisions, and performance management.)
- *Behavioural:* This involves work to teach and encourage employees to manage risk well as part of their work, including when they are not participating in standalone risk management activities or key management, design, or decision processes (e.g. in smaller, more diverse, everyday decisions).

5. For developing risk management that is integral to key processes, are all important **management, design, and decision processes** within the scope?
   - Does the scope include high level planning, decisions, and organizational design processes?
   - Does it include key decision and design work crucial to the outcomes of the organization (e.g. lending decisions, engineering design work)?
   - Does it include those processes with an enterprise-wide scope?
   - Does it include objective setting (or equivalent), reporting, performance evaluation, and rewards?
6. For all the broad approaches mentioned in criterion 4, is a range of good **techniques** for managing risk in scope?
   - Is the range of different techniques to be used within key management, design, and decision processes suitable for those processes, or is the intention to use only one method in all cases?
   - Do the techniques include those that involve thinking about possible futures (e.g. forecasting models, scenario planning, war gaming) as well as those that do not (e.g. policies promoting general resilience through improved communication, incremental project delivery, designed redundancy)?
   - Do the techniques range in rigour, allowing people to choose the best combination of rigour and cost for each situation?
   - In all cases where behaviour change or maintenance is required, is a combination of methods used to improve behaviour?
   - Do these include prompts that act at the time the behaviour is required (e.g. on-screen prompts, signs in the working environment, timely reminders in meetings) as well as written guidance/procedures, policies, training, coaching, and (dis)incentives?
7. Does behavioural work on the **risk management skills** of individuals cover all the following?
   - Reducing unhelpful behaviours and promoting helpful behaviours.
   - Specific behaviours along with general traits, attitudes, or virtues.

Encouraging a behavioural shift

Another project involving CRR researchers was initiated by a large systems integrator that wanted to produce a profound shift in decision-making behaviours across all its 1,600 managers.

This illustrates a behavioural initiative aimed at decisions under risk/uncertainty outside key processes, though it was thought of as a cultural change at the time. They wanted to encourage managers to be more willing to respond to threats with positive actions rather than retreat. Their market was changing rapidly and fundamentally so this willingness was crucial.

In groups of 20, all 1,600 managers attended a two-day educational event at which they worked through an extended business simulation. The case created realistic decisions where alternative responses to challenging, uncertain situations were required. Managers were guided to consider more positive, ambitious ways to manage risk than was typical in the company at that time. This contributed to a "cultural" shift that helped the company face its changing market.

Betting on horse racing is a traditional example of participating in prediction markets

Extracting the wisdom of crowds

One way to make better predictions is to get more people involved, efficiently, using a prediction market. Participants place bets on outcomes (e.g. projected sales, time to project completion), and those bets are turned into useful probabilities. This can work well when relevant information is widely distributed among participants because people tend to bet more heavily when they have reason to be more confident.

Betting markets are traditional examples of prediction markets, and a major current research area for the Centre for Risk Research.

In a recent project, we helped an organization with access to bets on a variety of sporting, political, and celebrity events to extract useful forecasting information from them. The work involved developing intelligent data cleaning algorithms and statistical tools applied to real-time, big data. The approach adopted was sophisticated and produced valuable forecasts but the principle of the approach was simple.

This case illustrates how dealing with risk better using powerful techniques can create competitive advantages, and even the opportunity to do business in new ways.

Fighting cybercrime

The world is increasingly intelligent and interconnected globally. For example, our wealth exists as bytes on a computer and our cars cannot be serviced without connecting them to a computer. Things are faster, more convenient, and more efficient, yet also more complex and more accessible to criminals with the skills and tools to exploit them.

Understanding and managing cyber threat/risk is a growing challenge and another major focus for teaching in the Centre for Risk Research. For example, one recent project, funded by the Higher Education Academy and supported by the University Chief Information Officer, is to facilitate collaboration between the University's Academic Centre of Excellence in Cyber-Security and IBM. The project is exploring, from both learning and practical perspectives, how the UK can educate the next generation of cyber-capable graduates.

Prediction and big data analytics technology can help organizations understand what normal user behaviour looks like and spot abnormal, suspicious behaviour as quickly as possible. A recent project funded by GCHQ is focusing on developing risk-aware data anonymization techniques.

Detecting suspicious behaviour often involves combining data to reveal patterns

Transport infrastructure projects are notorious for biased cost estimates, but improvement is possible

Revising estimates

A major government department responsible for many large transport infrastructure projects found that too many of its projects exceeded budget.

It initiated an exercise to review and adjust the estimates for its ongoing projects. With help from a CRR researcher, this was done using different methods to those originally used to form the estimates. These new estimates were typically larger but more accurate.

This illustrates one form of standalone risk management initiative, one in which the original estimators were involved.

Subsequently, changes to routine risk management processes were recommended and approved.

Criteria for evaluating the approach of an individual initiative

A suitably comprehensive scope for risk management development initiatives as a whole is crucial to outcomes. However, key features of individual initiatives can be crucial too.

The design of each proposed or ongoing initiative to develop risk management should be considered against evaluation criteria designed to reveal common weaknesses.

If an initiative does not meet some of those criteria then the weaknesses should be carefully considered. There should be no weak or missing elements other than as a result of well-informed decisions.

The Approach Criteria

The following six Approach Criteria and supporting points of focus have been developed for this purpose. Collectively, they ask the question: Is this initiative taking an approach that is likely to work?

1. Is the initiative designed to produce a **strong flow of good ideas** for specific improvements and adaptations?
   - Are there activities specifically designed to stimulate good new ideas for changes?
   - Does the initiative develop, acquire, and apply useful expertise and ideas?
   - Does the initiative use a toolkit of technical ideas for managing risk that is rich in powerful techniques, or is it a small set of bureaucratic ideas?
   - Does the initiative seek and generate ideas for supporting design, decision, and management using automation, mathematics, models, and data gathering, or are these opportunities ignored?
2. Does the initiative **focus its resources** on the most worthwhile improvements?
   - Does the approach do this by taking into consideration a range of relevant factors, not just perceived risk levels? (Examples of other factors include: availability of people and other resources, willingness to make changes, recent experiences that have heightened particular concerns, the introduction of powerful new ideas, and the amount of work done in an area in the past.)
   - When ideas for investing in models, automation, and data are evaluated, is there a realistic appraisal of the expertise needed, the expertise that is available or could be, the extent to which consideration of alternative plans and designs would increase with the aid of an automated model, and the advantages of accuracy?
   - Are the only improvements selected for implementation those that are expected to use resources efficiently?
3. Does the initiative adopt an **adaptive, incremental, measured approach** in which learning is planned, outcomes are assessed, and ideas for improvement continue to be generated over time (rather than all in an initial design phase)?
   - Is progress in generating and implementing ideas for improvement tracked and monitored?
   - Is the impact of implementing ideas for improvement assessed promptly, rigorously, and objectively (rather than assuming that ideas that should work, will work or have worked)?
4. Does the initiative include activities to understand, assess, value, and develop the **behaviours** that most contribute to managing risk in the organization?
   - Does the initiative include understanding, valuing, and improving activities that already contribute to good management of risk within the organization, such as within key management, design, and decision processes?
   - Does the initiative include understanding and addressing the negative consequences for risk management of management systems used by the organization?
   - Is thinking about behaviours clear and practical, or is it vague and idealistic?
5. Are assurance and compliance achieved in an **efficient, natural** way?
   - Is the need to create evidence of good management of risk recognized and reflected in plans?
   - Is the intention to capture that evidence conveniently (where possible), including

Oil industry projects are extremely costly and challenging, and uncertainty is a huge factor

Improving project uncertainty management

A major oil company successfully introduced a new and improved approach to managing uncertainty in its huge and challenging projects. It did this in steps, learning as it went.

First, it developed an approach based on a very promising design by one of the CRR's most experienced members, and tested a prototype on a project it had already done using other methods. During this trial, a company employee worked with, and learned from, the CRR expert.

The new approach was approved for use on its first live project. Another company employee became the project's uncertainty analyst and received continued support from the CRR expert.

The first live use was carefully monitored and the project itself was completed on time and within budget, despite some surprises, at least in part because of robust contingency plans put in place by the new approach.

The new approach was made mandatory for future projects that were large or sensitive and the first project's uncertainty analyst became the company's uncertainty process manager, with a team of analysts supporting all the company's projects. Within a year the analysis that had initially been done in 6 months was being achieved to the same level in less than 6 weeks.

The uncertainty analyst team was later integrated within a larger project planning team, formalizing the integration of its work into projects. Over time, the team's importance grew and it became involved in projects earlier and earlier so that strategies were formed using uncertainty rather than just analysed. At the same time, a simplified version of the method was used increasingly during detailed planning and execution.

In addition to monitoring each project, the outcomes of projects performed with the new approach were accumulated and specially analysed. This showed that bias in estimation had been removed, which is a remarkable achievement for such large and complex projects.

This example illustrates the value of an adaptive, incremental, measured approach to introducing improved risk management.

within key management, design, and decision processes?

- Where the organization has to comply with regulations on risk management, are those regulations interpreted carefully in a way that demonstrates compliance without creating unnecessary or unhelpful work (or is the approach just to interpret the regulations as literally as possible)?

6. Is there suitable **technical quality assurance**?
   - Is there technical challenge by adequately knowledgeable individuals of techniques proposed and used (e.g. to identify mathematical errors and unmanaged psychological biases)?
   - Do quality assurance requirements discourage investment in models because they place requirements on models but not on decisions taken without models?
   - If sufficient data are available, does quality assurance include testing any probabilities generated by models?
   - If an alternative to probabilities is used, is it systematic and logically defensible?

Having an initiative that addresses all these criteria does not guarantee good risk management, but it should help eliminate some of the common causes of disappointment.

SOX s404 programmes

In the early days of international compliance with section 404 of the Sarbanes-Oxley Act of 2002, which affected companies listed in the USA, it was common to start with a phase of documentation, then move on to a phase of testing, and finally collate the results to submit evidence on effectiveness of controls. All parts of a company would do the same activity at the same time.

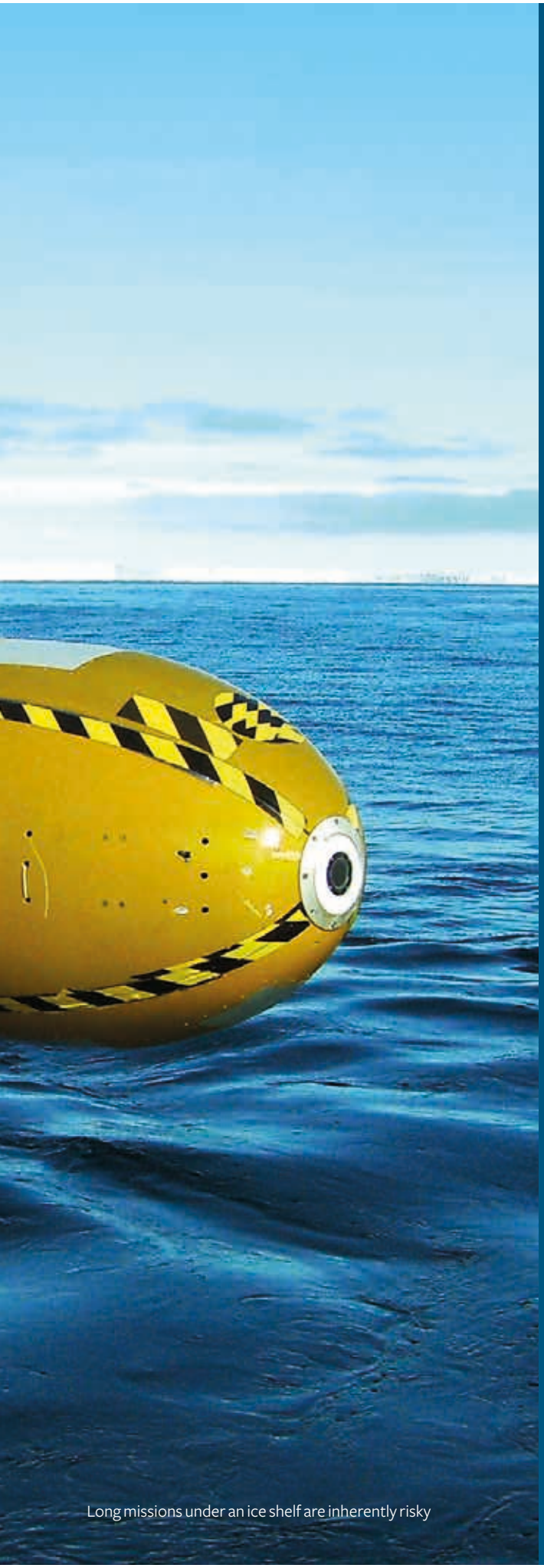
A much better approach was an incremental one in which some parts of the company went through the whole documentation-to-reporting cycle as quickly as possible and their lessons were shared with others that followed.

Weather forecasting accuracy

Weather forecasting is an area where the accuracy and value of forecasts are often carefully assessed and a number of metrics have been developed for doing this. A typical benchmark is "climate", which is simply the average weather for the time of year. A weather forecast that does not do better than forecasting "climate" is worthless, so many metrics focus on how much better a forecasting approach is than "climate".

This illustrates the value of testing probabilities.

Photograph: National Oceanography Centre



Long missions under an ice shelf are inherently risky

Autonomous Underwater Vehicle missions

Autonomous Underwater Vehicles (AUVs) are small, unmanned submarines. Larger AUVs can operate in extremely difficult and dangerous places. Missions that go many kilometres beneath ice shelves are particularly hazardous because if the AUV fails it usually cannot be recovered, the AUV is lost, the mission fails, and all subsequent missions planned for a particular campaign must be cancelled. Some missions are for scientific research purposes but others are for military or geopolitical purposes, where failure of the mission may be more important than the cost of the AUV itself.

Decisions about the design of an AUV, the exact plan for each mission, and the plan for a season's campaign require consideration of a wide range of hazards that might result in the AUV being lost entirely or unavailable for a period of time, so that missions have to be delayed or even cancelled.

The methods used for these decisions have been studied intensively and improved over the years. This progression illustrates the value of having a strong flow of good ideas for improvement, which is evidenced by the stream of publications on risk analysis for AUV decisions.

For example, Autosub3 is an AUV designed and operated by the National Oceanography Centre. The models used to support decisions about Autosub3 draw heavily on the huge body of scientific and technical work on modelling. The mathematical and behavioural methods used have combined innovations with techniques whose performance has been carefully studied in the past.

In one project undertaken by CRR members, models were used to explore the chances of Autosub3 being lost or unavailable and several steps were taken to increase the reliability of these models. The models were populated with probabilities that combined historical data from past missions with judgements from members of expert panels. This was done with both behavioural and mathematical techniques.

In addition, differences of opinion between experts were examined and either accepted or resolved by further discussion. The events of actual missions were considered afterwards by the experts who helped to build the model that was used to plan those missions.

These models are not correct in any absolute sense, but they are highly informative because they bring together so much information and then combine it appropriately.

Applying the evaluation criteria

The overall aim of applying the evaluation criteria is to replace narrow, low-impact initiatives with initiatives that (a) focus their resources on specific improvements with outstanding returns, (b) draw on a wide range of techniques, and (c) produce incremental, measurable improvements to the organization through its management of risk.

The criteria focus on high level matters, appropriate for those directing risk management development, and avoid conceptual and technical controversies.

However, a number of practical issues may still arise while assessing initiatives, asking for changes, and monitoring progress and outcomes.

Assessing initiatives against the criteria

Applying the evaluation criteria is more difficult where the scope and approach of an initiative have not been documented. The lack of an explicit approach is itself a weakness that needs to be addressed but does not entirely prevent assessment.

For example, when assessing the scope of ongoing risk management initiatives, lack of specific improvements in an area is evidence that the area may have been overlooked.

If an initiative seems to rely on just one technique as the solution for all situations then it is almost certainly not generating a strong flow of good ideas.

If there are obvious mathematical or logical errors then it is very likely that suitable technical quality assurance is not in place.

If it cannot easily be established if an approach meets the criteria then the conclusion should be that it does not and more work is needed to make the situation clear.

Another key challenge in evaluating risk management development is to identify important risk management activities that are not talked about often at board level (or equivalent). Some may not have been recognized as part of risk management. In particular, in some large companies, conversations at board level about risk focus on risk registers, heat maps, risk appetite statements, and perhaps also regulatory risk modelling. However, within those companies there may also be work going on to improve planning and forecasting processes, to capture and use more information, and to accelerate the pace of innovation through more efficient trialling. Such initiatives make a huge contribution to risk management and may involve far greater resources than work on the risk register.

If evaluating the scope of risk management development is made difficult by this challenge, one approach is to evaluate what is visible at board level and to ask for the scope gaps to be filled, either by new work or by making existing work more visible.

Asking for changes

Where the evaluation criteria are applied and reveal the need for changes, there are two ways to ask for those changes:

- Request particular changes to the scope and approach of an initiative or risk management development as a whole.
- Ask for an initiative or the whole approach to risk management development to be created or revised so that it meets the criteria.

Asking for wider scope does not necessarily mean asking for more work to be done. The goal is to find and implement the most worthwhile specific improvements by searching widely and being appropriately selective.

Widening scope might involve looking at work in areas where little or nothing has been done in the past and those who would do that work may be concerned that they may not succeed.

For example, where past initiatives have focused on implementing risk registers, an initiative that involves changing the way annual planning is done involves different skills and requires influencing people in a different way.

Those overseeing risk management usually have the authority to provide or facilitate cooperation and should expect suitable investments in developing or acquiring new skills. Risk management development will follow a progression as those involved develop their skills and their approach.

In judging the need for changes to the approach taken by an initiative to develop risk management, the comparison should be against other ways to use resources on risk management. An initiative

should not be accepted just because it is better than doing nothing. To be acceptable, the initiative should be at least as good as all obvious alternatives, which includes expending the same resources on alternative risk management activities.

If an initiative has obvious gaps, weaknesses, or even logical errors then it will usually be possible to think of a better alternative approach.

Regulations

Many organizations today are subject to a range of regulations on risk management and the perceived requirements of those regulations are sometimes seen as obstructive constraints that make it hard to do what seems sensible.

If this appears to be the situation then it is worth checking exactly how prescriptive the regulations really are. Sometimes the regulations have been interpreted more narrowly than necessary.

Also, even where the regulations clearly do require a superficial or illogical approach to be used, there is usually no requirement to rely entirely on that approach. An investment in the required technique that is adequate to meet the letter of the rules can perhaps be complemented by evidence of other effective procedures already in place and by new investments in more powerful techniques. The combined effectiveness of these may be greater and more convincing than an approach that invests the same resources entirely in the technique explicitly required by the regulations.

Following up

If the evaluation criteria have been applied and changes to the overall risk management development effort or to a specific initiative have been asked for, then there is a need to check again that revised proposals are acceptable.

In addition, the progress and outcomes from initiatives should be monitored. As stated in the Approach Criteria, an objective, measured approach is needed. It is very easy for people to feel that an initiative has been helpful when in reality it has made no positive difference overall, or its benefits have been short-lived.

Conclusion

Those responsible for overseeing risk management in organizations have a number of ways they can influence progress and outcomes. The evaluation criteria in this document provide a relatively easy opportunity to identify big issues of scope and approach that can be addressed, leading to better risk management development initiatives and a better approach overall.

The evaluation criteria encourage a wide search for truly worthwhile changes, and initiatives that are well designed to deliver improvements.

Development of the guidance

This guidance was developed during 2016 by a team based in the Centre for Risk Research.

It was inspired by our growing realization that a new kind of guide to risk management was needed.

The aim was to provide a fresh and distinctive guide that:

- provided a practical tool for senior people charged with overseeing risk management in organizations;
- encompassed all of risk management, not just the details of a particular process, tool, or template;
- was open to a wide variety of ways to manage risk and yet still tackled the practical issues and mistakes we have seen too often; and
- openly recognized the current lack of evidence and agreement on many aspects of risk management.

The content is based on our experience of risk management projects and of problems organizations have with risk management, and of course drew on the vast body of relevant scientific research. We also took into consideration our experiences of participating in standardization work and the results of a series of surveys designed to find out what most people really think on a range of risk management questions.

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