Supporting safety decision making in companies: Briefing notes for Board members, managers and other leaders

energy institute

SUPPORTING SAFETY DECISION MAKING IN COMPANIES: BRIEFING NOTES FOR
BOARD MEMBERS, MANAGERS AND OTHER LEADERS

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FOREWORD

Safety within an organisation is heavily influenced by decisions made at executive Board level and by senior managers of the divisions in the case of large multilevel organisations ('leaders'). Lack of direction and oversight from leaders has been cited as a major contributory factor by investigations into some of the largest incidents that have occurred in the energy industry. However, leaders do not act in a vacuum; they are responding to the information they are provided with by managers and their understanding of that information, as they balance the demands placed on them by competing business drivers such as: optimisation of income and expenditure to maximise profit; and maintaining licence to operate and the confidence of all stakeholders.

Even if leaders are not directly involved in operational decision making about personal safety and process safety issues, they are responsible for creating the appropriate environment to assure the safety of the organisation's activities, create the right conditions for itself in which to make good decisions, and avoid falling into the pitfalls of bad decision making.

The Energy Institute (EI) Human and Organisational Factors Committee (HOFCOM) identified the requirement to provide guidance on supporting good decision making in companies to:

– enable companies to understand and manage the factors that influence decision making at leadership levels, and

– improve the quality, understanding, and flow of information at the top of organisations, in order to facilitate better informed decisions, specifically where those decisions can impact on major accident hazard safety.

In order to reach a large target audience, which includes Board members, other senior personnel, and others who wish to gain an insight into how companies operate, each section in this publication is designed to be, to a certain extent, a stand-alone briefing note. Each 'briefing note' focuses on a different aspect of supporting decision making by leaders, and can be read by Board members, senior managers and other personnel individually (giving a snapshot of one aspect of decision making), or as a single publication (giving a more complete picture).

This publication covers a number of subjects, including safety culture, social and cognitive biases, and risk assessment. The information within should not be considered to be definitive; instead, the publication aims to provide practical guidance, to be informative, and to give a well-rounded overview of the subject. It is clear that any one of the topics discussed within the publication can be expanded upon with a publication in its own right, and that practices around managing decision making are likely to develop and improve over the next few years. The first edition of *Supporting safety decision making in companies: briefing notes for board members, managers and other leaders* represents a starting point for beginning to address the subject.

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1   INTRODUCTION

Safety within an organisation is heavily influenced by decisions made at executive Board level and by senior managers of the divisions in the case of large multilevel organisations ('leaders'). Lack of direction and oversight from leaders has been cited as a major contributory factor by investigations into some of the largest incidents that have occurred in the energy industry. For example, the CSB report into the incident at Texas City in 2005 stated, '[The company] Board did not provide effective oversight of the company's safety culture and major accident prevention programs' (Report no. 2005-04-I-TX). However, leaders do not act in a vacuum; they are responding to the information they are provided with by other managers and their understanding of that information, as they balance the demands placed on them by competing business drivers such as: optimisation of income and expenditure to maximise profit; and maintaining licence to operate and the confidence of all stakeholders.

In large public companies, the Board tends to exercise more of a supervisory role, and individual responsibility and management tends to be delegated downward to individual professional executives (such as a finance director, marketing director or an operations director) who deal with particular areas of the company's affairs. In smaller companies, the Board members themselves may also be executive managers in the company, and directly responsible for operational areas.

Even where leaders are not directly involved in operational decision making about process and personal safety issues, they are responsible for creating the appropriate environment to assure the safety of the organisation's activities, create the right conditions for good internal decision making, and avoid falling into the pitfalls of bad decision making.

As suggested by various models of human error, such as Shappel and Wiegmann's human factors analysis and classification system and Reason's Swiss cheese model, decision making and latent failures at all levels of the organisation (i.e. not just Board members and leaders) can have an impact on unsafe acts by operators. In many organisations, the term 'leader' can refer to those at the operational level, such as control room supervisors, as well as those further up the organisational structure. This guidance is not specifically aimed at those leaders/supervisors further down the organisational ladder, such as maintenance and operational supervisors. The focus is instead on senior managers or 'leaders' who interact and support Board members, as well as Board members themselves, although some guidance is applicable to a broader audience.

1.1   WHAT ARE THE BOARD'S RESPONSIBILITIES FOR MANAGING SAFETY?

The Board's responsibilities for managing process and personal safety can be split into five areas:

1.   Setting the safety culture of the organisation.
2.   Ensuring that effective process and personal safety management arrangements are implemented.
3.   Defining and monitoring the required performance measurement and reporting arrangements, and stewarding the organisation's progress to achieve the defined performance targets.
4.   Defining the organisation's 'appetite for risk'.

5.   Strategic business planning and budgeting; ensuring that performance targets and plans to achieve them are established and implemented.

1.2   CREATING THE RIGHT CONDITIONS FOR DECISION MAKING (AND AVOIDING THE PITFALLS)

Process and personal safety decision making can be negatively affected by the following issues:

–   Lack of specialist process and personal safety specialism at Board – and other leadership – levels.

–   'Groupthink' and other cognitive/social biases: leaders convince each other that all is well, and dismiss the signals that say otherwise.

–   Inappropriate performance measures or misunderstanding what those measures mean: an overreliance on lagging personal safety indicators, lack of 'bad news', and a 'target culture'.

–   Issues of risk perception: the perception of risk is not completely rational, and can differ from person to person.

–   Not considering the unintended consequences of budget setting: lack of understanding how different expenditures affect process and personal safety performance.

1.3   SCOPE OF THIS PUBLICATION

The EI and HOFCOM identified the requirement to provide guidance on supporting good safety decision making at leadership level to:

–   enable companies to understand and manage the factors that influence decision making by leaders, and

–   improve the quality, understanding, and flow of information at the top of organisations, in order to facilitate better informed decisions, specifically where those decisions can impact on major accident hazard safety.

In order to reach a large target audience, which includes Board members, senior personnel, and others who wish to gain an insight into how companies operate, each section in this publication is designed to be short and, to a certain extent, stand alone. The intention is not to be exhaustive, but to give useful information to a reasonable level of depth. Each section focuses on a different aspect of supporting decision making at leadership level, and can be read by Board members and other senior personnel individually, or as a single publication. The sections combine aspects of the Board's responsibilities, along with elements of the pitfalls of decision making in a way that is brief and, as much as possible, avoids duplication. However, it should be noted that aspects of decision making are interrelated, meaning that only reading one section will not give the full picture.

2 SETTING THE RIGHT SAFETY CULTURE

2.1 THE LEADERSHIP ROLE

Safety culture is 'the way we do things around here' – or perhaps more accurately, 'what we do when nobody is watching'. Safety culture should be set from the top of the organisation, starting with the Board and senior managers.

Decisions that the Board and senior leaders make should visibly demonstrate personal commitment and accountability for process and personal safety, leading by example and upholding core values and standards of the organisation. Decision makers should ask 'what does this decision say about my values, and about our safety culture?'

People within the organisation are more likely to be influenced by the standards that they see being set, and the resulting behaviours displayed, than by written words. Leaders should set an example of the safety culture behaviours they want to see across their organisation. If leaders fail to adhere to the required standards or if they fail to intervene when they observe or are made aware of an unsafe act/situation, this will be seen by others as a clear signal that the rule or standard is not important and that it is acceptable not to comply (see Table 1 What makes a good safety leader?). The influence of the directors and senior managers is very significant in this respect as they will establish the lead for the way that successive levels of leadership behave. This is illustrated in Box 1.

Box 1: A $200 million message

A CEO of a multinational oil company was confronted with a decision relating to a very expensive exploration oil well. The well was very deep and had cost in excess of $200 million and was yet to strike oil. The geologists were confident that they were close to oil-bearing strata and that if they were to progress they would strike oil. Consequently they were keen to continue drilling. However, the drillers were concerned that they were at the limits of their equipment and that if they continued to drill, in the event of an incident, they could not guarantee that they would be able to control a blow-out. The CEO was confronted with a dilemma: a high probability of an oil strike balanced against the possibility of an incident if he were to sanction relaxing the company's drilling standards and accepting a higher level of risk.

The CEO was not prepared to relax the company's drilling standards and decided that the drilling should stop, the well be sealed and the opportunity passed up. The lead geologist was heard to say: 'We have just drilled a $200 million dry hole'. The response from the CEO was: 'We have just sent a $200 million message to the organisation that I mean what I say when it comes to safety'.

Table 1: What makes a good safety leader? (Adapted from Roger, I (2013) *Safety leadership in the energy industry,* Doctoral thesis, University of Aberdeen)

A good safety leader…	Good examples	Bad examples
'Walks the talk' Acts as a safety role model. Shows personal interest in safety by visibly dedicating time and attention to safety matters and adhering to company safety policies.	Challenges decisions that may have a negative impact on safety. Considers the unintended consequences of decisions. Seeks out input when making decisions. Devotes time to safety matters. Uses effective decision making processes.	Avoids safety related expenses (e.g. a risk assessment, equipment, etc.). Makes decisions based on questionable assumptions, risk analyses or scenarios to keep production going. Devotes little time to safety matters. Allows short-term cost pressures to dictate decisions.
Stays informed Proactively seeks to understand the organisation's safety culture.	Asks challenging questions. Encourages the communication of all concerns (big or small), and understands that small issues can contribute to disasters. Monitors the 'weak' signals that something may be wrong, and actively seeks out the 'bad news' (the vulnerabilities). Understands that different parts of the system interact to cause unforeseen problems.	Does not probe beyond the information given. Shows impatience when bad news is delivered. Doesn't seek relevant lessons from other companies. Overlooks repeated delays of audits and maintenance schedules. Only monitors minor or 'obvious' issues while neglecting more complex safety concerns.
Promotes trust and accountability Trusts, and is trusted by, the workforce to do the right thing.	Supports people who make tough decisions in favour of safety over production[1]. Promotes engagement with the workforce and helps create a culture of concern for colleagues. Considers the comfort and wellbeing of the workforce when making decisions. Looks beyond the individual (e.g. to procedures, availability of equipment) when expectations are not being met. Sets and upholds policies that promote safety and wellbeing.	Does not convey a sense of concern or caring for individuals. Cuts programmes that benefit general health or well-being of the workforce. Makes operational decisions that place additional burden on the workforce in the interest of saving money. Ignores policies on safety and wellbeing.
Prioritises safety over other considerations Safety is always the number one priority, even if it means stopping production.	Takes the time to visit sites. Rewards people who actively work safely. Steps in when safety expectations are not being met. Seriously considers attitudes and safety performance during performance evaluations. Provides additional coaching, training and resource if needed to get people up to safety standards. Makes the coaching and training of staff, including contractors, part of company policy. Tempers profitability motive with operational slack.	Safety is only rewarded when it does not interfere with production/schedule/budgets. Performance evaluations emphasise productivity above all else. Expresses irritation/anger when people shut down work in dangerous conditions. Company policy is not to get involved in contractor training and competence.

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[1] Note that leaders have an important role to play in promoting 'willingness to act'; i.e. willingness of frontline workers to respond to escalating loss of control by shutting down operations, even if it later proved to be unnecessary. This will be covered in El *Human factors briefing note no. 22: Willingness to act.*

2.2   SAFETY AT THE TOP OF THE AGENDA

With the continual drivers for commercial, financial, and production focus it is important to maintain a balance by considering safety and risk as key elements when making judgements and decisions at Board level. Long-term company success requires effective safety and risk management.

It is common now in companies to attempt to place safety at the top of the agenda, e.g. by having a 'safety moment', daily safety message, or a standing item to discuss safety at the beginning of leadership meetings. Every meeting starts with a 'safety moment' where process and personal safety issues are discussed, statistics reviewed and examples of incidents/near misses are given. The purpose of doing this is to ensure that safety is discussed during meetings and to demonstrate the importance of safety. It is therefore a means of improving safety culture.

These items should have some substance (not simply used as a way of telling everyone to 'be safe'); the issues discussed should be carefully considered and referred back to during the rest of the meeting if later discussions (such as budgets) could have an impact. The risk is that the 'safety moment' marginalises process and personal safety; be careful that safety moments are not followed by words such as 'and now down to business', or that people are not prevented from bringing up safety issues during the rest of the meeting.

2.3   WHAT DOES BETTER CULTURE LOOK LIKE?
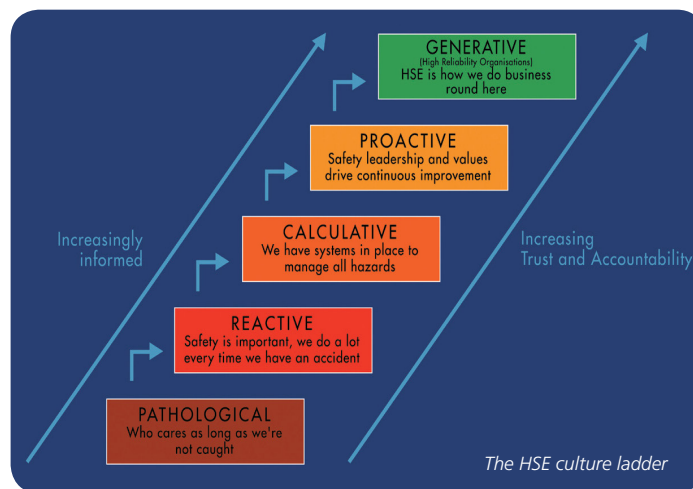
Figure 1: Hearts and Minds culture ladder

While there are a number of models of safety culture, a commonly used model is the Hearts and Minds/Hudson and Parker 'culture ladder'. This categorises culture into five stages of maturity, with the lowest stage of culture (pathological) being a company that does the minimum to maintain safety. Reactive cultures simply react to issues as they happen (with changes rarely lasting long), while calculative cultures are those with extensive management systems in place. Proactive cultures are those that proactively try to improve their management system by involving the people who use it to make improvements (both to the system and to

the way of working) before problems arise. Generative culture is an aspirational target, also known as being a 'high reliability organisation' where 'safety is how we do business around here'. The benefit of this model is that, once it is known where the company stands on the ladder, it is possible to 'see what better culture looks like'. However, in reality, organisations will display a mixture of cultures at once (e.g. varying from the night shift to the day shift), meaning the model is more a means of understanding cultures (plural) than a means of objectively allocating the organisation to a single cultural label.

2.4 FURTHER RESOURCES

There are numerous resources on improving safety culture, many of which are short and approachable. For further information, the following publications are readily available:

– EI, *Human factors briefing note no. 9: Safety culture*

– Hearts and Minds, *Understanding your culture*

– IOGP, report no 452*, Shaping safety culture through safety leadership*

3 WHAT COMPETENCES SHOULD THE BOARD HAVE?

3.1 COMPETENCE

Specific competences of Board members and other leaders may vary quite considerably according to their backgrounds. Typically executive directors with responsibility for production or operations are likely to have more experience of managing process and personal safety issues, while others may have very little. Therefore, there should be a system to establish the competences required for Board members to ensure these are present within the Board through selection, as well as a competence building programme in place to ensure a baseline competence regardless of the varying backgrounds and level of experience of Board members.

Research for Eurocontrol (*Safety intelligence for ATM CEOs*) has identified three types of safety competence leaders should have. Whilst the work does not specifically address Board competences these are readily applicable:

–   safety knowledge;

–   problem solving, and

–   social competence.

3.1.1 Safety knowledge

As a team the Board should be able to address the following topics confidently:

As a Board, can you confidently answer 'yes' to each of these questions?	Yes/No
Do you understand 'how safety works'? (Do you understand concepts like Swiss cheese, process safety, occupational safety, barriers, human factors, and unintended consequences?)	
Do you understand how incidents happen and how safety can fail? (Do you understand concepts like Swiss cheese, barriers, human factors, and root/underlying causes?)	
Do you accept that the underlying causes of incidents are often decisions made at senior (including Board) level?	
Do you understand the safety information in the company? (Do the company's safety performance key performance indicators (KPIs) mean much to you? Do you understand the difference between process safety and personal safety, and that indicators for one tell you nothing about the other? Do you understand the difference between a leading and lagging indicator?)	
Do you know what questions you should be asking concerning the available safety data? (Or do you take these data at face value?)	
Do you know whether safety is being maintained sufficiently? (Is the company 'ahead of the game' or slipping behind other companies? Do you understand the value of leading and lagging indicators?)	
Do you understand the possible threats to safety? (Do you understand the impact that Board decisions, e.g. when setting budgets, may have on safety? Do you understand that safety enables production and enables long-term value?)	

If the answer is 'no' to any of these questions, then it should be determined what is needed to improve the competences of the Board with regard to safety. In some companies, Board members attend short training courses on process safety. The expectation is not for Board members to be experts, but to know enough to be 'intelligent customers'. It is recommended that Board members and other senior leaders without an operational background attend one-day training courses covering process and personal safety management. These courses should include:

–   barrier-based approaches to risk management (i.e. Swiss cheese, Bow Tie, etc.);
–   how accidents occur;
–   human and organisational factors, and
–   risk assessment and mitigation.

3.1.2 Problem solving

From a Board perspective, this means being able (and willing) to look beyond performance data and understand how different issues may be related (or only appear to be related). This does not necessarily mean knowing the answer, but understanding when to probe further (e.g. by a site visit, or setting up a specialist task force). This type of knowledge is greatly enhanced through training in human and organisational factors.

3.1.3 Social competence

This means Board members have an authentic commitment to safety leadership, and are able to *communicate* that commitment. This in part requires good social skills such as being a good listener and understanding others' points of view, but can also be achieved through company activities, such as 'safety days' that demonstrate the Board's commitment.

3.2 TAILORING TO BOARD COMPETENCES

Even with basic training in process and personal safety management, the Board will not be specialists on these subjects, and those reporting to and advising the Board should make efforts to frame the information given to the Board in terms they are familiar with. This may involve avoiding technical language, will probably require working with the Board to see what format works best for them, and should involve the use of a commonly understood approach to communicating the levels of risk the organisation is/would be operating at, along with understandable scenarios of 'what could go wrong' and the potential effects to the organisation (see section 7: What is the company's 'appetite for risk'?).

3.3 THE SAFETY DIRECTOR

Some companies may choose to appoint a Board level safety director. This can help ensure the Board has the competence to understand process and personal safety data and the implications of decisions, and can ensure process and personal safety 'has a seat at the top table'. However, this can also marginalise process and personal safety matters, as it becomes seen as the sole responsibility of the safety director rather than a core concept for how the company functions.

If a safety director is appointed, the roles and responsibilities should be clearly defined throughout the Board, so that process and personal safety does not become the sole responsibility of one person. Accountability for overall process and personal safety performance should sit with the Board as a whole, with each director being responsible for the management of process and personal safety within their designated area. However, ideally the responsibility of the safety director should be to ensure that process and personal safety management arrangements are appropriately monitored. They should also be responsible for ensuring that the appropriate information is framed and presented, to provide the Board with a clear picture of what is going well and where there are issues that require an intervention, and in a way that makes sense to the Board. Where there are issues, it should be the responsibility of the safety director to ensure that they are presented in such a way that the issue, its significance in the context of the business, and any conflicting goals can be readily understood by all of the Board, including any less technically experienced Board members (see section 7: What is the company's 'appetite for risk'? and section 8: Avoiding the unintended consequences of business planning and budget setting). The safety director should also ensure that available options to address the issue are presented, including an assessment of advantages and disadvantages associated with each of the options.

In cases where there is no dedicated safety director, the responsibility for coordinating the information presented to the Board may sit with a safety manager who is not a member of the Board, or it may sit with each of the directors for their respective areas. In these cases it is likely that there will be a standing item for process and personal safety on the agenda for Board meetings. The benefit of this approach is that it can clearly demonstrate that each executive director has responsibility for safety within their own area. The downside can be the lack of an overall independent perspective being presented to the Board.

4 ENSURING EFFECTIVE PROCESS AND PERSONAL SAFETY MANAGEMENT ARRANGEMENTS ARE IN PLACE

The Board has overall accountability for the governance and performance of the company. In common with the requirement to have appropriate financial management arrangements and controls in place, appropriate process and personal safety management arrangements and controls should be established and implemented.

The vast majority of process and personal safety management and decision making will be delegated to managers at lower levels in the organisation. The Board should ensure that these managers are provided with appropriate guidance as to what they are expected to do, what they are authorised to approve and the criteria they should use in decision making – in short, a structured process and personal safety management system. Delegation without this form of guidance is in effect abdication of responsibility.

A structured process and personal safety management system will help to define what issues and decisions should be brought to the Board for review, resolution or approval.

Failure to establish an effective process and personal safety management system can result in misunderstanding about which process and personal safety issues should be raised with the Board. This in turn can jeopardise the Board's ability to develop a clear picture of the issues which underpin performance.

Box 2: An example of health, safety and environment arrangements

The EI has published a series of guidance documents that provide an example of a safety management system that will help ensure process safety performance. *Guidance on meeting expectations of EI process safety management framework* is a series of 20 publications ('guidelines') commissioned by the EI Process Safety Committee (PSC). Each guideline includes:

– a logical flow diagram of activities ('steps') the organisation should undertake in order to manage the different aspects of process safety performance (from 'leadership' to 'competence' to 'incident investigation');

– descriptions of those steps;

– example performance measures to measure the extent to which key steps have been undertaken;

– a list of further resources to help undertake key steps, and

– annexes of useful information.

Each guideline is freely available from the EI and has been adopted by a number of companies. For further information, please visit:

https://www.energyinst.org/technical/PSM/psm_guidelines

Personnel responsible for developing and implementing the proposed approach for a safety management system and presenting it for approval should ensure that they clearly define and present:

– the business case for having formal safety management arrangements;

– the gap between the current situation and the proposed situation together with the implications of these gaps (in terms of risk to the organisation);

- what should be done to implement this;

- the resources required;

- the proposed schedule;

- what will be required of the organisation, and.

- what will be required from the Board by the proposed arrangements.

When doing so, later sections of this publication should be taken into account, particularly section 7: What is the company's 'appetite for risk' and section 8: Avoiding the unintended consequences of business planning and budget setting.

4.1   QUESTIONS FOR THE BOARD

When reviewing the proposals for a process and personal safety management approach, the Board should ask the following types of questions to ensure that the suggested approach is appropriate:

1.   Does the proposed approach meet or exceed applicable legislation and recognised industry standards and good practice?

2.   What are the options available, and their scope and implications for safety?
    a.   Full scope.
    b.   Reduced scope.
    c.   Doing nothing.

3.   What is the priority of this activity relative to other issues that need to be addressed?

4.   What are the options available in terms of schedule and their implications for safety?
    a.   Schedule as proposed.
    b.   Accelerated schedule.
    c.   Elongated or deferred schedule.

5.   What is the availability of the required resources?

6.   What will be required of the people within the organisation?

7.   What will be expected from the Board and each of the directors?

8.   Do the arrangements define delegated levels of authority for decision making?

9.   What are the experiences of other organisations which have implemented similar arrangements?

5   COGNITIVE BIASES AND THEIR IMPACT ON DECISION MAKING

Decision making can simply be described as the ability to reach a judgement or choose an appropriate option to meet the needs of an assessed or anticipated situation. Leaders should be able to make 'good decisions', i.e. sound judgements based on the information they are presented with. The difference between a 'good' and a 'bad' decision can be the difference between success and failure. However, the way our brain works can introduce biases that impair or influence our decisions. Furthermore, these biases can be amplified through group decision making.

Awareness of these biases and how they can impact on decision making is the first step to avoidance. Although there is no quick and easy fix for this, being aware that biases exist and that we have little conscious control over them allows the use of various safeguards to try to limit the impact of biases on decision making. See 5.4: Overcoming cognitive biases and groupthink for further detail.

This section is relevant to Board members, managers, and other leaders as all individuals and groups/teams are susceptible to a range of biases. Some are more applicable to particular roles or situations, and this is indicated in this section where possible.

5.1   FAST AND SLOW DECISION MAKING

Psychologist, Daniel Kahneman (*Thinking fast and slow*), has identified two different ways of thinking known as system 1 ('fast') and system 2 ('slow'). System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control. System 2 allocates our attention to effortful mental activities, including complex computation. System 1 is fast, intuitive and emotional, while system 2 is slower, more deliberative and logical.

We think of ourselves as being system 2 thinkers: conscious, reasoning; we make choices and deliberately decide what to think about and what to do. However, in general, system 1 continuously generates suggestions, intuitions, and feelings which, if endorsed by system 2, become voluntary actions. This is generally a highly efficient process because most of the time system 1 accurately models familiar situations. However, system 1 thinking is fast because, in order to compensate for its limitations, the brain has developed certain short-cuts (heuristics) to allow individuals to make quick and reasonably accurate decisions when facing complex problems, time constraints or limited information. But these 'mental short-cuts' can also lead to severe and systematic errors in judgement, called 'cognitive biases' and 'social biases'.

The problem is that we cannot tell where an intuition or impression has arisen from (i.e. from accurate modelling of past experience, or biases) and therefore we tend to impart equal trust to all. This means that we often have high confidence in our judgements and decisions, despite them being based on inaccurate memories, perceptions, experience etc.

Box 3: System 1 vs. system 2 thinking (Adapted from Kahneman, *Thinking fast and slow)*

System 1 – When shown a picture of an angry woman we can immediately, and as easily, determine that she is angry. We do not intend to assess her mood or anticipate what she might say or do, it just happens to us. Other activities attributed to system 1 include orienting to the source of a sudden sound, detecting hostility in a voice, and creating stereotypes. We are born with some of these (i.e. to perceive the world and recognise objects) and others are developed through practice and experience.

System 2 – On the other hand, when given an arithmetic problem such as 17 x 24 we may have some vague intuitive knowledge of the range of possible results. However, carrying out the computation involves slow thinking as you proceed through a sequence of steps. The key feature that system 2 activities have in common is that they require attention and are distracted when attention is drawn away.

5.2 COMMON COGNITIVE AND SOCIAL BIASES

There are many cognitive/social biases. Cognitive biases largely arise from unconscious system 1 thinking and the heuristics associated with this. Cognitive biases are tendencies to think in certain ways that lead to systematic deviations from a standard of rationality or good judgement. Social biases are often also labelled as attribution biases because the focus is upon how we judge others or expect others to judge us. Biases in perception and information processing often involve a focus on individuals rather than systems, which may result in overlooking more likely causes of the problem. These are particularly important with regard to event investigations and Board member decisions based on feedback on success of initiatives or projects. Social biases also include those biases that arise during group interactions and how this can lead to potentially unjustified decisions/outcomes.

These biases can influence group interaction (i.e. Board member decision making directly), evaluation of project success, risk perception, and key learning from events and performance data (i.e. the accuracy of the information fed to the Board). This can all lead to poor decisions in relation to business planning, investment, and budget setting, which ultimately impacts safety.

Mitigations should be put in place to overcome the cognitive and social biases where possible. There should also be a healthy level of challenge directed towards the information that is presented to the Board and how this is used to support decisions made. Other leaders throughout the organisation also should consider these biases when they feed information up to higher levels of the organisation. Those who review Board decisions should be particularly wary of both cognitive and social biases and challenge the information used to reach decisions.

The link between biases, event investigations, and safety performance data is further explored in section 6: Safety performance data – what does it all mean?, as well as an explanation of how process safety management arrangements can provide leaders with assurance that the information they are reviewing is providing an accurate picture.

Common biases relevant to decision making are described in Tables 2 and 3.

Table 2: Common cognitive biases

Cognitive bias	Description	What does this mean for Board members?
Confirmation bias	A form of selection bias in collecting, remembering and/or interpreting evidence. Confirmation bias is a tendency for people to seek information and cues that confirm the tentatively held hypothesis, and not seek or discount those that support an opposite belief or conclusion.	For Board members and managers, this could lead to poor decisions based on inaccurate preconceptions. Ideally, the presence of other group members enables challenge of these preconceptions and inaccurate weighting of the supporting evidence; however, there is also the potential for groupthink (see 5.3).
Availability bias	People give more significance to easily remembered (and likely more recent), or more accessible, information. Judgements of frequency are based on our impression of the ease with which instances come to mind; we do not actually need to recall instances to give us this impression. Saliency, dramatic events, and personal experience are other factors that increase the ease with which instances come to mind. E.g. when spouses are asked 'How large was your personal contribution to keeping the house tidy, in percentages', the self-estimated contributions add up to more than 100 % because each spouse can remember their own efforts and contributions more clearly than those of the other.	For Board members and managers, this can mean that decisions on processes, initiatives, safety culture etc. are based on inaccurate judgements of frequency and risk, particularly in relation to performance data. Ultimately, if changes from the higher levels of the organisation are not seen to be addressing the right issues, it could lead to a disincentive towards safety culture at the operational level.
Anchoring bias	When given an initial piece of information, people fail to change their views significantly in light of new information and base their estimation on this original value (even if it has no relevance to the question at hand). This is a 'first impression' bias. E.g. two people are asked to estimate how old Albert Einstein was when he died (they do not know the answer). The person that is asked whether he was more than 114 years old when he died will subsequently give a higher estimate of his age at death than the person who is asked if he was older than 35 when he died. The initial question anchors the person.	For Board members, this can influence budgetary and business planning decisions (e.g. investment in a project).

Table 2: Common cognitive biases (continued)

Cognitive bias	Description	What does this mean for Board members?
Sunk cost bias	People make choices that support past decisions or escalate commitment to a course of action to which they have invested time, energy, reputation, or money – even when data indicate the course of action may be mistaken. Interacts with confirmation bias. E.g. this could lead to a decision to continue drilling a well, even if the risk of blow-out is getting intolerably high.	For Board members, this can influence budgetary and business planning decisions (e.g. unjustified continued investment to a failing project).
Over confidence bias	People often have excessive confidence in their own opinion or expertise, particularly after they have had a few 'easy wins'. E.g. a pilot may make a decision to fly in bad weather because they have never had any negative consequences of doing so in the past and therefore, have unjustified confidence in their ability.	For Board members, this may influence perceptions about project success and, therefore, decisions about risk and success of future projects and who is involved.
Status quo bias	People generally do not like change, and so favour options that perpetuate the status quo. 'If it ain't broke, don't fix it'. This also supports the mentality of 'If what we were doing in the past is OK and our current practice is almost identical, then it must be OK'. E.g. choosing to stick with the current equipment supplier rather than changing to a better one because things are 'OK'.	For Board members, this can impact decisions made about safety and such opinions can be perpetuated by groupthink and other cognitive biases. These types of decisions can result in distrust in Board members and managers by those at the operational level (i.e. they are not prepared to change).
Hindsight bias	Because of their knowledge of what happened after an event, people have a tendency to overestimate their ability to have predicted the outcome, even if it could not possibly have been predicted. Hindsight bias leads people to believe 'I knew it would happen'. E.g. 'I knew I should have taken the other route rather than this one, and now I'm stuck in traffic'.	For Board members and managers, hindsight bias is dangerous as it can prevent us from learning, as we already believe we knew how to prevent the thing that happened.

Table 3: Common social biases

Social bias	Description	What does this mean for Board members?
Social desirability bias	People tend to answer questions and present information in a manner they think will be viewed favourably by others. This is particularly a problem when collecting survey information.	For Board members and managers, it is important to be aware of this bias when reviewing survey results and understanding safety culture or other issues at the sharp end of the organisation.
Fundamental attribution error	People tend to over-emphasise personality when explaining other people's behaviours, while under-emphasising the role and power of situational influences (but do the opposite when explaining their own behaviour). E.g. 'he did this because he is careless'; 'I did this because I was under time pressure and distracted by something'.	Board members should be aware of this bias and the effect it can have on event reports and performance data; i.e. understanding the true root causes of failure.
Defensive attribution bias	People attribute more blame to a harm-doer as the outcome of a situation becomes more severe and as personal or situational similarity to the victim increases. This is used to avoid the worry that one might be victimised in a similar way. E.g. someone might be blamed more if a dropped object results in injury than if it injures no one.	Board members and managers should be wary of this bias when making decisions based on event investigations or reviews of project/initiative success. It may also bias risk perception and therefore, affect business planning.
False consensus effect	People tend to overestimate the degree to which others share their beliefs, attitudes, and behaviours. E.g. believing that all your friends think that protecting the environment is important because you personally think it is morally right.	Board members should be wary of this bias because it can prevent learning from a situation and contributes to cognitive biases when assessing future situations, risk and reaching decisions.
Moral luck	People tend to ascribe greater or lesser moral standing based on the outcome of an event. E.g. 'I knew I was right to take the risk, we finished in record time with no injuries!'	For Board members, this may affect planning and forecasts for projects, as well as decisions based on performance data, project success etc. (i.e. inaccurate information means poor decisions).

Table 3: Common social biases (continued)

Social bias	Description	What does this mean for Board members?
Self-serving bias	People tend to claim more responsibility for successes than failures. They attribute positive events to their own character and negative events to external factors. E.g. a student gets an A on an essay and attributes this to working hard, but they get a C on another essay and argue that the teacher did not explain the assignment well enough.	This bias is more likely to be used when we attribute the way we behave to external factors (i.e. those related to the situation and not the individual). For the Board, this can prevent learning.
Shared information bias	Group members tend to spend more time and energy discussing information that all members are already familiar with (i.e. shared information), and less time and energy discussing information that only some members are aware of (i.e. unshared information). This is most prevalent when group members are motivated by a desire to reach closure (e.g. when there are time constraints).	Board members and managers should be aware of this bias during meetings and mitigate against it, e.g. by appointing somebody to be impartial and challenge the topics discussed, the information presented, and the input from each group member.
Planning fallacy	People tend to estimate the success and timelines of a project they are involved in according to a best-case scenario rather than a realistic assessment. They focus on the specific circumstances (inside view) and search for evidence using this experience, rather than consulting the statistics of similar cases. E.g. a team perceived to be making good progress in a project will predict success in a short timescale and will not call to mind previous experience in similar projects which suggests otherwise.	This may affect the information passed up to Board members as well as the planning and decision making at the Board level. As a result, initiatives may be pursued that are unlikely to be on time, on budget or deliver the expected results.

These biases are often a result of our attempt to simplify information processing. Because they are hardwired into our brains, we fail to spot them and can make the same mistake over and over again. Decision-making, individually or as part of a team, is therefore not easy. Importantly, these biases influence our perception and processing of information as well as our perception of risk, which in turn affects the prioritisation of issues and the decisions made. As the stakes rise so does the possibility that the outcome will be driven by bias rather than the reality of the situation. This is particularly important in the energy sector, where risks and consequences of mistakes or failure are high and decision making is likely to be driven by risk.

5.3   GROUPTHINK

When working in groups, individual biases can be reinforced and amplified leading to poor group decisions. The result is 'groupthink'. This involves a group suspending their rational judgement in order to maintain group cohesion, often by accepting, without challenge, a proposal by a respected leader. Groupthink can apply to many teams or groups throughout an organisation, from the Board at the top, to leaders and supervisors, and down to operational teams.

Within a group, an individual's weak bias towards an option can be exacerbated by another individual holding a similar opinion, despite there being no further evidence to support the increased confidence in the weak bias. This results in the individual asking fewer questions, not testing hypotheses, and accepting this option as the right one much more easily.

While different companies and countries have different Board set-ups (making it difficult to generalise), typically there are two types of director:

–   **'Inside' director** – a director who is also an employee, officer, major shareholder, or someone similarly connected to the organisation. Inside directors represent the interests of the company's stakeholders, and often have special knowledge of its inner workings and its financial or market position. An inside director who is employed as a manager or executive of the company is typically referred to as an executive director. Executive directors often have a specified area of responsibility in the organisation, such as finance, marketing, human resources, or production.

–   **'Outside' director** – a member of the Board who is not otherwise employed by or engaged with the company, and does not represent any of its stakeholders. For example, an outside director may be a CEO of a firm in a different industry. Outside directors bring outside experience and perspective to the Board. They keep a watchful eye on the inside directors and on the way the company is run. However, they might lack familiarity with the specific issues connected to the company's governance. They are usually referred to as non-executive directors.

In the case of local affiliates of large multi-national corporations, the local country Board may be entirely composed of 'inside directors', typically executive directors with no 'outside' independent directors. A Board of this kind can be particularly vulnerable to 'groupthink', when a group makes faulty decisions because group pressures lead to a deterioration of 'mental efficiency, reality testing and moral judgement' (Irving Janis, 1972). In short, without external moderation, there is greater likelihood of each member in the group reinforcing one another, leading the group towards a predetermined decision. Board size can also affect the likely vulnerability of a Board to groupthink because of our cognitive limitations. For example, eight-12 people can know each other well enough such that a group's potential to integrate thinking is enhanced and the potential for dislocation (feeling of not belonging) is reduced. Large Boards increase the opportunity for leadership to be controlling and political and are also more likely to suffer from groupthink. This is because, in a larger group, there is more motivation to reach unanimity than to appraise alternative courses of action. Therefore, group members focus more on trying to minimise conflict and reach a consensus, rather than critically testing, analysing, and evaluating ideas.

5.4   OVERCOMING COGNITIVE BIASES AND GROUPTHINK

'If we can accept the fact that the human mind has an infinite, creative capacity to trick itself, we can guard against irrational, unethical decisions.' (Messick and Bazerman, 1996)

5.4.1   Overcoming cognitive bias

Individuals might not be able to do much about their own biases but they can learn to spot them in others. This knowledge, together with appropriate questioning, can then be used to reduce the effect of bias within the teams they work with, and in doing so, they will help improve the quality of business decisions.

Kahneman recommends three questions to minimise the impact of cognitive biases in decision making:

1.   Is there any reason to suspect the people making the recommendation of biases based on self-interest, overconfidence, or attachment to past experiences?
2.   Have the people making the recommendation 'fallen in love' with it (i.e. lost their objectivity)?
3.   Was there groupthink or were there dissenting opinions within the decision-making team?

Awareness and mitigation of these biases at the Board level do not guarantee a sound decision will be made, due to the interaction with leaders and managers further down the organisation (i.e. they should pass up accurate information). Therefore, the interaction between Board members and other managers/leaders is important. The Financial Reporting Council recommends some steps to counteract distorted judgement:

1.   Executives should put their case at earlier stages, well in advance of the point of decision, so that directors have the opportunity and time to share concerns and challenge assumptions.
2.   Inform Boards of the pre-Boardroom processes adopted to arrive at management proposals.
3.   Commission independent review of management proposals.
4.   Seek advice from experts.
5.   Take large decisions in stages, for example:
(a) concept;
(b) proposal for discussion, and
(c) proposal for decision.
6.   Allocate different roles within Boards.
7   Deliberately introduce a devil's advocate to provide challenge.
8.   Introduce automatic stops in decision making in the form of circuit breakers, mental breakers or calling for time-outs (an increasingly common feature of surgical theatres).
9.   Consider the outside view (reference class forecasting) – when making predictions about the success of a plan and timescales, call upon similar circumstances to provide a base rate of information.

Additionally, there are other mechanisms that can reduce the likelihood for biases to affect decision making and risk perception at lower levels of the organisation (so that the information reaching the Board derives from a reliable source).

For example:

– The use of a formal established review process provides the environment in which it is expected and accepted practice to seek technical reviews and robust challenge on work. These processes include peer checking, independent verification, and technical reviews by individuals with relevant competences. This provides an opportunity for challenge, recognition of bias, and more accurate assessment of local data, risk, and judgements. These checking or review mechanisms enable biases to be recognised and ensure assumptions and views are debated, tested and agreed at different levels within the organisation before they reach Board level.

– Operational decision making – a meeting between a group of specialists that occurs in response to recognition of degrading conditions. This is particularly suitable when there is a known fault and several routes to recovery because it allows various options to be considered and challenged in a safe and knowledgeable environment. It also allows the consideration of potential options and the decision route to be recorded; this is helpful for the Board and provides justification for decision given the information available at the time.

– Conservative decision making – a safety culture initiative which encourages all personnel to make conservative and safety related decisions in the face of uncertainty.

– Devil's advocate/conservative decision making advocate – a person in any group or meeting throughout the organisation can be assigned to be the devil's advocate. This means they challenge the assumptions and opinions of the group.

5.4.2 Overcoming groupthink

While groupthink can occur in situations where the CEO or Chair of the Board is a very strong and trusted character and there is an imbalance of influence which is skewed towards the CEO or Chair at the expense of other members of the Board, the CEO or Chair of the Board is also key to preventing groupthink. There are a number of things that they should do personally or ensure are done to help the Board maintain an objective and appropriately self-critical view:

– The Chair should avoid stating their preferences at the start of a discussion or review, as this may stifle debate and deter other Board members from voicing their concerns, questions and opinions. Avoid quickly criticising other ideas and insulting other Board members.

– The Chair should foster open discussion and encourage all Board members to be critical evaluators, so that they are confident to question information and assumptions presented to the Board and voice their concerns and opinions.

– Establish group norms that indicate conflict and speaking one's mind is expected. Reframe disagreement as a necessary, helpful characteristic of great teams.

– Invite outside experts to each meeting and encourage them to challenge the views of the Board members. The basic principle is to have diverse and well-informed external input and checks/challenge on Board decisions (consistent with the need to make such decisions, of course).

– Encourage the Board to get to the heart of the problem and make the best decision possible.

–   Ensure that there is sufficient time allocated for the review of process and personal safety related matters so that this is not rushed and that there is an appropriate level of challenge and debate.

–   Encourage junior members to contribute their views early.

–   Recognise and balance the conversation to ensure it is not dominated by one category of view. Consider using the six thinking hats (De Bono, 1999) to ensure views, thinking, and decisions take account of wider elements, e.g. facts, emotions, weaknesses, strengths, creativity, and control.

–   Foster the use of a formal decision making process.

–   Ensure risk is discussed as a key currency to support decision making. Defining the consequences and likelihood allows the safety impact of the decision to be understood and be compared with other decisions.

–   Ensure margin is recovered for decisions that decrease margin of safety.

–   Encourage periodic review of decisions to prevent aggregation of risk or 'death by a thousand cuts'.

–   Encourage groups, following discussion and conclusion, to confirm to themselves that they personally agree with the decision made by physically signing it off. This forces individuals to justify their own arguments rather than relying on a collective decision where blame can be attributed elsewhere.

Assigning someone from within or outside the Board to challenge groupthink during meeting proceedings should reduce the likelihood of the occurrence of groupthink. Table 4 can be used to help identify whether the Board displays characteristics of groupthink.

Table 4: Symptoms of groupthink

Symptoms	Description	Does the Board show signs of this?
Illusion of invulnerability	A prolonged period without incident can cause complacency, and Board members forget how to be 'afraid'. Excessive optimism develops which can allow a progressive increase in risk tolerance to develop.	
Collective rationalisation	Where warning signs are discounted and the group does not reconsider the assumptions which are underpinning their decisions.	
Direct pressure on dissenters	Where members are under pressure not to express opinions and argue against any of the group's views.	
Self-censorship	Where an individual's doubts and deviations from the perceived consensus are not expressed.	
Illusion of unanimity	Where majority view and judgement is assumed to be unanimous.	
Self-appointed 'mind guards'	Where members shield the leader from information which is problematic or contradictory to the group's view, decisions or cohesiveness.	

5.5   FURTHER RESOURCES

There are numerous resources on the theory of information processing, biases, decision making, and groupthink. Much research has focused on decision making under stress and uncertainty, specifically relating to operators.

For further information, see the following publications:

–   Kahneman, D. (2011) *Thinking, Fast and Slow*

–   Flin, O'Connor, & Crichton (2008) *Safety at the sharp end*

–   Kahneman & Tversky (1979) *Prospect theory; An analysis of decision under risk*

–   De Bono, E (1999) *Six thinking hats*

6 SAFETY PERFORMANCE DATA – WHAT DOES IT ALL MEAN?

The Board are responsible for making decisions relating to business planning, budget setting, future projects etc. with safety in mind. The management of process and personal safety will be carried out at multiple levels in the organisation, typically with only summary or aggregated information being presented to the Board. Therefore, Board members and other managers and leaders have a duty to appropriately analyse and challenge performance data.

Leaders should ensure that the 'barriers' which defend the organisation from unwanted incidents are in place and working effectively. Understanding whether these barriers are in place and effective is dependent upon the availability of the right data. However, such data can easily mask reality if leaders do not fully understand what these data represent, do not question what is *not* being said, and do not consider how improvements in a measure have come about.

The Board should ensure that there are effective management review and control arrangements at each level of the organisation and that there is clarity about what information should be presented and reviewed at each level, including at Board level (see EI *Guidance on meeting expectations of EI Process safety framework Element 20: Audit, assurance, management review and intervention*).

In common with the audit arrangements for other aspects of the business, the Board should also ensure that there is an audit and assurance programme for the process and personal safety management arrangements. This will provide leaders with assurance that the information they are reviewing is providing an accurate picture of the status of the safety management arrangements and safety performance.

6.1 A TALE OF TWO 'SAFETIES'

> **Box 3: Texas City Refinery**
>
> Prior to the 2005 Texas City Refinery explosion, BP had a strong and successful drive to reduce personal safety incidents, reducing lost time injuries (LTIs) and noticing a prolonged absence of major accidents. However, following the accident, in which 15 employees were killed and 170 injured, the investigation report completed by the Baker Panel noted that across the industry undue emphasis was being placed upon personal safety incidents. The number of LTIs does not provide an indication of how likely an organisation is to have a major process safety incident. The Baker Panel report also highlighted an overdependence on lagging indicators highlighting the fact that the absence of incidents in the past does not provide any assurance of an incident free future: 'The passing of time without an incident is not necessarily an indication that all is well'.

It is vital that the Board understands there are effectively two types of 'safety' with regard to performance data.

6.1.1 Personal safety

This primarily covers management of incidents affecting individual workers. It includes acute one-off injuries such as slips, trips and falls and cumulative physical and psychological factors.

A common method of measuring personal safety performance is LTIs, the number or frequency of people injured sufficiently enough to need to take time off work. This is a lagging indicator (an indicator of where things have gone wrong). Other indicators may focus on specific issues that management want to reduce, such as the number of dropped objects, back injuries, or falls from height. This type of safety is easily understood, and tends to become the focus for precisely this reason.

6.1.2 Process safety

This addresses major hazards that are more likely to result in major accidents; for example major energy or hydrocarbon releases, explosions or fires.

Measuring process safety performance is much harder, because these types of accidents happen much, much less frequently, making it impossible to monitor trends in the same way as LTIs. Furthermore, because major accidents rely on a number of things to go wrong at the same time, they can happen at any time – or may not happen at all – meaning the amount of time since the last major accident is no indicator of how likely it is to happen again. When they do happen they can be catastrophic and potentially company-ruining. They also often come as a shock – 'these things don't happen to us!'. In reality the warning signs are there to be seen by those who know where to look. Process safety KPIs should focus on these warning signs (leading indicators), such as:

– numbers of maintenance backlogs;

– amount of overtime being worked (a possible indicator of worker fatigue);

– audit results;

– overdue inspections, and

– outstanding actions not implemented from incident investigations.

These types of indicators are not obviously about safety; they are about business as usual. It is therefore important that leaders understand the safety implications of these data.

6.1.3 False equivalency

It is now recognised that personal safety performance has no bearing on process safety performance. On one level there are some similarities in the arrangements required to manage these quite different risks, e.g. effective leadership, identifying the hazards, assessing risk, putting in place ways to manage that risk, etc. However, at a detailed level there are significant differences in scope, and the successful management of one does not necessarily assure the effective management of the other. It is not a case of addressing either personal or process safety; both should be managed effectively in order to safeguard the interests of all stakeholders in the business. However, too much attention has been paid to statistics on LTIs and there has not been enough sustained focus on process safety and the major hazard risks. The UK HSE has warned against treating personal safety as a 'magic bullet' (http://www.hse.gov.uk/humanfactors/topics/magicbullet.pdf). During the 2014 IChemE Hazards 24 conference, the Chair of HSE implored the major accident hazard industry to focus on process safety, noting that the industry's personal safety performance is generally very high.

Table 5 shows a few examples of what different performance measures can tell us about personal or process safety. Note that each KPI can indicate a range of issues and Table 5 presents the most commonly associated indications for each KPI.

Table 5: What do KPIs tell me about safety?

As a Board, do you receive the following information?	Yes/No/Not sure	What does this tell me?
'Accident frequency rates'		These are likely to be LTIs, or something similar, which tell you the number of personal safety accidents you have had. These are lagging indicators.
Number of specific accidents taking place		These may focus on specific issues, such as numbers of dropped objects, especially if this is a current concern (which is a personal safety issue). There may be specific process safety measures such as the 'number of leaks'. These are lagging indicators.
Overview of audit or survey results clearly linked to aspects of the safety management system		Generally this tells you about process safety performance, however will not contain enough information to pinpoint specific issues. This can be a form of leading indicator.
Overdue implementation of specific aspects of the safety management system		Generally tells you about lack of resources to manage process safety effectively. This can be a form of leading indicator.
Overdue maintenance		This tells you about process safety – an increase in overdue maintenance may indicate that the company doesn't have the resources to maintain the reliability of the plant and safe operation. This can be a form of leading indicator.
Amount of overtime being worked by employees		An indicator of fatigue, which can affect employee reliability and health, but is also a precursor to major process safety events (e.g. Texas City refinery disaster). This can be a form of leading indicator.
Recommendations from incident investigations not yet implemented		A sign of lack of resources to manage either process safety or personal safety (depending on the recommendations), failure to learn as an organisation, a poor safety culture or too many recommendations being made. This can be a form of leading indicator.

6.2   WHAT DATA SHOULD BE PROVIDED?

The key question that the Board should answer is not 'How many incidents did we have yesterday?' it is 'How are we improving processes and their implementation to proactively decrease the likelihood of an incident tomorrow?'. The Board should ensure that an appropriate set of performance measures is established for use throughout the organisation. These should encompass lagging indicators measuring outcomes and leading indicators measuring the implementation and compliance with safety management arrangements. EI *Guidance on meeting expectations of EI Process safety framework* series of publications contain a large number of example KPIs, as does EI *Human factors performance indicators for the energy and related process industries*.

Inappropriate or insufficient performance measures, performance reporting and assurance arrangements will limit the Board's ability to identify and understand issues that may be developing within the organisation. This will in turn jeopardise their ability to ensure that timely corrective interventions are made to prevent a major incident.

Typically, process and personal safety performance measures should address:

–   Planning: Are the arrangements for management process and personal safety suitable and sufficient?

–   Operation and compliance: Are we doing what is required by these arrangements?

–   Outcome: Are these arrangements delivering the required results?

If more senior levels of the organisation, such as the Board, are only presented aggregated data, these data should allow them to easily understand:

–   What are the overall performance issues?

–   Which parts of the organisation are causing these performance issues?

–   The relevant detail of those specific issues, as required to judge whether to endorse the proposal.

Box 4: Event investigations

KPIs, if working effectively, should indicate issues which need to be corrected in order to prevent an incident occurring, as well as record the data that create a sense of unease or worrying trends. Incidents and events are likely to occur at some point. The analysis of these events and their root causes also provides essential data and information on performance; not just in terms of what the performance issues are, but where they are occurring and why. However, this relies upon an effective causation analysis of an event, which itself relies on those carrying out event investigations having the appropriate knowledge or tools that allow consideration of human factors issues (including human performance, to ensure investigations look beyond blaming the individual and procedures).

Effective KPIs will predict worsening safety culture and increase in safety events if action is not taken. Reviewing the trend of KPIs against event investigation data will provide a marker of effectiveness of these leading and lagging indicators as signals to changing safety risk, i.e. if there is an increase in event investigations but the KPIs have not changed, this suggests the KPIs are not effective. The combined information from KPIs and event investigation can then guide Board level decisions concerning process safety and highlight where corrective actions and further initiatives are required.

6.3   WHAT ARE LEADERS NOT BEING TOLD?

In some organisations there may be a reluctance to seek out 'bad news'; problems get filtered out of the information that is reported at senior levels, or do not get discussed. In the first instance, this can be counteracted by careful design of what performance measures should be reported to leaders. However, if the leaders' reactions to bad news are negative (anger, irritation, etc.) then soon the bad news will stop being communicated to leaders (and *not* because everything is now OK).

It is the bad news (the overdue maintenance, the actions not yet completed) that contain the leading indicators of an impending process safety incident, and so leaders should be willing to ask challenging questions about the information they are (or are not) given. Leaders should also consider worksite visits to get a feel for what is happening, but again, leaders should be willing to hear the bad news and ask questions. In the best organisations, senior leaders display 'chronic unease', which means that they are never content that 'everything is OK'. Hopkins (2008) notes '…mindful leaders do not rely on assurances from subordinates that all is as it should be… They…fear that there are problems lying in wait to pounce…and they …probe for these problems and expose them before they can impact detrimentally…'.

Box 5: Chronic unease

'It can be said that there are two important KPIs: the red ones (what is going wrong) and the green ones (what is going well). The red ones mean you need to do something. But it is the green ones that are more dangerous because they mean you may have missed something. Look again and make sure they are not really 'reds'.' Steve Flynn, Vice President, HSSE BP Group Safety and Operations, 2014 IChemE Hazards 24 conference (paraphrased)

6.4   AVOIDING TARGET CULTURE

KPIs should be temporary measures used to track transient issues. Continual use of an indicator and overreliance on that indicator as a measure of performance can create the illusion that all is well. Over time, the target will be met through unexpected means that no longer bear relevance to what the target represented, because it is being met at the expense of other activities, or even through manipulation. A key question to ask would be 'How is the target being met?'

Box 6: Case study

In the 2000s, the British Government had a heavily target-driven process for improving public services. However, it is believed that the continuous usage of these targets had unintended consequences. For example, a target that patients should be able to see a general practitioner (a doctor) within 48 hours led to some medical facilities meeting the target by preventing patients from booking more than 48 hours in advance. (BBC news http://news.bbc.co.uk/1/hi/uk_politics/vote_2005/frontpage/4495865.stm)

6.5   FRAMING INFORMATION

The way information is presented can have a significant impact upon the way it is understood and the outcomes and decisions made resulting from its review. The competences and consequent needs of the Board should be considered when managers and other leaders present information to Board and senior management levels. Key things for managers to consider include the following:

- Board member competences generally lie outside process and personal safety management. Do not assume they see the significance of the information they are being presented with and what impact that information may have more widely on safety performance. Be clear what this information does and does not tell them about safety.

- Do Board members have the same understanding of risk as you? How are you communicating that risk? Use scenarios and/or a consistent and established means of communicating risk, such as a risk matrix, to illustrate the impact of performance data.

- It is good practice to agree the format with the recipients and to ensure that the purpose of each measure is agreed and understood. The use of trends, the presentation of targets and actual performance, together with commentary which highlights deviations or issues and proposed corrective actions is also good practice and will stimulate the desired review and response from the audience. Ask the Board whether the format is suitable for them.

- Be wary of misleading Board members through providing data in a way that can be misinterpreted through cognitive or social bias (e.g. saliency bias). Table 6 provides some examples of cognitive biases when reviewing data.

Several of the cognitive and social biases described in 5.2 are applicable to the analysis of safety performance data. For example, availability bias, saliency bias, group attribution bias, and self-serving bias can all affect the perception of success, the perception of risk, and the resulting judgements and decisions made by Boards. These are applicable both to the way event investigations are conducted (and the conclusions they reach) and the analysis of performance data themselves (i.e. what they are telling us about safety, risk, and the likelihood of an event occurring). Table 6 presents some biases that are likely to occur when reviewing data:

Table 6: Cognitive biases when reviewing data

Cognitive bias	Description
Base rate bias	Available statistical data are ignored in favour of specific data to make a probability judgement. For example: 'An incident has occurred at a few competitor organisations, but it has not happened here, therefore is unlikely to happen'. The specific information (it hasn't happened here) in this case outweighs the base rate information that it has occurred a number of times elsewhere. In reality, that it hasn't happened here only tells us that it hasn't happened here, not about how *likely* it is to happen here.
Insensitivity to sample size	Smaller samples result in more variance; however, most people are not aware of this or do not consider it. For example: 'Safety performance is more varied at this small installation compared to larger installations, therefore they must be doing things differently'. In reality, we expect smaller sample sizes (less people, less operations going on) to display more variance from the base population.
Illusion of validity	The belief that performance in one thing indicates performance in another. For example: 'Lost time indicators are improving therefore we are unlikely to have a major accident'. In reality, the two things are not related.

6.6   QUESTIONS FOR LEADERS (INCLUDING BOARD MEMBERS)

Leaders should ask how happy they are that the performance measures they receive tell them what they need to know about process and personal safety performance, by answering the following questions:

Questions	Yes/No
Do I specify what performance measures I want to see?	
Do the arrangements provide what I need to know in order to be confident that the organisation will achieve required process and personal safety performance?	
Do the measures that are being presented provide me with the assurance that: – What can go wrong is understood? – The systems are in place to prevent these things from happening? – These systems are working effectively?	
Are the measures presented in a way that enables me to understand: – The overall performance issues? – Whether performance is where it is planned to be? – Whether performance is getting better or deteriorating? – The parts of the organisation having these performance issues? – What needs to be done to get back on track or improve performance? – The questions I need to ask and the interventions that I need to make?	
Do the measures tell me whether: – Our arrangements for management of process and personal safety are suitable and sufficient? – The arrangements are delivering the required results? – We are doing what is required by the arrangements? – Our performance is where we planned to be? – Our performance is getting better or deteriorating?	
Are the measures presented in a way that enables me to understand: – The overall performance issues? – The parts of the organisation having these performance issues? – What we need to do to get back on track or improve performance? – The questions I need to ask and the interventions that I need to make?	

7   WHAT IS THE COMPANY'S 'APPETITE FOR RISK'?

'Management and Boards are facing questions regarding how strategy affects risk, and vice versa, and are challenged by how to best approach risk and discuss risk management in a meaningful, productive way. How can Board Directors and senior management be certain that they are making and approving the best possible decisions in the immediate and long term, and that the relevant risks have been appropriately taken into account? Was the right information given, received, and understood? What risk information is essential for accurately and efficiently evaluating decisions?' (Wittenburg and McDowell, 2007).

Whilst major hazard operations by definition carry risk, the purpose of the organisation's safety management system is to manage that risk down to an acceptable level. However, what level of risk is 'acceptable', and does everybody have the same understanding of what that risk means?

When there is no common and consistently applied approach to the assessment and quantification of risk, safety decision making can be unnecessarily complicated and inconsistent. This can be more problematic when the Board needs to prioritise activity and expenditure across different parts of the company.

Directors and senior managers should ensure that there is a structured approach to the assessment and quantification of process and personal safety risk, and ensure that they themselves understand that approach and use it when making strategic decisions, such as about capital expenditure. A consistently applied and structured approach can ensure that decisions are made on a consistent basis throughout the organisation. If the approach is working well this means that decisions throughout the organisation will be being made on the same basis as they would if they were being made by the Board. Without a universally understood approach to risk management it is very difficult to make informed decisions, and the wrong message may unwittingly be communicated out from the Board about how much risk they are willing to accept.

It is likely that the health, safety and environment department would take a key role in developing a suitable approach to assessment and quantification of risk and safety decision making, which would then be reviewed and ratified by the Board. When doing so the Board should ask:

–   Do I understand the risk quantification approach?

–   Can I equate different levels of risk to worst case scenarios?

–   Is the risk quantification approach used at all levels of the organisation?

–   Is the risk quantification approach understood at all levels of the organisation?

–   Does the risk quantification approach generate an output that can be used for decision making (at Board and other levels of the organisation)?

–   Does the risk approach quantify all forms of risk including process, plant, equipment, commercial, and people?

–   If using a risk matrix approach, are the risk matrices calibrated appropriately to meet the needs of the organisation?

–   How acceptable do I find the 'acceptable' levels of risk?

7.1   RISK MATRIX APPROACH

A consistently calibrated risk matrix or set of risk matrices provides a relatively easily understood way for consistently evaluating the relative levels of risk. The example shown in Figure 2 is reproduced from EI *Guidance on meeting expectations of EI Process safety management framework Element 6: Hazard identification and risk assessment.* Once calibrated and ratified by the Board, the matrices can provide a consistent basis for all process and personal safety risk-based decision making throughout the organisation, including strategic planning, and expense and capital budget development.
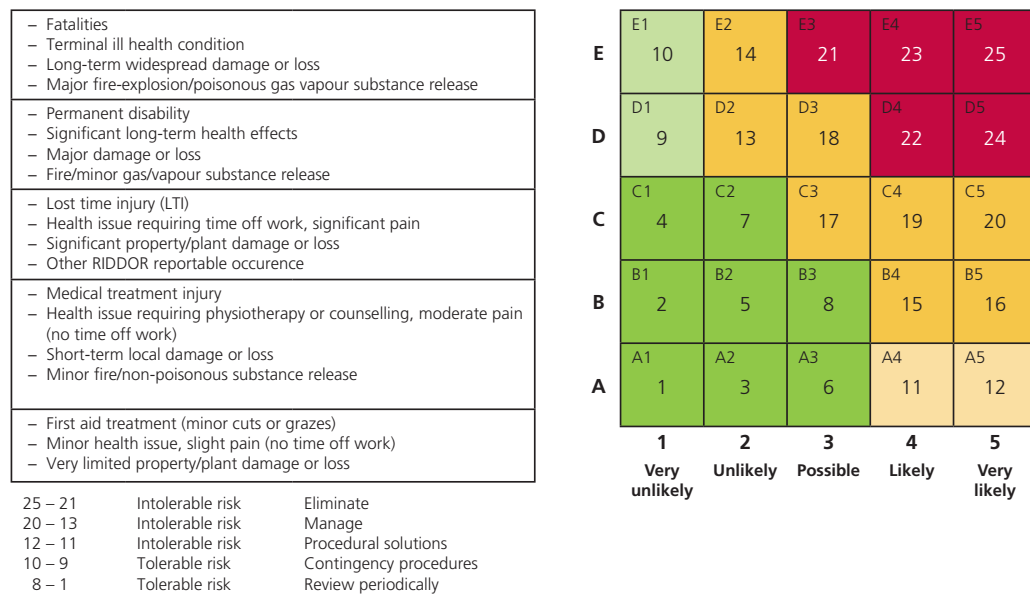
Consequence		Likelihood				
– Fatalities – Terminal ill health condition – Long-term widespread damage or loss – Major fire-explosion/poisonous gas vapour substance release	**E**	E1 10	E2 14	E3 21	E4 23	E5 25
– Permanent disability – Significant long-term health effects – Major damage or loss – Fire/minor gas/vapour substance release	**D**	D1 9	D2 13	D3 18	D4 22	D5 24
– Lost time injury (LTI) – Health issue requiring time off work, significant pain – Significant property/plant damage or loss – Other RIDDOR reportable occurence	**C**	C1 4	C2 7	C3 17	C4 19	C5 20
– Medical treatment injury – Health issue requiring physiotherapy or counselling, moderate pain (no time off work) – Short-term local damage or loss – Minor fire/non-poisonous substance release	**B**	B1 2	B2 5	B3 8	B4 15	B5 16
– First aid treatment (minor cuts or grazes) – Minor health issue, slight pain (no time off work) – Very limited property/plant damage or loss	**A**	A1 1	A2 3	A3 6	A4 11	A5 12
		1 Very unlikely	**2** Unlikely	**3** Possible	**4** Likely	**5** Very likely

25 – 21	Intolerable risk	Eliminate
20 – 13	Intolerable risk	Manage
12 – 11	Intolerable risk	Procedural solutions
10 – 9	Tolerable risk	Contingency procedures
8 – 1	Tolerable risk	Review periodically

Figure 2: Example risk matrix

In this example, a 5 x 5 matrix has been calibrated for health and safety consequences and makes use of simple likelihood terms. Each square in the matrix has also been assigned a 'risk rank number', such that an unlikely fatality in square E2 is ranked as 14, whereas a likely LTI in square C4 is ranked as 19. In this way the risk of a likely LTI would be a higher priority than the risk of an unlikely fatality.

The matrix has a number of 'zones' that help guide whether a risk is acceptable or not. In the first instance, these zones should be defined based on what the Board is willing to accept. Usually there are three zones: unacceptable, acceptable if managed to ALARP (as low as reasonably practicable) and broadly acceptable. Broadly acceptable risk does not require an ALARP demonstration. Acceptable if ALARP risk should either be managed down to broadly acceptable levels, or managed to the point where the risk is shown to be ALARP (this will require an ALARP demonstration) where reasonably practicable is interpreted to mean that measures should be taken to reduce risk unless the money, time and trouble of implementing those measures is grossly disproportionate to the risk averted. Unacceptable risk should be managed down to lower levels, i.e. broadly acceptable or tolerable if ALARP.

7.2   THE SOFTER SIDE OF RISK PERCEPTION

Risk perception is not completely rational. The numbers used to represent risk in many quantification methods, including risk matrices, do not mean anything until they are 'translated' by each individual into terms they understand. However, if there is no common meaning, then there will be no common basis for conversations to take place and decisions to be made. One way of doing this is to back up the numbers with scenarios. For example, when being presented with a proposed reduction in budget, not only should the consequences of this be made clear using a risk ranking, but using scenarios to illustrate:

–   What does this risk mean?

–   What is the worst scenario that could happen?

–   What is a typical scenario that could happen?

–   What would be the implications of that?

–   How likely is that to happen?

–   Would we know if it was going to happen? Would there be any warning signs?

–   What is needed to prevent that from happening?

Also bear in mind that, when assessing risk, people can be influenced in subtle ways by various cognitive biases (that they may not be aware of) that make it hard to make a rational decision. These can make it more likely for people to make certain decisions. Many of the cognitive and social biases described in 5.2 are also applicable in this context. In particular, the planning fallacy often impacts the forecasting of outcomes of risky projects, and this can affect budget setting. Table 7 describes a number of biases related specifically to risk perception.

Table 7: Cognitive biases related to risk perception

Cognitive bias	Explanation
Loss aversion bias	People fear a loss much more than they want a gain, meaning decisions tend to be conservative. If we've spent significant resources on something that's not proving to be worthwhile then we're inclined to stick with it so as not to waste what we've already spent. For example, this could mean the Board fear a loss to income more than a gain in safety performance.
Cultural theory of risk	The acceptability of risk is dependent upon culture. Whilst it is now unacceptable for someone to be INJURED at work, in the past it was more acceptable as being a 'part of life'. In some cultures, risk to one segment of the workforce is not equivalent to risk to another segment (e.g. nationals vs. expats).
Order bias	There is some limited evidence that people will be more risk averse if the benefits of doing something are stated before the risks (for example, the benefits of medical treatments compared with the side effects).

Prospect theory (Kahneman and Tversky, 1979) suggests that humans do not make rational choices when assessing risky options. In particular, people underweigh decisions where outcomes are merely probable (i.e. THEY are less likely to act) in comparison with decisions where outcomes are a certainty. This contributes to risk aversion in choices involving sure gains and to risk-seeking in choices involving sure losses. This is an automatic reaction of system 1 thinking. Due to the combination of loss aversion and narrow framing (thinking about each gambled decision in isolation) organisations may not take risks which could ultimately be profitable. However, through broad framing (the aggregation of risks) the emotional reaction to individual losses can be blunted and result in an increased willingness to take risks, with positive results. This is a technique used by experienced traders in the financial market to avoid the costs of loss aversion by treating each decision as one of many that will sum together to produce a 'portfolio' (and this rapidly reduces the probability of losing).

Unlike many organisations, Board decisions in the energy sector should be conservative rather than risky and therefore narrow framing is of preference in some circumstances. However, the Chair of the Board may wish to take the broad frame view of decisions to ensure that the value of aggregate risks is being considered. Research has focused its efforts on economic theories of decision making in relation to monetary values; however, in the energy sector the conservatism should be skewed towards safety rather than costs (which is more easily quantified).

7.3   FURTHER RESOURCES

HSE, *The tolerability of risk from nuclear power stations*

8   AVOIDING THE UNINTENDED CONSEQUENCES OF BUSINESS PLANNING AND BUDGET SETTING

A major way in which the Board affects the safety of the organisation is through business planning and budget setting. Business plans and budgets will typically be developed annually by each business unit. These will normally look up to five to 10 years ahead and will address all factors affecting income and expenditure. They will provide a forecast of the likely business performance out to the horizon year. These are normally reviewed and approved by the Board prior to their release and implementation.

There is always an expectation from shareholders that the Board will maximise overall business performance and generally this means maximising profit and share value. In a business environment where there may be uncertainty over margins because of volatility of feedstock and product prices the control of expenditure is a critical issue. As a consequence of this all proposed expenditures tend to be subject to a high level of scrutiny.

8.1   UNINTENDED CONSEQUENCES

During tough economic times when income and profits are reduced, cost reduction initiatives can set in motion a major incident. Unfortunately, poorly judged cost reduction programmes have been cited as contributory causes to a number of major incidents. It is vital that in times such as this cost reduction decisions are fully cognisant of the value of any activity which is stopped and the impact upon the residual risk level if it is not done. This is especially true when considering inspection and maintenance activities where there may be no short-term impact but very significant impact in the long term. Reactively fixing equipment takes away resources from proactive management of risk. The unintended consequences of failing to invest in a replacement may create increase in risks elsewhere due to resource drain, resulting in reduced available resource.

Box 7: Case study, Humber refinery fire and explosion, 2001

On 16 April 2001 a fire and explosion incident occurred at the ConocoPhillips Humber Refinery following the catastrophic failure of an overhead gas pipe. The incident had the potential to cause fatal injury and environmental impact although no serious injury occurred, and there was only short-term impact on the environment. There was, however, significant damage to the refinery and properties nearby. It caused concern to residents, and received national press coverage. ConocoPhillips were prosecuted on indictment and pleaded guilty to breaches of Section 2 and 3 of the Health and Safety at Work etc. Act 1974 relating to the incident. At the sentencing hearing on 29 June 2005 they were fined £800 000, plus £95 000 for other offences. The causes of the incident stemmed back to at least 1999 when a risk-based maintenance process was introduced in order to save resources on maintenance.

HSE, *Public report of the fire and explosion at the ConocoPhillips Humber Refinery*

Box 8: A familiar story?

An executive Board member was walking around the plant one day when he slipped over a patch of oil. Luckily he wasn't hurt, but he saw that the oil was leaking from one of the pieces of equipment, so he sought out the maintenance manager.

'Do you know this machine is leaking oil!? Why hasn't it been fixed?' he demanded.

'Again?' the maintenance manager replied. 'That's the third time this month we've fixed it. It's these new seals procurement have bought us. They're not as good as the old ones, and keep failing. They refuse to buy the ones we used to use'.

'Right, leave it with me,' said the executive, and went to find the procurement manager. 'Why have you been buying cheap seals? They keep leaking, and I was nearly killed slipping over!' he said to the procurement manager.

'Well, we had our maintenance budget cut by 10 % by the finance department, which means we can't afford the old ones. These were the best ones we could afford.'

'Right, leave it with me,' said the executive, and went to find the finance manager.

'Why have you cut the maintenance budget by 10 %? They now can't afford what they need, equipment keeps leaking and I nearly got killed!' he said to the finance manager.

'You told us that the company had to increase profits by 10 %, or make the equivalent in savings, so we told each department to cut 10 % from their budgets' the finance manager replied. 'We thought you would be happy'.

The executive returned to his office and sat at his desk. He was wondering who to blame for this accident. '*Who was ultimately responsible?*', he thought. It was then he noticed his reflection in the mirror…
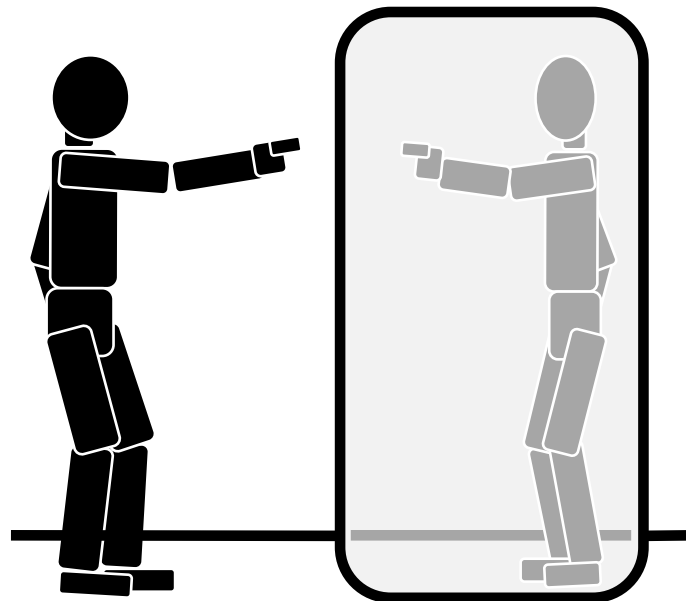
Directors should always consider the implications of decisions related to budgets, especially where the implications of a wrong decision can manifest themselves a number of years after a decision to cut budgets has been taken. This is particularly pertinent when considering maintenance budgets where the immediate effect of reducing expenditure on preventative

maintenance and inspection is likely to be limited, but this will likely lead to a longer term degradation of the integrity of the plant. This lack of an immediate downside can have a tendency to reinforce bad decisions and inappropriately increase confidence to apply further budget cuts.

Such decision making requires either deep experience or great mentoring along one's career path. Those who are promoted quickly through the ranks may be unable to accurately assess the long-term impact of the decision and the unintended consequences, due to lack of experience. However, one mitigation technique for this is to request the long-term impact of the decision to be drawn out for review alongside the immediate actions.

8.1.1 Capital expenditure

Capital expenditure on process and personal safety does not show a return on investment by increasing income or reducing cost in an easily quantifiable way. Consequently there is always an underlying pressure on a Board to challenge and minimise, where possible, capital expenditure on process and personal safety. However, such capital expenditure reduces the likelihood of an incident and consequent loss occurring, or reduces the magnitude of the consequences following the occurrence of an incident.

In effect, process and personal safety capital expenditure can be considered a defensive investment which reduces the risk associated with the hazards present within the organisation. In the short term, capital expenditure on process and personal safety does not improve business performance in terms of two widely used measures of financial performance: return on capital employed (ROCE), and earnings before interest, tax, depreciation and amortisation (EBITDA). Whereas this type of capital expenditure will not yield any improvement in EBITDA, it will have a negative effect on ROCE because it increases the level of capital employed in the business without providing any direct increase in net income. This makes process and personal safety expenditure an easy target for cuts, but ultimately this is a false economy.

8.1.2 Routine expense budgets

Maintenance budgets
The business plans and budgets will typically include 'routine expenditure'. A large component of this routine expenditure will be maintenance costs. In a well-run operation the majority of the maintenance costs will be associated with inspection and preventative maintenance work. This work is carried out in order to reduce the likelihood of high consequence equipment failures; in effect, this work is carried out to manage the risk of failure to an acceptable level.

The level of maintenance expenditure has a direct effect upon both ROCE and EBITDA, with a direct measurable impact on the net income. Consequently there is again an underlying pressure on the Board to challenge and minimise, where possible, maintenance budgets.

Understanding the cost is relatively easy, but organisations have differing levels of success when trying to understand or present the value that inspection and preventative maintenance programmes deliver. This can lead to directors feeling starved of information when needing to make decisions to trim maintenance budgets, and being over-influenced by quantifiable cost pressures because they do not have such a quantifiable understanding of the implications on process and personal safety. In the long term, reduced maintenance budgets are likely to result in higher costs through increased outages and incidents.

Other operating cost plans and budgets

In the same way that there is pressure on maintenance costs there is also pressure on all other aspects of routine expenditure. Personnel salaries, wages and benefits are a significant component of these other costs.

Pressure on these costs can result in initiatives to either reduce headcount or outsource activities to service companies ('downsize'). The cost reduction arising from these initiatives can cloud the judgement of the organisation, and the unintended consequences which may arise from these changes and have a detrimental impact upon process and personal safety, can be missed, such as through inadequate staffing levels and loss of knowledge and expertise in the organisation.

In cases where such initiatives are included in proposed business plans it is important to ensure that they are appropriately assessed to ensure that any potential unintended consequences are identified, and that appropriate provisions are included in plans and budgets to manage the associated risks to a tolerable level.

8.2   A RISK-BASED APPROACH

Although plans and budgets usually show the proposed project and routine expenditures on process and personal safety, it is uncommon for proposed expenditures to be clearly linked to the levels of process and personal safety *risk*. This lack of clarity can introduce unnecessary complication into the Board's review and decision making processes.

Section 7: What is the company's 'appetite for risk'? provides information on ensuring the organisation employs a common approach to understanding and communicating risk. Expenditure plans should make use of this approach by using the guidance in Table 8.

Table 8: Community not in expenditure plans

Capital expenditure	Maintenance budgets	Change (e.g. downsizing)
Rank the budget items in order of the level of risk the budget item is trying to reduce (risk-ranking). Clearly identify the issue being addressed by each budget item. Define the residual risk which would be left if the item is not incorporated in the budget and implemented. Demonstrate how the proposed investment programme will affect the targeted HSE and process safety risk levels for each planning period, out to the horizon year and clearly link them to the capital project items and expenditures required to deliver these targets. Include provision for currently unknown minor items which may arise during the budget period (such as unexpected maintenance).	Ensure the issue being addressed by each work item is clear. Clearly identify the residual risk which would be left if the item is not incorporated in the maintenance programme. Demonstrate how the proposed work programme will affect the HSE and process safety residual risk levels for each planning period, out to the horizon year. Include provision for an appropriate level of breakdown and remedial work.	Carry out a thorough review to identify and assess potential risks arising from the proposed approach. Ensure to involve appropriate independent personnel to provide an objective assessment. Present the outcome of the assessment in a way that is easily understandable and consistent with the organisation's risk rating and acceptability criteria.

Adopting this approach can assist the Board to more easily understand the requirements for safety expenditure and the implications of approval or rejection. It can be especially helpful where the Board has to balance investment priorities across a number of operating divisions or sites.

To illustrate this, in the same way that a typical business plan will show profiles for income, expenditure and profit, it can be helpful to show a profile for residual risk plotted against planned expenditure, as shown in Figure 3. The same can also be done for routine maintenance expenses.
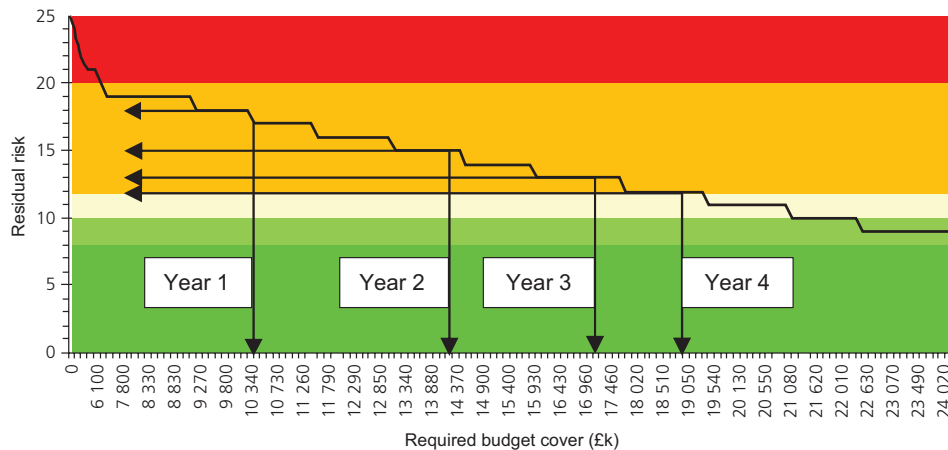
Figure 3: Risk profile example

In the event that a highly ranked process or personal safety issue arises, which cannot be covered by the capital budget contingency provision, the ranking of the new project can be compared to the ranking of the projects which have been included in the budget. If the new project is highly ranked then the responsible directors and senior managers can consider whether they should stop one or more of the lower ranked projects and defer them to the following budget year in order to fund the progression of the new, higher ranked, project. In making this decision they should consider the overall impact of stopping the current projects, in terms of risk, cost and schedule versus the risk of delaying the new project until the next budget year.

Incorporating process and personal safety residual risk into the business plan in this way will ensure that, in the event of any requirement to reduce budgets, the impact upon the residual risk level is systematically considered. This will enable directors and senior managers who are confronted with the need to constrain budgets to make their decisions with a full understanding of their impact on the resulting levels of residual risk across the organisation.

8.2.1 Subject to specialist review and management of change

A common practice in many large multinational organisations is the concept of a 'staff review' in advance of review by the Board. The staff review ensures that senior specialist staff have considered all aspects of a budgetary proposal, endorsing it or otherwise and providing advice and support to the Board during the decision making process.

Specific proposals should always be considered as 'changes' and subjected to appropriate management of change assessment. This assessment should ensure that, in addition to the benefits arising from the change, the risks arising from it are also identified and assessed, with the necessary measures being identified to manage these risks to an acceptable level. Board members and senior managers reviewing and approving these specific proposals should question:

– The thoroughness of the risk identification and assessment, including the identification of unintended consequences which may arise.

– The practicality and efficacy of the proposed control measures.

– Whether the residual level of risk is tolerable in the short- and long-term.

8.3   QUESTIONS FOR THE BOARD

Of proposed budgets:	Yes/No
Do I understand the impact that the overall investment programme will have on the company/business unit process and personal safety risk?	
For items just above and below the 'cut line', do I understand: – The issue that is being addressed by the proposed budget item? – The residual risk level which will be achieved if the item is included in the capital budget? – The implications and residual risk level if the item is omitted from the capital budget? – The amount and adequacy of the provision for non-discretionary minor items which may arise during the budget period?	
Of maintenance budgets:	
– Do I understand the impact that the overall maintenance programme will have on the company/business unit process and personal safety risk?	
– Do I understand that each work item is there to manage, control or mitigate a specific risk, and that if there is no budget for the work item, it will not get done and the risk will remain unmitigated?	
For items just above and below the 'cut line' do I understand: – The issue that is being addressed by the proposed budget item? – The risk level which will be achieved if the item is included in the maintenance budget? – The implications and risk level if the item is omitted from the maintenance budget? – The amount and adequacy of the provision for breakdown maintenance which can reasonably be expected to arise during the budget period?	
Of change (e.g. downsizing):	
– Do I understand the potential risks?	
– Am I confident of the independence and objectivity of the identification and assessment of those risks?	
– Am I confident that provision has been made for the *cost* of managing the risks?	
– Do I understand the experiences of other organisations which have implemented similar approaches?	

9   SUMMARY

In summary, this document highlights the influence that Board decision making has on other aspects of the business/organisation and, ultimately, safety. Therefore, it is important to make Board members aware of the key pitfalls and considerations required throughout the decision making process.

This document provides guidance for Board members and other managers with regard to safety culture, competences, cognitive biases, safety performance data, risk, and business planning/budget setting.

The key theme throughout is to promote an understanding by Board members of the impact of their decisions in practice, i.e. that decisions that may seem unrelated to important operations can indirectly influence safety through budget cuts, maintenance work, and general attitude/culture.

In particular, it is important for Board members to think about the impact of their decisions on the resource requirements within the organisation. Departments often remain with a fixed head-count and have to absorb differing levels of work demands. Ideally, the resource should be flexible and dependent on project demands.

This links to the concept of dynamic ALARP; the balancing of resources over projects to gain the greatest risk reduction for the business. This concept suggests that driving risk down to zero on one project may not affect overall risk levels as positively as driving risk down to an acceptable level on several projects. Board members should bear this concept in mind when making budget and resource decisions.

Key messages:

– Board members should visibly demonstrate commitment to safety through their decisions, and think about the long-term impact and consequences of their decisions. This also impacts on safety culture.

– Board members should have certain competences, such as problem solving and social competence.

– Cognitive biases have a large impact on decision making at the Board level both in terms of the Board actually making decisions as a group and in terms of processing of information provided from other levels of the organisation. Biases can also significantly impact risk judgements, which go on to influence decisions. Therefore, it is important for Board members to be aware of this and put mitigations in place where appropriate.

– Board members should understand the information that safety data (KPIs) can provide, how to interpret this, and when they are functioning effectively. This links to information framing and biases and how these affect interpretation of data.

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ANNEX B
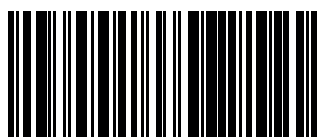# ABBREVIATIONS AND ACRONYMS

ALARP	as low as reasonably practicable
BBC	British Broadcasting Corporation
CCOHS	Canadian Centre for Occupational Health and Safety
CCPS	Center for Chemical Process Safety
CSB	US Chemical Safety and Hazard Investigation Board
EBITDA	earnings before interest, tax, depreciation and amortisation
EI	Energy institute
HOFCOM	Human and Organisational Factors Committee
HSE	Health and Safety Executive
IOGP	International Association of Oil and Gas Producers
KPI	key performance indicator
OECD	Organisation for Economic Co-operation and Development
PSC	Process Safety Committee
ROCE	return on capital employed

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