EUROCONTROL

Governance Principles of Management Systems:

Rationale for Governance Principles

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Abstract

This document presents the rationale and needs for governance principles of management systems for ANSP. It begins with a discussion of governance and the issues identified with the implementation of multiple management systems. It then continues to discuss the objectives of the governance principles

This document defines and describes management systems, details the management system requirements for ANSPs and reviews the emerging ISO 31000 Risk Management Standard. Also, it discusses the overlaps and conflicts that can come from the implementation of multiple management systems.

Keywords

Governance	SMS	EMS
Management Systems	QMS	
Rationale	SecMS	

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DOCUMENT APPROVAL

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LIST OF ABBREVIATIONS

ANSP	Air Navigation Service Provider
EFQM	European Foundation for Quality Management
EMAS	Eco-Management and Audit scheme
EMS	Environmental Management System
ESARR	EUROCONTROL Safety Regulatory Requirements
HSE	Health and Safety Executive
HSEQ	Health, Safety, Environment and Quality (Management System)
IATA	International Air Transport Association
ICAO	International Civil Aviation Conference
ISO	International Organisation for Standardization
OHSAS	Occupational Health & Safety Assessment Series
PDCA	Plan-Do-Check-Act
QMS	Quality Management System
SecMS	Security Management System
SESAR	Single European Sky ATM Research
SMS	Safety Management System

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1. THE NEED FOR GOVERNANCE PRINCIPLES OF MANAGEMENT SYSTEMS

1.1 What are Governance Principles of Management Systems?

There is no specific definition of governance principles of management systems. It should be noted that the term “Corporate Governance” is well known and there are several national and international codes and best practice guides providing guidance and principles in this area. This study is focused on Governance Principle of Management Systems rather than Corporate Governance in general.

Therefore in the absence of a formal definition of corporate governance principles for management systems, the following concepts are presented for further consideration.

1.1.1 What is Governance

Governance can be defined as:-

“The act, process, or power of governing”

Therefore governance principles of management systems can be inferred as the principles which direct a management system at the top level down. This concept is presented in Figure 1. The figure shows a model by which the top management business goals can be translated down into the various levels within the management system in the form of “principles” which can be applied.

1.1.2 Integration

The internationally recognised general standards presented in this report have been refined such that they are compatible and can therefore support integration. Yet, the choice to integrate systems lies with the organisation themselves. Mature systems can move towards integration, but equally there are effective non-integrated systems which have been in place for many years. The ATM community has industry specific requirements and this can add a further dimension to the issue of system integration. Therefore one of the issues that this overall project will address in the work packages is whether integration is positive or negative in terms of governance principles.

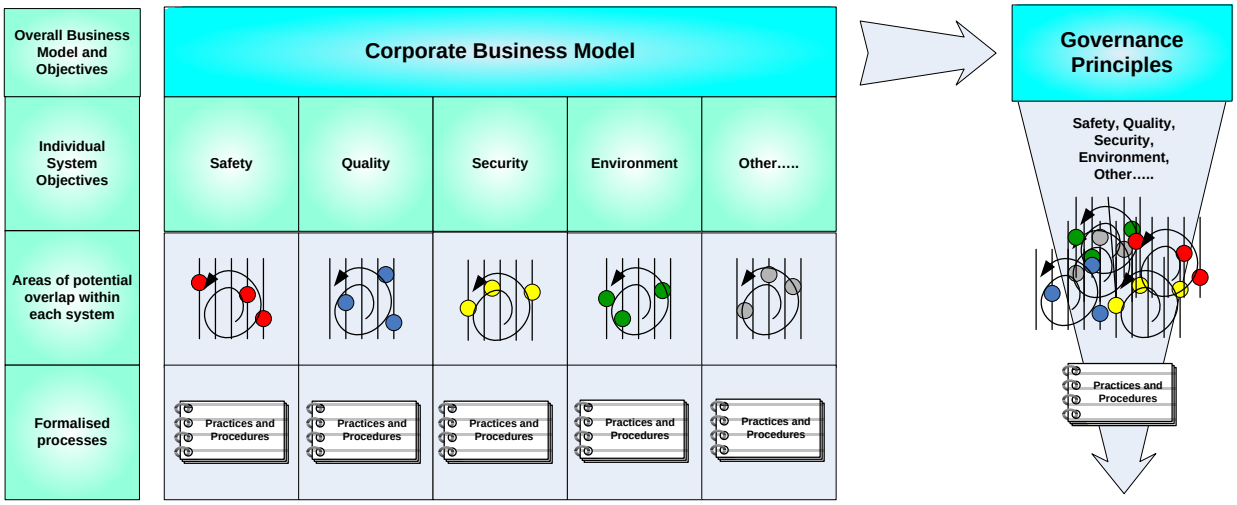


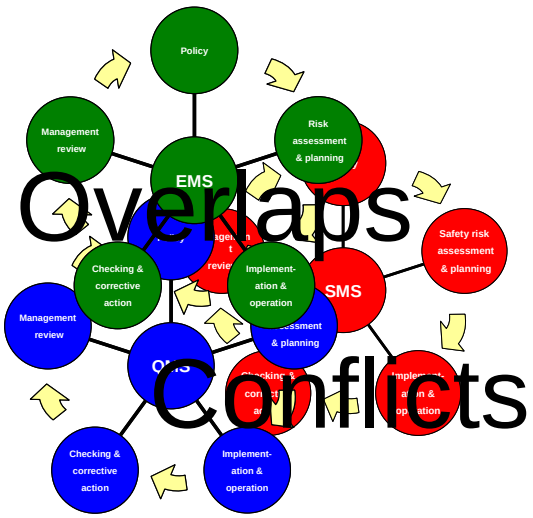
Figure 1: Concept of Governance Principles of Management Systems

1.2 Need for Governance Principles

Traditionally safety management and quality management have been the most important management systems for an ANSP. These systems have been implemented well, with many ANSPs having in place well established systems. The balance between safety and quality has been relatively easy to achieve, with safety targets in place.

There is increasing importance being given to other management systems, especially security and environmental management, although all of these systems are compatible, there is limited or no guidance on how to manage the interfaces and system interaction. There can also be significant competition for resources, e.g. between a measures to improve safety and one to improve security.

Regulations for ANSPs in Europe, especially the Common Requirement CR 2096 [6] require the introduction of multiple management systems, at least Safety, Security and Quality. Many organisations are also implementing an environmental management system.



These multiple management systems have common elements and are often arranged in a Plan-Do-Check-Act cycle.

However they also have individual requirements and they need measures to manage interfaces between systems.

Figure 2: Overlaps and conflicts in implementing multiple management systems

There are also holistic risk management frameworks, e.g. the ISO 31000 standard [20] which intends to harmonise risk management processes in existing and future standards and provides a common approach in support of standards dealing with specific risks and/or sectors.

1.3 Conflicts within Multiple Management Systems

Figure 3 below presents a safety management system based upon the requirements of the EUROCONTROL Generic Safety Management Manual (EGSMM) [9]. The elements have been represented in the context of the Plan-Do-Check-Act cycle for alignment with other management systems. The figure shows how each part of the management system has inputs, both in terms of the policy outlining top management direction as well as input from other parts of the management system cycle. The policy should be influenced by the business model since the policy document represents top management commitment. Performance data and judgements are made within each part of the management system and these are fed into the management review and also back up into the policy, in a series of iterative loops.

Within each part of the management system there exists the potential for conflicts and overlaps with other systems. These can present a bias or distort the information which is passed back into the corporate business model. This is the model by which an organization's ethos or overall purpose is defined, and this may generate mission statements and/or business objectives.

It is at the corporate business model stage that top management decisions will be made and therefore any misrepresentation of the performance and status of the

management system can repeatedly pass through the management system without detection or resolution.

When Figure 3 is considered in the context of multiple management systems, additional actions may be required to assist in minimising the potential for conflicts and assist in the management of overlaps.

Whilst differences may occur within different management systems the key building blocks remain the same, so the figure is valid whether we consider from a safety, quality, security or environmental perspective.

In terms of governance principles, these could act as an overlay which would work to minimise the conflicts across the various management systems, at the various stages of the management cycle, in a top down manner. They can also provide guidance on how to deal with potential overlaps. For example one of the Governance Principles proposed in section 7 below is “Need for Transparency” – this principle could lead to clear defined criteria for dealing with the conflicting impacts of an ATM changes. The principle of “Drive for Commonality” could help in maximising potential benefits from overlaps.

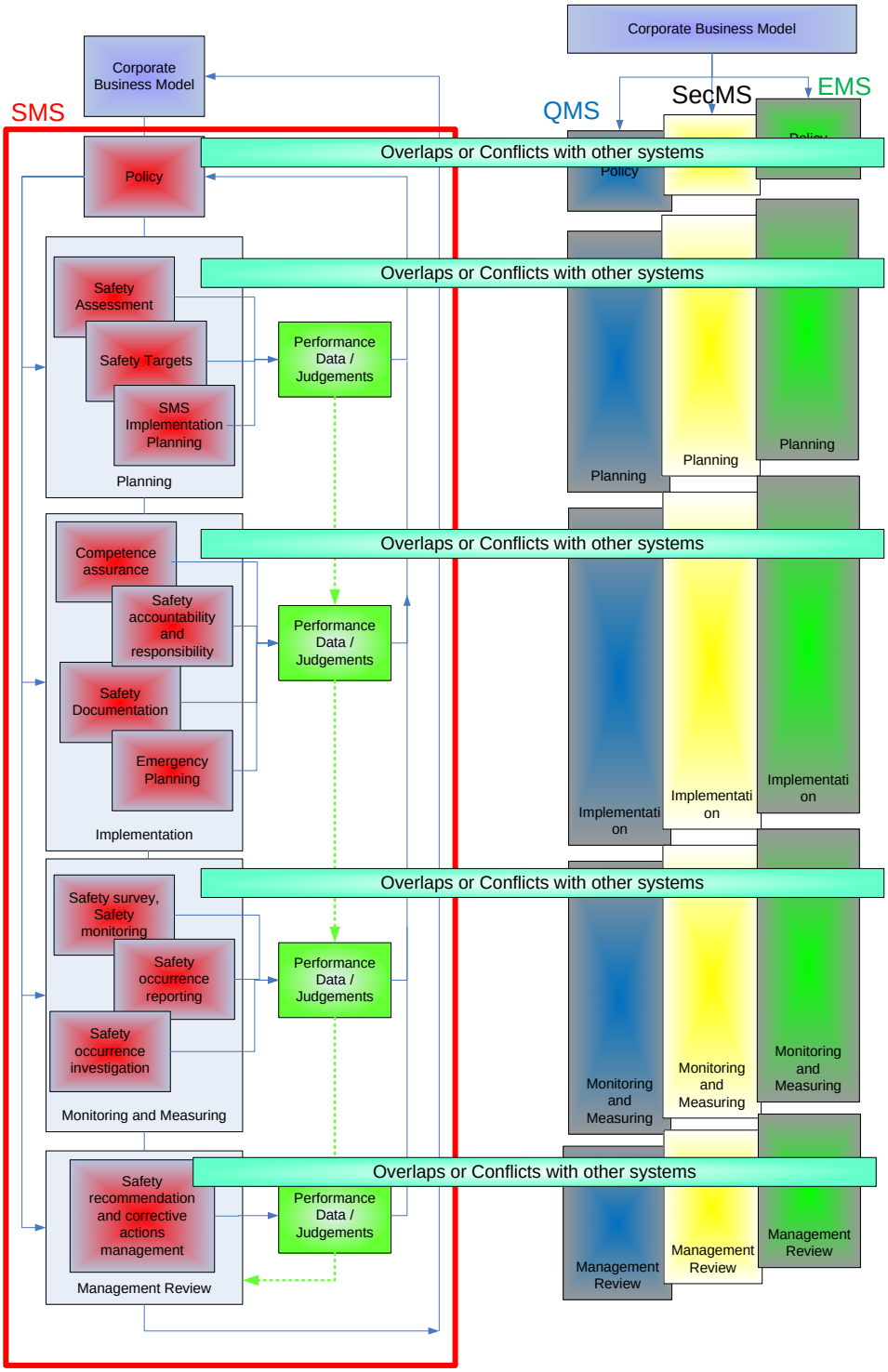


Figure 3: Overview of Conflicts and Overlaps within Multiple Management Systems

2. THE OBJECTIVES AND BENEFITS TO THE ATM COMMUNITY

2.1 Objectives of Governance Principles

Governance Principles of Management Systems are a series of principles to enhance multiple management systems, specifically their role is:

- to **minimise** conflicts.
- to **manage** overlaps.
- to **increase** the overall effectiveness of an organization's system(s).
- to **create value** by minimizing loss.
- to be an **integral part** of the organizational processes.

The principles are intended to be an overlay of "best practise" for multiple systems; they are not a route to integration but a series of principles for improving systems.

There is no overlap with the Corporate Governance Principles in place within many large organisations. Drivers for corporate governance are related to transparency and accountability in the context of financial reporting and practices. Most member states have requirements at a national level based around the Sarbanes Oxley Act [21].

The governance principles of management systems are a series of principles which will assist ANSPs with their current systems. The principles may be used as a checklist to confirm that the current systems are working efficiently and in line with best practice. Alternatively they can be used as a mechanism for improving selected problem areas within a management system or at a more fundamental level.

The principles are an "overlay". They are not a separate management system, nor are they are solely a series of high-level principles which an organisation must take and translate into their own systems. They have also been developed to compliment and work within existing systems.

3. INTRODUCTION AND OVERVIEW OF MANAGEMENT SYSTEMS

3.1 What are Management Systems?

This section provides answers at a high level to the following questions:-

- What is a Management Systems?
- What is the Plan-Do-Check-Act cycle?
- Why are they needed?
- What are the common types of Management Systems?
- What is the general structure of a Management System?
- What documentation is needed for a Management System?

3.1.1 What are Management Systems?

Management systems are designed to help an organisation manage and control a sector of their business. Fundamentally they provide a framework and process to drive and improve performance and to prevent loss within that area of the business.

A management system described at a high level typically involves the following parts:

- a policy set by “top management” covering broad goals; and
- a set of elements which “deliver” the goals set out in the policy;
- arranged in such a way as to ensure “continual improvement”.

Whilst there may be some differences within the management systems there is often a commonality to the language used to describe the various elements. For consistency we have used the ISO (International Organization for Standardization) terminology as applicable. Figure 4 presents an overview of a typical management system.

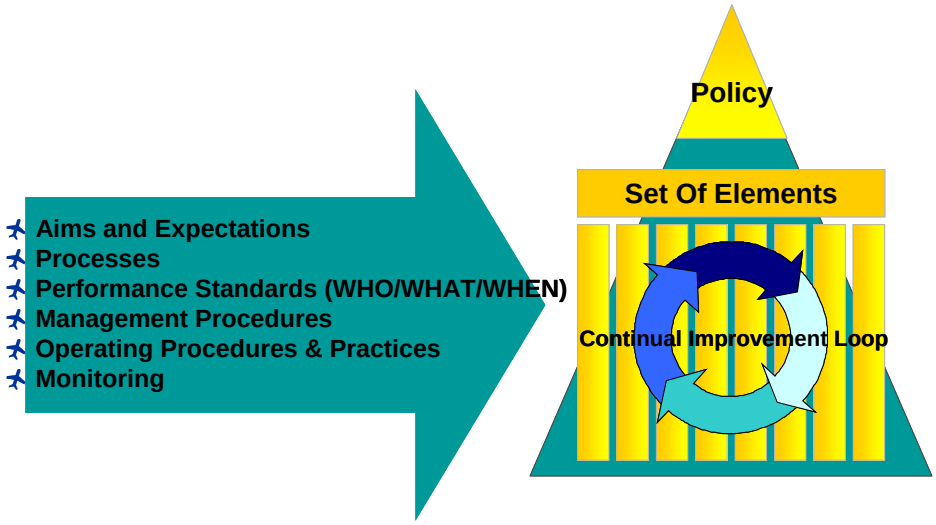


Figure 4: Overview of a "generic" management system

There are common elements contained within management systems, namely: -

- Aims and expectations – either within the policy or underlying plans
- Processes – for each element to make them work effectively and repeatedly
- Performance Standards (WHO/WHAT/WHEN) – to ensure that the processes operate correctly
- Management Procedures – underpinning the processes (e.g. how to develop an annual plan)
- Operating Procedures & Practices – how to do the "sharp-end" work for the controller, engineer, IT etc.
- Monitoring – making sure everything is going to plan and highlighting deviations
- Review – adjusting the management system to ensure it continues to be fit for purpose.

3.1.2 What is the Plan-Do-Check-Act cycle?

The phrase "Management System" can be rather abstract and interpreted in many ways depending upon the knowledge and experience of the individuals involved. We recognise managers, but we do not see Management Systems walking around our workplace. To help in understanding Management Systems, we can think of a financial management system (e.g. family budget) as we will readily recognise key features of this even if we are not financial specialists.

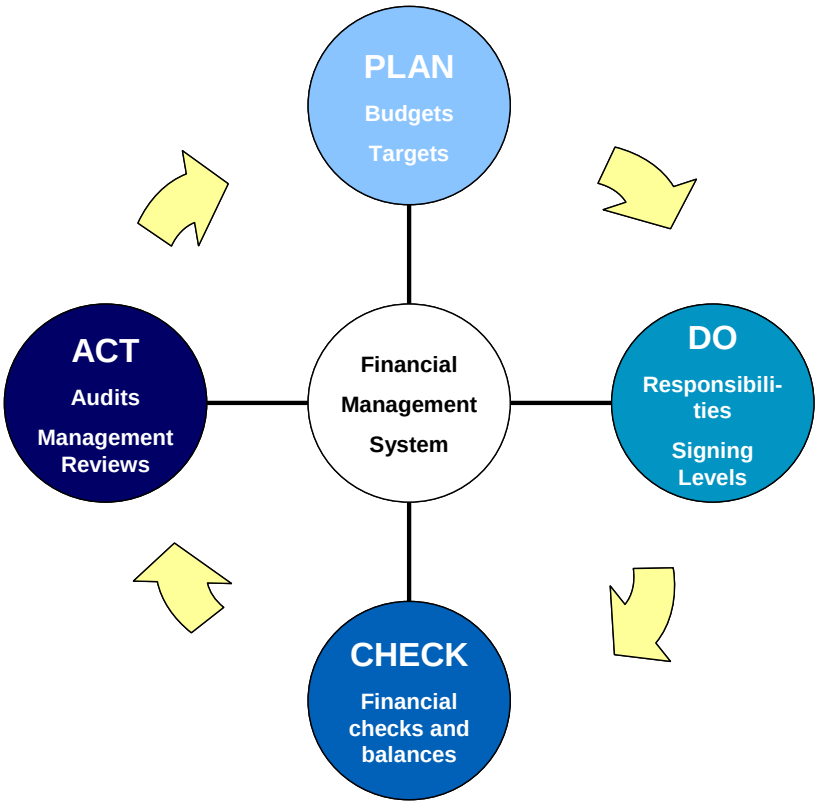


Figure 5: Simplified management system loop

Figure 5 above uses the "PLAN-DO-CHECK-ACT"[1] loop which underlies many management systems. Further explanation of the steps is provided below : -

- Plan: establish the objectives and processes necessary to deliver results in accordance with the organisations policy.
- Do: implement the processes.
- Check: monitor and measure processes against policy, objectives, targets, legal and other requirements, and report the results.
- Act: take necessary actions to continually improve performance of the management system.

It has been increasingly recognised that Quality, Safety Security and other areas of business should be treated in a similar systematic way. A major quality lapse, accident or a security breach could also lead to a large loss to an organisation, in the extreme case threatening the organisation's survival.

[1] **PDCA** ("**Plan-Do-Check-Act**") is an iterative four-step problem-solving process typically used in business process improvement. It is also known as the Deming Cycle

Within ISO, there are a number of technical committees which draft standards. ISO provides the following definition [3]:

"A management system is a set of interrelated elements used to establish policy and objectives and to achieve those objectives. A management system includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources."

3.1.3 Why Are They Needed?

Very visible losses may be major accidents causing large loss of life and damage to property and the environment. A series of such major accidents in various industries (e.g. Seveso, Piper Alpha, Uberlingen[2]) has highlighted the need for addressing Management Systems as well as equipment/ technical issues which may have been the immediate or direct causes of the accidents.

Figure 6 below was developed to illustrate historical trends in safety, but is also applicable to other areas. Aviation and other industries put a large amount of effort into improving equipment reliability and incident and accident rates decreased accordingly (Phase 1). However, there is a limit to what that can achieve through design alone and incident rates could begin to plateau, unless effort is also devoted into improving the underlying Management Systems (Phase 2). Some have argued that even that effort may not be enough and that Cultural issues, which are potentially overlooked within formal Management System development, also need to be addressed (Phase 3).

Traditionally, businesses have concentrated on developing their product or service in a way to maximise revenue and sales; however another key element is the prevention of loss, from whatever source. This was the initial driver towards the introduction of Safety Management Systems (SMS).

[2] Seveso Italy 1976. Dioxin Release. Drove EC legislation, Piper Alpha. North Sea 1988. Explosion and fire on offshore platform, Uberlingen, 2002 Mid-air collision

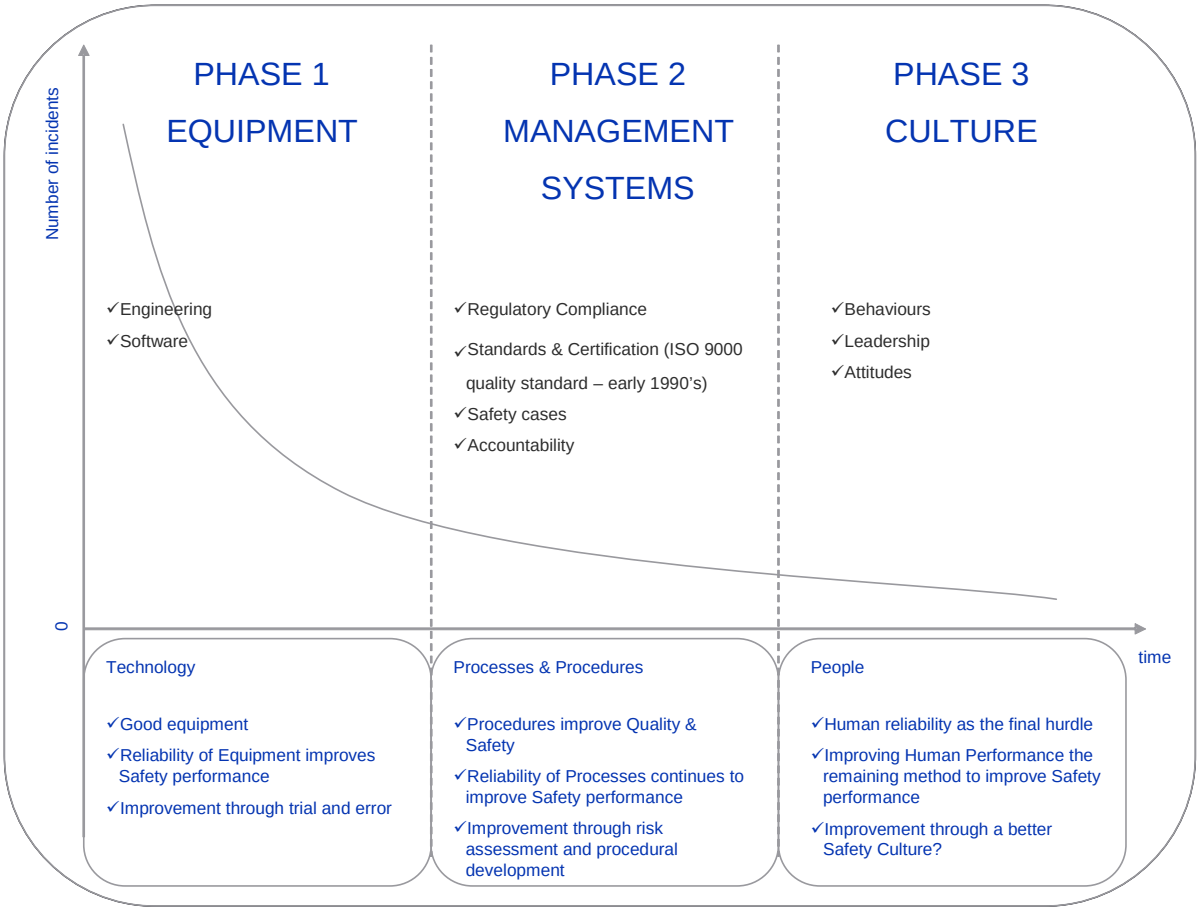


Figure 6: The need for management systems

The goal of management can be considered as:-

"To co-ordinate activities and resources to meet an objective"

So a "management system" can be seen as a mechanism to achieve the goal of management.

The drivers or needs for a management system can be varied. Some systems such as safety management systems have been driven by legislation. E.g. for organisations of a certain size there is a legal requirement to have in place a safety management system in line with recognised principles, such as UK Governments Health and Safety Executive HSE HSG65 [17]. Organisations may choose to seek further external validation of their systems; this issue is further discussed later in this document.

For others, the drivers have been business focussed. The quality standard ISO9001 [2] has become almost a prerequisite within the supply chain and organisations without a system in place in line with ISO9000 risk loss of business as a result.

Finally systems such as ISO14001 [3], the environmental standard, have been used by organisations as a “green badge”. Initially the management system was used as a means of differentiating companies, with leading edge companies displaying commitment to the environment. Whereas safety and quality standards can be seen in the context of being mandatory, from either a legal or a “business” position, ISO14001 is historically a voluntary standard, and more recently is seen as a requirement for more socially conscious organisations especially those with a drive or commitment towards a “sustainable business”.

For other organisations, the implementation of a recognised management system is an insurance requirement, providing adjusted premiums as a result.

Considering the issue of security, management systems in this area have developed for organisations which have specific needs. They have been developed in a manner which is in line with other management systems standards, since a management system is viewed as a best practice technique of controlling and improving performance.

3.1.4 What are the Common Types of Management Systems?

Management systems have been defined to cover many activities that an organisation may undertake.

Within the ATM community there are mandatory requirements for ANSPs with respect to management systems. Therefore we shall concentrate on the three management systems which are required for ANSPs (#1 to 3 below) and an additional important and emerging system (#4 below).

These are:

1. Quality management system,
2. Safety management system,
3. Security management system, and
4. Environmental management system.

There are a number of internationally recognised management systems, which have been mentioned in this document. The following table provides an overview of the ATM specific standards, as well as the commonly available management systems and the issues that they cover, see Table 1.

Some of these standards are internationally recognised, e.g. the ISO standards, others are nationally recognised, others cover certain regions.

Organisations can choose to implement systems in line with or in full compliance with these standards. In addition organisations can choose to seek external

confirmation that their systems meet these required standards in the form of certification. Many of these standards were not initially prepared for the purpose of third-party assessment. Therefore over time, supporting standards and documentation has been developed outside of the main standard document which provides mandatory guidelines for Certification Bodies (accredited organisations for carrying out third party certification).

Issue	Management system	Comment
Quality	ISO 9001:2008 [2]	• ISO standard which is Internationally recognized. • Suitable for third party assessment / certification. • Sometimes a requirement to operate or tender for work with organizations or governments.
	EFQM	• European focused organizational management model. • Can be self-assessed or externally assessed.
Safety	ICAO SMS [10]	• International ICAO standard designed to apply across aviation including operation/maintenance of aircraft, air traffic services and aerodromes. • Mandatory ICAO requirement to establish a SMS (since 2006). • Recognized in other sectors of the aviation industry.
	CR 2096/2005 [1] / EUROCONTROL EGSMM [9]	• CR 2096/2005 specifies requirements for a SMS and the EUROCONTROL EGSMM guidance supports states in developing their own SMS.
	OHSAS 18001 [11]	• British standard but internationally recognized and developed by a selection of leading trade bodies, international standards and certification bodies. • Suitable for third party assessment / certification
Security	EUROCONTROL SecMS [6]	• Outline management system developed by EUROCONTROL designed to meet the security requirements of CR2096. • ATM specific, applies to physical, ICT and personnel security • Not suitable for third party assessment / certification
	ISO 28000 [4]	• International standard for supply chain security. • Recognized widely. • Suitable for third party assessment / certification. • Used as the basis of the EUROCONTROL SecMS.
	ISO 27000	• International standard for information security, published jointly by ISO and the International Electrotechnical Commission (IEC). • Recognized widely • Suitable for third party assessment / certification
Environment	ISO14001 [3]	• ISO standard • internationally recognized, • Suitable for third party assessment/certification
	EMAS (Eco-Management and Audit scheme	• European standard • Recognized widely • Suitable for third party assessment/verification and validation

Table 1: Overview of different international quality, safety, security and environmental management systems

3.1.5 What is the General Structure of a Management System?

Management systems are often represented in a loop structure, which is designed to represent the ability to continually learn, adapt and improve the management system.

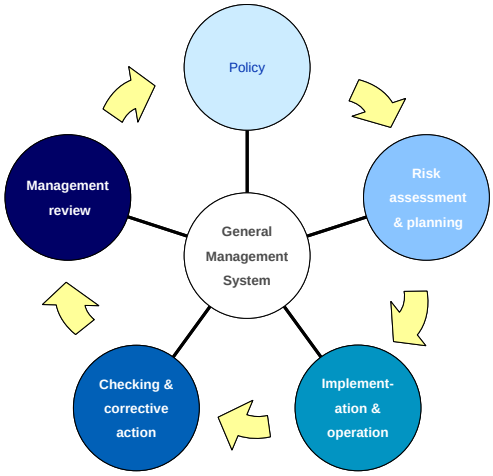


Figure 7: Overview of a management system

An overview of a general management is given above. It consists of a set of activities, which generally fit into the PLAN-DO-CHECK-ACT (PCDA) cycle. In the graphic above we have separated the PLAN aspect into the *Policy* activity and the *Risk Assessment* and Planning activities to show the importance of the policy statement. Figure 7 is based on ISO 28000 (Security Management Systems for the Supply Chain) [4], but it is generally applicable.

The PDCA provides a simplistic overview of a management system. Management systems within organisations typically contain many iterative cycles confirming that the objectives are being met.

The purpose of each activity is outlined briefly below in Table 2. Normally each activity would contain several specific “elements” which define the management system in more detail.

Key management System Elements	
Policy	• The policy should demonstrate management commitment and recognise the value to the business of Quality/ Safety/ Security/ Environment. • It should define how the management system is going to be compliant with regulations and the consistency with other management systems. • The document also defines expectations with respect to performance improvement. • The policy statement should convey the implicit message that "Senior Managers care about Quality/ Safety/ Security/ Environment and we want all our staff and stakeholders to care about it as well".
Risk assessment and planning	• All management system frameworks have a planning activity. This includes defining what objectives, targets and programmes are required from the management system. • In many systems this planning stage includes a risk assessment element; this can be used to identify the highest risk parts so the targets and programmes can be directed to reducing these risks. • In management systems such as safety and security the risk assessment becomes a key part of the system where a significant amount of effort can be spent. • For quality management systems the risk assessment element is not always so explicit, but it should still exist.
Implementation and operation	• This activity involves the "doing" part of the system. • It includes the management structure and defines the procedures for what is done in the management system.
Checking and corrective action	• Management systems should all include a checking activity, which includes measuring and monitoring performance, identifying non-conformances and formal audits.
Management review	• This activity completes the continual improvement loop involving follow up from managers and changes to the management system as a result of the checking and corrective action activity.

Table 2: Overview of Key Management System Elements

3.1.6 What Documentation is needed for a Management System?

The amount of documentation generated in a formal Management System can appear daunting so it is important to keep an overview of why the documents are necessary.

The triangle in Figure 8 can be seen as representing a systematic cascade of documentation running from a high level policy to a set of working documents. The following diagram illustrates a document pyramid for a management system. As shown the amount of detail and localisation increases down the levels.

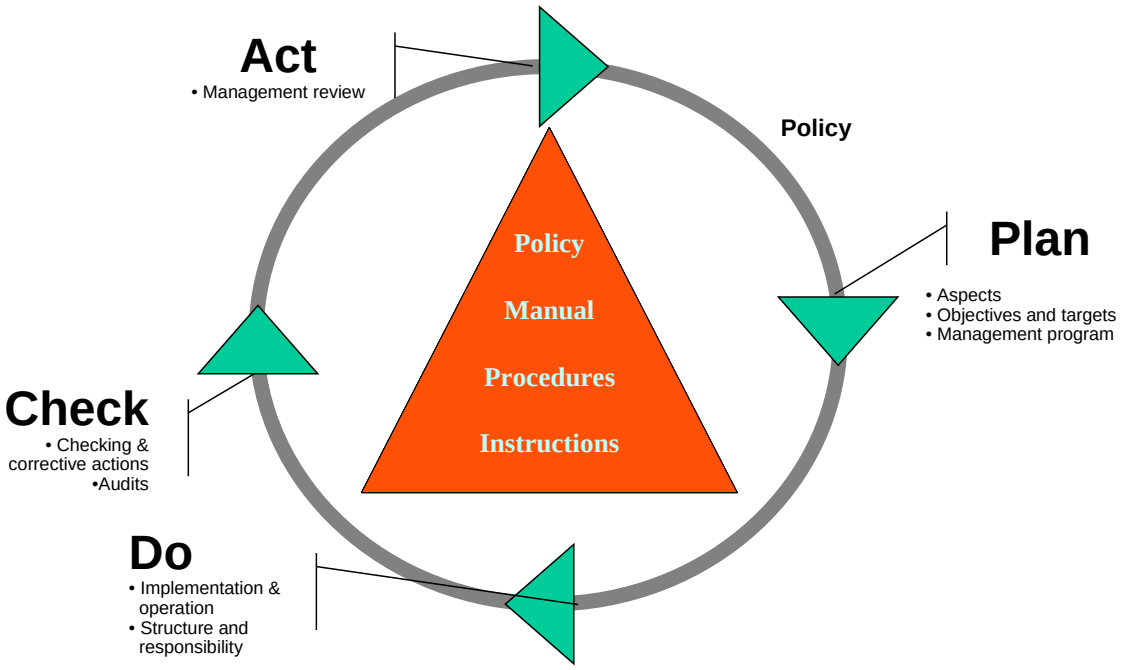


Figure 8: Illustrative system document structure

4. MANAGEMENT SYSTEM REQUIREMENT FOR ANSPS

4.1 EC CR 2096:2005

European Union Commission Regulation (EC) No. 2096/2005 lays down common requirements for the provision of air navigation services [1] and describes a number of conditions, requirements and expectations for ANSPs operating within the region.

This regulation is key to an ANSP's operations. Important to this current project are the requirements that an ANSP implements a number of management systems as part of meeting regulation 2096/2005. The management systems explicitly described are a Quality Management System (QMS), Safety Management System (SMS) and a Security Management System (SecMS).

Within these categories, certain specific requirements are mentioned that the management system should include.

4.2 Quality Management System

The ISO 9001:2008 Quality Management System (QMS) has been taken as the representation of a QMS [2]. The management system is explicitly referenced in CR 2096:2005 as an acceptable means to comply with the quality requirements of 2096.

The term quality sometimes leads to a misinterpretation of the goal of ISO 9001. The general requirements of ISO 9001:2008 are relatively simple and are presented in Table 3. Figure 8 presents the process model taken from ISO 9001.

Quality Management System	
Mission Objective	The goal of the QMS is to help an organisation function efficiently and to do this through a "process approach" in which an organisation identifies and manages its activities and ensures the transformation of inputs into outputs
Requirements	CR2096/2005 specified some requirements for a QMS but described ISO 9001 as an acceptable means of compliance. ISO 9001 is often used as an externally certified management system to meet these requirements and contains further requirements, see below: The organization shall: a) determine the processes needed for the quality management system and their application throughout the organization , b) determine the sequence and interaction of these processes, c) determine criteria and methods needed to ensure that both the operation and control of these processes are effective, d) ensure the availability of resources and information necessary to support the operation and monitoring of these processes, e) monitor, measure where applicable, and analyse these processes, and f) implement actions necessary to achieve planned results and continual improvement of these processes.
Guidance	If ISO 9001 is used to fulfil the CR2096/2005 requirements, significant guidance and information on developing a system compatible with ISO 9001 in other documents as part of the ISO 9000 series.

Table 3: Overview of QMS Requirements

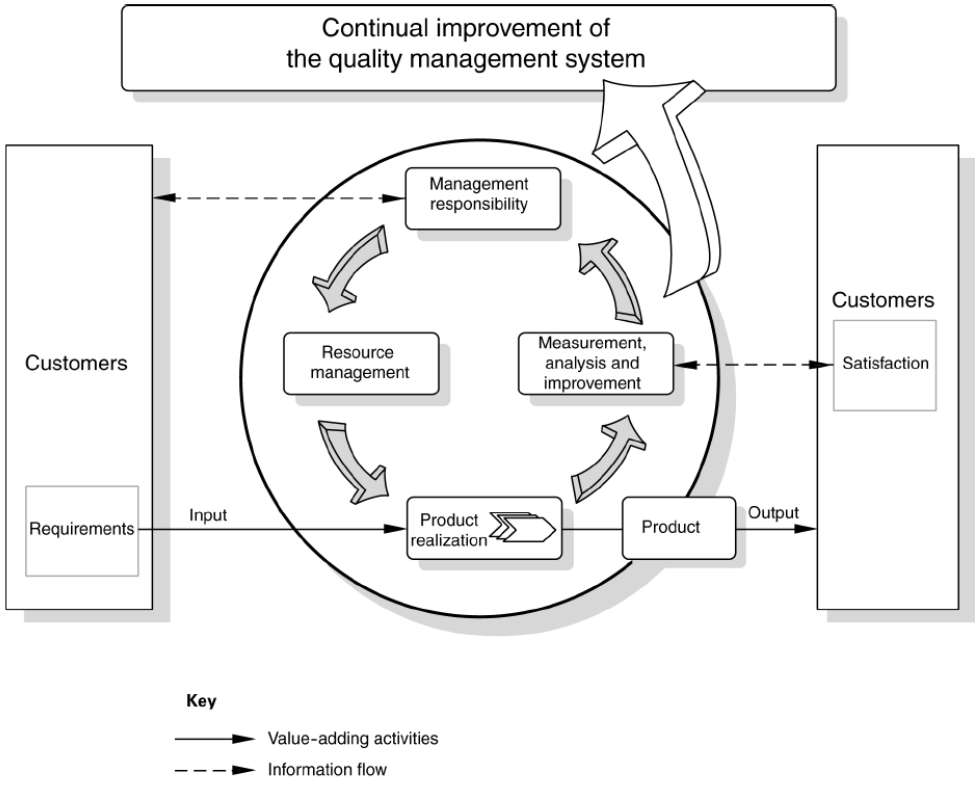


Figure 9: Model of a processes based quality management system, reproduced from ISO 9001:2008 [2]

4.3 Safety Management System

Safety Management refers to a system to ensure the safety of staff, customers or the public. Depending on the industry or organisation, the focus could be on occupational accidents to staff or it could be on major hazards affecting large numbers of the public. An overview is provided in Table 4 .

Safety Management System	
Mission Objective	Ensure the safety of staff, customers or the public by ensuring all safety risks have been identified assessed and satisfactorily mitigated.
Requirements	Requirements specified in CR2096:2005, ICAO SMS and national legalisation.
Guidance	Guidance on management system structure included in the Eurocontrol generic safety management manual (EGSMM) [9], guidance also included in the ICAO SMS Manual [19].

Table 4: Overview of Safety Management System based upon CR 2096:2005

An SMS is presented as follows in the Common Requirements (CR) [1] and ESARR 3;

> "*Safety management is that function of service provision, which ensures that all safety risks have been identified, assessed and satisfactorily mitigated. A formal and systematic approach to safety management will maximise safety benefits in a visible and traceable way*."

The Common Requirement [1] identifies several features of a Safety Management Systems that ANSPs should implement, for example

- Ensuring staff are adequately trained and competent (from safety achievement)
- Ensuring quantifiable safety levels are derived and maintained (from safety achievement)
- Ensuring safety surveys are carried out (from safety assurance)

Amongst many other requirements. The CR makes direct reference to the EUROCONTROL Safety Regulatory Requirements (ESARRs) in particular:

- ESARR 3 on the use of safety management by air traffic management service providers,
- ESARR 4 on risk assessment and mitigation in ATM and
- ESARR 5 on ATM services' personnel, requirements for engineering and technical personnel undertaking operational safety related tasks.

ICAO within Annex 11 [15] and PANS ATM Doc 4444 [16], also requires the implementation of formal and systematic safety management programmes within

Air Traffic Services. Recently ICAO published its Safety Management Manual for all aviation organisations [19].

Other safety management systems that are more widely employed in industry include the OHSAS 18001 [11] system.

4.4 Security Management System

Security Management as a formal system is newer and less universally implemented than an SMS. The nature of security threats that need to be considered within a SecMS can be wide ranging from internal and external sources, from theft to terrorism and include physical, people and information assets. Table 5 contains an overview of the requirements for a security management system.

Security Management System	
Mission Objective	To allow an organisation to establish an adequate level of security within the domain it controls by means of assessment of the security environment, determining adequate measures and implementing them effectively.
Requirements	Requirement for a security management systems for ANSPs are defined in CR 2096/2005. This includes specific elements/features but does not outline a full management system. EUROCONTROL has developed a Security Management System SecMS [5] designed to meet the requirements from CR2096/2005, although it is not defined as an acceptable means of compliance.
Guidance	The EUROCONTROL SecMS contains guidance for the development of a complete security management system, and an associated training course has been developed.

Table 5: Overview of Security Management System Requirements

Often strong overlaps exist between safety management and security management. The key differences come from the deliberate nature of the hazard and the active attempt to overcome barriers, which creates extra challenges including at the risk assessment level.

Security management systems have been defined by ISO but they are directed towards specific areas such as Supply Chain Security (ISO 28000) [4] or Information Security (ISO 27000) [18]. In the ANSP context EUROCONTROL has recently produced a security management system framework that fulfils the requirements of EC 2096 [1]. This has been termed the SecMS [5] and has recently been adopted by some ANSPs.

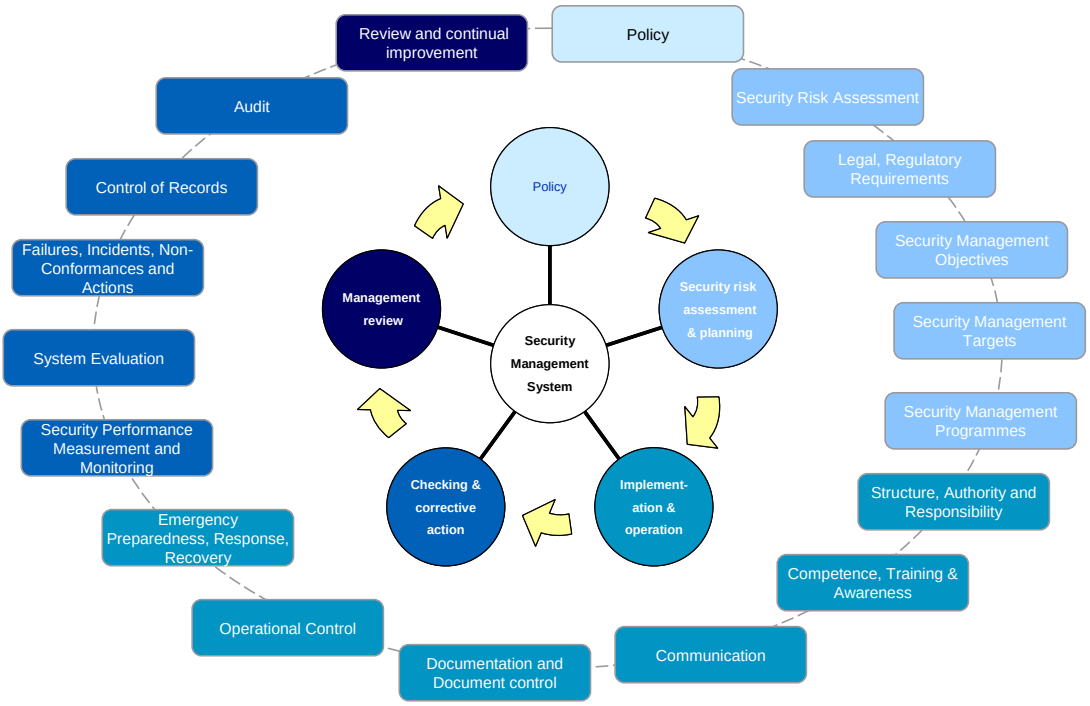


Figure 10: Overview of the 16 element EUROCONTROL Security Management System Framework

4.5 Environmental Management System

Environmental management is concerned with achieving and demonstrating sound environmental performance by controlling the impacts of an organisation's activities, products and services on the environment. An ISO standard for Environmental Management has been available since the mid-1990's and subsequently revised in 2004 [3].

Within EC 2096 there is not an explicit requirement for ANSPs to have an environmental management system in place. However aviation is becoming more environmentally significant and environmental targets have been set by SESAR [13] and according to the International Air Transport Association (IATA) the industry as a whole has agreed to significant absolute reduction in emissions of 50% (2050 compared with 2005) [12].

Environmental Management System	
Mission Objective	Environmental management is concerned with achieving and demonstrating sound environmental performance by controlling the impacts of an organisation's activities, products and services on the

	environment.
Requirements	There are no specific requirements at present in the regulations for ANSPs to manage environmental performance, but it is recognised that environmental issues associated with aviation are increasingly on the agenda for stakeholders and this will drive greater focus in this area.
Guidance	ISO 14001 is a complete environmental management system and includes guidance and detailed information.

Table 6: Overview of Environmental Management System Requirements

Conflicts can arise in achieving environmental goals against other issues such as capacity, safety etc.

Environmental Management is a broad term, especially when applied in an aviation or ANSP context, and covers an extensive range of topics which are not necessarily related. Some examples include:

- Noise, this is a key parameter especially in the areas immediately around airports. Local planning and regulation often specifically dictate noise allowances and public complaints often concentrate on noise. Noise regulations are also defined by ICAO [14].

- Greenhouse gases, often the wider public considers the reduction of CO_2 to be environmental management and many targets are driven by these considerations correlated with the expected increase in aviation and decrease in CO_2 from other sources.

- Engine exhaust emissions, turbojet and turbofan aircraft engines emit smoke, unburnt hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NO_x). Limits on these are defined by ICAO [14].

- Office environmental performance; ANSPs are complex organisations with engineering, support, and administrative functions. Therefore traditional EMS measures may apply include recycling, electricity/gas usage and source, staff travel choices etc.

Figure 11 presents the ISO14001 continuous improvement loop and the main elements of the standard.

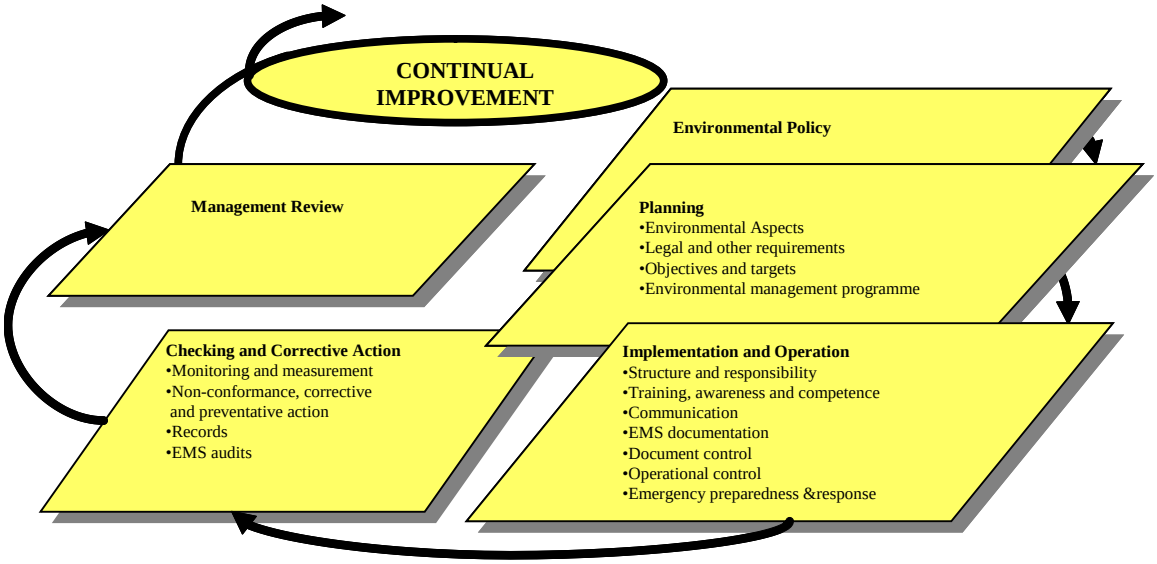


Figure 11: ISO14001 Structure and Key Elements

4.6 Risk Management

Whilst not specifically a management system, there is currently a draft ISO standard for Risk Management, ISO 31000 Risk Management – Principles and guidelines on Implementation [20]. The relevance and application of this standard to the project will be explored further in the work packages, but in the context of this report, Figure 12 and Figure 13 are presented to show the Framework and Components of the standard. Unlike the other ISO standards referenced, this standard has is not to be used for the purposes of Certification.

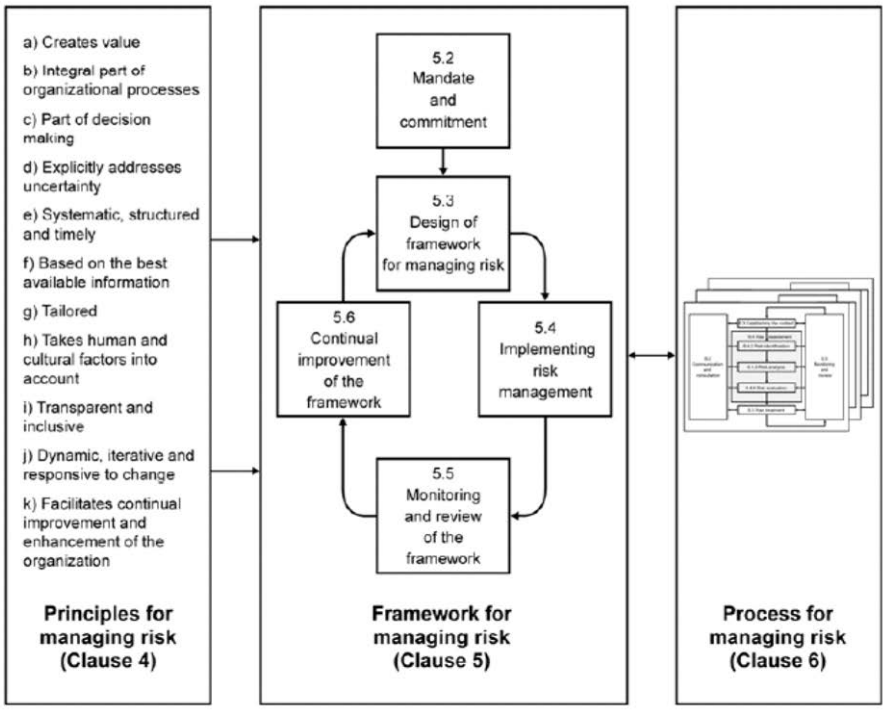


Figure 12: Relationship between the risk management principles, framework and process

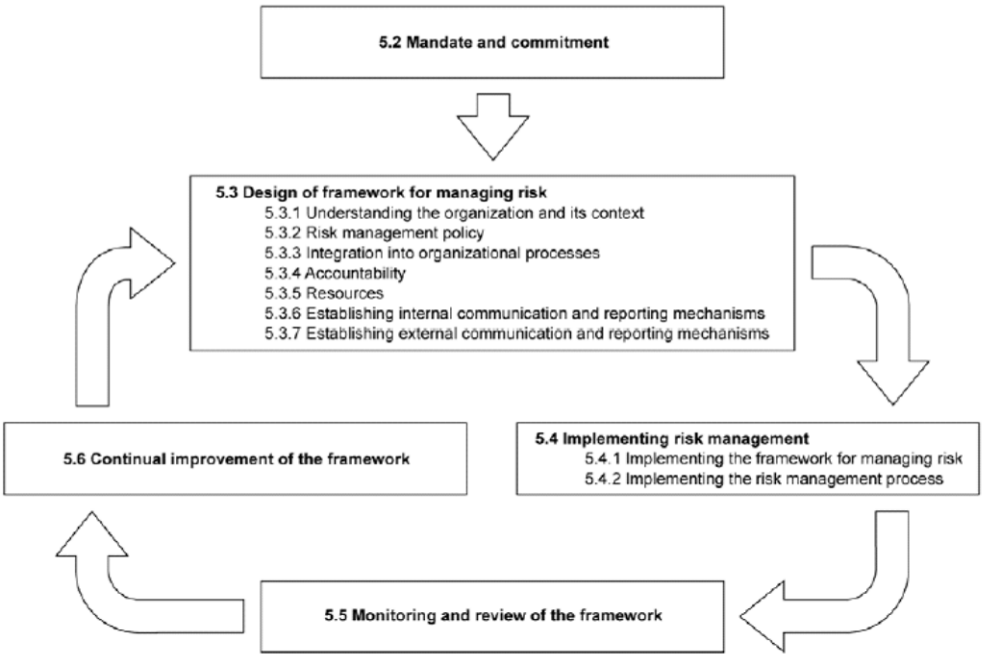


Figure 13: Components or the Framework for Managing Risk

4.7 Summary of management systems

Table 7 below provides a summary of the management systems outlined in this section.

Management System	Objective
Quality	Ensure an organisation functions efficiently, and delivers its business goals including meeting customer requirements.
Safety	Ensure the safety of staff, customers or the public by ensuring all safety risks have been identified assessed and satisfactorily mitigated.
Security	Establish an adequate level of security within the domain it controls by means of assessment of the security environment, determining adequate measures and implementing them effectively.
Environment	Achieving and demonstrating sound environmental performance by controlling the impacts of an organisation's activities, products and services on the environment.

Table 7: Summary of the Objectives of Outlines Management Systems

5. OVERLAPS AND CONFLICTS IN MANAGEMENT SYSTEMS

5.1 Introduction

Whilst the ISO standards for management systems have been refined and aligned so that they are compatible with one another, the issue of overlap and possible conflicts are dependent upon how an organisation implements a management system. The following section discusses the possible areas of overlap as well as the areas in which conflicts may arise.

5.2 Overlaps

The international standards (ISO standards) and other internationally recognised standards discussed in previous sections all broadly follow the Deming Plan-Do-Check-Act cycle. Therefore it is unsurprising that many of the standards share common elements. In the broadest terms they all contain the following element requirements: -

- Policy
- Identification of “issues” and prioritisation
- Procedures
- Corrective action
- Monitoring
- Audits
- Management Review

This can also be seen in Figure 13 below. The figure represents an organisation with established management systems such as safety or quality in place, and wishing to implement an EMS in line with ISO14001. The figure shows the areas where significant development and resources are needed together with the areas which are already almost in compliance due to the existent of overlaps with other standards/systems. The “Management Review and ”Implementation and Operational” elements are virtually addressed, the “Checking and Corrective Action” is partly covered and the “Policy” and “Planning” elements still in relative infancy.

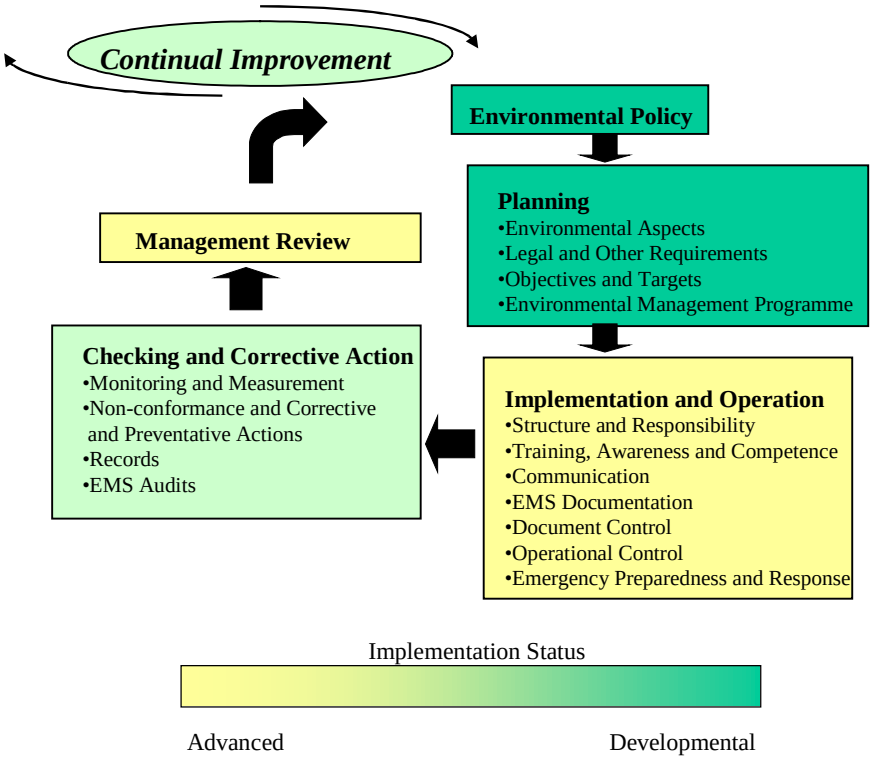


Figure 14: ISO14001 requirements and overlap with existing management systems

The latest version of ISO 9001 [2] has been revised in order to provide better correspondence with ISO 14001.

5.3 Potential Conflicts

Whilst the systems contain a number of common elements and requirements, there can also be potential areas of conflict. These can materialise in various places within the management systems. All potentially relate to conflicting issues arising from the conflicting goals and/or objectives of each management system. In some cases these require intervention of top management and here communication issues can arise from translating the individual system risks into business focussed risks.

Furthermore, the timeline for system development can have an influence. For established safety and quality management systems, implementing additional systems can cause imbalance e.g. favouring one issue over another.

The nature and scale of conflicts can also vary. Typically conflicts may be viewed as a major disparity between the drivers of separate management systems, but conflicts can also occur at

5.3.1 Policy

The recognised standards contain specific commitments to be made within the Policy document by top management. Even at this high-level there may be conflicting goals or required commitments. Organisations policies vary considerably, some are very open, whereas others can be very specific and targeted. Those policies which are more focussed can introduce potential conflicts. For example stating in a policy to use approved suppliers with a specific certified management systems can create business issues.

"A tanker company stated in it's policy only to use suppliers and contractors with ISO14001 certified systems. A tanker required immediate dry-docking only to find out that a dockyard complying with their policy requirements did not exist."

From an ISO perspective, a policy document outlines the top management commitment. All the ISO standards are designed to be stand-alone, but as discussed previously, do contain common elements. It is not stated explicitly within ISO, but there is an expectation that objectives and goals will be balanced from a "business" perspective. This should be visible from the policy down into the individual or integrated systems.

5.3.2 Goals

Organisations have limited resources and there can be conflicts on choosing which projects to consider. For example, a project may achieve a significant improvement in safety, but with limited benefits to environment, whereas there is a similar value project which delivers improvements in security. Both requirements will deliver the improvements required by the "policy" but what mechanisms can be used to determine which project should be selected. Techniques such as cost benefit analysis can be used to determine how to identify the most beneficial project, but these techniques can be difficulty to apply across less important issues.

The issue of balancing issues and priorities can be difficult. Many view safety as the only priority, whereas others can interpret safety to be one of the priorities.

5.3.3 Hierarchy of Systems

Often organisations have in place a safety or quality management system into which other management system requirements are embedded. In poorer, less efficient systems these requirements can be included as an afterthought. These can downgrade the requirements of the individual systems, and inadvertently prioritise issues.

5.3.4 Resourcing Issues

Different systems may require different levels of people resourcing. This can raise conflict in terms of any duel roles or team sizes. Some systems may require more procedures than others, whereas another system may require more

monitoring and measurement activity. Sufficient allocation of resources together with ensuring the correct competence can result in conflicts.

5.3.5 Monitoring and Measurement

Auditing can be an area of possible conflict in the systems. Whilst there is flexibility in how an organisation carries out audits, there can also be conflict in terms of identifying a specific issue and the associated corrective action. For example, identification of a quality issue may also lead to associated issues within the safety system. The required corrective action may differ for each system.

5.3.6 Communication

There can often be a disconnect between the language used within the management systems and the language used at board-level. Individual management systems consider safety risks, quality risks etc. Board level discussions relate to the context of business risk. Conflicts can often arise from poor communication or translation from the management systems into the corporate level discussions.

5.4 Conflicts Examples

In general conflicts often occur at the risk assessment level, a procedure, mitigation or technical system introduced to the benefit of one management system could be to the determent of another and mechanisms are required to ensure that the best option is taken.

Some regulators have developed documentation on the issues of managing a specific conflict, e.g. the UK CAA has produced a report on “Delivering Safety in the Context of Environmental Restrictions” [8]. Often new procedures are introduced on environmental (usually noise) grounds such as the use of non-precision runways or noise abatement take-off procedures which require a significant increase in pilot workload.

Often these risks are accepted on the basis that the system reaches a minimum level of safety, and after this, other considerations can be considered, indeed CR 2096 declares the safety priority [1] Annex II, 3.1.1 as

- ensures that the achievement of satisfactory safety in air traffic services shall be afforded the highest priority (safety priority),

Where the key word is *satisfactory* which ultimately resides as part of the risk assessment.

Examples of conflicts have occurred across most combinations, for example security measurers such as lights, sirens or dogs have been known to lead to environmental concerns including light or noise pollution.

The identification of conflicting goals and the processes for resolving these shall be the focus of later work packages within this project.

5.5 Integration or Separation

Management systems can either be integrated or separated. Historically organisations have implemented various management systems in the form of stand-alone systems. Many smaller organisations relied upon external consultants to develop “quality manuals” which sat outside any internal operating systems. In recent times integration has become more popular with a number of acronyms detailing combinations including SHE, SHEQ, HSEQ, S&S (Safety and Security), S&E (Security and Environment) and almost every other combination appearing across different organisations.

Although integration is becoming recognised as generally positive, it can present potential issues, benefits would include

- prevention of contradictory policies/targets
- increasing the efficient use of resources (e.g. auditors),
- facilitating the effective flow of communication and
- the installation of a common purpose.

There can however be negative connotations,

- One domain may become very junior, without a direct route to senior management, and
- the knowledge requirements and staff required could be considerably different (e.g. an ICT security specialist and an environmental management specialist).

Previously, many organisations have been against integration, preferring separation in their systems. Such organisations have third party auditors where a non-compliance can result in penalties or loss of operation. E.g. in the maritime community, a non-compliance against the Safety Management Code can result in a ship being detained.

As management systems mature, there is a trend to reduce the system documentation. It is often at this stage that organisations take the business decision to integrate and streamline their systems.

Integration is one potential way of addressing the Conflicting Goals note above, but it is not necessarily the only or best way.

6. GLOBAL RISK MANAGEMENT APPROACH

ISO 31000 Risk management – Principles and guidelines on implementation is an emerging standard which is currently in draft form.

The standard intends to harmonise risk management processes in existing and future standards and provides a common approach in support of standards dealing with specific risks and/or sectors. The standard is not intended to be used for the purpose of certification.

The standard can be taken as an example of "future" best practice in the area of risk management. The figure shows that the standard puts forward a series of principles for effective risk management. These principles have been considered in this project and taken forward into the final list of principles as appropriate.

The link between ISO 31000 principles and the governance principles of management systems is detailed in the next section.

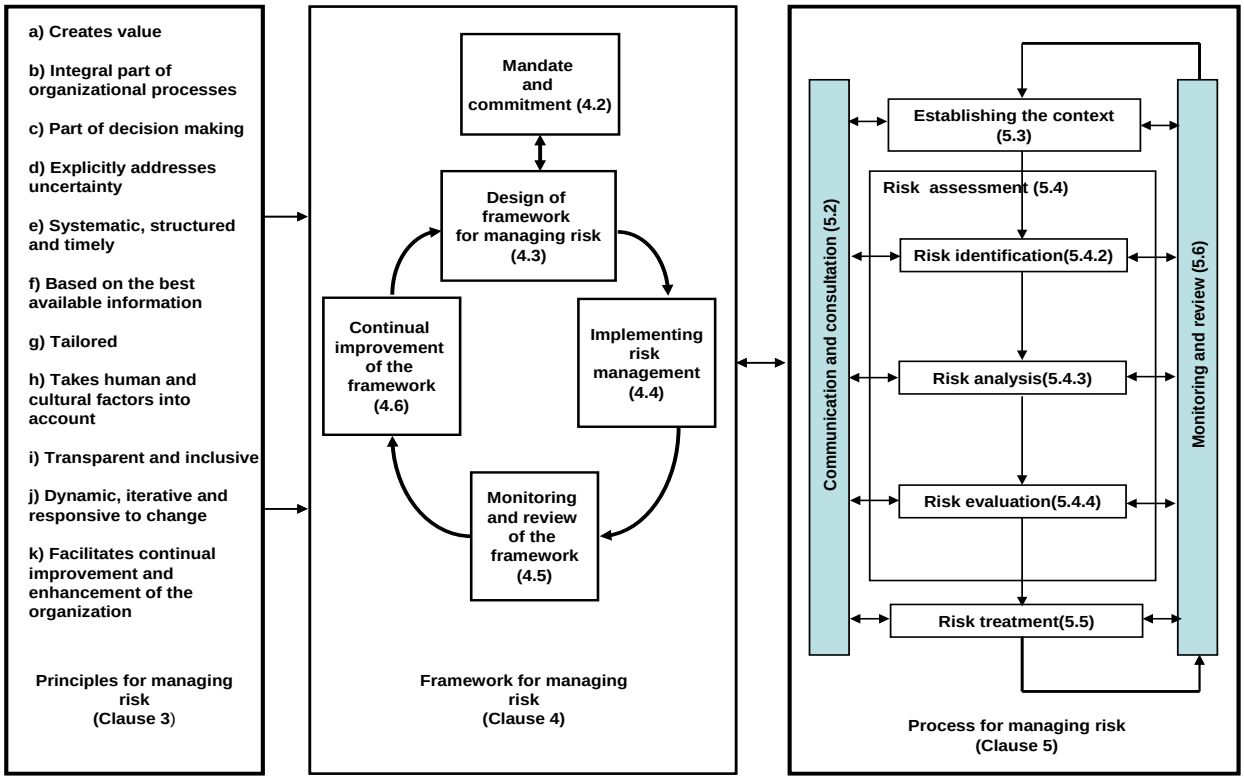


Figure 15: ISO 31000 Principles, Framework and Processes

7. GOVERNANCE PRINCIPLES

7.1 Overview of Governance Principles

The Governance Principles of Management systems have been summarised in the diagram below.

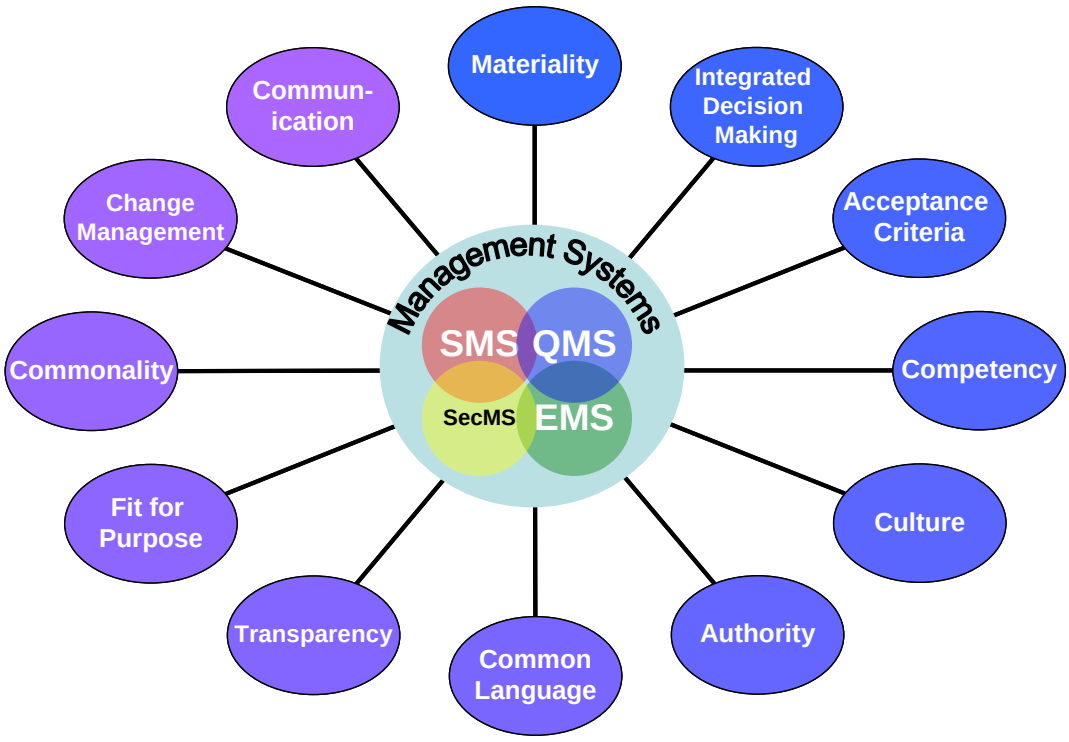


Figure 16: Overview of Governance Principles of Management Systems

7.2 Governance Principles

From the survey of current practices, available standards and best practise a total of 12 governance principles have been identified. Their source is explained in more detail in Table 9. Specific guidance on individual principles, including advice on their implementation will be included in a further document.

7.2.1 Principle of Materiality

The Principle of Materiality is:

Ensuring that issues are managed effectively within the system, i.e. to not provide unnecessary bias of one issue over another, unless this is appropriate.

When multiple management systems are implemented, some existing systems can be unintentional biased toward one issue, e.g. a management policy document that states “safety is the only priority”.

7.2.2 Integrated Decision Making Process

The Integrated Decision Making Process is:

A project mechanism by which Safety, Quality, Environment and Security can be considered together, ensuring decision making is not floored, full range of issues is considered and stakeholder accountability is maintained.

It is accepted that appropriate technical approaches must be used to ensure that robust assessments are performed including

- Different techniques appropriate for different issues.
- Each issue will have a separate criteria for assessment phase.
- Some numerical targets, e.g. safety Others qualitative targets, e.g. quality.

7.2.3 Acceptance Criteria Principle.

The Acceptance Criteria Principal states that:

Criteria are known before the risk assessment and decision making stages are reached.

Currently it can happen that assessments are performed then criteria are developed or assigned. These criteria can often be influenced by outcome of assessment.

7.2.4 Principle of Competency

The Principle of Competency ensures that:

Competency is considered in day-to-day tasks and in context of multiple management systems, in particular individuals need the skills to managed interfaces and an understanding of the impact to actions.

In addition individuals must be competent to carry out their own roles and:

- need to have an understanding of the impact there own activities have on others.
- need to understand expectations of their role within system.

7.2.5 Principle of Culture

The Principle of Culture states that:

Cultural issues and possible impact of management system performance are considered within the context of improving system performance.

Cultural issues can limit the performance of a system, it may require that Cultural issues may need to be changed System developments need to take into account existing cultures.

7.2.6 Principle of Authority

The Principle of Authority ensures that:

Adequate powers of authority are provided as appropriate throughout the system, to improve the efficiency of the system.

Projects can stall or ultimately fail due to:

- poor provision of authority across the decision making process.
- no authority to allow individuals to input.

7.2.7 Principle of Common Language

The Principle of Common Language states that

Need for a common unified language and common terminology ensuring that unnecessary bias and legacy issues are removed from the systems.

Poor use of language can often lead to bias or possible conflicts within multiple management systems. Misunderstandings can lead to issues or delays. Even in the most integrated of systems similar tasks can have very different names e.g. surveys, audits, inspections and checklists can all refer to the same process.

7.2.8 Principle of Transparency

The Principle of Transparency ensures that

All aspects of the management system process are clear information and performance data needed is available to those making decisions.

The principle aims to remove previous areas of uncertainty within the system and lead to reduction in wasted resources.

7.2.9 Fit for Purpose Principle

The Fit for Purpose Principle states that:

The management systems should be efficient and create value wherever possible. They should be systematic and ensure issues are addressed in a timely manner.

Historically management systems, especially quality systems can be paper intensive and unnecessarily bureaucratic. They can involve undertaking actions which do not add value and lead to abuse of system and poor compliance. More efficient systems are those that work with the day-to-day activities of individuals ensuring that issues are dealt with and that the drive is towards achievement of the goals and objectives of the systems.

7.2.10 Principle of Commonality

The Principle of commonality states that:

The organisation should utilise the common elements and requirements within each system and therefore harmonise, e.g. common policies, common audits etc.

Taking advantage of commonalities can lead to creation of value. This can be full integration but it is not necessarily the case.

7.2.11 Principle of Change Management

The Principle of change management states that:

The system needs to have in place formal processes for the management of change. Processes are needed to stop the system being updated without full consideration of the impact across other systems.

The concept of change management and the need for the management of change is well documented in the business community. From a management systems perspective the ability to roll out changes into the system efficiently and effectively is a relatively new concept. This principle addresses the need for the management systems to be responsive to the concept of change and for mechanisms in place to manage such changes.

ANSPs are currently undergoing significant change, with some moving from national bodies to more commercial entities. This can have a significant

impact upon existing structures and processes. This principle is far reaching and should not be seen solely as an add-on to document control.

7.2.12 Principle of Communication

The Principle of communication is that:

Stakeholder involvement is considered throughout system, and a communication strategy is developed so those performing tasks know what the information is going to be used for.

The Principle of Communication drives an organisation to consider a communication strategy associated with the management system, both at the point of implementation, and then periodically during the system lifecycle. A detailed communications strategy would prevent individuals within the organisation performing tasks without knowing what the information would be used for.

7.3 How the Principles have been derived

The principles have been derived from a variety of sources. These include the ISO31000 standard, best practise identified from ANSPs and industry and management system expertise from the project team in the implementation and support of management systems.

7.3.1 ISO 31000 Principles

The emerging ISO 31000 standard was discussed in Section 6, along with its principles for risk management. The link between the principles included in the standard and the governance principles and detailed in the table below.

ISO 31000 Principle	Comment
Creates Value	Value is created through minimising losses, inherent in all of the principles. No specific principle developed.
Integral part of organizational processes	Principles have been developed to compliment existing systems and form an integrated part of the management system(s). No specific principle developed.
Part of decision making	Part of the Principle for Integrated Decision Making Process. No specific principle developed.
Systematic, structured and timely	To be developed into a Fit for Purpose Principle.
Based upon the best available information	Part of the Fit for Purpose Principle.
Tailored	Part of the Fit for Purpose Principle.
Takes human and cultural factors into account	To be developed under Cultural Principle.
Transparent and Inclusive	Transparency covered in existing Principle of Transparency. Issues of inclusivity to be considered under Principle of Communication which will include stakeholder accountability.
Dynamic iterative and responsive to change	To be developed under the Principle of Change Management.
Facilitates continual improvement and enhancement of the organization	Embedded in each management system requirement. No specific principle developed.

Table 8: ISO 31000 Principle and how they relate to the Governance Principles

7.3.2 Derivation of Governance Principles

A significant amount of information was collected in interviews with ANSPs, this helped identify both best practise in mature management systems and issues that prevented efficient running of multiple management systems.

below.

Governance Principles	Derivation
Materiality	Linked to issues identified from interviews with ANSPs and review of policies with actual and apparent inconsistencies.
Integrated Decision Making Process	Linked to ISO 31000, *Part of Decision Making*. Also best-practise in managing multiple management systems. Done by mature ANSPs.
Acceptance Criteria	Management system best practise, ANSP interviews.
Competency	Management system best practise, ANSP interviews.
Culture	Linked to 31000 *Takes Human and Cultural Factors into Account*. Management system best practise.
Authority	Identified in interviews as a barrier to high-efficiency management systems.
Common Language	Identified from interviews as a barrier, documented in ISO management systems as good practise. ISO system moving this way.
Transparency	Linked to 31000 *Transparent and Inclusive*.
Fit for Purpose	Linked to 31000. *Systematic, Structured and Timely*, *Based on Best Available Information* and *Tailored*. Also best practise and interviews.
Commonality	Identified from interviews, best practise especially in the context of integrated management systems.
Change Management	Linked to 31000 *Dynamic, Iterative and Responsive to change*. MS best practise.
Communication	Communication identified as a potential issue from interviews, backed up by experience from poorly performing management systems.

Table 9: Derivation of Governance Principles of Management Systems. ISO 31000 principles have been shown in italics

8. IMPACTS OF COMPONENTS AND FEASIBILITY OF IMPLEMENTATION

8.1 Introduction

This section considers the feasibility of implementing each individual governance principle or group of principles, together with consideration of how they can be implemented in multiple phasing.

The governance principles can be subdivided into three areas, see Table 10 below.

Governance Principle Area	Governance Principles
Risk Assessment Process – these principles have been developed to support the risk assessment process.	• ***Materiality***
	• ***Integrated Decision Making Process***
	• ***Acceptance Criteria***
The Human Element – these principles have been developed to ensure that the staff support the management system improvements.	• ***Competency***
	• ***Culture***
	• ***Authority***
System Improvements – these principles have been developed to ensure that the management systems elements are improved	• ***Common Language***
	• ***Transparency***
	• ***Fit for Purpose***
	• ***Commonality***
	• ***Change Management***
	• ***Communication***

Table 10: Governance Principles of Management Systems Areas

The principles, as shown in Table, are presented as complimentary and therefore the organisational impact can be minimised or controlled through implementation of complimentary principles in parallel rather than in discreet projects.

8.1.1 Risk Assessment Process

The principles associated with the risk assessment process are primarily "Materiality", "Integrated Decision Making Process" and "Acceptance Criteria".

These principles are stand-alone principles but implementing an Integrated Decision Making process is difficult without considering the issue of Materiality. Therefore there is merit for a larger change process by implementing both principles together. The Acceptance Criteria is more of a stand alone principle. Benefits can be realised from implementing this principle on it's own, but these benefits are likely to increase by implementing in conjunction with the other risk assessment principles.

For the majority of ANSPs, they are unlikely to have any existing measures in place. Although it must be noted, that one large ANSP surveyed had a mature integrated system in place which incorporates an integrated approach to decision making together with some degree of consideration of materiality.

8.1.2 The Human Element

The principles associated the human element are "Competency", "Culture" and "Authority". In terms of the potential impact of these principles, the ANSPs may already have in place some measures addressing these issues. The survey completed in WP2 indicated that the ANSPs were aware of the need to address the issue of organisational culture, although measures had not yet been determined and implemented.

Therefore the degree of impact for these issues will vary from ANSP to ANSP. The issues raised by these principles may be controversial and difficult to solve but without implementation, the benefits from implementing other principles may be negated.

Lessons learnt from other industries confirm that the long term benefits of system improvements can only be realised if the cultural issues are also addressed.

Major management system upgrades will require consideration of any competency gaps.

8.1.3 System Improvements

The remaining principles are targeted at improving the performance of the management systems. The principles are "Common Language", "Transparency", "Fit for Purpose", "Commonality", "Change Management", and "Communication". These principles are all stand alone, although a structured programme of multiple implementation can be beneficial. In terms of the impact these components may have on an ANSP, this will again be dependent upon the current status of the issues within the existing management system. E.g. those systems which already try and use a common language approach would have minimum impact in fully implementing this principle. For those systems which do not adopt such

an approach, implementation of this principle will results in a significant document change across the entire system.

8.2 Impact on Safety

This section considers the possible impacts on safety. Some ANSPs are working under the basis of safety being the only priority. Any changes to this approach will have an immediate impact on the management systems and require a major step-change in approach and the mentality of the personnel. Whilst these ANSPs work under the mantra of safety being the only priority, this actually relates to safety being primarily the only issue they assess new projects under in terms of the safety case approach. So, in reality, projects to increase capacity, efficiency or to lower costs are implemented providing the safety objectives are maintained or improved. Therefore, it is likely that significant changes to this approach will result in a perceived impact on safety.

Although, one ANSP had already gone through such a process and was able to demonstrate how they can move beyond only considering safety and provide a more balanced solution.

Implementation of the proposed governance principles of management systems will result in a more efficient and productive management system within an ANSP. This in turn should result in an overall improvement in all areas of the management system. This should be demonstrated in the following areas:-

- Robustness of the Decision making process;
- Ability to demonstrate performance to external stakeholders;
- Improved efficiency internally;
- Improved results of internal audits/surveys;
- Improved culture;
- Improved Employee satisfaction; etc

Considering the negative impacts, individuals may believe that the implementation of the governance principles will reduce the focus on safety and result in a reduction in safety performance. As stated above, this is a perceived rather than actual impact, but if not properly addressed, may lead to actual impacts. Therefore any implementation programme must take this issue into consideration to minimise the realisation of any such impacts.

9. SUMMARY AND CONCLUSIONS

9.1 Summary

This report presents the rationale and needs for governance principles of management systems for ANSP.

It begins with a discussion of governance and the issues identified with the implementation of multiple management systems. It then continues to discuss the objectives of the governance principles, specifically

- to **minimise** conflicts.
- to **manage** overlaps.
- to **increase** the overall effectiveness of an organization's system(s).
- to **create value** by minimizing loss.
- to be an **integral part** of the organizational processes.

The report then steps back to define and describe management systems, detail the management system requirements for ANSPs and to review the ISO 31000 Risk Management Standard.

The report continues to discuss the overlaps and conflicts that can come from the implementation of multiple management systems.

Section six describes the emerging ISO 31000 standard on risk management.

In section seven, the governance principles are described, along with explanations of issues they have been designed to resolve. The link with the ISO31000 principles is also described and finally the origin of each of the governance principles.

Section eight discusses the impact on components and the feasibility of implementation, and this section provides a summary and conclusions.

9.2 Conclusions

This deliverable has provided background and an overview of the rationale for the governance principles of management systems. Including discussions of the management systems which are relevant to ANSPs, and how the principles can make these work more efficiently.

The principles themselves have been derived and it has been described how they can be implemented within the existing ANSP organisational structures.

The degree of impact will vary and therefore a structured implementation programme is needed. The level of impact is based upon the existing structures, system maturity, the degree of current implementation, the availability of resources and other issues. The impact will need to be assessed and measures taken in the implementation plan to minimise the impact where possible. This will be considered further in WP5.2, the guidance for ANSPs on the implementation of governance principles of management systems.

In terms of the individual components, some components are complimentary and efficiency can be achieved by implementing together, whereas other principles are stand alone and therefore these can be implemented separately.

The full benefits cannot be realised without considering all of the principles, e.g. implementation of the risk assessment principles will deliver some benefits, but this will be increased if the human element is also considered.

For those ANSPs working on the basis of safety being the only priority, there will be an impact on safety, in terms of reduced focus and allocation of resources. As the principles are implemented a more balance approach will emerge with resources and priority targeted to the necessary areas. This will result in an improved more robust decision making process and ultimately improve safety, as well as the other focus areas of quality, security and environment.

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