Safety Management System Principles
Moving beyond compliance

www.rssb.co.uk
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Introduction

SMS Principles - Moving beyond compliance

The requirement for businesses to have in place arrangements to manage safety within their organisations is not a new concept; it has been enshrined in various forms of legislation for many years.

Much has been written on SMSs over the past 20 years ranging from well established documents such as Successful Health & Safety Management (HSE, 1997a) and OHSAS 18001 (BSI, 2007) through to lesser known industry specific documents and academic papers. In spite of such a wealth of information there is still a degree of uncertainty in the detail of what an SMS actually is and its purpose. Although the basic structures of an SMS are clear, the organisational environment and relationships that affect its use and practice can be complex.

Furthermore, SMSs can be overly complicated and their effectiveness compromised by high levels of bureaucracy, a ‘compliance-centred’ approach, or a lack of purpose. Major accidents in many different industries around the world have occurred where SMSs existed but were ineffective.

The purpose of this guidance therefore is to provoke thought and discussion within rail organisations regarding the underlying factors that contribute to the effective working of the SMS in practice.

The guidance is structured into four sections:

Section 1: The evolution of safety arrangements - explains how safety arrangements have evolved over time influenced by lessons learned from major accidents, key legislation and quality standards leading to the development of an SMS.

Section 2: Shaping the system - highlights the importance of having a clear purpose for the organisation’s SMS which is bespoke to its individual circumstances and operating risk. Lack of clarity and drive in this area typically leads to uncertainty and apathy within the organisation and has been a root cause of many major accidents, various examples of which are presented. Greater clarity on the other hand can create a conscious focus for improvement at all levels of the organisation.

Section 3: The system in practice - discusses the drivers to improve the SMS in practice, the advantages of a management style and approach that encourages and empowers continuous improvement at all levels and how using data correctly can help assure the effective use of the SMS.

Section 4: System performance and maturity - focuses on what this means for an individual organisation, the difference between ‘excellence’ and ‘gold plating’, and what is involved in going beyond simple compliance.
Using the Guidance

Who is this document for?

This document is aimed at:

• Senior managers who work closely with an organisation’s safety management system (SMS)
• Other stakeholders who want to consider ways of making their SMS more effective

This guidance is suitable for all organisations within the GB rail industry, regardless of whether or not they have to comply with Railway and Other Guided Transport Systems (Safety) Regulations (ROGS, 2006). Therefore:

• Transport Operator is used in relation to ROGS requirements because it is the definition used within ROGS guidance for Transport Undertakings plus Infrastructure Managers
• Organisation is otherwise used to mean any organisation that works within the GB rail industry

How to use this document

While SMSs have been initiated by regulation, this guidance aims to complement the compliance focus with additional concepts such as systems thinking.

It aims to provide key principles to prompt thought and discussion within an organisation so that managers can make the most appropriate decisions that will improve the effectiveness of their SMS at the most appropriate times. The SMS therefore becomes effective through considered effort over time rather than at the end of a series of prescribed steps.

It is suggested that within different system set-ups some ideas will work better than others but none are likely to be the best option in all circumstances.

While reading the guidance, certain well-used SMS principles are worth keeping in mind:

• The SMS should be commensurate with the organisation’s risks
• The complexity of the SMS is likely to match the complexity of the organisation and its operations
• Where practicable, simplicity should be sought, but a more complete picture of how the SMS is working will allow the organisation to have a better understanding of the entire situation

What is not in this document?

As this document is focused on moving beyond compliance, it is assumed that readers will already have a compliant SMS in operation. Therefore, this document does not provide a step-by-step guide to writing an SMS from scratch.

There are important aspects of an SMS that are not covered specifically within this guidance, such as risk management and accident investigation. RSSB and other organisations already produce comprehensive guidance on these subjects, references to which can be found throughout this document (full URL links are at the back) and in supporting SMS web pages found on the RSSB website.
Glossary

<table>
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<tr>
<th>BS</th>
<th>British Standard</th>
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<tr>
<td>CAIB</td>
<td>Columbia Accident Investigation Board</td>
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<td>CMMI</td>
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<td>Competence Management System</td>
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<td>CSM</td>
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<td>ERA</td>
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<td>FAA</td>
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<td>HRO</td>
<td>High Reliability Organisation</td>
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<td>HSE</td>
<td>Health and Safety Executive</td>
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<td>HSG65</td>
<td>Successful Health and Safety Management HSG65</td>
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<td>ISO</td>
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<td>OHSAS</td>
<td>Occupational Health and Safety Advisory Services</td>
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<td>Operator</td>
<td>The short term for a Transport Operator</td>
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<td>ORR</td>
<td>Office of Rail Regulation</td>
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<td>RSCR</td>
<td>Railway Safety Case Regulations</td>
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<td>ROGS</td>
<td>Railways and Other Guided Transport (Safety) Regulations</td>
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<td>SPG</td>
<td>Safety Policy Group</td>
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<td>SMS</td>
<td>Safety Management System</td>
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<td>TQM</td>
<td>Total Quality Management</td>
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<tr>
<td>Transport Operator</td>
<td>The collective term used within ORR’s ROGS guidance for Railway Undertaking and Infrastructure Managers</td>
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The FAQ matrix provides a quick reference to pages related to the questions posed. It is not designed to answer all questions or provide exhaustive answers.

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Section 1
The evolution of safety arrangements
The origins of management systems and the evolution of safety legislation that has influenced railway safety arrangements are presented in this section in order to provide background and put the SMS into context.

Quality within Great Britain (GB) has often been associated with the attainment of compliance to minimum standards, rather than a drive for continuous improvement, but the drive to achieve quality cannot be delivered unless it is an embedded objective within the whole workforce.

The concept of the SMS is built on the principles of Total Quality Management (TQM) although not all of the principles have been successfully adopted. ROGS provides the opportunity for the development of an SMS bespoke to the organisation’s scope of operations and risk profile. However where there is a culture of compliance it will be more difficult to do this. Making the SMS bespoke to the organisation provides a platform to move beyond compliance building on a broader approach.

The contents include:

1.1 SMS basics
1.2 Evolution timeline
1.3 The origins of SMS
1.4 The impact of legislation
1.5 Where are we now?
1.6 Conclusion
1.1 SMS basics

The SMS can be considered to be the totality of an organisation's arrangements for assuring and improving safety. As ROGS guidance states 'the safety management system is the basis for making sure a transport system runs safely and in line with ROGS.'

The SMS should also fulfil the requirements of regulation 5 of the Management of Health and Safety at Work Regulations (MHSWR) to have arrangements in place to cover health and safety. It is said that ‘management of health and safety will depend, amongst other things, on a suitable and sufficient risk assessment being carried out and the findings being used effectively’.

The scope of this guidance is not to reiterate what is already available on the mandatory or common elements of railway SMSs (see further reading). Rather it is to consider what is appropriate beyond the mandatory minimum and to prompt thought and discussion within organisations with regard to how their individual SMS can work more effectively in practice.

To find out more about general SMS guidance it may be useful to refer to the documents listed below:

**Health and Safety**

HSE: ‘Successful health and safety management’ (HS(G)65)

**Rail Based**

European Rail Agency: ‘A System Approach Application Guide for SMS’

*NTC Australia: ‘Preparation of a Rail Safety Management System’

**Aviation Based**


*Federal Aviation Authority: ‘SMS Framework’

**Others**


*International Labour Organisation: ‘Guidelines on occupational safety and health management systems’

*Ministry of Defence: ‘An introduction to system safety management in the MOD’

* Although these documents are useful references to the subject area, they are written under different legislative regimes and should be read with this in mind. See page 70 onwards for full references
Section 1 - The evolution of safety arrangements

1.2 Evolution timeline for organisational safety arrangements

1965
The Nuclear Installations Act 1965. This required the first set of formalised safety arrangements to be developed by organisations in order to gain a licence to operate.

1976
A chemical release incident occurred near Seveso, Italy. It was a major hazardous event affecting thousands, but which led to development of the European Seveso Directive.

1984
The European Seveso Directive was implemented in UK law by the Control of Industrial Major Accident Hazards (CIMAH) regulations in 1984, which created the need for chemical operators to have a Safety Case.

1991
Piper Alpha offshore oil installation disaster occurred in the North Sea, leaving 167 people dead.

1992

1996
BS8800 developed as a British Standard to help implement and manage an SMS.

2006
ROGS replaced the RSC with the Safety Management System and brought it to the forefront of an organisation’s effort to manage safety.

1971
The first UK wide standard for quality assurance in the electronics industry BS 9000, was produced by the British Standards Institute.

1979
The UK agreed British Standard document BS 5750, an assurance standard that would be available across all industries.

1984
BS 5750 was developed into the international standard ISO 9000:1987. Its aim was to influence the management of organisations to meet a certain standard of quality in their products.

1991
Concept of TQM was combined with safety to form HS(G)65 Successful Health and Safety Management.

1994
Railway (Safety Case) Regulations (RSCR) required transport operators to have a Safety Case. Within the Safety Case actions were required in pursuance of Regulation 5 of the MHSWR.

2000
RSCR guidance highlighted that operators should hold a Health and Safety Management System highlighting the benefits of TQM and HS(G)65.

2011
Five year anniversary of the introduction of ROGS and start of the safety recertification process for duty holders.

Figure 1: Timeline of organisational safety arrangements
1.3 The Origins of the SMS

The concept of managing safety through processes and management systems has its origins in manufacturing standards. As manufacturing developed in the twentieth century, the demand for assurance and consistency of products grew with it. Early standards required manufacturers to document their work procedures, which were later inspected to ensure that work was being undertaken accordingly. These early approaches aimed at compliance rather than improvement. Quality was generally regarded as consistency in achieving the minimum required standards.

The first UK wide standard for quality assurance was British Standard (BS) 9000, produced by the British Standards Institute (BSI) in 1971 to assist the electronics industry in the development of this new sector. By 1979 the UK had agreed an assurance standard that would be available across all industries. This BS 5750 was produced to assist quality compliance as a general aim within organisations. Its main contents were:

- Management responsibility
- A quality system
- Design control
- Document control
- Process control
- Inspection
- Measuring
- Testing
- Corrective action
- Training

In 1987, BS 5750 was developed into the international standard ISO 9000:1987. This document aimed to control the management of organisations so that they could produce to a certain standard of quality in their products.

During this time a different view of management systems from Japan gained popularity because of a successful step change achieved in the field of quality.

This change endeavoured to move the management of quality within an organisation’s product away from inspection at the end of its development, towards activities and involvement by all workers to continuously improve quality throughout production.

The changes brought about by this shift looked to engage the whole organisation in the activity of improving product quality. This led to dramatic improvements in the product caused by the engagement of the employees undertaking the work.

The success of this change in approach to quality created widespread interest across other countries, industries and subject areas. Many of the principles were collected in an approach known as Total Quality Management (TQM).

Continuous improvement in the Japanese automotive industry

This example shows how continuous improvements made by employees can outperform improvements directed by senior management and attempts to achieve quality through procedures and inspections alone.

The vehicle transmission of a Japanese car manufacturer was found to function at much higher specifications than its American rivals. The transmission’s components were working with a tolerance well within the specifications required by American car manufacturers.

The superiority of the Japanese components did not come from higher specifications set out by management. It came from the will of its workers to continuously improve beyond minimum standards. The workers had a purpose they believed in, which generated trust and results beyond what could be achieved by specification and compliance alone.

There are many aspects of TQM that we would recognise in today’s SMS including:

- Senior management leadership and commitment
- Continuous improvement
- Plan – Do – Check – Act
- Worker participation
- A TQM culture (this has many similarities to a safety culture)

Seeing the potential of TQM, the Health and Safety Executive (HSE) combined these principles with safety in 1991 and published ‘HS(G)65 Successful Health and Safety Management’.
In 1994 the ISO standard 9001 was updated but with a new emphasis to undertake preventative actions to manage safety. In 2000 the document was updated once again, this time incorporating the principles of TQM.

The spread of management systems from quality into the fields of environment, safety, asset management, security management and social accountability has resulted in a variety of applications. However, ISO standards can continue to promote top-down control within the organisation similar to their earlier counterparts rather than encouraging the need to generate understanding for improvement amongst everyone, as per the TQM approach.

ISOs can be seen as simply cataloguing work procedures and conforming to them. By design they do not require organisations to demonstrate that they understand what the management systems mean beyond compliance with a tick box list of components. In this way the organisation can earn an ISO standard without fully understanding or integrating meaningful principles bespoke to their operation into the organisation.

1.4 The impact of legislation

The safety arrangements of an organisation first became formalised in the UK by the use of a Safety Case presented to regulators as part of a permissioning regime.

The Nuclear Installations Act of 1965 required nuclear installations to hold a licence; one of its requirements was the development and use of a Safety Case.

The Safety Case required the organisation to describe - and demonstrate the fitness for purpose and effectiveness of - safety arrangements through the nuclear installation’s lifecycle. The actions carried out by people working at the installation and the equipment, maintenance arrangements etc, were then required to conform to those described in the Safety Case.

In 1976, a chemical release near Seveso, Italy caused widespread environmental damage and adversely affected the health of thousands of people. The resultant European Seveso Directive was implemented in UK law by the Control of Industrial Major Accident Hazards (CIMAH) regulations in 1984, which created the need for chemical operators to also have a Safety Case. This set a precedent that was followed by other industries. Subsequent to the Piper Alpha offshore oil installation disaster in 1991, the Safety Case used to demonstrate that oil production platforms were safe also had to deliver a successful SMS.

In 1996, BS8800 was developed as a British Standard to help implement and manage an SMS. It built on HS(G)65 but placed a further emphasis on implementing the SMS, the Plan – Do – Check – Act cycle and a safety culture. The development of Occupational Health and Safety Management System Specification (OHSAS) 18001 which has international recognition, may be seen as the continuation of standards thinking on SMS and the attempted incorporation of TQM ideas.

In 1994 the Railway (Safety Case) Regulations (RSCR) required transport operators to have a Safety Case, within which actions were required in pursuance of Regulation 5 of MHSWR. Later in 2000 the RSCR guidance highlighted that operators should hold a Health and Safety Management System highlighting the benefits of TQM and HS(G)65.
The railway safety case (RSC) regime had two purposes:

(a) To give confidence that an operator had the ability, commitment and resources to properly assess and effectively control risks to the health and safety of staff, contractors, passengers and the public

(b) To provide a comprehensive core document, with links to other more specific documents, rules and procedures, against which management and HSE can check that the accepted risk control measures and the health and safety management systems have been properly put into place and continue to operate in a way originally intended. (HSE, 2001)

The RSC brought about a number of benefits for Duty Holders (Transport Operators). A major benefit of the regulations came from the process of developing the RSC itself. The process identified gaps in procedural documentation and led to the development of new company standards.

The RSC also encouraged the proactive use of risk assessment to explore specific risks within a Duty Holder’s operation.

However, the RSC regulations often resulted in large amounts of detail to be provided by operators because the safety case was developed to satisfy two users; the operator and the regulator. A large document would be good for the regulator, because it would fully explain and document activities to be audited against, but was cumbersome for the operator to maintain.

1.5 Where are we now?

In 2006 ROGS replaced the RSC Regulations and brought the SMS to the forefront of an organisation’s effort to manage safety.

The previous regime had maintained the ‘compliance’ aspect of safety also advocated by quality standards. This may have inhibited the improvement and understanding aspects of safety.

The main reason for the introduction of ROGS was to implement the European Railway Safety Directive (2004/49/EC) which created a common framework for railway safety across Europe. The requirement for the transport operator to provide comprehensive documents for the regulator had been removed and a smaller ‘signpost’ document could be produced with a summary of the safety management system.

The requirements of ROGS are supported by ORR guidance:


See page 70 onwards for the full reference.

Effective safety management requires a balance between compliance to approved ways of working and the widespread understanding of how work processes and procedures are developing. Excessive documentation written only by those who strategise the work can exaggerate a separation between those who do the thinking about the work and those who are carrying it out. This can limit innovation and continuous improvement.

ROGS provided an opportunity to address the balance, although this can prove challenging, especially to an industry that has developed through a tradition focussed on compliance, law and standardisation.

1.6 Conclusion

A ‘compliance culture’ has been ingrained in rail organisations by many years of rules and standards-driven safety legislation and management. This compliance culture has in some ways been reinforced through the RSC. It is a culture which is widespread and difficult to change.

Approaches such as TQM suggest greater balance between compliance with minimum standards where necessary and innovation in pursuit of continuous safety performance improvement. This is the context within which the railway SMS now sits and is the challenge that this guidance aims to help safety managers and others address.
Summing up

• Quality cannot be inspected into a product. The drive to achieve a quality product needs to be an objective shared among, and embedded within, the whole workforce.

• ISO standards can continue to promote conformance and control rather than understanding and improvement unless integrated into wider practices of the organisation.

• Previous legislation and organisational standards may have maintained a conformance attitude to safety rather than the development of understanding and improvement.

• ROGS allows for the development of an SMS bespoke to the organisation’s operations and risk profile.

• The SMS should satisfy the organisation itself, not just the regulator.

Discussion point...

What does this guidance mean by compliance cultures...?

The extract below from a 2009 speech by Judith Hackitt, chair of the Health and Safety Executive, highlights the problems of an overly bureaucratic mindset on organisational safety.

‘Standards, frameworks and management systems have become increasingly popular as tools for delivering assurance to boards and organisations’ stakeholders. There is no doubt that management systems can and do provide a good framework for structured and comprehensive management of risks. But that said, paperwork does not save lives...

[with regard to] ever more prescription and detailed instruction. I can fully appreciate the immediate attraction of this approach... but it is not appropriate for [safety assistance] to come in the form of prescriptive detailed requirements. I am firmly of the view that we have reduced far too much of the role of managers and supervisors to ‘ticking the boxes’, and we should certainly not do that in the field of health and safety...

I’ve already said a number of things about common sense - don’t over bureaucratis the process, don’t try to eliminate all risk - because you can’t and because that is not what the law requires. We all need to recognise that this is an area of management which requires the exercising of judgment - not just at Board level but throughout the organisation, and ensure that people at all levels in the organisation are trained and encouraged to exercise their own judgment not just comply with the rules’.
Section 2
Shaping the system
The previous section highlighted the opportunity and benefits for organisations to tailor their SMS to their own particular needs and activities. This section highlights the benefits to be gained from giving thorough consideration to the foundations on which the SMS is built, starting with setting a clear and understood purpose.

Many organisations will already hold a compliant SMS. However, there is benefit in an organisation making a conscious effort to look again at the purpose of the SMS, what the principles are for achievement and what this achievement looks like.

Examples of major accidents and events are provided throughout section 2. These illustrate various underlying factors that relate to failures of SMSs for which principles for improvement are discussed in Section 3.

Preparations for creating an effective system are discussed and include re-considering the purpose of the SMS, its scope and structure and establishing the system in practice.

The contents include:

2.1 What is a system?
2.2 Establishing a purpose
2.3 Implications of an ill-defined purpose
2.4 Preparations for an effective system
2.5 Conclusion
2.1 What is a system?

Before defining the purpose of the SMS it is important to understand some key terms, such as what is meant by the concept of a ‘system’.

A system can be defined as:

‘Two or more parts that work together to accomplish a shared aim.’ (Deming, 2000)

For a system to be effective it must have a clear purpose and also a defined system boundary to establish what should and should not be included within it.

At a basic level, a system can be anything that a person is interested in understanding better. For a Formula One team, it may be an engine, the whole car, the car plus the driver, or the car plus driver with track and pit stop crew.

A system will have an environment and/or a supersystem that it is a part of, as well as subsystems that work within it. What counts as supersystem, system or subsystem will vary depending on each individual’s perspective. For example, one person’s system of interest may also be another’s supersystem or subsystem.

Systems can be complex; they have purposes, boundaries, differing views of use and interfaces, they also have subsystems and may be part of a supersystem. These factors should be recognised, understood and managed. Where the system begins and ends is often not obvious and therefore it needs to be debated, iterated and decided, in order to be managed effectively.

Further reading...

For further details on the ideas behind this:
Royal Academy of Engineering: ‘Creating systems that work’
See page 70 onwards for the full reference.
Section 2 - Shaping the system

BP Deepwater Horizon disaster

This example highlights the importance of a shared aim for a system that links management and its employees. It also shows the benefits of identifying supersystems, systems and subsystems.

On the evening of 20 April 2010, hydrocarbons escaped from the Macondo well onto Transocean’s Deepwater Horizon oil rig in the Gulf of Mexico leading to explosions and a fire that killed 11 and injured 17. The fire burned for 36 hours until the rig sank. Hydrocarbons continued to flow from the wellbore for 87 days, causing an environmental disaster.

The US commission’s report on the disaster (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011) identified a significant lack of understanding between management thinking and front line activity as a contributing factor. It identified a disconnection in what was required by management and what could be achieved. In essence the aims of management were not aligned and shared with its employees.

The accident was also caused by failings between the organisations that worked on the rig and was exacerbated by differing levels of safety culture throughout organisations in the offshore oil and gas industry. By recognising supersystems, systems and subsystems for the management of safety arrangements the interfaces between organisations would have been more readily identified and the important interfaces better managed.

Other contributing factors to this disaster include:

- Overbearing organisational standards and procedures
- Lack of competence
- Poor management style
- Low workforce participation
- Poor cooperation and communication between organisations

RSSB has produced a summary of the investigation report into this incident; see page 70 onwards for the full reference.

2.2 Establishing a purpose

An organisation needs to put concerted effort into stating a clear purpose for the SMS to determine how it needs to be built and share understanding as to how it should be shaped. The importance of establishing a clear purpose for the SMS should not be underestimated. Without this the outcomes from the SMS may not be fit for purpose. During its development, the organisation should make a conscious effort to understand:

- What the SMS is to be about
- What the principles are for achievement
- What achievement looks like in reality

Other reasons to develop a clear purpose are that:

- The purpose sets out what the employees aim towards, it allows them to understand what they contribute to and clearly asks them to invest in the idea
- It allows management to show leadership and direction
- It is only through conscious effort that the relationships between SMS activities will be clearly understood and therefore open to optimisation
- It should generate cooperation between functional interfaces to meet the overall purpose
- It promotes the development of a positive organisational culture
2.3 Implications of an ill-defined purpose

Unclear and ill-defined aims, built up over time, can default the SMS to a form that has reduced benefits.

An under-performing SMS with an ill-defined purpose is more likely when the organisation is:

- Only attempting to meet basic legal requirements
- Unthinkingly following the SMS of other organisations
- Repackaging versions of previous / existing systems
- Focusing purely on producing comprehensive standards and procedures, resulting in a compliance culture

An SMS with an ill-defined purpose will prove less effective because it has:

- Poor foundations on which to develop a safety culture and continuous improvement
- Been designed by convenience which sacrifices effectiveness and efficiency
- Originally been designed for, and therefore better suits, a different organisation
- Details and structure that better suit a different legislative system
- Become overly complex and inflexible, and is continually added to without thought or justification

The loss of the Nimrod aircraft

This example from the independent inquiry into the Nimrod accident of 2006 review shows how the lack of a clear and conscious purpose can reduce the effectiveness of safety arrangements.

On 2 September 2006, RAF Nimrod XV230 was on a routine mission when it suffered a catastrophic mid-air fire, leading to the death of all 14 people on board. The immediate cause of the fire was a fuel leak. However, behind this cause was a series of errors made in the Nimrod safety case.

The development of the safety case showed all the hallmarks of an ill-defined purpose. The safety case was said to have ‘missed the key dangers’ and was ‘fatally undermined by a general malaise’. The ‘task of drawing up the Safety Case became essentially a paperwork and ‘tickbox’ exercise’. The lack of a clear and bespoke purpose also allowed the system to become very complex and defeat the overall objective of the safety case: ‘The Safety Case regime has lost its way. It has led to a culture of ‘paper safety’ at the expense of real safety. It currently does not represent value for money’.

The Nimrod Review highlighted:

Other contributing factors to this loss include:

- Poor governance and leadership
- A poor organisational approach
- Poor standards and procedures

RSSB has produced a summary of the investigation report into this incident; see page 70 onwards for the full reference.

<table>
<thead>
<tr>
<th>Safety Case faults as:</th>
<th>Principles for the future as:</th>
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<tr>
<td>Bureaucratic length</td>
<td>Succinct</td>
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<tr>
<td>Compliance-only exercises</td>
<td>Home-grown</td>
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<tr>
<td>Failure to see the wood for the trees</td>
<td>Accessible</td>
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<tr>
<td>Archaeological documentary exercises</td>
<td>Proportionate</td>
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<tr>
<td>Lack of operator input</td>
<td>Easy to understand</td>
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<tr>
<td>Disproportionality</td>
<td>Document light</td>
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</tbody>
</table>
Section 2 - Shaping the system

The purpose cannot be at odds with how the organisation is run. For example, a purpose that sees employees as viable contributors will struggle if working alongside organisational structures, standards and a culture that limits real participation. A compromise that involves the employees, but does not satisfy commercial objectives, can equally be a shortcoming.

The purpose should be believed in by senior management. It also needs to make sense to employees, contractors and suppliers because the effectiveness and efficiencies of the future will be found by everyone directing their energies together towards this common aim.

In order to promote benefits and gain commitment to a clearly defined purpose:

• Senior management needs to show consistency of purpose to strive towards the goal

• Time should be allowed for trust and conviction to build; it will not come quickly, especially if it has previously been broken

• Short-term and perhaps unsustainable benefits may need to be sacrificed for long-term thinking

• Managers and employees should have the responsibility, competence and resources to achieve their purposes

• Recommendations should be generated for the future as new attainment levels of effectiveness can lead to the identification of new purposes

The organisation may choose to set out the purpose of the SMS in policies, detailed policy breakdowns, objectives, plans and strategies.

Fire Service Reforms

This example illustrates the importance of periodically reviewing SMS arrangements to ensure they are still optimised for the risks they address. It also illustrates the importance of thinking carefully about the purpose and scope of an SMS when reviewing its component parts.

In 2001 the UK introduced a major reform to the basis on which Fire and Rescue Services were planned and operated. The Fire Service had previously been set targets in terms of the required number of appliances and maximum time for response. The standards were highest for dense industrial and commercial centres. Over the intervening decades, however, building standards had evolved to the point where fire risk in these areas was minimal. The safety risk from fires was now almost entirely in residential areas.

On top of this shift in where the safety risk lay, the old Fire Service standards made no reference to any form of activity to prevent fire. Nor did the standards (or Fire Service funding) at all reflect the large volumes of Fire Service activity and numerous lives they saved in road traffic accidents and other emergencies they attended besides fires.

The reforms reset the purpose and scope of the Fire Service to include a wider ‘fire and rescue’ remit, and required Fire Authorities to plan their services around an Integrated Risk Management Plan - directing their resources towards where they could have the greatest effect in reducing public risk.
2.4 Preparations for an effective system

The steps set out within figure 4 can help define the SMS purpose and a supporting scope and structure can be created or revitalised. The building of a clear SMS purpose can provide an opportunity for a fresh look at the safety arrangements of the organisation. In beginning this task there is a need to take stock of the safety risks involved in organisational activities, and of the SMS role in managing them. The following questions will help clarify the situation:

- Who is at risk from the activities?
- What part does the organisation play in controlling those risks?
- What part does the organisation play in controlling risks generated by the activities of others?
- What are the current levels of those risks and how are they changing?

In some circumstances after following the steps in figure 4, the organisation may retain its current purpose deciding there is no need for a change. However, it will be reassured that alternatives have been considered and that the SMS in use is currently the ‘best fit’ for the organisation.

In figure 4 A and B represent the concept phases to plan a purpose, scope and structure for a system (in this case an SMS) and C, a method for establishing it.
A Purpose

To develop an SMS purpose that can deliver the most benefit to the organisation, various factors that influence what can be achieved should be considered.

A.1 Testing boundary options

For an organisation to decide its purpose, it could consider defining what it intends the SMS to do, including what components are going to be part of the SMS and what is to be outside it. This is called setting the boundary.

The boundary:

The SMS does not have a shape or form set in stone. Establishing a boundary allows the SMS users to define what is going to be directly managed by the SMS and what external conditions there are that will affect the SMS and may require interfaces.

Systems have boundaries; without them, they cannot be thought of as systems. These boundaries should be recognised, understood and managed. Where the system ends is often not obvious and therefore needs to be debated, iterated and decided, in order to be managed.

During consideration of the boundary, the organisation should consider what the inputs, actions and outputs of the SMS are to be.

To determine the SMS boundary the organisation may ask:

- Is the SMS a road map to documents, the creator of documents or both?
- In which areas is it being expected to guide and in which will it drive?
- What are the areas of control and required conformity?
- What are the areas of possible or necessary influence?
- Is the purpose of the SMS to permeate the disciplines of operations and engineering, or is it to connect them through defined interfaces?
- What interfaces need to be built up? Are these interfaces to be formal or informal?
- Is the SMS a facilitator of communications?
- Will communications pass more freely if third parties such as contractors are within the boundary of the SMS or outside?
- What other functions of the business are included and how?
A.2 Views of use

Individuals have established agendas that underpin their activities. These are informed by their personal experiences, needs and goals and may differ widely across an organisation. Understanding the mix of views is important when establishing a boundary that makes sense to SMS users and engages more of them.

To understand the view of the user, the organisation may ask:

- **How will different groups of people react to the SMS?** For example, how will engineers react to the SMS? Does it conflict with their professional body of knowledge?
- **Will the supplier/contractor see being part of the SMS as an advantage or a hindrance?**
- **Does the boundary include employees by name only or does it really want active participation?**
- **If employees are included will they react any differently than if they are the passive recipients of processes, rules and standards?**
- **Which boundary will best enable the idea of the SMS to permeate the organisation?**
- **Why does a particular function benefit from interacting with the SMS?**

A.3 Internal interfaces

The SMS will cover a number of different business and organisational processes, as well as functions and departments it interfaces with and influences.

Functions such as engineering tend to have qualified professionals with well-defined approaches and traditions of their own that have evolved over a long period of time. In such cases, the SMS may be considered as a side-issue, something which is delivered by ‘other departments’. Therefore extra effort may be required to ensure the right level of involvement of such groups in the development of the SMS.

The organisation should clearly establish where and how the SMS will interface with other organisational activities. With regard to engineering, it could be with the activities guided by documents such as EN50126: The specification and demonstration of reliability, availability, maintainability and safety or Engineering Safety Management (The Yellow Book) and with processes such as safety verification.

These recognised interfaces are important because the organisation’s SMS, although attempting to manage all organisational safety requirements, can have inherent bias towards particular aspects of safety.

This is because:

- **Functions might specialise in one form of safety but not link up with others**
- **Measures or knowledge appear comprehensive but only partially cover the organisation’s activities**
- **Individuals are biased to areas where competence is already established**
- **Culture and behaviours are thought to be uniform, but are not**

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**Different views of level crossings**

This example shows that to deliver a system that all can buy into, the views of as many stakeholders as possible should be understood.

Over many years the railway and highway authorities have struggled to agree the most effective safety management arrangements for level crossings. Many rail transport operators feel the burden is entirely on them to try and manage this significant risk, despite it being created in large part by the behaviour of road users such as motorists.

However, in road safety terms level crossings are a tiny proportion of the risk so are not a major priority for highway authorities. While railways have an obligation to consider the impact of their activities on others who are not rail users, highway authorities’ duties are focused on road users rather than on others.
Because of the variety of disciplines and activities of an organisation, the full implications of the SMS cannot be managed or understood by one person alone. It takes understanding and effort across departments and between organisations (including contractors and suppliers) to manage the SMS.

Hazards do not recognise silos or functional divisions, despite the fact that an organisation’s structure and work tasks may do.

To encourage cooperation across interfaces, refer to the systems thinking principles section discussed in 3.3.2 Management Style.

A.4 Environment

The environment refers to everything which lies outside the SMS boundary, and it is within this that the SMS needs to establish itself.

The development of the SMS purpose needs to recognise the pushes and pulls its environment creates if it is to establish its relevance within the organisation.

Stakeholders (including customers) will have a significant impact on the environment as they are the ultimate judges of the performance of the company, part of which will be driven by the SMS. Solely satisfying internal indicators of performance means little if the groups who rely on the organisation’s output, or contribute to its revenue or funding, are unhappy with the organisation’s approach and delivery of products with regards to safety. The organisation needs to identify stakeholders and customers and their relevance to the SMS as a first step towards understanding their needs.

In reality the picture is complex and depends on levels of interest and influence that can become stronger or weaker depending on other environmental conditions, such as costs and recent events.

Costs to the organisation can increase either when irrelevant needs are catered for (perhaps because of unnecessary bureaucracy) or when relevant needs are missed (such as contractor/supplier requirements). SMS integration in the right areas will ultimately depend on satisfying the organisation’s customers.
Legislation creates obligations that the organisational SMS is required to meet. These requirements and the continuing changes to legislation relevant to the work undertaken by the organisation, need to be identified and integrated by SMS processes and competent people.

These amendments (or pending changes to legislation) need to be communicated in a targeted way to those that need to put them into practice. Managers may also take account of supporting approved codes of practice and guidance, where applicable.

Organisational failure at Mid-Staffordshire NHS Foundation Trust

This example highlights that the system has to produce outcomes which satisfy customers rather than just internal indicators of performance.

Concerns about mortality levels and the standard of care provided at the Mid-Staffordshire NHS Foundation Trust resulted in an inquiry into the activities of the trust. This inquiry gave rise to widespread public concern and a loss of confidence in the Trust, its services and management. The evidence gathered by the Inquiry (Francis, 2010) showed that:

- Basic elements of care were neglected
- Staff were dismissive of the needs of patients leading to injury and loss of dignity
- Staff failed to make basic observations and pain relief was provided late or in some cases not at all
- Patients were too often discharged before it was appropriate, only to have to be re-admitted shortly afterwards
- Poor standards of hygiene

The Trust’s board was found to be ‘disconnected from what was actually happening in the hospital and chose to rely on apparently favourable performance reports by outside bodies such as the Healthcare Commission, rather than effective internal assessment and feedback from staff and patients’. There was said to be a focus on systems, not their outcomes. The purpose of a system is to deliver outcomes that satisfy its customers.

Other contributing factors to this organisational failure include:

- Poor governance
- Disconnected management style and approach
- Lack of workforce participation
- Poor use of targets and measurements
- Poor cooperation and communication

RSSB has produced a summary of the inquiry; see page 70 onwards for the full reference.

Legislation creates obligations that the organisational SMS is required to meet. These requirements and the continuing changes to legislation relevant to the work undertaken by the organisation, need to be identified and integrated by SMS processes and competent people.

These amendments (or pending changes to legislation) need to be communicated in a targeted way to those that need to put them into practice. Managers may also take account of supporting approved codes of practice and guidance, where applicable.
Standards agencies use the achievement of standards such as OHSAS 18001 to show a level of SMS attainment akin to HSE guidance such as HSG65. These standards can also provide some competitive advantage in potential contract awards. Following ROGS, ORR is to increase the focus of its interventions beyond paper-driven compliance towards the SMS ‘in practice’. However, SMS holders may still experience the allure of awards presented by organisations providing more theoretical, paper-based standards. They may therefore continue to focus on paper-based structures that are easy for standards agencies to audit.

Business objectives and strategic integration of safety management should be seen as part of business management. This means the SMS’s purpose should readily align with the over-arching organisational business objectives. Where possible, direct links should be made between business objectives and what the SMS will deliver. Safety activities should also be linked to local or functional business plans to help promote the SMS throughout the organisation.

Business objectives also need to recognise how the SMS contributes to a sustainable organisation. Misconceptions of conflicts between safety bureaucracy and business survival should be dispelled.

Holistic views of the business like this will contribute to strategic integration. This means the independent components of an organisation are integrated into combined effort. Its activities are closely linked to developing integrated management systems.

Integration is not just about the creation of cross-functional teams and mindsets for organisational improvement; it requires an appreciation of other professions and recognition of the benefits that can be attained when they work well together through a combined perspective. For example, the purposes of HR, safety and the operational managers need to be mutually understood to build a competency management system that really delivers.

These themes are all explored within this guidance and they are easily transferred beyond the discipline of safety. What will make the SMS effective is to be clear on what defines good quality safety practice and what different parts of the organisation need to do to achieve this.

Further reading...

The NASA Systems Engineering Handbook is a technical engineering document that may prove helpful. Systems Engineers are beginning to use some of the ideas covered within System Design beyond ‘hard’ systems to also apply when managing ‘soft’ organisational systems.

The document also covers:

- Interface management
- Configuration management
- Decision analysis

National Aeronautics and Space Administration: ‘NASA Systems Engineering Handbook’

See page 70 onwards for the full reference.
B Scope and Structure

Once the purpose of the SMS has been considered and provisionally agreed, the organisation can build on it by identifying a supporting scope and structure.

This may involve identifying:

- A set of user needs for the SMS
- The system delivery requirements to meet the user needs
- A design stage to achieve system delivery
- The formal documentation of plans

B.1 User needs

Building on the identification of the SMS customers in defining the purpose (A), this next step in the process is understanding how best to meet their needs. Interviews and workshops could be used to elicit this information. On each occasion those working with the SMS are attempting to develop profound knowledge of the SMS; what it involves, how it works, who is involved, what individual aspirations there are and most importantly what is realistic to achieve.

User needs should be understood and documented as completely as possible but they should be kept short, non-technical, and be understandable to all users.

For example, a user need may be: ‘for our train drivers to provide a safe train service’.

User needs may also include:

- The operational environment such as the geography of the area covered, densities of use, attitude and education of staff, etc
- Business objectives which should define the interaction between the business and the SMS – these are just as important as general user needs

It is important that the development of solutions to the users needs are dealt with at a later stage and that the users do not become waylaid by trying to think of a solution to the need before properly establishing exactly what their requirements are. This is so that the organisation does not become constrained or biased towards one potential solution but instead, through developing a thorough understanding of all user needs, other solutions may arise that may more fully address them.

B.2 System delivery

System delivery identifies the requirements for what the SMS must do to overcome challenges to meet requests created by user needs. They state the essence of what the SMS must do, but not how it is done – this is developed further in B.3 ‘the design stage’.

For example, it may be established that the SMS must deliver ‘Train drivers who are competent to standard X’. However, it is not explicit in defining how these are achieved. By addressing these stages separately, organisations can design to match the capability needed, rather than be tempted to leap forward to outcomes that have not been fully thought through.

At the system delivery stage, controls to the possible solutions are introduced so that the answers arrived at are usable. These controls may be:

- Legal requirements
- Learning from operational experience
- Quality requirements

Such controls help funnel the way so responses and solutions are developed, to ensure they are fit for purpose.
B.3 Design stage

At the design stage the organisation may:

- Produce a design structure that links the user needs with the system delivery
- Identify the various parts required to meet the design
- Identify how the various parts will interact to create the system required

For example: the design stage may suggest ‘a list of all train drivers needs to be produced and kept up to date, standard X needs to be obtained and taught to the drivers, a competence programme needs to be delivered by driver managers’.

Discussion point...

Case study reviews

To assist with the designs being developed, case study reviews can be used to better understand the benefits and challenges of the various options that may be generated. This may be completed by gathering a number of experienced employees together that have a stake in a particular issue and asking them to read through three or four case studies that have been created, which are credible as possible designs for a solution. The thoughts of the experienced personnel regarding the case studies raised should then be recorded and used to help formulate decisions.

It may be useful to approach the design stage by addressing four main areas the SMS should influence:

1) Business process arrangements are the reason the business is in operation. Their successful management relates directly to the success of the organisation. They should have integrated safety practices, so that they are safe but still perform well. The other areas should assist with this integration.

2) Organisational arrangements make the organisational system work. These arrangements are the connections and feedback mechanisms that make the organisation aware of what it is trying to do and how it is performing. When they do not function correctly, understanding and control can be lost. They include: organisation and responsibilities; communications; cooperation; monitoring, and review.

3) SMS enablers are the components which put the SMS into action. They are the activities that should be carried out within the organisation to assist organisational safety. Components such as risk management, change management, and accident investigation fall within this topic. SMS enablers should be used when required to apply safety principles to other processes or during the course of work.

4) Safety specific arrangements include components such as fatigue, noise, Hand Arm Vibration (HAVS) etc that should be directly put into place as safety arrangements.

B.4 Documentation

Documentation of the SMS should have a clear and logical structure. The main areas covered may include:

- System structure
- System behaviour
- System layout

The three areas are closely related and have some overlap but for ease of use it can help to describe them separately.

It may be easier to start by documenting the main SMS deliverables and then to build on this whilst trying to avoid making the structure too complex.

System structure covers what the major structures of the SMS are, how they are organised, and what relationships exist between them. This will present a static view of the SMS.

System behaviour covers the interaction between the various SMS parts and highlights the main behaviours expected, such as:

- Major system processes
- Data flows
- Assurance processes
System behaviour processes from end to end across the whole of the system should be considered, covering the effects that one part of the system can have on another further down the line.

**System layout** will describe how the system is applied to the organisation. It will highlight things such as:

- *How information is accessed* (for example via an intranet, who has access to what)
- *Where training is managed*
- *Which groups will exist to actively participate in and enhance the SMS activities*
- *Which meetings are being used to discuss safety issues*

By documenting the system layout, the organisation will be able to identify clearly the infrastructure that is needed to meet the SMS design.

These three areas can also be summarised in a form that can be passed to the governance body and/or employees to help them understand their role within the system. For employees, it might identify such things as the hazards they are exposed to through documenting and distributing information on hazard paths and barriers.
C Establishing

By following the suggestions contained within sections A and B, the organisation will be able to come to a decision about the concept purpose, scope and structure of the SMS.

This is a significant step and the work and effort gone into getting this far should not be underestimated or undervalued, even if a decision is made for ‘no change’.

In order to do justice to the work conducted to this point, a structured and considered process should be used to decide whether to go ahead with any changes and to ensure that the system is faithfully implemented as per its design.

C.1 Decision

Once a clear purpose has been reached and scope and structure agreed, a decision needs to be taken in order to take the proposed new system from concept through to reality.

This could be achieved through developing a formal business case or may occur naturally because the timing is right for the organisation.

C.2 Gap analysis

Following a decision to go ahead with a different SMS purpose, scope and structure it is most likely that a gap analysis will need to be undertaken to establish the difference between current and desired usage.

During the gap analysis, it will be important for management to distinguish between what it perceives it is currently achieving through the SMS it is using and the stakeholders’ and customers’ experience of it.

Gaps will be identified across themes such as:

- **Physical attributes**: the SMS has the correct procedures, personnel, equipment etc
- **Reliability**: the ability of the SMS to perform the promised service dependably, accurately and with quality
- **Responsiveness**: the ability of the SMS to respond to the requirements of its customers
- **Assurance**: the reliable level of assurance the SMS provides the organisation in regards to safety
- **Participation**: the amount of activity the SMS creates in practice in order to manage safety

The gap analysis should:

- Define what the organisation is trying to find out and where it is going to find it out
- Determine the key expectations across of the SMS
- Use key performance indicators, audit reports, field reports, assurance activities and regulator interventions to produce data on any gaps
C.3 Managing change

By looking again at the purpose of the SMS and attempting to align it to more effective forms for SMS content, a number of changes can become apparent. These may not cause immediate significant change as improving effectiveness can be about a change of approach and mindset that leads to incremental improvements.

The pace of any desired changes may also be slow, as those working with the SMS look for the most opportune moments to instigate plans along with new business projects or changes in approach elsewhere within the organisation.

However, it is essential that an organisation is awake to the possibility of change and the impacts / consequences it may present. Significant change(s) should follow a considered change management process.

Significant change can be identified by the following criteria:

• **Failure consequence:** credible worst-case scenario in the event of failure of the system under assessment, taking into account the existence of safety barriers outside the system

• **Novelty used in implementing the change:** this concerns both what is innovative in the railway sector, and what is new just for the organisation implementing the change

• **Complexity of the change**

• **Monitoring:** the difficulty in monitoring the implemented change throughout its use and taking appropriate interventions

• **Reversibility:** the ability to revert to the system before the change

• **Additionality:** assessment of the significance of the change taking into account all recent safety-related modifications to the system under assessment and which were not judged as significant (ERA, 2009)

In all cases where change is required, measures implemented should be proportionate to the risk(s) they present. The signpost box highlights detailed change management guidance available.

Further reading...

To find out more about change management it may be useful to refer to the following guidance:

For managing organisational change –
International Atomic Energy Agency: ‘Application of the Management System for facilities and activities’

For a good understanding of the legal requirements and management of change –
European Rail Agency: ‘CSM Risk Evaluation and Assessment, ERA Guide for Implementation’

For a good understanding of how change is managed within the nuclear industry –
International Atomic Energy Agency: ‘Managing change in nuclear utilities’

See page 70 onwards for full references.

C.4 Promotion

Senior management should promote and encourage discussion within the organisation about the SMS purpose that has been developed.

A publication of the purpose and senior management’s stated commitment to deliver it could be aimed at employees to grab their attention and encourage widespread understanding. It should also be made clear to everyone how they will contribute to the purpose. An effective employee reporting and feedback system may be made available to understand the effects of the conscious purpose in practice.

Any competency needs and resource requirements to implement and maintain changes identified by the new purpose should be recognised.

Taking steps towards fulfilling the purpose in practice is not likely to be easy nor without setbacks. This should also be made clear to everyone, and the progress being made against the purpose made visible through updates.

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C.5 Ongoing adjustments and refinements

It is almost certain that the SMS ideas developed on paper will not perform exactly as expected in practice; this is perfectly natural and acceptable.

When data and field information highlights where the SMS does not perform as expected, it will be easier to identify where this is occurring if the purpose has been consciously developed.

Reviews can provide the opportunity to identify and discuss any issues and ideas that emerge as a result of the SMS’s purpose. The purpose itself should also be reviewed from time to time to maintain its relevance and currency within the organisation.

Treating the purpose in this way encourages clarity and conscious development.

2.5 Conclusion

An SMS needs to change with time. But some parts of the rail system – in particular a strong compliance culture, and a recent history of voluminous safety case documentation – make change difficult to implement and can be a double-edged sword, stifling innovation.

Strengths in current GB safety performance trends provide a good place to start. However, it is possible to derive a lot more benefit, both to the individual organisation and the railway as a system, if there is more conscious effort invested in SMS design. Establishing a clear purpose, scope and structure will help with this.

SMS design can empower the entire workforce to deliver continuous improvement in safety performance, as an integral part of the organisation’s over-arching business objectives.

The design also needs to be sensitive to existing ‘compliance cultures’ which can over-emphasise the prescriptive dimension of safety management and stifle the opportunity to innovate and increase competence.

In section 3, the guidance considers how, having tailored the SMS to the organisation; it can be made to work effectively in practice.

Summing up:

- Preparations for an effective system include defining a clear purpose, scope and structure and a method for establishing the system in practice
- For a system to be effective it must have a clear purpose and also a defined system boundary to establish what should and should not be included within it
- An SMS that has an ill-defined purpose will often not fit the organisation’s structure, philosophy and aims or recognise and take into account ever changing risk factors
- Working to arrive at the most appropriate purpose and boundary by understanding many views of use can mean that many more people have a stake in the success of the SMS. However, the purpose will need to be clear to all
- It is essential that senior managers understand and accept their roles and responsibilities in creating the environment for the SMS to succeed
- If senior managers do not understand or back a well-defined purpose for the SMS they stand little chance in taking workers / contractors / suppliers along with them and being effective in practice
- Safety risks appear very differently when viewed from different stakeholder perspectives, and railway organisations need to think carefully about the part others play in creating and managing risks when devising their own SMS
- The SMS and business objectives should be aligned to facilitate SMS integration into the wider organisation
- User needs should be identified and documented in a way that is understandable to all
- The design stage of an SMS may be approached by understanding business process arrangements, organisational arrangements, SMS enablers and safety specific arrangements
- Gap analysis can help establish differences between current SMS usage and the desired SMS usage
- Managing change is part and parcel of improving the effectiveness of the SMS
- Ongoing reviews of, and where necessary adjustments to, the SMS are essential to keep the system effective
Section 3
The SMS in practice
Section 3
The SMS in practice
Section Overview

It is important to recognise that it is not just the SMS ‘model’ and its constituent components that make up the SMS, but also how an organisation ‘lives out’ its SMS through activity and associated behaviours.

All these factors should come together for deliberation during the development of the SMS purpose and the practice of safety within the organisation.

This document suggests that when you change the way work is designed and managed, and make those who do the work the central part of the intervention, the safety culture of an organisation can change dramatically as a consequence.

The ‘safety culture’ of an organisation can be defined as: the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation’s health and safety management. (HSE Advisory Committee on the Safety of Nuclear Installations (ACSNI)).

The principles presented in this document do not focus on culture as something distinct from the work or as something that can be the subject of a direct intervention. Instead it sees the safety culture of the organisation as an emergent property from the activities of management (including taking a system wide view) and their relationship with employees.

For this reason there is not a distinct section on safety culture in this document. However, interpretations of safety culture can provide a focus on the frequency of key day-to-day behaviours (frontline and management) and the extent to which these are encouraged and supported by an effective and flexible safety management system. It can also highlight the shared belief in the importance of safety.

It is widely recognised that the elements contained within section 3 of this document contribute to making management systems more effective (Deming, 2000, Seddon 2003, et al). However they are often looked at in isolation as separate entities and so not considered collectively as a whole with regard to system development, a key feature of this document.

The elements in this section are here first and foremost because they make management systems more effective. Many of the contributory factors in the examples of accidents and events highlighted in section 2 further demonstrate the importance of these ideas.

This section provides the opportunity to weigh up alternative ideas for improvement of organisational factors in relation to a particular SMS. It aims to help managers make the most appropriate decisions to improve the effectiveness of an SMS at the most appropriate times. Within different systems some ideas will work better, and therefore have a stronger emphasis, than others but none are likely to be the best or only option in all circumstances.

The contents include:

3.1 The organisational essentials
3.2 Management style and approach
3.3 Monitoring SMS effectiveness
3.4 Conclusion
3.1 Organisational Essentials

Whatever the organisation’s management style, there are some basic building blocks without which it will be difficult to improve an SMS. These are:

- Governance arrangements (3.2.1)
- Organisational approach (3.2.2)
- Company standards and procedures (3.2.3)
- Competence (3.2.4)

3.1.1 Governance arrangements

It is important that the people who are most closely involved with an organisation’s governance arrangements (including functions such as management, executive, board, trustees, funders etc) understand the actions taken to develop the SMS and how it assists their collective responsibility to the organisation.

Safety risk should be considered within governance arrangements as a part of business risk and treated as seriously as any other risk, such as financial risk, commercial risk, environmental risk, and so on. Governance arrangements should take steps to ensure that appropriate control processes are in place and that their effectiveness is monitored collectively.

Through participating in the SMS developments described in section 2, governance bodies within the organisation will understand what they want from the SMS and how it supplies information and support to managers to help them put safety into practice.

Building trust within the organisation should not just be a matter of the employees learning to trust management, but also senior managers learning to trust their employees.

The organisation’s governance bodies need to take clear action to allow participation and responsibility at all levels of the organisation and to avoid unnecessary compliance requirements and bureaucracy.

There must be clear accountabilities for safety at governance level. All senior managers should receive appropriate training to ensure they are aware of safety risks and basic safety management arrangements.

However one individual could have specific accountability for safety in the business, and have a higher level of safety knowledge and competence. It is beneficial if this person is not the senior safety manager too, so that appropriate and objective checks and balances can take place.

Senior management will need to form a view on the effectiveness of the SMS after due and careful enquiry, based on information and assurances provided. Reviewing the effectiveness of internal control is an essential part of the senior management’s responsibilities. Management is accountable to its governance bodies for monitoring the SMS requirements and for providing accurate assurance information that it has done so.

Governance bodies may monitor safety performance through the identification and tracking of suitable health and safety Key Performance Indicators (KPIs), and ideally should track ‘Active Indicators’ (see 3.4.2) to enable them to monitor key controls in the SMS to receive early warning of emerging problems.

Governance bodies should not be above reviews on their own ability to perform in relation to the SMS. For example, it is good practice to employ one or more non-executive directors with appropriate knowledge and experience to challenge a Board’s thinking and engagement on safety.

Good governance arrangements will:

- Embed the SMS into the day-to-day operations of the company and form part of its wider business culture
- Respond quickly to evolving risks to the business arising from factors highlighted by the communication and monitoring elements of the SMS
- Allow reporting measures to reach the board to highlight any significant problems or failings
- Be willing to receive ‘bad news’ so that it has a clear view of reality in the business
Section 3 - The SMS in practice

3.1 Organisational Essentials

Anyone who takes part in governance or is part of a governance body, would benefit from an introduction to the SMS upon joining. They should understand the role they play in the delivery of the SMS and understand the need for consistent leadership and commitment.

3.1.2 Organisational approach to the system

The SMS is an enabler for the development of safety ideas, control, innovation and communication; however, how well these are delivered will be significantly affected by the type of approach used by an organisation.

Those using the SMS need to be aware of the type of approaches to safety management they can choose for the SMS and the overall organisational approach that the SMS must work within.

Three types of approaches discussed here are:

- Top down
- Bottom up
- Middle out

Further reading...

The following guidance covers information relating to governance responsibilities:

- HSE: ‘Leading Health and Safety at Work’
- Revised Guidance (Turnball): ‘Internal Control: Guidance for Directors on the Combined Code’
- RSSB: ‘Ethical basis of rail safety decisions’
- RSSB: ‘Taking Safe Decisions’
- HSE: ‘Case studies that identify and exemplify Boards of Directors who provide leadership and direction on occupational health and safety’

See page 70 onwards for full references.
See table 1 on the following page for examples of these three approaches.

Traditionally heavy industries such as nuclear, oil and gas, and rail have top down approaches to their organisations. They are characterised in the following ways:

- The thinking part of the organisation is centralised
- Power as well as responsibility is hierarchical
- Plans and decisions about the right way to work within the organisation come from the top and are applied down through the organisation

This approach will be highly standardised offering high levels of control and uniformity across the organisation. Input into the standards by employees will generally be low, with perhaps some consultation with a few employees at the centre, but little that can be seen as meaningful beyond this.

In practical situations requiring discussion and action from employees, outcomes will often default to compliance with a person’s position in the hierarchy of the organisation and/or in line with standards and procedures, rather than to the expertise of the people who know the situation best.

Senior managers retain much freedom within this structure, but this decreases significantly as an individual’s position within the hierarchy descends and the structures from the top take effect.

Original interpretations of continuous improvement best reflect the bottom up approach. In this instance:

- Employees have the maximum freedom to actively take part in the organising and delivery of the company
- Power is decentralised from the top; employee participation is a necessary requirement to make things happen and allow communications to pass freely
- The management hierarchy is generally much flatter, so that much of the management role is undertaken at the ground level
### Section 3 - The SMS in practice

#### 3.1 Organisational Essentials

#### 3.2 Management Style & Approach

#### 3.3 Monitoring SMS Effectiveness

<table>
<thead>
<tr>
<th>Major Contributors</th>
<th>Top Down</th>
<th>Bottom Up</th>
<th>Middle Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditionally used</td>
<td>Heavy industries such as nuclear, oil and gas</td>
<td>Creative industries, Automotive industry</td>
<td>Mixed</td>
</tr>
</tbody>
</table>
| Characteristics     | • The thinking part of the organisation is centralised  
  • Power as well as responsibility is hierarchical  
  • Plans and decisions about the right way to work within the organisation come from the top and are applied down through the organisation | • Maximum freedom to actively take part in the organising and delivery of the organisation  
  • Power is decentralised from the top, employee participation is a necessary requirement to make things happen and communications pass more freely  
  • The management hierarchy is generally much flatter so that much of the management role is undertaken at the ground level | • The middle out approach means that the main inputs and flows for the SMS come from the middle management level  
  • The middle out approach may use the middle manager level to form a version of the SMS at a lower level within the organisation but which will still input into overarching organisational SMS objectives  
  • Below this middle SMS, managers and employees would have greater freedoms to have an effect on the contents of the SMS and how it is run |
| Control             | Senior Managers | Employees | Middle Management |
| Deference to        | High | Low | High |
| Employee input      | Hierarchy | Competence | Both |
| Needs neglected     | Low | High | Mixed |
| Continuous Improvement | Changed to accommodate senior management, targets etc | Original interpretations of continuous improvement: Engages employees from the bottom to invest in improvements | Uses both bottom up and top down |
| SMS Influences      | Top down SMS approach | Many bottom up inputs | 1 Top Down SMS + some harmonised/ Local/Bottom up SMS |

**Table 1:** Examples of Top Down, Bottom Up and Middle Out approaches to safety
If not implemented effectively however, common issues associated with adopting this approach include:

- Inconsistent quality control across the organisation
- Employees overstepping the boundaries of permissible activities
- Limitations to centralised awareness and control

However, these challenges can be offset by high levels of competence and understanding throughout the organisation as well as a heavy reliance on strong leadership and strong reporting activities.

The middle out approach means that the main inputs and flows for the SMS come from the middle management level. Information from this source may be seen as more acceptable to the other levels, having greater trust from both and being in a position to better negotiate the needs of the top and bottom of the organisation.

The middle out approach may use the middle manager level to form a version of the SMS at a lower level within the organisation but which will still input into overarching organisational SMS objectives. This would provide senior management with a consistency of standards and processes below the middle as well as a reliable stream of information about the performance of the middle SMS to the top organisational SMS.

Below this middle SMS, managers and employees would have greater freedoms to have an effect on the contents of the SMS and how it is implemented. This will enable greater participation and generate the awareness of the safety principles created by developing and managing the SMS at a lower level. Competence would need to be developed in a way that creates trust and assurance at the various levels of the organisation.

The various middle SMSs would require harmonisation between them via the organisational SMS rather than homogenisation.

Empowering the whole workforce

This example shows a method used to help empower the whole workforce. However, it is important to remember that tools and methods will naturally follow if the right principles are used to set up an environment for participation.

Many privatised utilities inherited rigid, rule-based structures for decision making at lower levels of the organisation – as indeed did the railways. This led to numerous problems; in particular people focusing on ‘keeping to the rules’ rather than ‘doing our best for the system’, even in situations where it was clear that these were in conflict.

To tackle this problem, some utilities reviewed their processes and procedures and introduced, in parallel, a ‘traffic light’ system to make clear to staff at all levels the scope of and limits on their delegated authority to make decisions and depart from normal practices. Green denoted decisions entirely within the employee’s scope, red those not to be taken by the employee without approval from above, and amber intermediate cases.

In the best practice cases, these schemes were accompanied by a general statement that no employee would ever be disciplined or criticised for taking a decision outside their ‘green’ scope where they did so in the genuine belief that they were acting in the best interests of the whole organisation.

Further reading...

For further information on how different organisational approaches can assist the delivery of objectives:

Environmental Change Institute: ‘Midstream and sideways: considering a middle-out approach to changing energy demand’

See page 70 onwards for the full reference.
3.1.3 Company standards and procedures

The development of company standards and procedures influenced by safety considerations has no doubt assisted the establishment of unprecedented levels of safety within the GB workplace.

Some would argue that these levels of safety have been achieved mostly because of direct legislative intervention and technology rather than the organisational management of safety. Whether this is true or not, safety management that works more on paper than in practice is a recognised challenge for many organisations.

Company standards and procedures can set expectations and promote consistency of approach to safety in a company's activities. However, rather than an approach agreed by management, such standards can also be mistaken for an exact representation of how activities can be undertaken as well as an audit trail proving safety. This misconception can lead to the development of higher levels of safety bureaucracy in order to fulfil the perception of greater assurance up the chain of command while also creating less ability to put safety improvement into practice in the field.

The SMS has a double-edged challenge in demonstrating the theoretical commitment to safety in company standards, procedures, indicators and targets as well as engaging the competence, cultural and behavioural instincts in an organisation's employees to be able to actually work an SMS in practice. These requirements need to be recognised and managed by those delivering an SMS.

When company standards and procedures are put together it is therefore desirable to consider:

- The role of the employee and their satisfaction with the task
- The complexity of the environment where the task is to be carried out

In some standards and procedures, the role of the employee has been reduced to a powerless ‘doer’, either because of the false belief that it reduces organisational costs or to increase the perception of central control.

In this type of situation, management’s intentions are not put into practice because the employees have become alienated from their roles. When employees do feel satisfied with their role it has been shown to improve performance at work, reduce feelings of stress, and lead to inclusion.

Organisations should look for ways of introducing standards and work procedures without turning off employees’ ability to think. When practical, employees at all levels in the organisation can be trained and encouraged to exercise their own judgment, leaving absolute control in place for high risk activities. The potential for continuous improvement will also be increased under such conditions.

This flexibility to interpret some standards and procedures can also help when the paperwork developed cannot match the complexity of the tasks undertaken.

For the organisation to remain viable its practice must meet the complexity of its activities. Managers may develop ‘tick box’ mentalities or a mentality that is only reactive because the standards and procedures in use cannot meet the complexity of the environment that they are designed to operate within.

The link between those creating company standards/procedures and those implementing them should therefore be well understood by the organisation. The organisation should consider in which elements the paper or the practice is more important to enable the objective to be met in a safe manner.

If the development of company standards and procedures is to assist the activities of employees in practice, then it is important for the standards to serve, facilitate and complement the activities being undertaken.

3.1.4 Competence

If the principles of a purposeful SMS are to be successfully followed, then it is necessary for competent and motivated employees to be developed at all levels within the organisation.

Although developing competence will not in itself guarantee safety, it will improve levels of consistency of performance and adherence to the principles of the SMS.
Organisations which can tap into their employees’ ability to learn and increase their value on their behalf will often derive benefits as a consequence. Competence is central to developing a learning organisation and continuous improvement. It also tackles issues of poor staff performance, low morale and high staff turnover.

Competence management systems (CMS) within heavy industries are often well established and in the case of the GB rail industry, the management of competence is also a legal requirement.

It is recognised within these industries that an individual’s competence is based upon their personal abilities, training and skills developed through experience.

If any concerns do arise with organisational competence, it may be because a CMS can only ever be as good as the information that is put into it and an understanding of how far this truly reflects competence within the organisation.

As with the use of all data, a CMS can deceive its users into thinking that what the system is trying to highlight is actually the reality of competence within the organisation. This can cause an overreliance on the CMS as a source of information for competence instead of building and using other methods such as one to one development by line managers.

Many major accidents such as those that occurred at Columbia, Texas City, Hatfield and Ladbroke Grove, highlight failings in employee competence in those that might usually have been deemed competent by the organisation. This is because general competence standards had reduced, experienced personnel had picked up poor behaviours, or the opportunity to identify the competence requirement was missed.

The reliability of the CMS may be limited because:

- The CMS can become a tick box exercise showing high activity while hiding low quality
- Competence can be seen as ending with training and not through the acquisition of tacit skills and knowledge (which are harder to monitor)
- Inexperienced staff may be wrongly designated as competent in the CMS as a result of it being process driven (eg being ‘rushed through the system’)
- Experience is seen to equate to competence and therefore poor behaviours picked up over time as habits are not challenged
- Skill and staff shortages are not recognised within the CMS
- The CMS becomes the only focus for safety competence neglecting the roles not covered by the CMS
- Managers see the training duration and costs as being uncompensated so do not recognise the full benefits of competence development and cut corners where possible

Searching out competence

The example shows that it is important to keep improving on levels of competence.

The Sizewell B nuclear reactor was the first Pressurised Water Reactor (PWR) to be built in the UK. An important part of the safety case for the reactor system was that any significant cracks in the pressure vessel with potential to cause failure would be able to be detected using ultrasound scanning. But this was a relatively novel and high-tech technology, and there were concerns as to how reliable such ultrasound measurements could be, even though the competency was being managed.

To address those concerns, a facility was set up containing a number of specially fabricated test pieces - mock parts of a reactor pressure vessel. Various types of defect were built into these test pieces, with no external clues at all as to their nature or location.

Ultrasonic inspectors who were to be employed at Sizewell had first to come to this facility, with their equipment, and prove that they were able to locate and characterise defects in the test pieces.
Experience from what is happening at the ground level of an organisation can become very complex as can the knowledge of how to operate. To manage this, tacit knowledge is developed and internalised by the individual, which is very difficult to reproduce in training documents as it is the craft of the employee developed over time and through intimate experience. It is the sort of information that is lost when an experienced employee leaves the organisation.

The generation of these skills can only be passed/generated through the upkeep of mentoring activities following training and continuing throughout the development of the employee. Levels of training can be easily reflected within the CMS. Experience should not be undervalued because it is difficult to show. It is vitally important in the attainment of competence.

Within many organisations, the competence requirements for the safety related activities of managers are not as well thought through as they are for safety critical roles, and they are not tracked within a CMS.

It is vital for managers to hold a level of competence in safety that shows that they understand their role in managing it within the organisation. Safety managers have principles, processes and tools that they work to in order to manage safety; this creates a logical structure behind what they are trying to achieve.

Managers with safety related activities should have enough safety knowledge to have a defined logic to their safety work. They will have to know the principles behind what hazards have been identified, why barriers to hazards are in place and their role in managing the activities.

<table>
<thead>
<tr>
<th>Barriers:</th>
<th>Enablers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tacit skills that are built up by experienced personnel can be lost if:</td>
<td>To be effective managers should have competency objectives developed in line with:</td>
</tr>
<tr>
<td>• The culture of the organisation creates an environment where lifelong development is not recognised or positively encouraged</td>
<td>• The delivery of the purpose of the SMS</td>
</tr>
<tr>
<td>• Poor practices are seen to be a reflection of the individuals involved rather than the system and therefore become an unmentioned subject</td>
<td>• Departmental or functional safety objectives</td>
</tr>
<tr>
<td>• It is hard to collect worthwhile data on mentoring activities and its success and so it is not valued</td>
<td>• The desire to create effective teams within the organisation</td>
</tr>
<tr>
<td>• Rushed working environments make it difficult to find the time required to provide the assistance needed to develop and maintain a good level of competence</td>
<td>• Knowledge of how safety works across functions as a system, and not in silos, requiring cooperation and co-ordination</td>
</tr>
<tr>
<td>• Frequent changes of senior operational management can cause a lack of experience and inability to pass on learning</td>
<td>• Understanding how learning across the organisation can assist functional/departmental safety</td>
</tr>
<tr>
<td>• Reductions in staff numbers and increased workloads can reduce the ability of the organisation to incorporate new information and remain competent</td>
<td>If the safety role is not defined for the organisation’s managers then:</td>
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<tr>
<td></td>
<td>• They may be overwhelmed by all the eventualities they feel they have to control</td>
</tr>
<tr>
<td></td>
<td>• Managers may direct their energies towards other activities that they feel more able to control</td>
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</tbody>
</table>
Having the right levels of safety competence throughout the business

Organisations often provide prescriptive standards for managers to supervise safety within the organisation. To provide leadership in safety, managers also need a level of competence to work from.

A survey for the HSE (1997b) looking into the chemical regulations (COSHH) found that safety representatives were far more knowledgeable than their managers on safety related issues. In fact, 90% of safety representatives were aware of the main principles of the main chemical safety regulations, whereas over a third of managers had not even heard of the regulations. The survey also found that over 80% of safety representatives had received training in health and safety in the last two years, compared to 44% of managers.

The compliance/competence balance

What counts as competence may vary between organisations because of the balance required between the need for competence and the observation of, and compliance to, the rules. For some organisations the more standards and processes there are to know and follow the less there is a need for a level of competence of the worker to interpret, and understand a situation or be aware of their own limitations.

Compliance cultures should fully recognise that the generation of standards and procedures are not the only or final answer to achieving safety and therefore they should increase the personal responsibility of workers within the organisation by trusting in leadership, competence and professional judgement to drive the organisation forwards.

By putting thinking into standards and procedures and relying less on paper to make the SMS work, employees can improve safety performance where it has previously stagnated.

This would also reduce friction between functions and managers as well as any issues between interfaces, allowing the SMS to integrate further into the organisation. A thorough analysis of the competence requirements of the organisation can determine where detailed compliance is required / is working and where there are tasks that can allow for interpretation by competent employees.
3.2 Management style and approach

The success of a management system depends not just on what is done, but also on the way that it is done. Significant future improvements in safety and performance are likely to be unlocked through an approach which moves away from the predominance of a compliance culture and instead enables the right behaviours and competence, potentially via systems approaches.

A number of examples in section 2 highlighted some key factors that need to be addressed in terms of management style and approach:

- Leadership (3.2.1)
- Management style (3.2.2)
- Employee participation (3.2.3)
- Cooperation (3.2.4)
- Communication (3.2.5)

3.2.1 Leadership

Effective leadership in relation to safety provides a clear statement to everyone that the management of the organisation is worth engaging with.

Leadership is not the same as management. It should not be assumed that managers are automatically leaders just because they have experience of a role or have been on a training course. Overseeing compliance to standards, targets and quotas is more akin to supervision than leadership.

Organisations should have a clear understanding about what effective leadership looks like for them.

Within the workplace a supportive environment for leadership includes long term commitment, mentoring and provision of responsibility provided continuously so leadership behaviours have a chance to embed and become adopted by other employees that may become leaders one day. This includes providing appropriate competencies and structures.

Leadership is often cited to provide responsibility and authority for safety and it should be recognised in the SMS that:

- It is important for managers to lead from the front when communicating the importance of safety and set a consistently good example
- Leadership is more than simply endorsing a procedure or conducting a safety tour, it is about making a demonstrable and visible commitment to ensuring safety and welfare
- Managers should demonstrate engagement with employees and take their issues seriously. It cannot be expected that every problem will be solved each and every time; however the manager should show the employee that their points have been taken seriously
- Managers should provide staff with encouragement with regard to working in a safe manner and should welcome suggestions and contributions whether positive or negative

An important characteristic for a leader is to be authoritative; this leader specifies a vision to work towards and then creates an environment where the leader can take people with them. With regards to the SMS, this vision should be linked to the well thought out purpose suggested in section 2.

To be able to create the right environment the leader needs the authority and freedom to lead, otherwise the employee’s/group’s/team’s confidence in, and respect for, the leader may be undermined by an organisation whose bureaucracy cannot react to the demands required for change.

In such circumstances, the expertise of the leader may have become subordinate to the authority of standards and procedures that can be inflexible in the face of complex situations faced on the ground. If the authoritative leader cannot create change about them, because what is really expected from them is compliance, their enthusiasm and ability may account for little.
To progress towards a good safety culture leaders will also need to be able to:

- **Create understanding for change within the organisation.** Here the leader creates understanding within a department/function/group of the different views behind the need to drive for safety and how it is going to be put into place within the organisation.

  Leaders consider the initiation of the change, and highlight the more strategic aspects to the employees around them.

  They:
  - Establish starting points for change
  - Design and manage the journey
  - Communicate the guiding principles in the organisation

- **Create the capacity for safety.** Capacity is created by leaders within the organisation in order for a change in approach to safety to take effect. Leaders help develop the skills required for working with change, through coaching or being democratic towards others to help them develop their ideas for safety.

  An important enabler of capacity building is the power and significance of informal networks that create understanding of the value and importance of having the capability for safety in place. The leader:
  - Creates individual, team and organisational capacities for change in safety
  - Communicates and makes informal connections to create a path for change

Where there are strong organisational barriers to management’s ability to show their leadership skills in safety, they may look to show them in other aspects of their role, pushing safety to one side.

**3.2.2 Management Style**

Distinct styles of management used within the organisation can have very different effects on the ability of the SMS to have a positive impact. For instance, command and control activities may excel in achieving compliance whereas systems thinking may be better for creating involvement.

A dominant version of either style within the organisation is likely to limit SMS development and therefore it is important to be able to adapt a response to the particular needs of a situation, mixing approaches as appropriate.

The command and control delivery of management objectives has been used by organisations over long periods of time. It’s about exercising authority and direction to effectively manage resources.

The authority in control:
  - Establishes the objectives
  - Determines roles, responsibilities, and relationships
  - Establishes rules and controls (standards, etc)
  - Monitors and assesses the situation and progress

Subordinates then carry out the actions required and
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create a flow of information to the ‘commander’ on the success of the activities. When a subordinate is given a task it is important for them to do what they are told and follow the chain of command. In this way the flow of information is linked to someone’s place in the chain.

Targets and measures may be set to gather data on the level of work being produced and to be able to react accordingly. This style of management lends itself to a reductionist approach where it is felt that by reducing the organisation’s work down to functions and departments the work is better managed. If each part is driven to comply or excel with their requirements independently, it is assumed that the whole will benefit.

The use of command and control styles has, in some organisations, created an effect whereby the freedom of the individual to have an input into their work has been reduced as much as possible. The reasons for this are either to increase the control of their actions (eg to stop unsafe acts) or to be able to substantiate claims for the reduction in cost for the individual’s work.

This type of management may increase the sense of control and reliability of the organisation’s delivery but it can also create an environment where the employee becomes disenfranchised from their work contributing to a lack of trust, a poor working culture, higher costs and a lack of innovation.

In contrast, systems thinking is a different management style that can be used. It has two major themes:

1) Understand the working environment as a system
2) Work with employees on the system

Systems thinking considers the work to be undertaken as a continuous flow and therefore it should be managed as such, otherwise competing elements will eventually reduce its effectiveness.

Within systems thinking, functions or departments need to be continually aware of how their activities affect the system as a whole and manage their practices to suit.

Systems thinking managers look to optimise the overall system of work by recognising the:

- Interdependences within the system and the need to pro-actively communicate and cooperate between functions and departments
- That individual functions should not act as competing parts but rather be recognised as interdependent functions whose delivery impacts on the whole system
- Contribution of individual work functions to improve the wider system as a whole rather than meeting their own independent needs
- Shared goals across all functions within the system

Example...

A whole system approach to reliability

Within this example, only a whole system approach will lead to a full appreciation of reliability issues and identify areas for further improvement.

‘Although the manufacture of rails is subject to rigorous quality control measures, these do not extend all the way to work sites. Rails leave the manufacturer within specification, but can often be damaged or crippled by the time that they arrive at worksites. These crippled rails are installed, partly because the damage may not be immediately obvious to the installation team laying the track, and partly because of the pressure to complete the work programme and reopen the line.

The installation of misaligned or crippled rails leads to poor track quality, which can lead to damage to bogies and wheel sets. This will be due to the higher contact forces generated between track and wheels at line speed. This is intensified by the trend to higher bogie stiffness, and can cause the train to ‘hunt’ for a considerable distance. This will accelerate the rate of rail wear above that normally expected. It may also contribute to secondary damage to the overhead line equipment and pantograph. The problem is increased by the level of pantograph maintenance performed by TOCs, which renders pantographs less tolerant to high dynamic loads’.

(RSSB Project T935 commissioned by TSLG)
Systems thinkers take a particular view about employees that seeks to fully engage them, and to highlight this the Theory X and Theory Y concept (McGregor, 1960) shown in table 2 is often referred to. Within the descriptions of the table it is not suggested that employees are absolutely one type or another but it is put forward that if managers generally treat employees in accordance with Theory Y it will deliver better returns for the business as the approach becomes a self fulfilling prophecy.

For further information on the ideas of Systems Thinking:
See page 70 onwards for the full reference.

<table>
<thead>
<tr>
<th>Theory X</th>
<th>Theory Y</th>
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<tbody>
<tr>
<td>• Views workers as shirkers, who dislike work and will avoid it where possible</td>
<td>• Views workers as naturally inclined to put effort into their work, just as they are to put effort into their play or rest</td>
</tr>
<tr>
<td>• Workers must be coerced into working towards goals set by the organisation</td>
<td>• Workers will show self-direction in the pursuit of organisational objectives</td>
</tr>
<tr>
<td>• People need to be directed. It is assumed that they are unambitious, will avoid responsibility and seek security above all else</td>
<td>• People usually accept and will often seek authority</td>
</tr>
<tr>
<td>• People are self-centred and resistant to change</td>
<td>• Most people are capable of using their own ingenuity to solve organisational problems</td>
</tr>
<tr>
<td>• People are generally gullible</td>
<td>• Most people are only given the chance to use a small proportion of their intellectual capabilities in the workplace</td>
</tr>
</tbody>
</table>

Table 2: Theory X and Y (MacGregor, 1960)
Improving training and competence of the workforce further increases returns as they assist the organisation to improve its business through the skills and abilities they have gained.

Much the same as TQM principles, ‘systems thinking’ moves the generation of quality in a product away from inspections and compliance towards activities that engage the whole workforce to become mindful of their work.

Employees are trusted with more power allowing them to have a real say in what happens which increases commitment, innovation and mutual trust. Their daily experience of a task can create better detailed interpretations for development than those of managers removed from the task.

Systems thinking methods also move the blame for failures or under-achievement in organisational tasks away from particular individuals and towards the overall system.

Managers provide leadership by working on improving the system, creating incremental changes that generate an environment where aims are achieved because employees are not fearful of repercussions for mistakes as for the most part these are considered to be generated as part of the system.

Here there is a similarity between systems thinking approaches to working together to improve the system and accident investigation approaches that look beyond the individual being at fault. Accident investigators understand that systemic organisational weaknesses or failures can indirectly or directly contribute to accidents and incidents. They recognise that effective safety management is dependent on an understanding of safety risks and then controlling these risks in an active and systematic way. For more information, see the Investigation guidance on the RSSB website www.rssb.co.uk.

### Discussion point...

**Contrasting management approaches prior to and after an accident**

<table>
<thead>
<tr>
<th>Clapham Railway Accident</th>
<th>Reactive Management Approach</th>
<th>Systems Thinking Management Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistent individual error during the maintenance of signals</td>
<td>Error is not identified and has been a long held practice</td>
<td>Train passes faulty signal and crashes</td>
</tr>
<tr>
<td>Regards workers as the primary cause of success or failure of a task</td>
<td>Managers use command and control activities to keep workers to the task</td>
<td>Accident Occurs</td>
</tr>
<tr>
<td>Error is not identified and has been a long held practice</td>
<td>Investigation: Only at this point does management look beyond the individual to the wider system for fault</td>
<td></td>
</tr>
<tr>
<td>Workers inclined to hide failures</td>
<td>Investigation: Managers and employees are used to looking beyond the individual for being at fault and continue to enhance this method of working</td>
<td></td>
</tr>
<tr>
<td>Workers have more freedom to recognise failures</td>
<td>Management show Leadership by improving the system</td>
<td></td>
</tr>
</tbody>
</table>

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1 The Clapham Railway Accident had many underlying causes. The error made during the maintenance of the signal is just one underlying cause used here to highlight a specific point. For further details of the accident a link to the report is provided below: http://www.railwaysarchive.co.uk/documents/DoT_Hidden001.pdf
3.2.3 Employee participation

Employee participation has often been cited by SMS guidance (such as HS(G)65 and OHSAS 18001) as a driver to improve safety and recently as a key component of a good safety culture. The employee on the ground is usually closer to the hazards and risks being controlled and therefore can play a significant role in how they are addressed.

Employee participation is usually cited as:

- Consultation in the creation of new policies and plans
- Involvement in risk assessment activities and job safety analysis
- Involvement in accident reviews and union representation in investigations
- Engaged working with trade union bodies

This is just a small list of how employees can be engaged. Continuous improvement can also be used to create employee participation in the day-to-day activities of the SMS. The use of continuous improvement that influenced the early principles of TQM relates to a bottom up approach whereby employees are given the trust, power, and freedom to have a greater say in the development of their work.

Instead of managers inspecting improvements in at the end of the task, employees are asked to actively participate and to improve the management system.

To build a culture of participation, management is encouraged to take actions that create the right environment for the culture to thrive.

A culture of participation may include:

- The granting of more power to those managers operating closely with employees so that they can provide effective leadership
- The creation of measurements and perhaps removal of some targets in a collaborative effort with the employees on the ground so that they agree with why the measure is needed and what it is intended to achieve
- A will to work on improving the overall system and not isolating failure or improvement to individual employees
- The removal of rivalries that create silos and break up the performance of the overall system

This style is different to organisational cultures that require full compliance to:

- Senior management rules
- The implementation of senior management’s ideas
- Meeting senior management targets

Within this form of continuous improvement, people are trusted to improve their work. This gives them a role to play within the organisation that improves cooperation, creates engagement, drive and a participative organisational culture.

Achieving appropriate levels of employee participation will be easier with some management approaches than others. Systems thinking encourages employees and managers to work together to improve the system and therefore participation will naturally develop. Command and control approaches may require more organised structures because the ability to actively participate becomes less the further down the hierarchy an employee is.
To support the philosophy of employee participation, employees can be formed into groups in order to develop and manage the ideas created by an SMS at the operational level and to increase the take up of these ideas within the organisation.

Engaging with the workforce

This example shows that engaging the whole organisation in hazard identification and management processes can have substantial benefits for business as well as safety.

Following an accident at a large UK water company the organisation asked its workforce to look again at the hazards present. A significant proportion of hazards identified were revealed to be ‘No safe way of doing it so actually in practice it never gets done’. Examples included whole buildings or premises becoming dark at all times because no-one could change light bulbs far beyond the reach of ladders/steps, and large numbers of ultrasonic level detectors for tanks and cisterns which were simply not being maintained – in many cases these were mounted on slender rods extending some metres out over an opening, with no way of bringing the detector back to a safe place to check it.

The process revealed significant gaps between the paper plans for maintenance and what was actually happening in practice – with significant business implications. By failing to maintain liquid level checks, for example, the company had become increasingly vulnerable to failures which could lead to millions of pounds worth of equipment damage, all for the sake of a check which should have cost a few pounds.

Groups are found to enable the take up and use of ideas because:

- Peer pressure and social norms influence the individuals to follow the lead of the group
- Participants become familiar with each other and begin to work well as a functional unit through loyalty and cohesion rather than hierarchies, rules and standards
- Direct face to face contact is made easier for managers
- Groups enable leadership activities

Weick and Sutcliffe’s (2007) reviews of High Reliability Organisations (HRO) such as those used to run US Navy aircraft carriers, have noted that in a shift from top down structures to a decentralised structure, teams are developed to have the competence, professionalism and leadership to reflect the safety principles and carry out tasks necessary to continue providing high levels of safety. This has also led to teams being more mindful about safety issues, allowed for the complexity of the working environment and recognised the shifting locations of expertise.

To form effective groups, departments or other units may establish an SMS plan of their own that they can respond to and have audited. This then feeds back into the organisational SMS. This group SMS may produce the change in organisational dynamics required to develop the safety culture often desired by organisations.

Smaller organisations often find that the benefits of group activities naturally form and increase participation. This is because there is an optimal size for groups to be active, above which meaningful participation becomes much more difficult.
3.2.4 Cooperation

Cooperation both within an organisation and between organisations will have an impact on the overall success of an SMS in practice.

As highlighted within 3.2.2 Management Style, management approaches such as command and control work with a reductionist mentality where it is thought that as long as each individual function does their part they would see the whole being taken care of.

These approaches have created problems with cooperation when targets and incentives are used to increase the performance of each part individually. These can further enhance barriers whereby functions are incentivised to work on their own tasks rather than co-operate on common risks, sub-optimising the whole system.

Cooperation is imperative for the system to perform well. The performance of the overall system relies on each of its parts knowing what it should be doing in conjunction with the other parts.

The ultimate level of cooperation would be where one part of the organisation is willing to sacrifice an advantageous position in order to help another part of the organisation improve theirs, with the intention of benefiting the organisation as a whole.

For further information on worker participation within the organisation:

HSE: ‘Involving your workforce in health and safety’

Flight Safety Digest: ‘A Road Map to a Just Culture’

See page 70 onwards for full references.

Cooperation should be increased between those within the organisation because the SMS fosters behaviours whereby:

• Employee’s involvement and competence should increase co-operative activity
• Employees will feel they will be treated fairly and therefore will co-operate more
• Trust between the workforce is increased
• Leadership will develop the intention to co-operate on safety issues

Cooperation can be further assisted by:

• Understanding others’ needs and viewpoints of how a situation affects them, recognising the pressures and constraints of other roles
• Creating shared overall purposes for those dealing with contentious issues
• Removal of divisive targets and managing the system, not the individual or function
• Fostering a management intention for win – win opportunities instead of infighting where managers look after their own corners

Enablers:

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Cooperation across organisations

This example shows that a lack of cooperation and understanding between people and organisations can inhibit good decision making.

The loss of the Challenger Space Shuttle and all its crew in 1988 was caused by the failure of an O ring seal (CAIB, 2003). Poor cooperation and communication can also be seen as an underlying cause to this disaster.

The launch had been postponed several times, meaning that the spaceship had been left standing outside during a particularly cold night. Engineers and managers at Morton Thiokol, the company responsible for the seals, held a teleconference with NASA the previous evening to discuss the implications of the weather. The engineers advised that the O rings – which were clearly identified as a top criticality component – could only be qualified down to 12°C, but their management, under pressure from NASA, agreed that the launch could go ahead.

The temperature that night dropped below freezing and the launch was delayed next morning while ice teams worked to ensure the rocket and gantry were clear. The Morton Thiokol engineers’ concerns were then realised as the tragedy unfolded.

As well as writing the interface requirements into the SMS, the co-operating organisations may also draw up a memorandum of understanding, use change management processes or use contracts to coordinate shared responsibilities.

The activities should define the nature of the hazards and risks, type and size of operations; recognise legal requirements as well as the duration and reassessment of the interface.

Cooperation can help improve:

- The exchange of safety ideas and awareness of risks
- Confidence and support built between organisations in the knowledge that the safety actions taken are the correct ones
- Assurance activities

It is vitally important to have strong cooperation within the rail system because of the variety of disciplines and specialist activities internally and externally to the organisation. Within complex environments the full implications of the SMS cannot be managed or understood by one group alone, it takes effort across the whole organisation and between organisations to manage it.

To have a real grasp of the risk, individuals have to co-
operate in an organised way that enables the awareness of the risk to all the relevant parties. This includes applying the right management style.

### 3.2.5 Communication

The SMS has a pivotal role within the organisation in assisting with the creation and application of safety communications.

Good communication builds trust and responsive behaviours within the organisation.

It is important to be aware of the barriers to the free flow of communication in order to avoid and reduce their impact.

A manager may experience the following if communication is poor:

- Some employees may be aggressive in reporting problems or expressing safety concerns because the activity makes them feel anxious
- Some employees do not understand certain levels of communication or may not speak good English, therefore communications should be targeted
- The employee may feel undervalued as a provider of information if responses are slow

The SMS should include the development of formal procedures for the sending and receiving of safety documentation vertically and horizontally within the organisational structure.

Particular attention should be given to the bottom up communications that can be difficult to achieve under certain management styles. Communications that are not acknowledged, that do not receive due consideration and have late responses are likely to become redundant to those previously participating in communication exchanges.

For further information on cooperation:
- RSSB: ‘Duty of Cooperation Guide’
- RSSB: ‘Industry Shared Risk Database’
- RSSB: ‘Safety Risk Model’
- Step Change in Safety: SMS Interfacing Guidance

To assist the development of good communications:

- Managers should encourage and welcome dialogue with employees by establishing two-way communications and being prepared to hear bad news
- A balance should be struck between safety and production in the number and location of communications. For instance, safety messages may be given in the working environment and not just in offices or mess rooms
- Managers should be aware that visible communications, ie their actions, can be stronger than verbal communications
- Inappropriate employee actions must be managed in such a way that they are not perceived to be reprisals related to safety activities, injuries, or complaints
- Managers should not allow functional barriers to become a natural dividing line where efforts to communicate or co-operate can be stopped
- One to one discussion should be regarded as pivotal for generating understanding so the manager can act in the most appropriate ways. Written information in the form of figures may give the manager an impression of what is happening but this should support face to face discussions that really complete the picture of what is going on

See page 70 onwards for full references.

Although open forms of communication, may be more easily understood by everyone, there are other forms of communication that are not easily understood. For example, rather than being openly communicated some safety information only reaches employees in the codified form of standards and procedures. Here the
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An employee is regarded as being protected to the best of the standard or procedure maker’s ability. However, the hazards they are protected from and barriers put in place to protect them may be unknown to them and can lose emphasis over time.

Managers should consider whether the hazards and barriers within standards should be communicated more clearly and openly so that the users are aware of the main hazards and barriers they are working with.

Informal communications are present throughout an organisation but, by definition, they are done so in an unmanaged way. Informal communications can take place most effectively in groups where positive behaviours can be reaffirmed and encouraged by those with good safety discipline. However, there will be a negative impact on the SMS and the business if informal communication is used inappropriately, especially by management, to resist the organisational safety culture or universally agreed standards and processes: for example, if a manager unofficially puts pressure on someone to achieve production at a faster pace to the detriment of safety.

Just as critical to manage is unsaid communication. Ideas and experiences between individuals can remain unsaid because it appears inappropriate for those involved to recognise its implications. For instance, the continued breach of safety rules known by management and employees alike may not be discussed because each participant sees it as part of the standing informal rules of the organisation. They therefore may not even be conscious of these unwritten rules.

Informal and unsaid communications within an organisation can allow catastrophic risks to build up without their formal recognition.

Informal communications are inevitable and can play as much of a role in a positive safety culture as in a negative one but they will only do so when:

- Employees are engaged with safety activities within the organisation and believe in their need
- Employees have been provided a role in safety by the organisation that they wish to take on and understand what it entails
- Management are competent in their safety role, are consistent in what it entails and can lead the employees to deliver safety

Unsaid communications on safety issues could be minimised by providing clear and recorded structures that support managers and employees to manage complicated or unresolved safety issues rather than hold them accountable for failure.

Further reading...

To read more on how communication barriers and functional thinking can prevent effective exchange of safety critical information and stifle professional differences of opinion refer to the Columbia accident investigation report:

NASA: ‘Volume I of Columbia Accident Investigation Board Report’

See page 70 onwards for the full reference.

Image Credit: Gary Blakeley / Shutterstock.com
3.3 Monitoring SMS effectiveness

If the effectiveness of the SMS is not continuously monitored and evaluated, then the organisation has little or no assurance over it, and it may be seriously sub-optimal.

Similarly if the organisation cannot create reliable information it may be sub-optimal but with deceptive appearances.

Effective monitoring is discussed here in terms of:

- **Targets (3.3.1)**
- **Safety performance indicators (3.3.2)**
- **The reliability of measurement processes (3.3.3)**
- **Safety assurance (3.3.4)**

### 3.3.1 Targets

Targets are a key part of managing the overall rail system and there is a clearly established role that organisations should be aware of:

- Organisational targets within the SMS are a legal requirement of ROGS
- The Office of Rail Regulation (ORR) is required to produce information on targets to meet Common Safety Targets (CST) set by the European Rail Agency (ERA)
- Organisations feed their target activities into this CST information
- High Level Output Specifications have targets
- RSSB assists organisations in the development of safety plans

Targets are used by many industries and are well liked by senior management as they can provide a quantifiable view of the achievements of safety within the organisation and a clear direction for senior managers to push the organisation towards.

Good targets should:

1. Be based on reliable measures
2. Have a clear purpose
3. Be clearly linked to desired outcomes
4. Be specific, quantified and timebound
5. Be challenging but realistic
6. Be attributable
7. Be balanced – in number, scope and timescale
8. Not encourage perverse behaviour
9. Be measurable using coherent Performance Indicators
10. Take account of local circumstances
11. Take account of uncertainty

(taken from RSSB, Managing the effects of applying targets to the GB rail industry, 2007)

An overemphasis placed on targets by the organisation can create damaging side-effects. These effects should be managed by those working with the SMS when supporting senior management’s need for data with the negative behaviours of employees that can be created by the targets.
As a whole the SMS would benefit through the cooperation and integration of purposes across the various organisational functions, but without care, targets can block this from happening.

Systems thinkers also believe that the accomplishments of individuals (good or bad) are most often as a result of the system and its natural variation. To use targets to praise success and criticise the failure of employees without knowledge of this creates feelings of unjust behaviour.

Targets can generate the following problems within the organisation:

- Targets can put a cap on achievement and disrupt the philosophy of continuous improvement
- The figures for targets may not be made upon solid information
- Targets often measure activity rather than quality, so quality can be lost
- The purpose of management and employees affected can drift towards focusing on targets and away from the original purpose of the work
- If the ability or worth of personnel is judged on the comparison of targets, it can create the perception of an unjust organisation as there are rarely level playing fields for a fair comparison to be made
- The ingenuity of management and employees to improve the system moves away from such innovation and towards meeting targets
- Targets can create conflict if functions do not integrate their activities

Negative effects of targets on the NHS

The side-effects that can be generated by targets have often been shown within the National Health Service because of the media attention drawn by this organisation. Extracts from a NHS review by The Institute of Healthcare Improvement (2008) below are illustrative.

The review identified that as the health service did not have a clear idea of what good quality health care meant it took a default position whereby quality meant meeting targets. The review suggested that targets created problems such as:

- The development of a culture more of fear and compliance rather than of learning, innovation and enthusiastic participation in improvement
- Nurses threatened with the sack because targets were not met
- Patients left at the bottom of the pile of priorities

The misuse of targets was most drastically shown when:

- Patients in danger of jeopardising a treatment target being met were put in a ‘clinical decision unit’ which was effectively a ‘dumping ground’ for patients in order to stop the clock
- Doctors were diverted away from seriously ill patients so that they could treat ones with minor problems in order to make the trust look better
3.3.2 Safety performance indicators

In the past, rail industry organisations have often used indicators that show the ‘outcome’ of how the system is functioning. This was often through indicators such as accident statistics or the failure of components.

Although this data provides good information that should be used to develop the SMS, it does rely on the failure of the system for the data to be provided.

As organisations have improved their safety arrangements and ‘outcome’ statistics have become less frequent, safety managers have been encouraged to also use indicators to measure the activities being used to prevent an outcome from occurring.

These ‘activity’ indicators may be placed into processes to highlight early on when they do not perform as expected so that faults are picked up prior to the negative outcome.

When ‘activity’ and ‘outcome’ indicators are used together they provide a greater detail of prevention and assurance than using one type of indicator on its own. Therefore a balance needs to be arrived at to maximise the benefits of both indicators and assist informed decisions on safety interventions.

It is important to recognise that the absence or reduction in the number or frequency of accidents/incidents does not necessarily mean that an organisation is safe. Moreover, even when all the key elements/components of effective safety management are in place and working well, safety performance can ‘plateau’ or even decline. Therefore sustained focus is required to ensure continuous improvement.

For further information on the effects of Targets:


- See page 70 onwards for the full reference.

Further reading...

For further information on the effects of Targets:


- See page 70 onwards for the full reference.

Discussion point...

Safety Performance Indicators

An outcome indicator is a measurement of events after they have occurred. Typically they fall into three categories:

- Accidents: measures of the frequency and/or consequence of events that result in injury or damage. For example, the number of train collisions or the risk from slips, trips and falls

- Precursors: measures based on events that are not accidents but which occur in the accident causal chain (usually because one or more safety barriers have been breached). For example the number of signals passed at danger (SPADs) or equipment failures

- Results: outcomes of an activity undertaken. For example, inspection scores, audit findings, observed behaviours or the pass rate for assessments

An activity indicator is a measurement of whether risk control systems are in place to prevent undesired safety outcomes. Activity indicators allow weaknesses to be identified in the current operations. They direct actions to strengthen and improve processes before accidents occur. Activity indicators show:

- The existence of an activity, input or process

- The level of implementation or compliance with an activity input or process

- The effectiveness of an activity, input or process (this is similar to a result (outcome) indicator)

- The use of an activity, input or process to identify areas of improvement
3.3.3 The reliability of measurement processes

In any system, it is necessary to set and measure outcomes in order to determine whether the system is operating in accordance with expectations, and to identify where action may be required to improve performance to meet these expectations.

However, in the collection and use of data, managers should have a healthy respect for its proper use and recognise that poor use can be a barrier to a positive safety culture.

For data to work well for the organisation, managers should look beyond figures alone and identify many important features behind the data received.

The users of data should understand:

- The limits of data
  - Data has no innate meaning, only a meaning that people attach to it. Therefore data cannot be right or wrong, but the meanings people place on it can
  - There are many necessities to manage and improve the organisation which cannot be measured

- Bias towards data
  - People have inherent biases in their understanding of data

- Variation within data
  - Poor appreciation of variation can unnecessarily increase workloads and costs

Data does not hold an internal truth that cannot be debated. For example, when we put forward a value such as ‘12 driver errors this period’ it should not be used as a fact that stands by itself. Rather the data should be a part of a build up of information from different sources that creates a knowledgeable idea of what is happening.

When data is used, the context needs to be understood:

- How reliable is it?
  - Are the figures genuine?
  - Could the collection of the data be only partial?
  - Do people understand what is being collected and therefore are reporting correctly?
  - Are the details of what is being collected open to error?

- Is it reasonable to base my interpretations upon the data?
  - Does the data actually tell me what I think it does?
  - Can the data be telling me something else?
  - Does the data tell me quantity or quality?
  - How much of the story is told or not told by the data?
  - Is the data driving the right behaviours?
  - Do I understand variation within the system?
  - Is the data conflicting?

Data is an important element in improving the system, but on its own it does not provide a robust evidence base for a decision.

When data is being used it should be balanced by how far the figures can provide an understanding of a situation with how much of a situation is not being told by the data. Managers must be careful not to allow the numbers to become the reality that they are actually trying to describe.
Managers do not have to be professional statisticians to be able to use data but they should understand the level of their own ability and allow themselves to be driven by the right principles rather than by just the numbers.

Bias towards data

In our interpretations of the data we receive we cannot escape our individual biases that inform our understanding of a situation. However, we can understand the types of bias that can have negative effects and therefore these should be managed when working with the SMS.

Bias can take the forms of:

a) Frequency bias - this is a result of how we usually understand internal information. We can make the mistake of under or over estimating the likelihood of an occurrence based on our own experiences, rather than recognise the full experience that many can have.

b) Selectivity, Conformity and Familiarity bias - all represent a similar mistake that can be made by people as they tend to become comfortable with a set of information that they are usually presented with. This means that people begin to look for the patterns of information they expect to see whether it be recent information, obvious evidence, or ideas that suit and support our own. These patterns can become very strong as confidence grows that the conformity is correct and therefore people can ignore alternative information that provides better solutions or highlights new problems.

c) Group Think bias - occurs when as a group people begin to become familiar with similar patterns of events that suit their ideas of life. Ideas that go against the groups are then stamped out as the group defends the shared experiences that they hold. This issue has been known to take groups of highly skilled professionals in completely the wrong direction when trying to manage a situation.

d) Overconfidence bias - shows that people can overestimate their knowledge of a situation and its outcome. Again this means that alternative information is not properly considered.

Variation within data

Statistical control charts can be difficult for managers to set up and use. However, an understanding of the basic principles of variation can at least mitigate some common mistakes made by people when using data.

The collection of any data about a process or a system of work will always show levels of variation as to how well it performs. This variation is often recognised by the ‘normal distribution’ or ‘bell curve’ highlighted by figure 5.

Variation within the process or system means that managers need to be mindful about what action they take when comparing only a few data points. Continually adjusting the system when poor performance is assumed (because of natural variation) rather than actually happening can lead to a decrease in the quality of the system. It can also increase the cost of the process or system at the same time.
Section 3 - The SMS in practice

For instance, managers can imagine that in one month, a figure highlighted that a team performed well, but in the next month, the figure indicated the performance was poor, whereas in actual fact the system has not changed at all and the differences are within natural variation. If managers were then to praise and blame employees accordingly it can be seen that the team at the receiving end may rightly feel they have been treated unjustly – having likely put the same amount of effort and diligence into both months.

Further, managers may put effort into developing solutions for the difference between one month and the other which will be wasted as the actions are likely to correct an independent variable rather than have an effect on the system as a whole.

To effectively improve the management system the organisation should learn more about variation. There are two types of variation within systems: ‘Common causes of variation’ and ‘Special causes of variation’. Common causes of variation fall within and form the shape of the bell curve. They are to be expected; they are normal and will not be removed (although the amount of variation may be reduced). Special causes of variation fall outside the bell curve and they should be removed from the system to bring it under statistical control.

To help understand variation, the statistical control chart shown in figure 6 is often used. The data gathered is used to construct a mean line to show the average of the data points that have been collected over a given time frame. Two further lines are also developed from the data (via formulas) that represent the capacity of the system.

These are known as the upper and lower control limits. In-between these lines are the common causes of variation and although they may show different results from one data point to the next these differences are not regarded, to a high level of confidence, as statistically significant.

Chasing after these common causes individually is not likely to improve the overall system. However comparing the data across the chart will allow managers to introduce change that makes a difference to the system as a whole.

Over time the data collected will show variation but as long as they are common causes it can be said with a high level of confidence that these differences are not significant.

Managers may wish to:

- Work to make the upper and lower control limits closer together so that the system in use is under greater control
- Lower the control levels so that overall numbers are reduced

In Figure 6, the data point found on its own above the upper control limit is a special cause of variation, so its value is statistically significantly different from the values of the common causes. It therefore requires specific attention and individually needs to be worked on so that the system is again brought under statistical control.

Likewise the value below the lower control limit line is also a special cause of variation and should draw the attention of the manager, perhaps because it highlights an improvement or because it indicates under reporting.
As the use of statistical control charts can be difficult, statisticians within the organisation may be turned to for assistance where possible. If this help is not available then managers should at least be aware of the principles of variation and work with them so that mistakes are not made when managing data and their response to it.

The manager supporting the SMS should recognise that:

- Variation is natural; compare results over a series of data points instead of a few to really understand what is happening and if anything is really changing
- Be patient in the reaction to what looks like common causes of variation and try to improve the system as a whole rather than chase individual issues. The solutions to individual issues are likely to overburden the system rather than improve it. Take the time to add quality to the system rather than simply more activity
- Be quick in the reaction to special causes of variation they reflect a lack of statistical control within the activities reviewed and the causes should be addressed

3.3.4 Safety Assurance

Effective organisational assurance involves detailing a picture of safety within the organisation from a number of targeted information sources. It is a collaboration of processes, activities and behaviours that aim to verify the integrity of a system and is an organisation’s response to safety risk.

Safety Assurance can be defined as;

‘Confidence that risks, processes and behaviours are being managed and controlled to acceptable levels through appropriate measures that will identify potential threats to safety’, RSSB Assurance Paper 2010

The application of safety assurance within the organisation will depend on the level and depth of the safety assurance programme and should be determined by the level of risk generated by the organisation’s activities. Effective safety risk management is the cornerstone of safety assurance.

Organisations will cover assurance activities within their SMS. However, what is classed as ‘assurance’ can vary. A list of assurance activities grouped by the FAA are shown in table 3.

<table>
<thead>
<tr>
<th>Assurance Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous monitoring</td>
</tr>
<tr>
<td>Employee reporting system</td>
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<tr>
<td>Audit</td>
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<tr>
<td>Analysis of data</td>
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<tr>
<td>Internal evaluation</td>
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<tr>
<td>System assessment</td>
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<tr>
<td>External evaluation</td>
</tr>
<tr>
<td>Preventive/Corrective action</td>
</tr>
<tr>
<td>Investigations</td>
</tr>
<tr>
<td>Management review</td>
</tr>
</tbody>
</table>

Table 3: FAA list of SMS Assurance Activities (2006)

For further information to help understand variation refer to:

Nolan. T and Provost. L: ‘Understanding Variation’

Foundation Coalition: Presentation on ‘Statistical Quality Control’

See page 70 onwards for full references.
Section 3 - The SMS in practice

3.1 Organisational Essentials
3.2 Management Style & Approach
3.3 Monitoring SMS Effectiveness

Enablers:
A safety assurance framework is enabled by:

- Corporate and operational objectives developed and implemented throughout the organisation
- Clarity of roles and responsibilities and delegated authority
- High standards of behaviour
- Competence (skills and ability)
- Effective communication throughout the organisation
- Effective monitoring and reporting

Traditional safety assurance guidance is systems-based but with a strong focus on legislative and regulatory compliance. It therefore tends to have strong formal controls. However, high profile major accidents have indicated that compliance activities alone do not guarantee sound safety assurance.

The establishment of a safety assurance framework without an underlying value system can encourage compliance rather than commitment which does not guarantee that appropriate assurance is undertaken even if a process is in place. Appropriate values and behaviours need to be developed and validated.

Barriers:
When assurance activities have reported successful arrangements on the ground, but then have been proven to be untrue through accident investigation or further review, it may have been because of:

- A lack of independence in the review of the system of management
- The poor identification of measures to identify how the SMS is performing
- An inability to learn from the findings made
- Overconfidence in one source of information instead of using a variety of information sources
- Poor communications about findings that could have made a difference

Discussion point...

Australian Assurance Guidance

The Australian Standard HB 254-2005 Governance, Risk Management and Control Assurance highlights a view of safety assurance that adds further ideas to the development of assurance activities which improve the SMS in practice.

Within this guidance the underlying value system of the organisation is said to be managed by inherent controls which are separated from formal controls, where:

- Inherent control relates to proactive promoting of purpose, capability and commitment throughout the organisation, including the board. It occurs continuously and consistently as part of normal business practice and includes: systems thinking, developing a learning organisation, motivating trust and relationships and matching competencies with objectives
- Formal control involves assigning, monitoring, reviewing, and reporting. Activities that are traditionally command-control style processes, compliance focused and based upon organisational hierarchy

3.1 Organisational Essentials
3.2 Management Style & Approach
3.3 Monitoring SMS Effectiveness
In short, the formal controls say that you have in place processes that can be followed and the inherent controls are there so that those participating in the processes are consciously going to act in accordance with them.

From the perspective of continuous improvement and systems thinking it should also be possible to go further. For example, activities could become more self-sustaining if measurement and review activities are placed with those responsible for undertaking the actual work. This could lead to managers intervening less, and being more selective in the use of formal controls. Instead they could focus on being systems orientated and testing that the SMS itself meets the required standards.

Assurance activities can then:

• Optimise the system by identifying areas of strength and weakness as well as multiple causes and effects
• Highlight relationships across the system via its interventions, which can then be worked upon
• Maintain a sustainable environment for good safety behaviours

3.4 Conclusion

Increasing the SMS’s impact in practice has the potential to make systems even more progressive and attain higher levels of maturity, as well as continuous improvement in safety, and other aspects of the business.

Having tailored the SMS to the organisation as discussed in section 2, the next step is to check the following align with the purpose, scope and structure of the SMS:

• Governance and organisational arrangements that support and enable the SMS
• Standards and procedures that empower and support, not just command
• Competence at management and employee level that goes beyond simple compliance

Management style is critical to SMS effectiveness. Railway organisations may need to blend command and control styles with more enabling and empowering approaches and operate across the system. A strong focus on the success of the whole system should permeate the organisation – silo mentalities are often counter-productive.

The SMS needs reliable methods to monitor and evaluate the organisation to truly reflect how well the system is doing and how it can do better. The aim should be to optimise the implementation of the SMS in place, but also to understand when and if there is a need to go back and review the fitness for purpose of the SMS itself.

Change is inevitable and intentions to stop it are unrealistic. However, with the principles for improvement suggested by this guidance in mind, it is worth noting and remembering that uncontrolled change or complacency can have negative side effects and includes the potential to lose what the organisation already does well.

Further reading...

For further information on the application of safety assurance:
FAA: ‘Introduction to Safety Management Systems for Air Operators’
Information on the WANO peer review may be found on the WANO web site
See page 70 onwards for full references.
Summing up

- Interpretations of safety culture can provide a focus on the frequency of key day-to-day behaviours (frontline and management) and the extent to which these are encouraged and supported by an effective and flexible safety management system. It can also highlight the shared belief in the importance of safety.

Further reading...

On safety culture:
Reason: Managing the risks of organisational accidents, Ashgate, Sydney
RSSB: Safety Culture Toolkit
Seddon: Systems thinking in the public sector: the failure of the reform regime and a manifesto for a better way
See page 70 onwards for full references.

- Effective behavioural change is most likely to occur when individuals have the freedom to change their behaviour because the ‘structural’ elements provide an environment that supports this change, instead of being a barrier to it.
- Company standards and procedures influenced by safety should be recognised as either assisting the practice of workers or commanding the practice. This will affect how they are developed.
- Developing competence will not in itself guarantee safety but it will improve the consistency of performance and adherence to SMS principles.
- The SMS needs to address not only how an organisation knows that its staff have the competence to do what they do, but also how it will know that they are actually doing it as intended.
- Levels of training can be easily reflected within the CMS. Experience should not be undervalued just because it is difficult to show. It is vitally important in the attainment of competence.
- Clear safety roles for managers make the safety discipline understandable and controllable, reducing stress and creating more safety activity.

Example...

Bias, change and the role of assurance to maintain what the organisation does well

This example shows that even well known organisations can get it wrong. When assurance activities do not help to manage change or allows complacency there can be drastic consequences.

Between 2007 and 2009 a number of crashes, injuries and deaths in America were identified by the National Highway Traffic Safety Administration (NHTSA) as being caused by defects within models of Toyota vehicles. These defects were ‘sticking’ accelerator pedals and a design flaw that enabled them to become trapped by floor mats, both of which created dangerous high-speed unintended acceleration incidents. During 2009 and 2010 Toyota began a recall of almost 8 million vehicles and paid almost £30 million in compensation because of these incidents.

In a statement to American Congress Akio Toyoda (Toyoda, 2010), the president and CEO of Toyota stated:

‘Toyota has, for the past few years, been expanding its business rapidly. Quite frankly, I fear the pace at which we have grown may have been too quick. I would like to point out here that Toyota’s priority has traditionally been the following: First; Safety, Second; Quality, and Third; Volume. These priorities became confused, and we were not able to stop, think, and make improvements as much as we were able to before, and our basic stance to listen to customers’ voices to make better products has weakened somewhat. We pursued growth over the speed at which we were able to develop our people and our organization, and we should sincerely be mindful of that’.

On safety culture:
Reason: Managing the risks of organisational accidents, Ashgate, Sydney
RSSB: Safety Culture Toolkit
Seddon: Systems thinking in the public sector: the failure of the reform regime and a manifesto for a better way
See page 70 onwards for full references.
• The ability to lead should not be assumed because a person is experienced in a role or has been on a training course. It is a skill acquired over time with directed effort towards clear attributes

• Where leadership traits can only be shown by obedience to rules, its example may struggle to be inspirational

• Systems thinking is an alternative management approach to command and control

• The whole of the organisation should be more than the sum of its parts. The organisation should focus on optimising the whole rather than each individual part via improved cooperation

• Original interpretations of continuous improvement relate to a bottom up approach

• Groups working to safety arrangements that they own can help to create leadership opportunities, engagement and self regulation (mindful activity) towards safety principles

• A process to list and transfer information on hazards and barriers to employees would greatly assist in communicating their presence

• Targets can sometimes lead people to optimise a task, department or function at the expense of the wider organisation. Sometimes optimising the overall purpose needs an individual goal to be relaxed or revisited

• Blindly following pure numbers in data can deny an organisation the richer picture of activities and issues that should be actively debated for improvement

• Many important features of an organisation can be difficult or impossible to measure. Do not overlook them

• Do not automatically assume that because there is always a positive number on a chart in the monthly report that it can be trusted to be reliable and unbiased

• Day-to-day or month-to-month variations in numbers may or may not be significant. Make sure you have the statistical capability to understand whether what you are seeing is a real issue or just part of background variability

• Traditional safety assurance guidance is systems-based but with a strong focus on legislative and regulatory compliance. It therefore tends to have strong formal controls. However, high profile major accidents have indicated that compliance activities alone do not guarantee sound safety assurance
Section 4
System performance and maturity
Section 4
System performance and maturity

Section Overview

Having shaped an SMS that moves beyond compliance and has the buy-in and functionality across the organisation, this section looks at how it might also be judged or tested as evidence of achieving a certain level of merit or distinction. It also looks at how this external assistance should not eclipse the development of internal capability.

The SMS must be designed primarily for the organisation using it and living by it. It is a tool that should contribute to overall business management goals and not merely be used to demonstrate compliance to a third party regulator (which nonetheless will need to inspect it).

Whether or not an organisation is excelling is a matter of judgement, and not necessarily something which automatically provides any useful information to the SMS holder about whether management is working or not.

The term ‘excellence’ is used widely within business as an indicator of performance even though the details of what it actually means and how it will look is not always clear.

Notions of ‘excellence’ and ‘maturity’ are attractive as they suggest a higher calibre of performance and achievement within an organisation.

This section aims to boost understanding of the ideas used by other industries and organisations to weigh up the maturity, merit and excellence demonstrated by an organisation and how this relates to SMSs.

However, for excellence to truly take hold in a way that is in keeping with the philosophy of an SMS that moves beyond compliance, it cannot be driven at any expense and should be a conscious choice made by the organisation.

Excellence is being increasingly cited by ORR as an aspiration for the rail industry. It is therefore fitting for this guidance to discuss some of these pertinent ideas, highlighting some of the thinking behind excellence and being clear on what it can mean.

The contents include:

4.1 Organisational excellence
4.2 The ORR approach to safety excellence
4.3 An approach to excellence
4.4 Conclusion
4.1 Organisational excellence

There are many bodies that promote routes to excellence, such as the International Institute for Organisational Excellence, which sees itself as ‘building world class organisations’ and the Malcolm Baldrige Performance Excellence Programme. Historically, the term ‘excellence’ is most often used with regard to quality, as a way to build on quality management standards. There are many structures suggested to help gain this version of excellence; one way for example, is through Total Organisational Excellence (TOE).

In a similar manner European Foundation for Quality Management (EFQM) promotes its ‘Excellence Model’ as a proven way to bring excellence to organisations. It was originally established to provide a European focus on TQM.

A similar organisation to EFQM is the British Quality Foundation which highlights that ‘these programmes are a great way to demonstrate to your stakeholders that you are committed to performance improvement and are serious about achieving excellence’. In much the same way as the International Standards Organisation has attempted to bring ‘quality’ to organisations, ‘excellence’ is sold as a route to improvement.

Capability Maturity Model (CMM) is a structure used to improve organisational performance and maturity. It is built on quality principles and was initially used to assess the maturity of potential software contractors. CMM provides criteria for organisations to progress through five levels of improvement, each time gaining a higher level of maturity.

Following the Success of CMM, Capability Maturity Model Integration (CMMI), was developed to enable the use of this maturity improvement model into disciplines other than software, for example into safety culture maturity models.

Models are made with assumptions and simplifications and therefore cannot be a completely accurate representation of reality. They assist interpretation but do not deliver a definitive answer not open to question. To look on these models from a considered perspective the founders of CMMI – the Carnegie Mellon University - use a quote with regard to their work worth highlighting here: ‘Remember that all models are wrong; the practical question is how wrong do they have to be to not be useful’.

The model should provide a valuable contribution to discussions but there can be a danger that too much reverence means that they can command them. Those working with a model cannot be passive bystanders, standing back and letting the tool do the work. Active interpretation is required by those using the model and collaborative working is needed to get the best out of it.

A model will get stronger – not because it has to be 100% correct – but because it is improved and built upon where necessary and enables its users to come together as active contributors to build a view of reality.

4.2 The ORR approach to safety excellence

The search for excellence has been promoted across many industries as well as by ORR.

ORR uses the content of table 4 to highlight its interpretations of what excellence is and what is not.
Looking back at sections 2 and 3 of this guide will reveal that the ORR vision resonates strongly with the ideas, themes and approaches put forward for an SMS that moves beyond compliance.

Indeed, the rail industry has itself developed initiatives which are designed to promote excellence. One example is RISAS (Railway Industry Supplier Approval Scheme), which looks to generate gumption in the supply chain for critical rolling stock components, and adopt an office-to-shop floor approach to competence, risk, management and safety culture.

ORR has provided a number of interpretations for excellence with regard to SMSs and has a structure for its assessment via the document Rail Management Maturity Model (RM3). EFQM’s excellence model is referred to in RM3. It is directly related to CMMI and is built around SMS guidance such as HS(G)65 and OHSAS 18001, but also has features from recent research and accident reports.

The document and its guidance are used by ORR inspectors to provide a consistent way of evaluating the management arrangements required by ROGS regulations. It looks to monitor the use of the SMS as it works in practice.

Under previous regimes such as the delivery of ISO standards, this type of criteria has resulted in some organisations setting out to attempt to achieve the goals whilst others tick the boxes to gain accreditations for their organisation.

As ORR will be carrying out interventions to see how the safety arrangements of the organisation are developed in practice, its inspectors will look to identify those with tick box approaches. The use of the SMS will therefore need to be made consciously and with judgement, alongside structure and compliance.

Additionally, the bespoke SMS that suits its own clearly developed purpose, stemming from established guidance, is more likely to be recognised by RM3 as being excellent. This is because its integration into practice is likely to be stronger as the intention requires a conscious effort and ‘fits’ the organisation.

However, inspectors may have to look beyond basic recognised structures to the logical intentions of the bespoke SMS and their achievement within the organisation’s unique and complex environment. This should be acceptable as long as actions are well-considered and justified.

### 4.3 An approach to excellence

The SMS can be more effective in practice and work towards excellence through developing learning at a number of levels:

- Optimisation across the system (4.3.1)
- Understanding localised complexity (4.3.2)
- Develop confidence within its employees to build on this learning (4.3.3)

#### 4.3.1 Optimisation across the system

The system will be managed and optimised best by following the ideas in sections 2 and 3:

- By clearly identifying the purpose of the SMS a statement is made across the organisation about what the SMS is and how it should work.
Activities such as leadership and participation enabled by the organisation then strive to put the purposeful SMS into practice. Data and assurance activities used in the appropriate manner mean the organisation can be set up to begin to understand what aspects of the SMS do or do not work.

System thinking then suggests looking across the system at what effects each part of the SMS is having on other parts to adjust them where necessary. The SMS should be responsive to the changing environment it works within and no single response will always be effective.

At the system level of the SMS, those managing it should be continually trying to get to the root cause as to why certain effects are occurring and what elements within, for instance, finance or engineering, need to be managed to optimise the whole system.

The system should be continually challenged and potential weaknesses sought out. The question to continually ask is ‘why?’ Why has an accident not been learned from, why are figures not truly reflective? Understanding can then be built up about the relationships within the system and how to get the most out of it.

As understanding is developed about the parts within the whole and the relationships between them (positive or negative), the organisation can begin to build on the positive interactions and reduce the negative features. For example, the locations of different initiatives, departmental objectives etc and their effects within the organisation. Through these activities, behaviours within the organisation become more harmonious and efficient. Waste will also be taken out reducing overall cost.

The users of the SMS will only be able to continually question the use of the SMS if it has created the right environment for clear headed and objective responses to its performance. Challenges will not be received well if they are thought to be focusing on the performance of individuals within the system. Instead, the organisation should create a learning environment where the focus is on improving the system.

As those working with the SMS attempt to balance activities across the system it will be found that there is not one single correct interpretation of how to progress. Different employees within the organisation will be operating to their own purposes (safety or otherwise).

The most appropriate way to move forward will be to try to understand the different purposes within the organisation and progress towards a common solution. The more the employees participate in this practice the better the solutions will be. They are also more likely to be followed. In this sense management’s role is less about goal setting and more about managing relationships and learning about the system.

The overall purpose of the SMS as well as business objectives will guide the discussions and may be updated following new information.

4.3.2 Understanding localised complexity

As discussed in section 3, by creating room for employees to participate and show leadership within the organisation another aspect of the SMS in practice can be improved. Through creating employee participation the managers of the organisation have a greater opportunity to develop responses to the complexity of activities on the ground.

Continuous improvement recognises that managers away from the locality of the work cannot fully appreciate the complexities of what happens to achieve it. Further, it recognises that a tolerable plan designed by those that will put it into use can work better in action than ‘excellent plans’ put together by those that may never meet those implementing them.

When management systems guidance talks about managers being ‘seen on the ground’, this is not because employees need a senior leader to show them what safety actions need to be taken. Rather, it is because if the manager is not on the ground and seeing for themselves what is happening they have very little chance of fully understanding what needs to be done. The system in action needs to be tested by its users in order to bring it closer to reality and/or usefulness.
Section 4 - System performance and maturity

Through working closely with the employees of the organisation, a better understanding of SMS use in particular locations can be understood and managed in the SMS. If the SMS enables competent employees and good leaders then some procedures can be adapted for the locality of the work.

Making usable rules for complex situations can be extremely difficult. It can be easier to provide the tools for those at the locality (controls, competence and leadership) so that rules can be continuously improved towards effective practice.

4.3.3 Confidence to build from within

Continuous improvement can develop the organisation from within itself. It is the development of the organisation’s own employees that engages them and their own successes that they will strive to put in place.

Looking externally for good practice and benchmarking ideas are obviously beneficial for the organisation. However, these activities should be balanced with efforts to develop from within.

If an organisation does not believe in the potential of its employees because they do not have the capabilities required to maintain and improve the organisation, it would not be surprising to also find that this organisation has an immature culture, safety or otherwise.

Structures and tools are easily observed within an organisation and with some effort can be copied into others. But evolutions in team dynamics and tacit abilities that created and embedded the improvements, and then seek to build on them, are complex.

An overemphasis on external developments can draw attention to looking outside the organisation for development and innovation. Complex internal developments may not receive the same attention. The organisation should develop for itself the fertile ground in which the good practice is generated. If this is not done then the ideas of the organisation’s personnel may always be subsumed by the ideas of others.

If the organisation does not build up the integrity of its own ideas, the department’s or function’s own self image and identity will be weak, participation may be low and continuous improvement inhibited.

Further reading...

For further information on the ideas behind continuous improvement it may be useful to refer to the following guidance:

Thinkflow: ‘Continuous Improvisation: why we are so good at it and why it holds back improvement’

See page 70 onwards for full references.

Discussion point...

External ideas of improvement can be misleading

‘In different parts of the world health care systems are busily copying approaches from other services that are in the process of abandoning them’

Nigel Edwards, Policy Director, NHS Confederation
4.4 Conclusion

This section has shown where interpretations of excellence have come from and has indicated that the ideas are closely linked to existing ideas about management systems.

A bespoke SMS develops a conscious purpose and therefore a strong integrity for its principles and reasoning. If it is to be excellent in practice it:

- Continually seeks to optimise its activities across the system by being able to respond to information from the organisation
- Meets the complexity of its work by creating an environment that really enables participation
- Works to improve activities from within itself

With the application of purpose and participation an organisation may continuously improve towards an SMS that achieves its goals.

The management system that can truly deliver this in practice has the potential to become excellent for safety as well as for the business.

Summing up

- There is a direct link between quality management systems and the promotion of ‘excellence’ as both are gained through large governing bodies and are based on quality
- ORR has provided a number of interpretations for excellence with regard to SMSs and has a structure for its assessment via the document Rail Management Maturity Model (RM3)
- Systems thinking suggests looking across the system at what effects each part of the SMS is having on other parts to adjust them where necessary
- Continuous improvement recognises that managers away from the locality of the work cannot fully appreciate the complexities of what happens to achieve it
- An overemphasis on external developments can draw attention to looking outside the organisation for development and innovation. Complex internal developments may not receive the same attention. The organisation should develop for itself the fertile ground in which the good practice is generated

Image Credit: Ints Vikmanis / Shutterstock.com
Conclusion

**Safety management system principles: moving beyond compliance** does not set a prescriptive path towards a more effective SMS. This is because each organisation and its operational risks are unique. It is important for the organisation to function well as a system and the components that make up this system should be adaptable to the changing context of the wider organisation. One answer is not likely to be right on every occasion, or work well with all other solutions. However, clear principles of risk, change management and configuration control can provide reasoned support to ongoing changes.

This document has suggested that, if the SMS is bespoke to the organisation, it will increase its effectiveness and therefore enhance safety culture. The organisation can develop the SMS so it becomes more than the sum of its parts by:

1. **Consciously developing the SMS with a clearly defined purpose and scope, as well as an understanding of how it fits into the organisational environment.**
2. **Creating an organisational environment that can sustain the purpose of the SMS, enabling its employees to put it into action and managers to maintain its effectiveness.**
3. **Optimising the SMS across the system and continuously learning how to refine/adjust its position within the organisation.**

By clearly understanding the SMS and being willing to work across the systems, functions and departments, organisations can improve SMS integration and use. There will also be a positive impact on business as these activities reduce costs and identify efficiencies.

Safety managers, among others, have a key role in moving the SMS forwards so that it offers more than legal compliance but also increased adaptability, suitability, business support and continuous improvement, in all aspects of management.

**Safety management system principles: moving beyond compliance** has provided principles that can underpin this work. Managers are able to draw on the principles that best fit their organisation and the changing environment within which it works.


EFQM. 2010 EFQM Excellence Model. EFQM


# Further reading details

## URL links for further reading

## Section 1 Links

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<thead>
<tr>
<th>Document</th>
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<tr>
<td>To find out more about general SMS guidance it may be useful to refer to the documents listed below:</td>
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<tr>
<td>To find out more about TQM and its links to safety and ISO standards it may be useful to refer to the documents listed below:</td>
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<tr>
<td>The requirements of ROGS are supported by ORR guidance:</td>
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<tr>
<td>For further details on the ideas behind creating systems that work:</td>
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<tr>
<td>Systems Engineers are beginning to use some of the ideas covered within System Design beyond ‘hard’ systems to also apply when managing ‘soft’ organisational systems. The NASA Systems Engineering Handbook may prove helpful to dip in and out of:</td>
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<tr>
<td>There are frameworks available that can prove helpful when making a decision whether to proceed with a scope of work. Such as:</td>
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<tr>
<td>To find out more about change management within the organisation it may be useful to refer to the following guidance:</td>
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<tr>
<td>For managing organisational change –</td>
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<td>For a good understanding of the legal requirements and management of change management –</td>
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<td>For a good understanding of how change is managed within the nuclear industry –</td>
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<td>For further reading on accident summaries produced by RSSB:</td>
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<td>RSSB summary report for Deepwater Horizon</td>
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<td>RSSB summary report for Mid Staffordshire NHS</td>
<td><a href="http://www.rssb.co.uk/SiteCollectionDocuments/docs/Mid-Staffs%20NHS%20OFU.pdf">http://www.rssb.co.uk/SiteCollectionDocuments/docs/Mid-Staffs%20NHS%20OFU.pdf</a></td>
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<td>RSSB, ‘Ethical basis of rail safety decisions’, 2005 (T230a)</td>
<td><a href="http://www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/research/T230a%20Ethical%20basis%20railway%20decisions.pdf">http://www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/research/T230a%20Ethical%20basis%20railway%20decisions.pdf</a></td>
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<tr>
<td>Health and Safety Executive, ‘Case studies that identify and exemplify Boards of Directors who provide leadership and direction on occupational health and safety’, 2006</td>
<td><a href="http://www.hse.gov/research/rrpdff/rr499.pdf">http://www.hse.gov/research/rrpdff/rr499.pdf</a></td>
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<tr>
<td>RSSB: Non-technical skills for rail: development, piloting and evaluation of a training course (T869)</td>
<td><a href="http://www.rssb.co.uk/RESEARCH/Lists/DispForm_Custom.aspx?ID=808">http://www.rssb.co.uk/RESEARCH/Lists/DispForm_Custom.aspx?ID=808</a></td>
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<td><strong>For further information on the ideas of Command and Control and Systems Thinking:</strong></td>
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<tr>
<td>RSSB, ‘Industry Shared Risk Database’</td>
<td><a href="http://isrd.rssb.co.uk/">http://isrd.rssb.co.uk/</a></td>
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<tr>
<td>RSSB, ‘Safety Risk Model’</td>
<td><a href="http://www.safetyriskmodel.co.uk/default.aspx">http://www.safetyriskmodel.co.uk/default.aspx</a></td>
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<tr>
<td><strong>To read more on how communication barriers and functional thinking can prevent effective exchange of safety critical information and stifle professional differences of opinion refer to the Columbia accident investigation report:</strong></td>
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<tr>
<td><strong>For further information on the effects of Targets:</strong></td>
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<tr>
<td>RSSB, Managing the effects of applying targets to the GB rail industry, 2007 (T611)</td>
<td><a href="http://www.rssb.co.uk/RESEARCH/Lists/DispForm_Custom.aspx?ID=700">http://www.rssb.co.uk/RESEARCH/Lists/DispForm_Custom.aspx?ID=700</a></td>
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<td><strong>For further information on setting and using indicators within the organisation:</strong></td>
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<td><strong>For further information to help understand variation it may be useful to try:</strong></td>
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<tr>
<td>Foundation Coalition, Presentation on ‘Statistical Quality Control’</td>
<td><a href="http://foundationcoalition.org/resources/ie/Quality1/quality1.ppt">http://foundationcoalition.org/resources/ie/Quality1/quality1.ppt</a></td>
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<td><strong>For further information on the application of safety assurance:</strong></td>
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<td><strong>For further reading on safety culture:</strong></td>
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<tr>
<td>RSSB, Safety Culture Toolkit</td>
<td><a href="http://safetyculturetoolkit.rssb.co.uk/Home.aspx">http://safetyculturetoolkit.rssb.co.uk/Home.aspx</a></td>
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<td><strong>For the EFQM and Excellence website:</strong></td>
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<td>EFQM website</td>
<td><a href="http://www.efqm.org/en/">http://www.efqm.org/en/</a></td>
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<tr>
<td><strong>For further information on the guide ORR use to support the identification of safety maturity:</strong></td>
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<tr>
<td><strong>For further information on Systems Thinking it may be useful to refer to the following guidance:</strong></td>
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<tr>
<td><strong>For further information on the ideas behind continuous improvement it may be useful to refer to the following guidance:</strong></td>
<td></td>
</tr>
<tr>
<td>Thinkflow, 'Continuous Improvisation: why we are so good at it and how it holds back improvement', 2005</td>
<td><a href="http://www.swimm.co.uk/events/documents/swimmpresentation170205_000.pdf">http://www.swimm.co.uk/events/documents/swimmpresentation170205_000.pdf</a></td>
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