Integration of the Management System for Research Reactor Operations: A Conceptual and Practical Approach

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IGORR 22nd & IAEA Technical Meeting on Integrated Management System for Research Reactors
MITO City Civic Center, Mito, Japan
16 - 19 June 2025

Summary of the presentation

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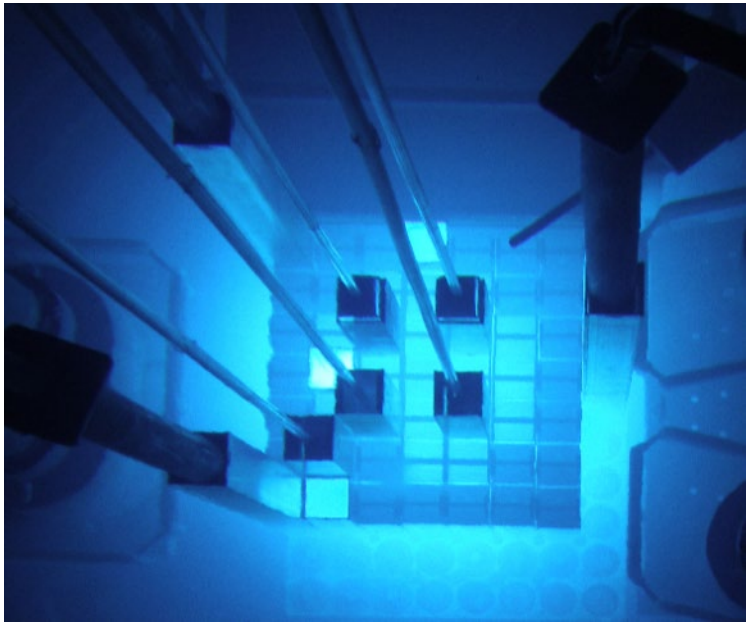


INTRODUCTION

RA6 is an open pool MTR type reactor, which has been operated by the Argentinean National Atomic Energy Commission (CNEA) over four decades.

In 2009 its core was converted from HEU to LEU and its power was up rated to 1MW. Located in the Bariloche Atomic Center, it is used mainly for Teaching/Training, Neutron Activation Analysis, Boron Neutron Capture Therapy, Neutron Radiography, Instrumentation Testing, etc

Design and implementation of a process-based integrated management system (IMS) was started in 2018.

From a traditional Quality Assurance System (previously in place) we started the transition to the new regulatory requirements for management systems of nuclear facilities in Argentina.

IDENTIFICATION OF REQUIREMENTS AND STANDARDS

NUCLEAR REGULATORY AUTHORITY (ARN) is the Argentinean Government's primary authority.

Licenses and permits for radiation sources and facilities are issued by the ARN Board.

The Operation License of Nuclear Research Reactors in Argentina is issued for a term of validity not exceeding 5 years

A new standard “AR10-6-1 r0 Management system for safety in facilities and practices” has been included in the nuclear regulatory framework of Argentina which is mandatory since 1st April of 2021.

Main difference with the previous ARN standard for management systems of nuclear facilities is the requirement of Integration of the Management System with focus on safety, which is aligned with international IAEA safety standards.

IDENTIFICATION OF REQUIREMENTS AND STANDARDS

AR10-6-1 Management system for safety in facilities and practices
Requirement D.3: Integration of the management system

The management system shall integrate its elements, including safety, health, environmental, security, quality, human-and-organizational-factor, societal and economic elements, so that safety is not compromised.

12. The management system shall include the necessary provisions for the resolution of conflicts that arise from the **decision-making** processes that affect safety.

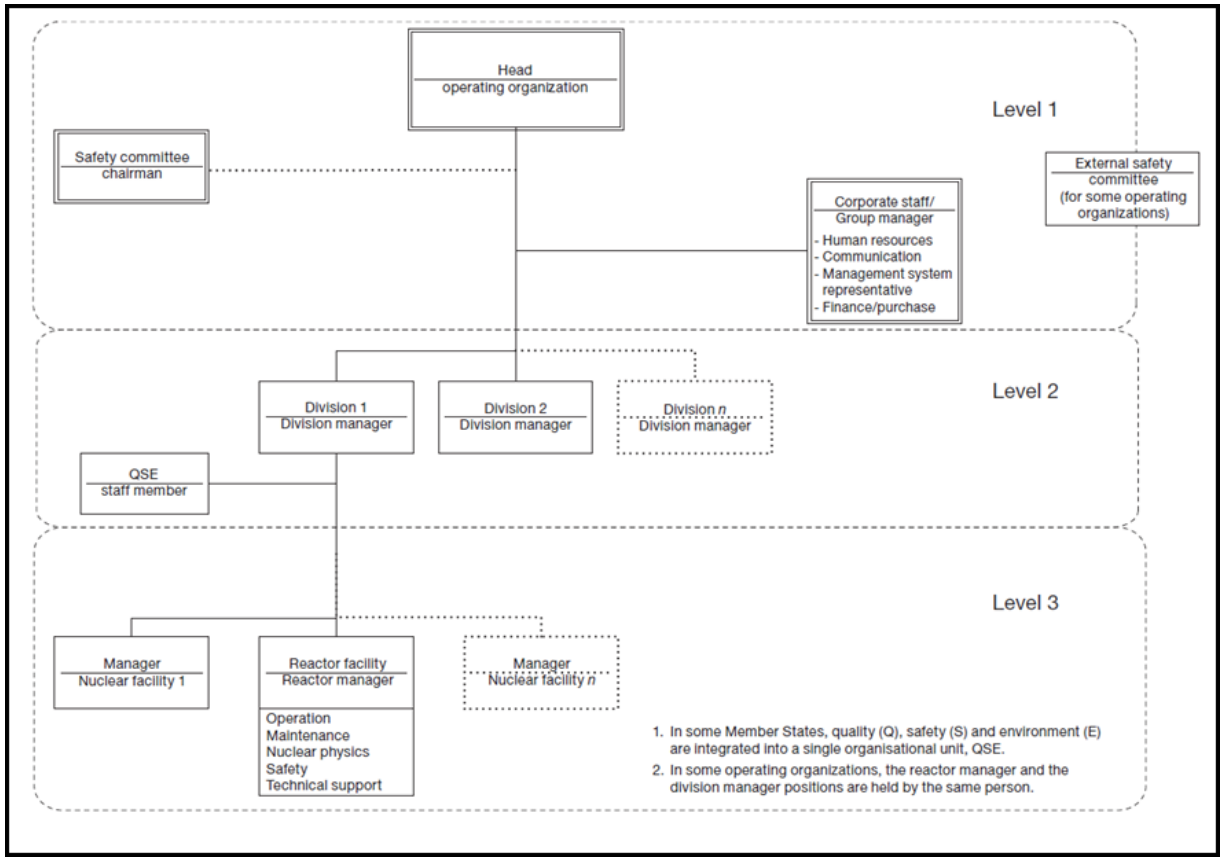
IAEA GSR Part 2 Leadership and Management for Safety
Requirement 6: Integration of the management system

The management system shall integrate its elements, including safety, health, environmental, security, quality, human-and-organizational-factor, societal and economic elements, so that safety is not compromised.

4.9. The management system shall be applied ensuring that safety is taken into account in **decision making** and is not compromised by any decisions taken.

OPERATING ORGANIZATION STRUCTURE

Research reactors are operated mainly by mayor governmental science and technology organization.



Reactor management system should be considered as inserted into the operating organization management system

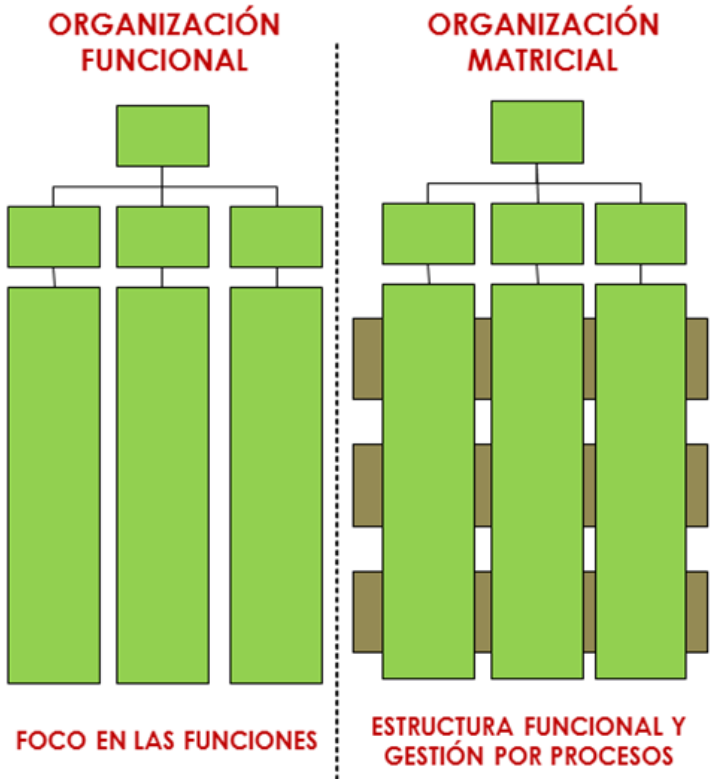
Functional dependencies should be elucidated before starting the implementation

OPERATING ORGANIZATION STRUCTURE

As is typical for small research reactors, the number of personnel is limited and therefore the various tasks and functions in the organization must be combined. Each staff member has to be involved in more than one function.

The appointment of process owners is constrained (some positions are authorized by a specific license issued by the Regulatory Body).

Hybrid organizational structure was adopted

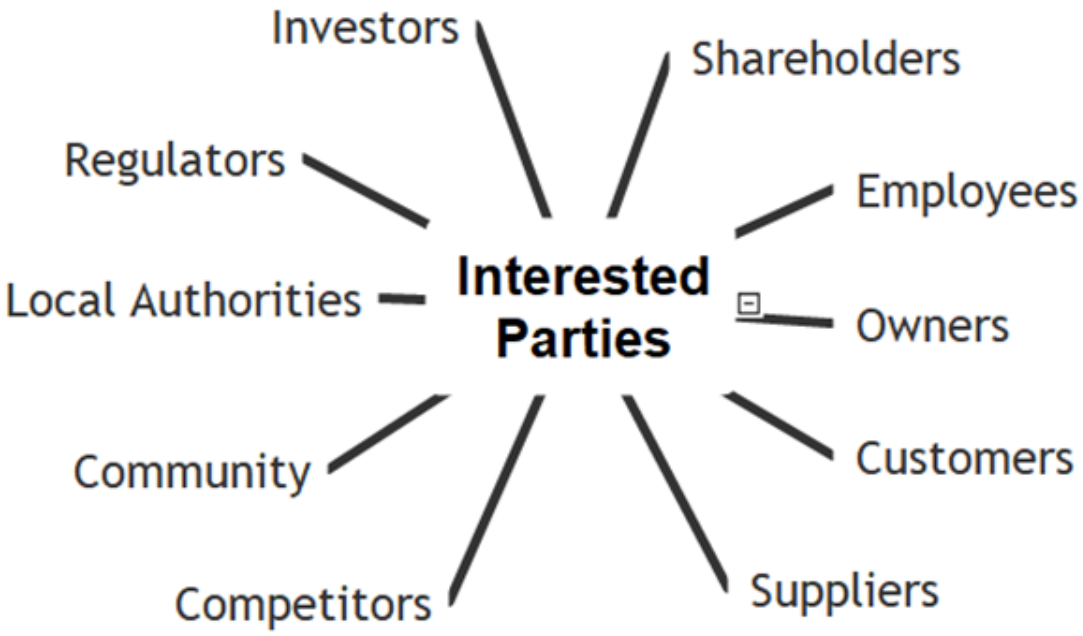


IDENTIFICATION AND ANALYSIS OF INTERESTED PARTIES

First task was to identify the interested parties.
Identification of all the requirements that must be met by the operating organization.

Key interested parties: Nuclear Regulatory Authority
Primary interested parties: scientific and academic community
Secondary interested parties: General public

COMMUNICATION with interested parties should be held timely and effective and takes into account their concerns and expectations



GRADING THE APPLICATION OF MANAGEMENT SYSTEM REQUIREMENTS

the stringency of the control measures is commensurate with the level of risk associated with, a loss of control.

The application of management system requirements shall be graded so as to deploy appropriate resources based on analyses, regulatory requirements, license conditions, the OLC and engineering judgment.

The application of the requirements to be graded has to be identified, with account taken of the nature and possible magnitude of the hazards presented by the research reactor and the activities conducted.

Graded approach philosophy was applied in order to define which processes should be addressed with priority in the implementation.

GAP ANALYSIS

A "rating" system was used to grade the level of implementation of the requirements

Level 0: Requirements / recommendations are not implemented.

Level 1: There is a low level of implementation and there are significant difficulties or limitations in completing the implementation of the requirements / recommendations.

Level 2: Requirements / recommendations are partially implemented and work is underway to fully implement them.

Level 3: Requirements / recommendations are fully implemented.

IAEA GSR Part 2 Leadership and Management for Safety		0	1	2	3
Responsabilidad del Personal Directivo	Req.1 Req.3		■		
Liderazgo del Personal Directivo	Req.2		■		
Metas, estrategias, planes y objetivos	Req.4		■		
Interacción con las partes interesadas	Req.5			■	
Integración del sistema de gestión	Req.6	■			
Aplicación del enfoque graduado	Req.7		■		
Documentación del sistema de gestión	Req.8			■	
Suministro de Recursos	Req.9			■	
Gestión de los procesos y actividades	Req.10		■		
Gestión de la cadena de suministro	Req.11		■		
Fomento de una cultura de la seguridad	Req.12			■	
Medición, Evaluación y Mejora	Req.13. Req.14			■	

CONCEPTUAL MODEL OF IMS FOCUS ON SAFETY

Conceptual modeling starts with the definition of the management system scope and then it is divided into mayor subsystems.

Typically, a Management System has 3 kind of processes (top management, core, support)

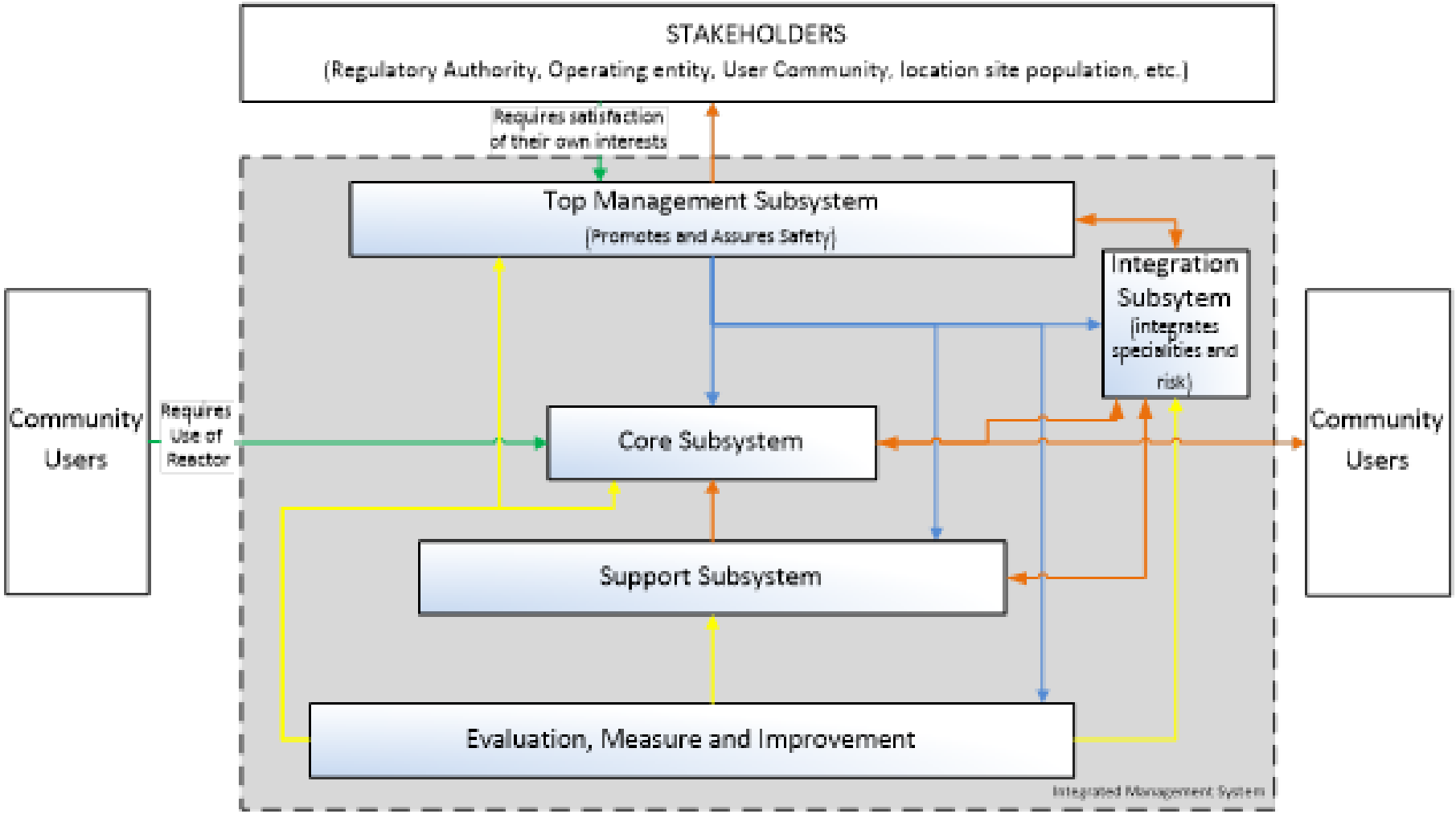
1. Top Management Subsystem:
2. Core Subsystem
3. Support Subsystem

in addition of these typical subsystems we defined two more:

4. Evaluation, Measurement and Improvement Subsystem:
5. Integration Subsystem

Additionally, this classification gets the Deming's Cycle more explicit.

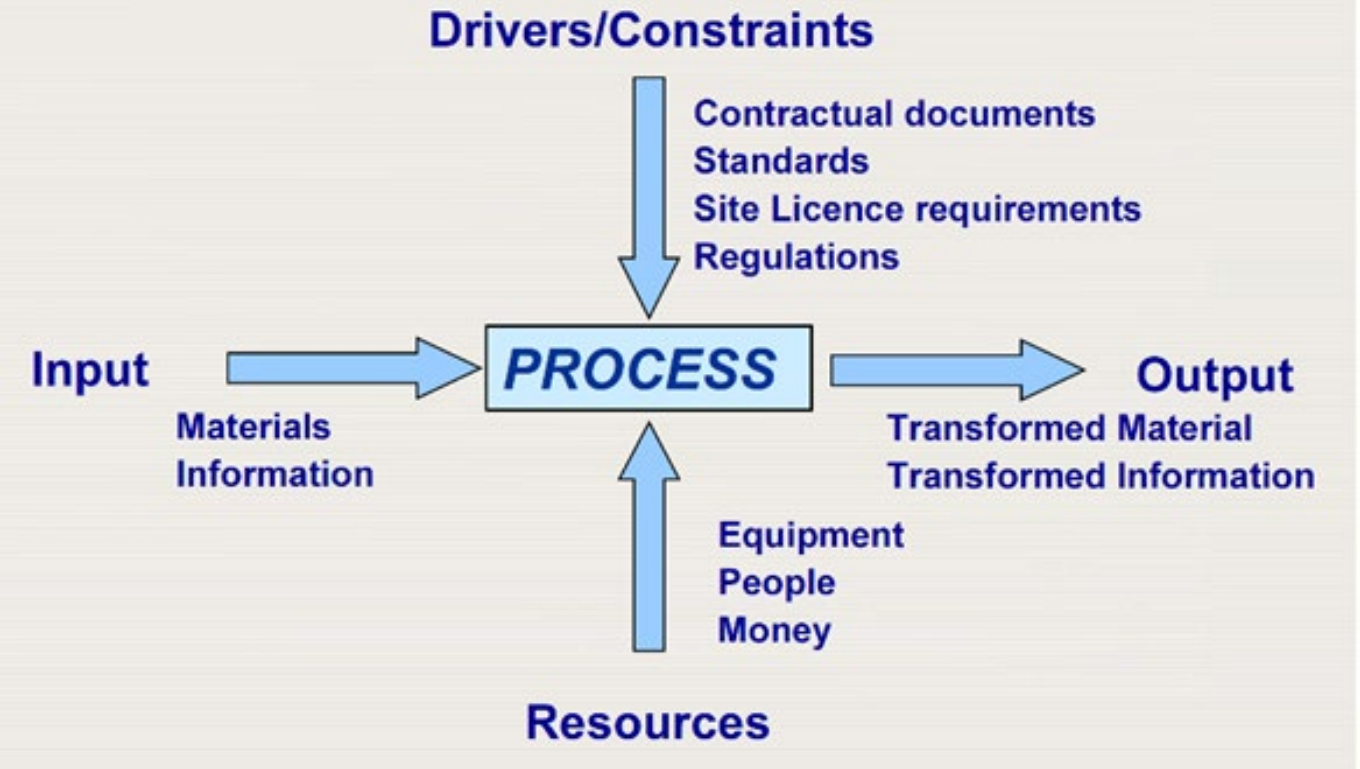
CONCEPTUAL MODEL OF IMS FOCUS ON SAFETY



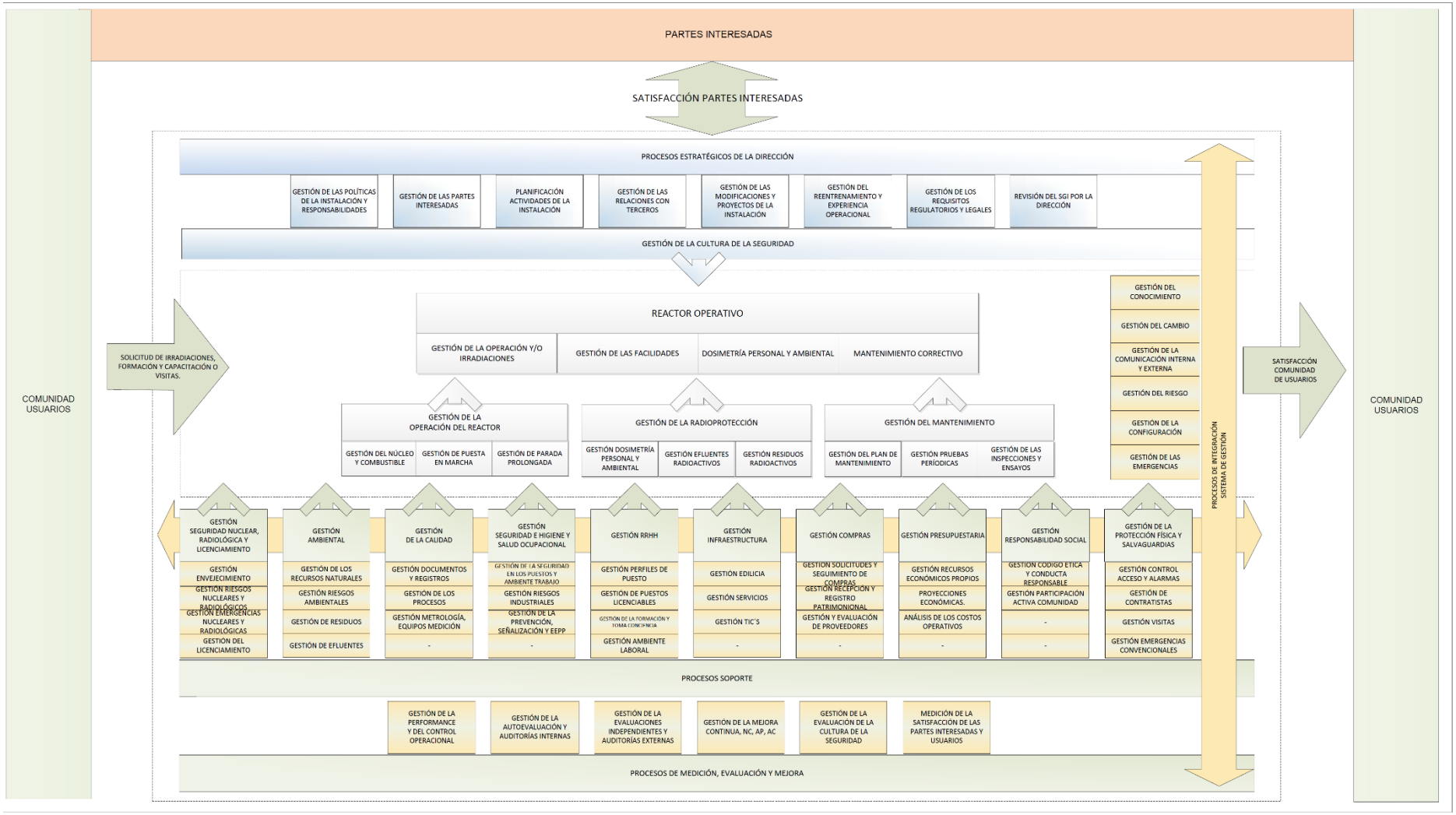
CONCEPTUAL MODEL OF IMS FOCUS ON SAFETY

After subsystems were established we follow with processes, activities and tasks definitions.

Application of the SIPOC technique was used to the definition of each process

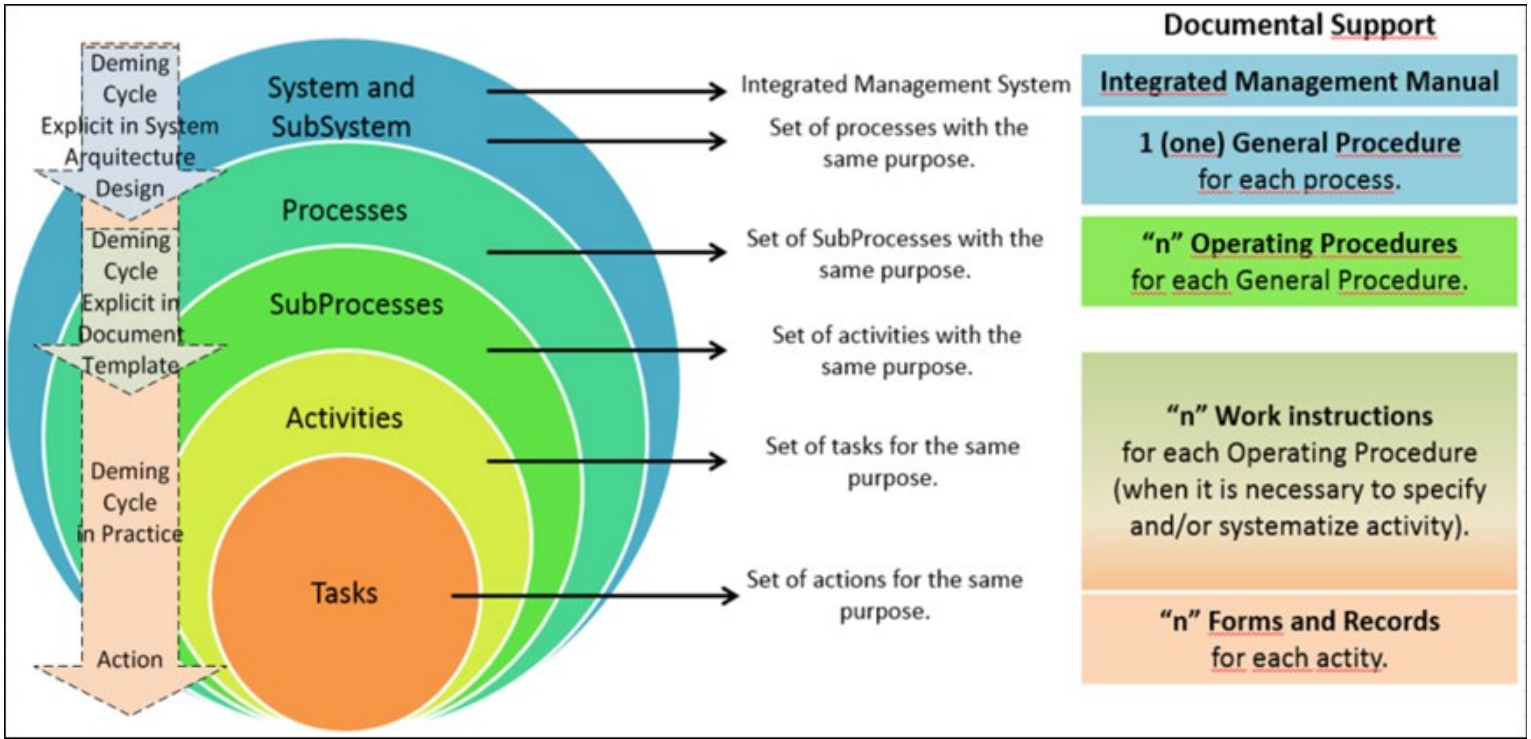


RA6 PROCESS MAP



DOCUMENTATION OF THE MANAGEMENT SYSTEM

A typical three level structure consists of:
Level 1 - An overview of how the organization and its management system are designed to meet its policies and objectives;
Level 2 - A description of the processes to be implemented to achieve the policies and objectives and the specification of which organizational unit is to carry them out;
Level 3 - Detailed instructions and guidance that enable the processes to be carried out and specification of the individual or unit that is to perform the work."

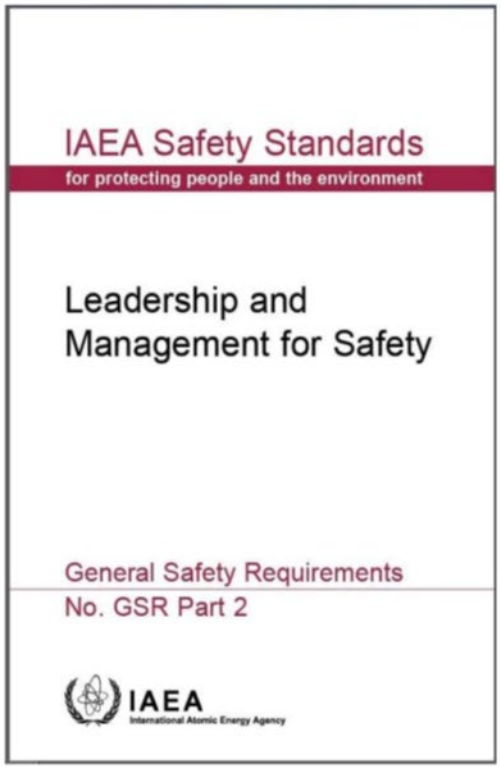


INTEGRATION OF THE MANAGEMENT SYSTEM

There are various standards worldwide.

ISO standards are the most widely accepted in the world for the implementation of Management Systems (9001, 14001, 45001)

General and Specific IAEA Safety Standards (SSR-3, GSR Part 2) which include requirements for Management System.



INTEGRATION OF THE MANAGEMENT SYSTEM

IAEA GSR Part 2	ISO 9001:2015
It is a process-based management system.	It is a process-based management system.
It adopts the PDCA cycle of continuous performance measurement and monitoring, assessment and improvement.	It adopts the PDCA cycle of continuous performance measurement and monitoring, assessment and improvement.
It focuses on safety and promotes safety culture.	It focuses in customer and interested parties satisfaction.
It is an standard for an integrated management system	It is not an standard for an integrated management system, however ISO facilitates the integration of different management standards through a high-level structure.
It considers the graded application of the requirements.	It doesn't considers the graded application of the requirements.
It requires the organization to define the processes which are necessary to be documented in order to achieve the objectives.	It establishes the processes that must be documented
It expressly incorporates the National Regulatory Authority within the scope of the standard	It doesn't incorporate specific considerations regarding any governmental organizations

WHAT DOES IT MEAN "INTEGRATION" FOCUSED ON SAFETY?

IAEA Standards on Management Systems consider that managing the requirements separately can introduce a **negative impact** on safety,

According to IAEA safety standards the key factors in order to achieve the integration of the management system are:

1. Integration of the management system elements -> focused on safety
2. Decision making processes -> safety oriented

The integration of the management system elements (focused on safety) is not expected to be achieved by itself just by putting together all the subsystems and their corresponding requirements to work separately. (Integration is not just the sum of the parts of the system but their interactions).

Integration must be operationalized within the facility by specific processes

THE INTEGRATION PROCESSES

IMS is to serve as an information system for supporting the human decision making process

IAEA: *"Safety shall be paramount within the management system, overriding all other demands."*

Integration Processes are intended to:

- operationalize within the facility the safety culture and other organization policies.
- foster a safety oriented decision making process in all activities
- oversee the resolution of conflicts arising in decision making processes, ensuring that safety is not compromised by any decisions taken.
- make the information consistently available to the top management to correct acts or conditions that could be adverse to safety.
- ensure that interaction with interested parties is held timely and effective and takes into account their concerns and expectations.

THE INTEGRATION PROCESSES AT RA6

1. Safety Culture Management
2. Configuration Management
3. Communication Management
4. Integrated Risk Management
5. Knowledge Management
6. Organizational Change Management

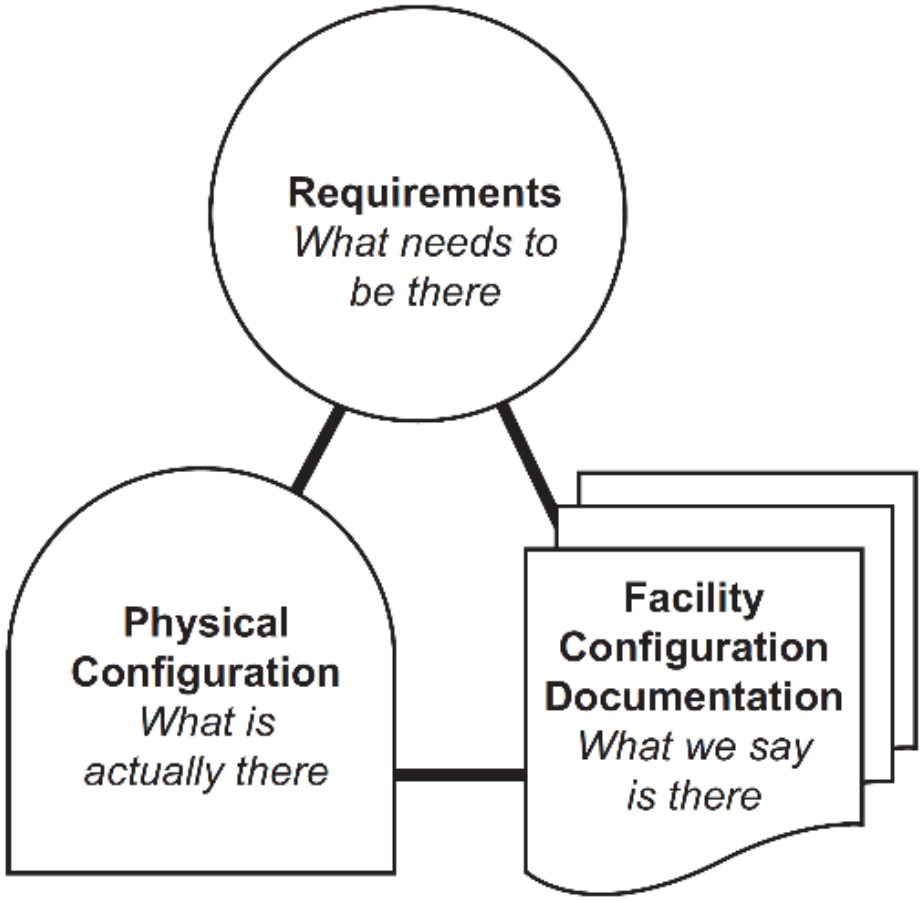
INTEGRATION PROCESS
1. SAFETY CULTURE MANAGEMENT

Operationalize within the facility the safety culture through:

- Undertake activities to encourages personnel trust, collaboration, consultation and communication;
- Develop a strong understanding of the significance of radiation risks and hazards for safety relating to work and to the working environment;
- Encourage the reporting of problems relating to technical, human and organizational factors and reporting of any deficiencies in structures, systems and components to avoid degradation of safety.
- Support a questioning and learning attitude at all levels in the organization and to discourage complacency with regard to safety;
- Conduct periodic self-assessment of safety culture at all organizational levels and for all functions in the organization.

INTEGRATION PROCESS
2. CONFIGURATION MANAGEMENT

'Operate and Maintain the Plant' addresses the need for conformance between requirements, operational configuration information and the physical configuration.



Configuration management equilibrium model.

INTEGRATION PROCESS
2. CONFIGURATION MANAGEMENT

An imbalance in the configuration can lead to significant safety and operational problems. When a discrepancy affecting configuration management equilibrium is identified, it must be resolved to restore the original equilibrium.

Such changes must take into account regulatory issues, cost–benefit and impact on other processes (i.e INTEGRATION).

Effective implementation of an operational configuration management programme provides the tools and information necessary for INTEGRATION to ensure that work is done correctly and safely, fostering a safety oriented decision making process in all activities.

Typical examples of lack of conformance include failure to follow operating procedures and maintenance procedures.

CONCLUDING REMARKS

- Design and implementation of a process-based integrated management system (IMS) focused on safety are being developed at the RA6 reactor.
- A new standard “AR10-6-1 r0 Management system for safety in facilities and practices” has been issued by the regulatory authority which is mandatory since 2021.
- This includes the requirement of Integration of the Management System with focus on safety, which is aligned with international IAEA safety standards.
- Small research reactors have limited staff, therefore some members have to be involved in more than one function. In addition, the appointment of process owners is constrained due to some functions/positions which are authorized by a specific license issued by the Regulatory Authorithy.
- An hybrid organizational structure was established at RA6, made up of vertical management by functional areas in combination with management by horizontal processes.

CONCLUDING REMARKS

- In addition to the typical three categories of processes two other categories were defined.
- Integration must be operationalized within the facility by specific processes. Key factors in order to achieve the integration

  1. Integration of the management system elements -> focused on safety
  2. Decision making processes -> safety oriented

- Integration Processes are intended to the cross cutting integration of the whole system is achieved, ensuring that safety receive the attention warranted by its significance.
- Integration Processes:

  1. Safety Culture Management
  2. Configuration Management
  3. Communication Management
  4. Integrated Risk Management
  5. Knowledge Management
  6. Organizational Change Management

CONCLUDING REMARKS

- ISO (9001, 14001 & 45001) are not focus on safety, they have not a graded application of the requirements and they do not explicitly incorporates consideration about the National Regulatory Authority prerogatives.

- The integration of the management system elements (focused on safety) is not expected to be achieved by itself just by putting together all the subsystems and their corresponding requirements to work separately. (Integration is not just the sum of the parts of the system but their interactions).

- We introduce this conceptual approach hoping may be useful to other research reactors.

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