

IAEA Safety Standards on Management Systems

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The IAEA has developed a new set of Safety Standards that establishes requirements and provide guidance for applying an integrated Management System for facilities and activities. This set will replace the current Safety Series on QA. The main objective is to ensure that safety is not compromised by considering separately the management system elements.

With an integrated approach to management systems it is also necessary to include the aspect of culture, where the organizational culture and safety culture is seen as crucial elements of the successful implementation of this management system and the attainment of all the goals and particularly the safety goals of the organization.

The IAEA has developed a set of services aimed at assisting its Member States in establishing, implementing, assessing and continually improving an integrated management system based on best international practices and standards, including the IAEA Safety Standards, and other relevant IAEA guidance documents.

El OIEA ha desarrollado un nuevo conjunto de Normas de Seguridad en las que se establecen requisitos y se dan consejos para la aplicación de un Sistema de Gestión integrado para instalaciones y actividades. Este conjunto sustituirá la actual Serie de Seguridad sobre Garantía de Calidad. Su objetivo principal es garantizar que no se quede comprometida la seguridad al considerar por separado los elementos del sistema de gestión.

Con un planteamiento integrado de los sistemas de gestión, también es necesario incluir el aspecto de cultura, donde se consideran la cultura organizacional y la cultura de seguridad como elementos cruciales de la implantación con éxito de dicho sistema de gestión y la consecución de todos los objetivos, y en particular los objetivos de seguridad de la organización.

El OIEA ha desarrollado un conjunto de servicios destinados a ayudar a sus Estados Miembros en el establecimiento, implantación, evaluación y mejora continua de un sistema de gestión integrado basado en las mejores prácticas y normas internacionales, entre ellas las Normas de Seguridad y otras guías relevantes del OIEA.

BACKGROUND

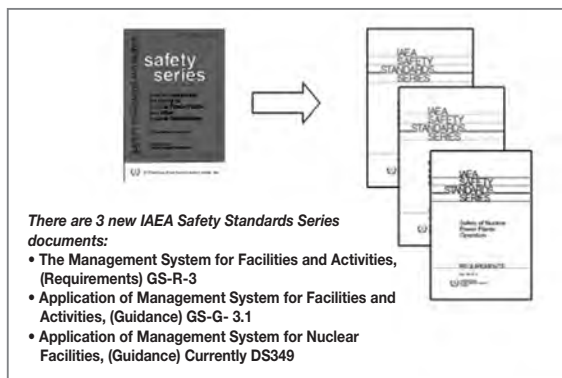
The IAEA support to Member States regarding application of safety, technological and engineering best practices included the development of an extensive number of publications related with quality management/assurance, issued in the Safety Standards, Safety Reports, Technical Report and Technical Document (TECDOC) Series.

Quality Assurance was identified as one of the five areas of the Safety Standard program for the development of Safety Standards. The IAEA Advisory Committee on Safety Standards (now Commission of Safety Standards) decided in its first meeting (18-20 March, 1996) to include quality

assurance under the category of General Safety (along with governmental organization and emergency response) recognizing the relevance of the quality assurance Standards in the four areas of nuclear, radiation, waste and transport safety.

The IAEA top documents on the subject are the Safety Standards on Quality Assurance, issued as Safety Series No. 50/C/SG-Q (1966), which includes a Code and 14 Safety Guides.

The IAEA is revising the above mentioned requirement and guidance in the subject area of Quality



Assurance contained within the Safety Series 50-C/SG-Q (1996) into a new Safety Series on "The Management System for Facilities and Activities", planned to be published in 2006. The term "Management System" has

been adopted in the revised series of documents instead of the term Quality Assurance/Quality Assurance Programme. This development integrates all aspects of managing a nuclear facility, including the Safety, Health, Environmental, Security, Quality and Economic requirements into one coherent system.

MANAGEMENT SYSTEMS

The management developments to achieve the number of different objectives pursued by any organization have to adjust to changes over time. The aim of any organization is to deliver products and/or services that comply with all applicable requirements and satisfy all stakeholders. There are requirements, for example regarding safety in the nuclear field, that are paramount, and can not be compromised. The achievement of all requirements and satisfaction of all the stakeholders is necessary for the survival of an organization.

Organizational models, concepts and tools have developed to include human factors and culture issues and more integrated management approaches that complement the old traditional classical approach to achieving results that were based on inspection and verification checks. Products must be made and activities must be carried out in a safe manner, however it is recognized that all organizations only remain in business if they make a profit.

The technological innovations have radically altered the relationship between systems and humans and therefore the way to manage the whole organization. The issues related with complex activities and multiple objectives involve people operating at different levels in the organization. The operating processes are modified by the introduction of new management practices and new requirements. The daily practices and the results achieved by the organization, the organizational culture and the management processes are deeply interrelated. The way to manage the organization has had to evolve accordingly to accommodate these changes and to ensure that the employees understand what has to be done to meet all requirements.

The model illustrated below tries to represent the evolution over the last

century regarding the approaches applied by organizations in order to achieve good safety standards and performance. The reality is undoubtedly more detailed and complex. Many initiatives have often been introduced in parallel and new initiatives have co-existed with former initiatives. The important message that the model delivers is that the activity of managing an organization and surviving has been evolving to continually strive for higher levels of performance and safety and that this trend is ongoing. The model marks only some of the key management approaches:

- Quality Control sorted the conforming products from the non-conforming at the end of the process. Mostly consisted of some type of inspections/measurements for yes or not acceptance.
- Quality Assurance took measures to systematically prevent non-conformances by using established procedures and documentation to demonstrate that quality was implemented throughout the production process. The Quality Assurance approach has also evolved from a compliance approach to one of a more performance based focus.



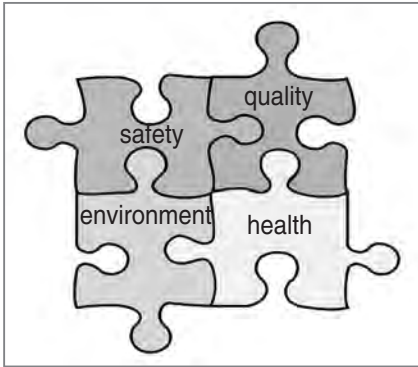
- Quality Management introduced the consideration of everyone involved within the process and the concept of customer and supplier. This was a relevant development bringing attention to organization being essentially about people and recognition of the organizational culture issue. Business excellence models appeared.
- Management System integration was the development where the organizations became increasingly aware that other stakeholders, apart from just their customers and

employees, had to be addressed while conducting their business. Organizations put increasing attention on issues such as the safety, health, quality, environment, finance, security, human resources, cultural aspects, etc, and aimed to manage the totality by using an integrated Management System aimed at meeting the totality of their objectives. Integrating the Management System leads to a coherent, harmonious and optimal way of delivering the vision of top management and the goals and objectives of the organization.

The model also suggests that an integrated Management System is not the final solution in the evolution. The continuing path and need for higher levels of performance and safety will further evolve. It is therefore important to remain flexible in order to be able to dynamically adjust to the increasing, changing and challenging demands. An idealized end point could be envisaged; where a full recognition that the human being is the ultimate source of quality and safety. This ideal end point might then be described in a single and short statement: "Do the things right the first time, and apply continual improvement afterwards".

STATUS OF THE REVISION PROCESS

The IAEA is developing a new set of Safety Standards directed to establish requirements and provide guidance for implementing Management Systems that integrate safety, health, environmental, security, quality and economic objectives. The new standards will replace the IAEA 50-C-Q Code on Quality Assurance for Safety in Nuclear Power Plants and other Nuclear Installations, as well as the related 14 Safety Guides contained in the Safety Series No.50-C/SG-Q (1996). The IAEA Code 50-C-Q (1996) and developments within the International Organization for Standardization (ISO) ISO 9001:2000 and ISO14001: 1996 publications are considered in developing this comprehensive, integrated set of Management System requirements. Member States experience in developing, implementing and improving Management Systems is also taken into account.

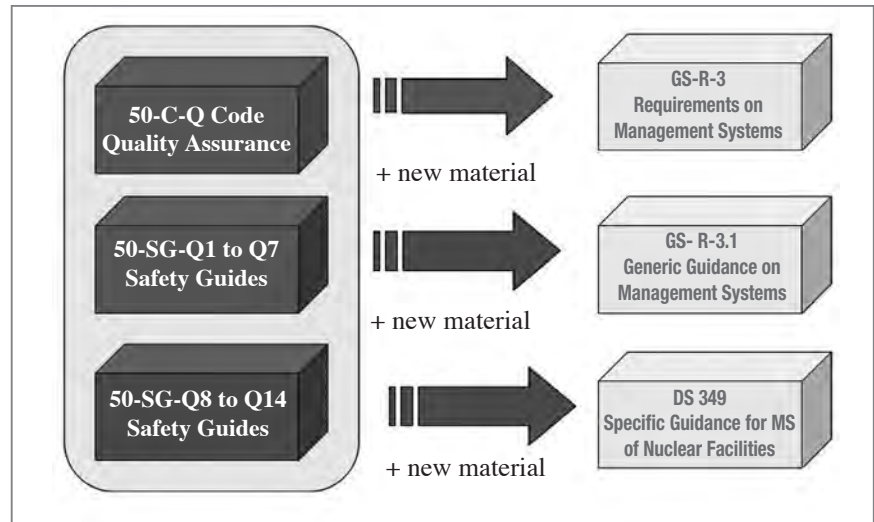


The aim of the new set of Safety Standards is to provide requirements and guidance for implementing an effective Management System that:

1. Integrates all aspect of managing nuclear installations and activities including the safety, health, quality, environmental, security and economic requirements in a coherent manner,
2. Describes the planned and systematic actions necessary to provide adequate confidence that all these requirements can be satisfied, and
3. Supports the enhancement and improvement of safety culture.

This integration aims to ensure that economic, environmental, health, security and quality matters are not considered separately to safety matters, to avoid any potential negative impact on safety. The three main elements of the management system safety standards are:

1. Safety Requirements GS-R-3 specifies the Management System requirements for all nuclear installations and activities, that is based on the Code 50-C-Q and other relevant international standards. It will be published in 2006.
2. The Safety Guide GS-G-3.1 provides thematic guidance for each of the requirements contained in GS-R-3 and applicable to all nuclear facilities and activities. GS-G-3.1 will include all of the relevant guidance material that is contained in current Safety Guides 50-SG-Q1 to Q7 as well as new material. It will be published in 2006.
3. Draft Safety Guide (DS349) will provide specific guidance for Management Systems for nuclear facilities. It will include all of the relevant guidance material that is



contained in current Safety Guides 50-SG-Q8- Q14 as well as new material. The expected publication is 2007

MANAGEMENT SYSTEMS AND CULTURE

Why does Culture Matter?

When developing the new set of IAEA Safety Standards for Management Systems it was recognized at an early stage that with an integrated approach to management systems it was necessary to include the aspect of culture. With an integrated approach, the aspects of the management system that define processes and practices need to be combined with people's values, attitudes and behaviours in order for the organization to fully reach it's goals and objectives.

Today, nuclear organizations are also facing many new challenges that require that they will be able to continually change and improve in order to survive in a more competitive environment. There are numerous examples of how organizations have failed to improve organizational effectiveness through new management strategies due to the

fact that the change and improvement efforts did not consider the impacts of the organizational culture.

The management system will both influence and be influenced by the overall culture of the organization. Figure 1 illustrates this relationship.

In order to achieve desired outcomes it is necessary to consider the formal processes and strategies of the organization and at the same time recognize that they have been produced based on the thinking prevalent in the organizational culture. The way in which the management system is implemented will in turn have an impact on the values, attitudes, and behaviours of the members of the organization i.e. the organization's culture.

For a nuclear organization an integrated approach to the achievement of all the goals of the organization should be addressed in a way that ensures that safety is not compromised. Therefore the management system should provide structure and direction to the organization in a way that promotes and enables the development of a strong safety culture together with the achievement of high levels of safety performance.

In the new IAEA Safety Standards on Management Systems for Facilities and Activities the generic Requirements (GS-R-3) have been formulated as follows: " The management system shall be used to promote and support a strong safety culture by:

- Ensuring a common understanding of the key aspects of safety culture within the organization;

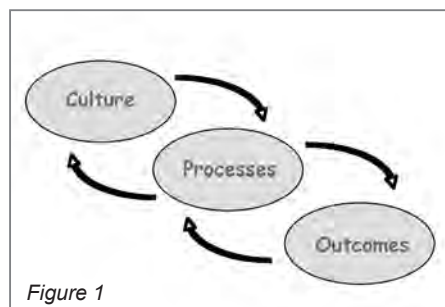


Figure 1

- Providing the means by which the organization supports individuals and teams to carry out their tasks safely and successfully, taking into account the interaction between individuals, technology and the organization;
- Reinforcing a learning and questioning attitude at all levels of the organization;
- Providing the means by which the organization continually seeks to develop and improve its safety culture.

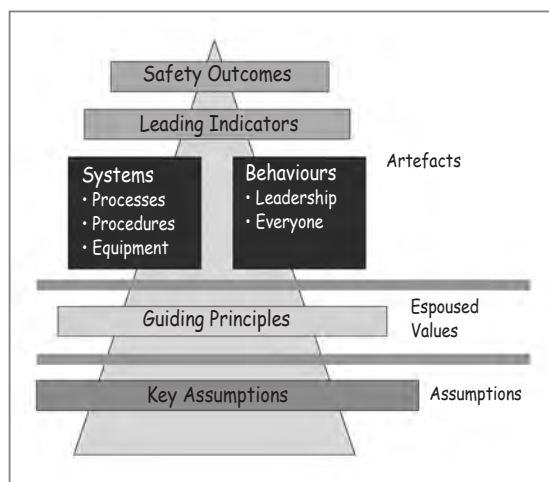
What is organizational culture and safety culture?

This year we were reminded of the fact that twenty years has passed since the accident at the Chernobyl plant. It was in the IAEA investigation report that followed upon this accident that the term "Safety Culture" was introduced for the first time to the nuclear community. While intended to describe how the thinking and behaviours of people in the organization with regard to safety contributed to the accident it also created a need to further define and describe what was really meant by this concept. A further clarification of the concept came in the report by the International Nuclear Safety Advisory Group to the IAEA (INSAG-4, 1991). They maintained that the establishment of a safety culture within an organization is one of the fundamental management principles necessary for the safe operation of a nuclear facility. The definition they presented recognized that safety culture is both structural and attitudinal in nature and relates to the organization and its style, as well as to attitudes, behaviours and the commitment of individuals at all levels in the organization.

Since the introduction of the concept of safety culture the IAEA has broadened its perspective further with attention focused on obtaining a deeper understanding of the actual concept of culture and particularly organizational culture. The IAEA guidance documents and support services has reflected the needs of Member States to first get a better understanding of the concept itself, then how to assess, enhance and continuously improve and sustain a strong safety culture particularly during times of change. The latest developments have been the

integrated approach to management systems where the organizational culture and safety culture is seen as crucial elements of the successful implementation of this system and the attainment of all the goals and particularly the safety goals of the organization.

There are many ways in which the culture of an organization has been described. A common phrase used is "it's the way we do things around here", which provides unwritten and often unspoken guidelines for how to get along in the organization, a sense of identity to employees. It reflects what is valued, the dominant managerial and leadership styles, the language, the procedures and routines, and the definitions of success. Another way to understand culture is to realize that it exists at several "levels" and that we must endeavour to understand the different levels, but especially the deeper levels. A three-level model, consisting of "artefacts", "espoused values" and "basic assumptions" has been proposed when studying organizational culture (Schein, 1992), which can be applied to safety culture as well. These levels of culture go from the very visible to the tacit and invisible. The following diagram shows how the multilevel model of culture can be applied to safety culture:



Examples of visible safety culture artefacts are the documented management system with safety policy statements and behaviours such as management's visible commitment to safety and things like the use of safety equipment. The guiding principles at the espoused level are those values

stated by management such as "safety is top priority". Key basic assumptions for safety culture is, for example, how the relationship between safety and production is seen – do they go hand in hand or is safety considered a cost; and do people consider the hazards in a way that they believe they are vulnerable to an unexpected event, that "it can happen here". It is these basic assumptions that ultimately will determine how people will think and act in relation to safety issues.

Misunderstandings of Safety Culture

Although there has been a lot of work initiated world-wide regarding safety culture, there are still some misunderstandings and even misuse of the concept. We can, for example, see a tendency to classify all events or incidents where human errors have occurred as signs of poor safety culture. However, human errors can occur even within good safety cultures due to the interaction of various factors at a particular point in time. For example, we know that human performance is poor during the night due to the influence of human circadian (24-hour) rhythms and the probability of human error therefore is higher during this time. Therefore, a human error at this time of day doesn't have to be a sign of poor safety culture. But, if safety critical tasks are scheduled to this time of the day, this may be associated with a poor safety culture.

Another common misconception is that you can totally lack a safety culture. There is always an organizational culture in an organization and with safety as a primary goal in a nuclear organization there will always be a safety culture that has developed. The issue is whether it is the one you want, whether it is functional or dysfunctional in reaching the safety goals. Also, the culture is something that is shared among groups of individuals and not a characteristic of single individuals. It is something that members of the organization learn over time as the correct or wrong way of behaving in their organization.

How can a culture and safety culture be changed or improved?

A culture is learned and is particularly influenced by how the leaders of the organization behave and act and the values they communicate. The leader's role is to 1) define reality: where are we today? 2) define the vision: where do we want to be? and 3) define how to get there. You then need to know what *characteristics and attributes* you want to see in the workplace, and what you want the culture to achieve.

In the new generic Safety Guide (GS-G-3.1) of IAEA Safety Standards for Management Systems a set of characteristics and their corresponding attributes for safety culture have been defined. The main characteristics are illustrated in the following figure:



Each of the 5 safety culture characteristics are further specified by attributes (not presented here). To begin with, any organization wanting to understand their safety culture and seek for areas for improvement can start by reviewing these characteristics and attributes in order to identify where its strengths and weaknesses are.

IAEA support to continual improvement of management systems, culture and safety culture

The IAEA has developed a set of services aimed at assisting its Member States in establishing, implementing, assessing and continually improving an integrated management system based on best international practices and standards, including the IAEA Safety Standards, and other relevant IAEA guidance documents.

For detailed information on these services, please contact Mr. Christer

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IAEA Documents for further reading

Link to the IAEA Safety Standards: <http://www-ns.iaea.org/standards/>

- GS-R-3 "The Management System for Facilities and Activities"
- GS-R-3.1 "Application of the Management System for Facilities and Activities"
- DS349 "Management Systems for Nuclear Facilities" (Draft Document)
- INSAG-4 "Safety Culture"
- INSAG-13 "Management of Operational Safety in Nuclear Power Plants"
- INSAG-15 "Key Practical Issues in Strengthening Safety Culture"
- Safety Reports Series Nº 11 "Developing Safety Culture in the Nuclear Activities"
- Safety Reports Series Nº 42 "Safety Culture in the Maintenance of NPPs"
- TECDOC-1321 "Self-assessment of Safety Culture in Nuclear Installations"
- TECDOC-1329 "Safety Culture in Nuclear Installations"



Pal Vincze graduated in St., Petersburg Technical University. Before joining the IAEA he was the Head of QA Section in Paks NPP, Hungary. He was the Vice Chairman of FORATOM's Quality Management Working Group. He works for IAEA Nuclear Power Engineering Section. He is the Scientific Secretary in the area Management Systems. He is responsible together with Kerstin Dahlgren Persson for the revision of IAEA Safety Standards on Management Systems and for development of related documents, such as Continual Improvement, Management of Change, Grading of Application of Requirements and Comparison of the IAEA and ISO Documents on Management Systems.



Kerstin Dahlgren Persson, Ph.D. in Industrial Psychology, University of Stockholm, Sweden. Before joining the IAEA in 1997 she was the Head of the Department of Man, Technology, Organization (MTO), Swedish Nuclear Power Inspectorate (SKI). She has worked as a Safety Culture Specialist responsible for developing the IAEA Safety Culture Services within the Division of Nuclear Installation Safety. She recently joined the Division of Nuclear Power, to continue the work together with Mr Pal Vincze on the revision of IAEA Safety Standards on Management Systems and to develop guidance in the areas of management systems and culture, leadership, ethics, human performance, continual improvement, management of change, and services to Member States in these areas.