

## **IMPLEMENTATION OF THE INTEGRATED MANAGEMENT SYSTEM IN THE NUCLEAR SECTOR IN ACCORDANCE WITH INTERNATIONAL ISO STANDARDS AND THE REQUIREMENTS OF THE INTERNATIONAL ATOMIC ENERGY AGENCY**

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### **ABSTRACT**

Nuclear Materials Authority seeks to create an integrated management system where (IMS) is becoming increasingly important for nuclear organizations, the interest in this topic means that IMS is seen as the future management system.

The integration of management systems is an important requirement in light of the global interest in the safety of nuclear activities to protect the environment and sustainable development, and revisions were made to the standards of ISO 9001: 2015, ISO 14001: 2015, ISO 45001: 2018 and the standards of IAEA.

The nuclear industry, due to its peculiar characteristics, has always been viewed with suspicion by society. This fact is understood because of the occurrence of accidents in the area throughout its history. To control these activities and their facilities, national and international organizations, created standards and regulations to ensure the security and protection of humans and the environment.

This activity requires high safety and quality standards, and their development has contributed much to the improvement of quality assurance tools.

Currently, global quality systems are capable, reliable, and well-accepted by society. Therefore, specific requirements of the nuclear industry can join these systems to demonstrate compliance with its products and activities, transparency in the management of activities and facilities, and provision of security. It can still contribute to demystifying the sector of society.

The adequacy of the systems is not simple, and the nuclear sector finds difficulties in this area; therefore, this paper has been prepared to clarify how to integrate systems, requirements and a timetable for implementation in Nuclear Materials Authority Egypt (NMA.eg).

**KEYWORDS:** Integrated Management System (IMS) - International Atomic Energy Agency (IAEA) - Nuclear Materials Authority (NMA) - International Organization for Standardization (ISO) - ISO 9001, ISO 14001, ISO 45001 - Integration - Environmental Management System (EMS), Quality Management System (QMS), Occupational Health and Safety System (OHSAS), Plan-Do-Check-Act (PDCA).

## INTRODUCTION

The "First Geneva Conference," which drew 1500 scientists and engineers and featured more than 1000 scientific papers, was held in August 1955. Other than the bomb's development, the only nuclear technology that remained a closely kept secret was that of enriching uranium; the IAEA Statute, which authorized it, was passed in 1956. The IAEA was granted seven responsibilities: [1]

1. Research into atomic energy for peaceful purposes;
2. provision of materials, to enable research;
3. considering the under-developed areas of the world;
4. fostering information exchange;
5. encouraging training;
6. establishing and administering safeguards;
7. establishing safety standards, acquiring facilities, to undertake the first six functions.

Nuclear Materials Authority – Egypt was established in 1977 by Egyptian Presidential Decree No. 196 of 1977 and consider a research center owned by the Egyptian government. It is responsible for researching and exploring nuclear materials in all parts of Egypt; the Authority's administrative headquarters and laboratories are located in the Katameya area, and it has another headquarters in Inshas. The Authority also has seven field centers covering all geographical areas related to the Authority's fields of work in the Egyptian deserts. Within this framework, the Authority's activities focus on many research, scientific, production, and technology fields, such as [2]

- Proposing general policies and setting plans in research and studies to detect and prospect nuclear materials, organize their circulation, and conduct comprehensive surveys to identify areas with potential in atomic materials.
- Training and preparation of human and scientific cadres specialized in the fields of work of the commission dispatching training grants and scholarships in coordination with the missions department of the ministry of higher education and scientific research and other concerned parties.
- Coordination with universities, institutes, bodies and research centers on topics of common interest, such as scientific records (diploma - master's - doctorate) and research and training projects.
- Working to implement the state's policy of using scientific research in applied fields to serve development goals and national, research and environmental projects.
- In order to achieve its goals, the Authority adopts modern scientific methods in the studies and research it conducts in the geological, geophysical (ground and atmospheric) and geochemical fields, as well as chemical analyzes, mineral, environmental, radiological and other studies.
- The Authority consists of five main sectors, including four scientific sectors that include members of the research body (professors - assistant professors - lecturers - assistant lecturers - teaching assistants) and the occupants of technical, administrative

and assistant positions and the financial and administrative affairs sector, in addition to many public administrations and administrations specialized.

The Authority is one of the Egyptian national expertise houses in the field of geological and mining research and studies, exploration of ores and nuclear and economic minerals, drilling and evaluating the proven reserves of mineral ores, as it is one of the nationally responsible authorities for studies related to exploration, mining and extraction of nuclear ores and the accompanying economic elements, black sand and various mineral deposits, and raising the added value of mineral ores; Because of its modern techniques for atmospheric and ground geophysical exploration and multiple technological units, exploration of groundwater sources and transforming them into productive wells, and determining the safe discharge of water, which qualified it to participate in many national projects that Egypt abounds in.

The ISO Standards series encourages adopting a process approach to quality management, Environmental Management, Occupational Health and Safety Management; in this context, any activity that receives inputs and converts them to outputs can be considered a process; for organizations to function effectively, they have to identify and manage numerous linked processes. Often the output from one process will be the direct input into the next process.

## **2. LITERATURE REVIEW**

In this review, we examine the factors that underpin the achievement of the goal. Therefore, we have discussed several studies on the PDCA cycle; Quality tools; Environmental tools, Occupational Health and Safety tools and their implementation strategies; and the incorporation into the Integrated Management System.

### **2.1 THE PDCA CYCLE**

The PDCA cycle methodology was developed in 1930 when the products hitherto considered exclusive were no longer unique and began to face competition in a market increasingly geared to quality management; the creator of the method was the American statistical expert Walter A. Shewhart; however, it was William Edward Deming who, in the 1950s, developed one of the most known tools in the world, this method was successfully implemented in Japanese companies and later began to be known as the Deming Cycle, the PDCA cycle was at first used as a tool to control the quality of products but, soon after, it was recognized as a method to develop improvements in organizational processes currently, the cycle is characterized by its focus on continuous improvement or in other words an ongoing quest for the best methods to improve products and processes, PDCA is much more than a simple tool; it is a continuous improvement philosophy introduced into the organization's culture. This methodology induces stepwise change, thereby leading to the company's evolution. [3]

The phases of PDCA can be understood as follows:

- a) Plan: During this phase, opportunities for improvement are identified and prioritized; the existing state of the process is studied using consistent data; the reasons for the problem are recognized; potential solutions to the issues are sketched out.
- b) Execute: The purpose of this stage is to deliberately carry out the action plan, select and document data, and record unexpected events, lessons learned, and knowledge gained.
- c) Check: The outcomes of the acts are analyzed at this phase.

The new condition is compared to the old to see if there were any improvements and the objectives were reached.

Various graph support tools are used for this.

- d) Action: At this stage, the team involved develops methods to standardize the improvement (if the result has been achieved); repeats the test to collect new data and re-evaluates the intervention (if the collected data is insufficient or circumstances have changed), or abandons the project and restarts from the beginning (if the collected data is insufficient or circumstances have changed) (if the actions taken have not generated effective improvements).

For the steps to be effectively performed, it may be necessary to use other quality, environmental, and occupational health and safety tools. These tools help mainly to analyze the problem and define the actions to be implemented.

Organizations must establish and maintain one or more management improvement programs to achieve their objectives. Objectives and targets must be communicated within the organization by line management to create awareness and a culture of working together to achieve these amongst the staff members.

The integrated management program should be reviewed regularly to reflect changes in the organization's objectives and targets. Track all new or modified operations, activities, or products if the management program needs to be amended to reflect these changes. Figure 1



Figure 1. PDCA Cycle steps for integration. Source: Adapted from [ISO].

## 2.2 INTEGRATED MANAGEMENT SYSTEM

When these three standards, ISO 9001, ISO 14001, and ISO 45001, are combined, they form an Integrated Management System that integrates and synergizes the systems and processes of the firm into a single comprehensive framework (IMS). The move to the IMS represents one of the most delicate moments in the organization's history, yet the benefits of doing so are numerous and long-term.

An Integrated Management System (IMS) is a management system that integrates all business components into one coherent system to achieve its purpose and mission. Anything that affects business results must be part of the management system. Therefore, an IMS should integrate all formalized systems focusing on quality, environment, health and safety, finance, personnel, and security. All the processes and documents that describe them would be integrated [4]. Applying the integrated management system does not entail the disappearance of existing management systems in an organization, so it should be understood as improved in a more perfect, simpler, and more functional management system [5].

And It is defined as a single structure used by organizations to manage their operations or activities that transform inputs from resources into a product or service so that they meet the requirements that the organization aims to achieve in terms of quality, environment, security, ethics, and other requirements of stakeholders [6]

Accordingly, the Integrated Management System (IMS) is a management system for achieving quality within the institution, and it combines all components of the activity in one integrated system to achieve its goal and strategy. It is also a management system that combines the three systems of quality (quality, environment, health, and occupational safety) to form one system that is a combination of a quality management system (ISO 9001), an environmental management system (ISO 14001) and occupational health and safety (ISO 45001), and the main objective of the integration is to restructure, simplify operations, and avoid duplication) [7] Figure 2



Figure 2: Structure of Integrated Management System IMS (Prepare by Author)

### **2.2.1 The importance and purpose of integrated management systems (IMS)**

The literature indicates that integration systems are the current topic of this century, as the need for systems thinking and integration has increased along with the number of management systems standards. [8]

The integrated management system achieves several technical tasks, including those related to the technical aspect of the management and operation of the organization's systems, as well as tasks related to management and administration, starting from defining objectives and the means of achieving them, and ending with control and feedback that can be modified and improved.

It also has tasks that serve external relations within the open system framework and the presence of requirements and commitments with the interested parties dealing with the institution or its affiliated bodies. [9]

The integrated quality management system is one of the important administrative systems in achieving successful management in institutions because it achieves outputs that have an effective return in the community. It also enables the institution to perform its work in the required manner and works to save time and effort, and achieve the desired return at the lowest possible cost without wasting. Accordingly, the integrated management system is of great importance to achieving the quality of institutions, and this importance is evident in the following: [10]

- A. A clear and specific continuous improvement management policy includes the three components of the integrated management system.
- B. Ensuring the administrative and functional organization of the institution to achieve IMS.
- C. The existence of a system for follow-up and periodic review by departments of the system to avoid making future mistakes.
- D. Existence of high-level training systems for administrators and workers to ensure quality performance at all times and achieve sustainable professional development.
- E. Regular and periodic development of the product, the practice of irreversible feeding during the production stages, and the consolidation of the principle of preventing error, not curing it.

Based on the importance of integrated management systems (IMS), it aims to improve performance within production and service institutions by increasing the effectiveness of the decision-making process in the long term, avoiding inconsistencies and duplication, and achieving ecosystem needs, as well as human needs through the implementation of an integrated methodology, and planning for inputs. For operations, procedures, as well as the product that satisfies the customer or the beneficiary of the institutional service, the objectives of the integrated management system are clear as follows: [11]

- A. They are setting goals for management and following up on their implementation from an integrated perspective.

- B. Design guides for the integrated management system that achieves quality and follow-up performance.
- C. Improving quality, increasing productivity, and reducing costs as integrated objectives.
- D. A quality management review system exists in terms of its effectiveness and application.
- E. Reducing the risks resulting from low confidence in or dependence on the service and the responsibilities or negative consequences.

### **2.2.2 Components of Integrated Management System and its Operations.**

The integrated management system aims to achieve quality through a single management system, and this system is built based on the three quality standards of the International Organization for Standardization (ISO), which depends on the integration of them into one system, namely: Quality management QM -(ISO:9001), Occupational health and safety - (ISO:45001) and Environmental management - EMS (ISO:14001).

This system has been used in many countries to achieve quality in economic and research organizations, which called for benefiting from it in nuclear organizations. Figure 3.



**Figure 3.** Relationship between ISO 9001:2015 ISO 9001, ISO 14001, OHSAS 45001 IMS. (Prepare by Author)

To start, the Nuclear Materials Authority identified the processes that are required for the establishment of an Integrated Quality, Environment, and Health and Safety management system, and then it put these processes into practice in the areas of research and development; design; testing; controlling; engineering; consulting; transfer of knowledge and technologies; and the education of personnel in natural –

mathematical; technological; biotechnological; medical; and multidisciplinary sciences.

Those procedures can be categorized into four main categories, as follows: [12]

1. The design and development procedures include the implementation of scientific research initiatives and applied research.
2. Processes for delivering services, such as the provision of services, the provision of consulting services, the provision of testing, and the provision of personnel training at the user's request.
3. Knowledge transmission processes: supervising the creation of graduate, master, and doctorate papers, training of personnel, are examples of knowledge transfer processes.
4. Management processes include: reviewing the quality management system, doing internal checks, addressing inconsistencies and complaints, implementing corrective actions, measuring customer satisfaction, entering into new contracts, and document management.

### **2.3 THE PDCA CYCLE WITH IMS**

Since many of the definitions of quality require the availability of the condition of the ability to continue in management and the importance of maintaining continuity as an indicator of the integration of the quality process in the service or product, then employing the concept of (total quality management) since it was presented by Edward Deming as an integrated and specific applied approach; therefore, the concept of IMS is defined in that it is a theoretical and applied approach to an integrated and coordinated process of a set of organized concepts, means, methods and procedural steps, which aim to ensure the continuity of the quality of the product or service provided, and that is what is called the IMS, Dr. Deming Cycle is considered the best systematic application of IMS through four stages: The PDCA cycle with IMS can be briefly described as follows: [13]

1. Plan with IMS: define the objectives of the systems and its processes, as well as the resources required to produce results in compliance with the needs of consumers and the policies of the organization, and identify and address risks and opportunities;
2. Do with IMS: implement what was planned;
3. Check with IMS to track and (when appropriate) measure processes, as well as the resulting products and services, against rules, objectives, requirements, and scheduled activities and to report the findings;
4. Act with IMS: if necessary, take measures to improve performance.

The PDCA cycle can be applied to all processes, and the can be combined with all three systems. Figure 4 illustrates how Clauses 4 to 10 can be grouped about the PDCA cycle,

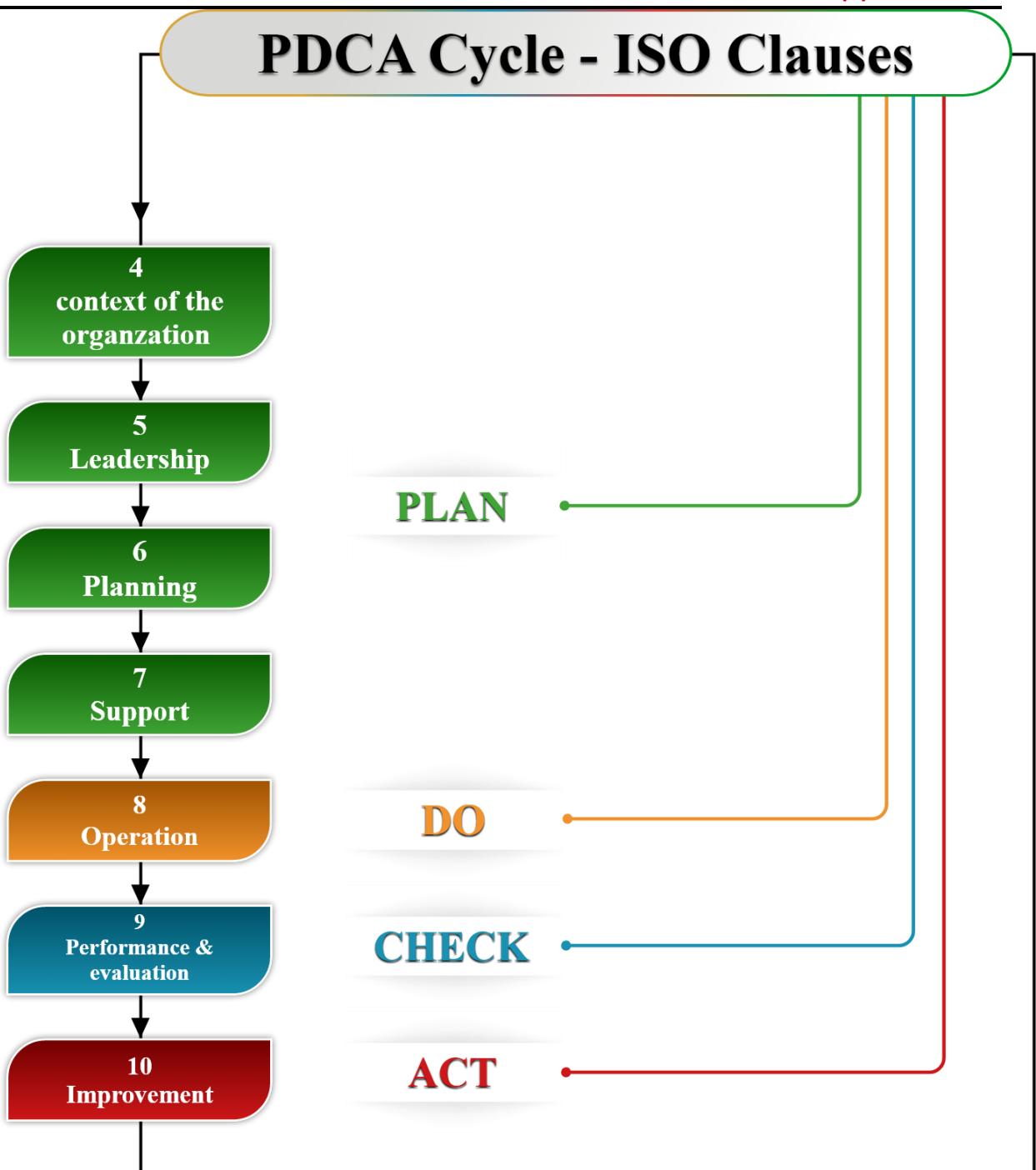


Fig. 4. PDCA Cycle steps for integration into ISO Clauses. Source: (Adapted from ISO)

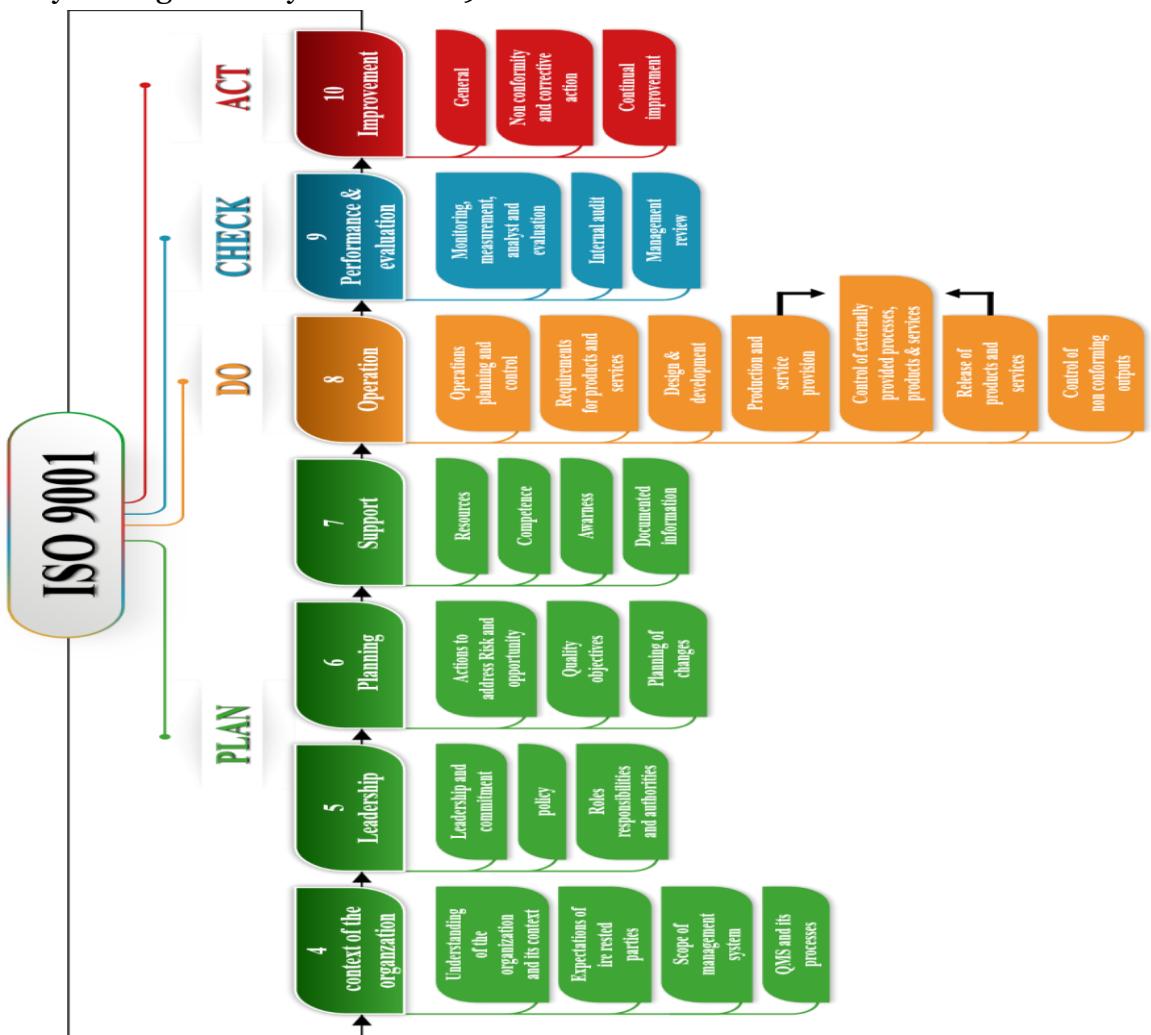
#### 2.4 Quality Management System - QMS (ISO 9001)

Attention to the issue of quality has increased globally during the last two decades of the last twentieth century, and quality has become a global language to distinguish between globally traded goods and services. Moreover, attention to quality has become a global phenomenon, and organizations and governments around the world pay

special attention to it, as it is the first function and an administrative philosophy a lifestyle for any organization; To enable it to obtain a competitive advantage that helps it to survive and continue, in light of environmental changes and increased competition, which led to quality becoming a strategic weapon to obtain a competitive advantage and thus adopting the philosophy of international quality management and its implementation through PDCA cycle **Figure 5.[14]**

ISO 9001 is an administrative specification that focuses on the organization's management system, and it searches in the end for the efficiency of the performance of the administrative system and continuous improvement for total quality management.

A quality management standard is a set of specific requirements contained in clauses of the specification, and it must be met to be awarded the International Certificate of Quality Management System - ISO 9001.



## 2.5 Environmental Management System - EMS (ISO 14001)

Local and international efforts have targeted the preservation of man as the main goal and tool for sustainable development, which achieves his physical and economic

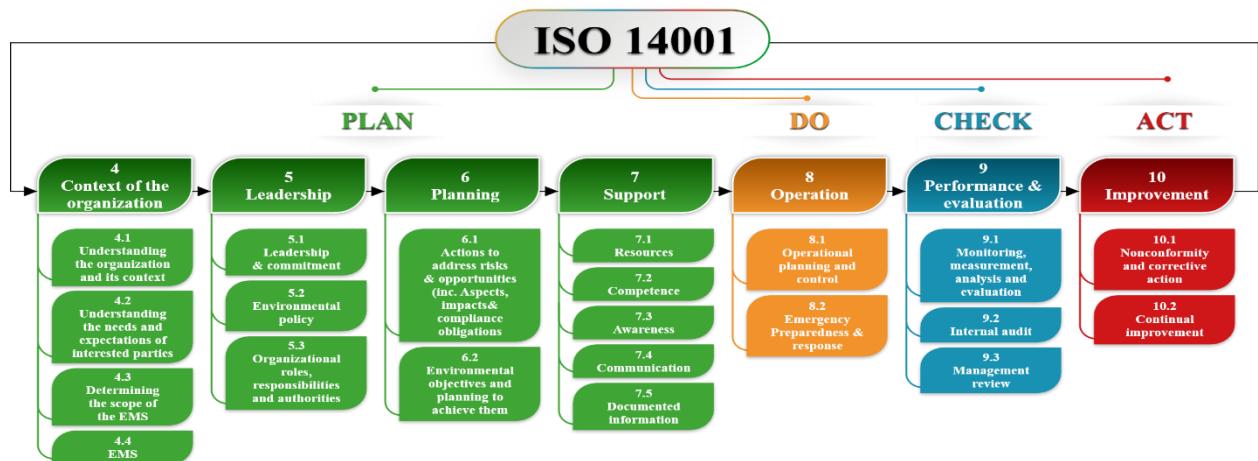
Figure 5. PDCA relationship to the ISO 9001:2015 Clauses (Adapted from ISO)

requirements since nuclear organizations are one of the main components of development and whose various activities affect the environment in general through the effects resulting from their activities that harm the environment with its various components. (Human-Animal-Soil-Water-Air), the interest in the existence of environmental systems that protect and maintain the environment within its objectives and requirements. These systems are known today as environmental management systems (ISO 14001). [15]

Environmental management means those administrative processes, practices, and legislation that aim to protect humans and their environment from the negative effects of development processes and require an assessment of the effects of environmental activities in order to discover the physical, biological, social, and economic effects resulting from the implementation of projects, and to predict their effects on humans and the environment, and to explain and inform about those effects. Moreover, work to reduce it by making sound, logical decisions about it. [16]

An environmental management system is a group of interrelated elements that form a sub-management system that aims to manage the environmental impacts resulting from the activities of the organization, regardless of the size and type of that activity, by providing an integrated framework for the development implementation, and maintenance of environmental policies, ensuring compliance with environmental laws and improving environmental performance. [17]

It was also defined as a continuous cycle of planning, implementation, review, and improvement of the work that organizations are working on to achieve the best performance and commitment to the environment and its implementation through the PDCA cycle. Figure 6.



**Figure 6.** PDCA relationship to the ISO 14001:2015 Clauses (Adapted from ISO)

## 2.6 Occupational Health and Safety System (ISO 45001:2018)

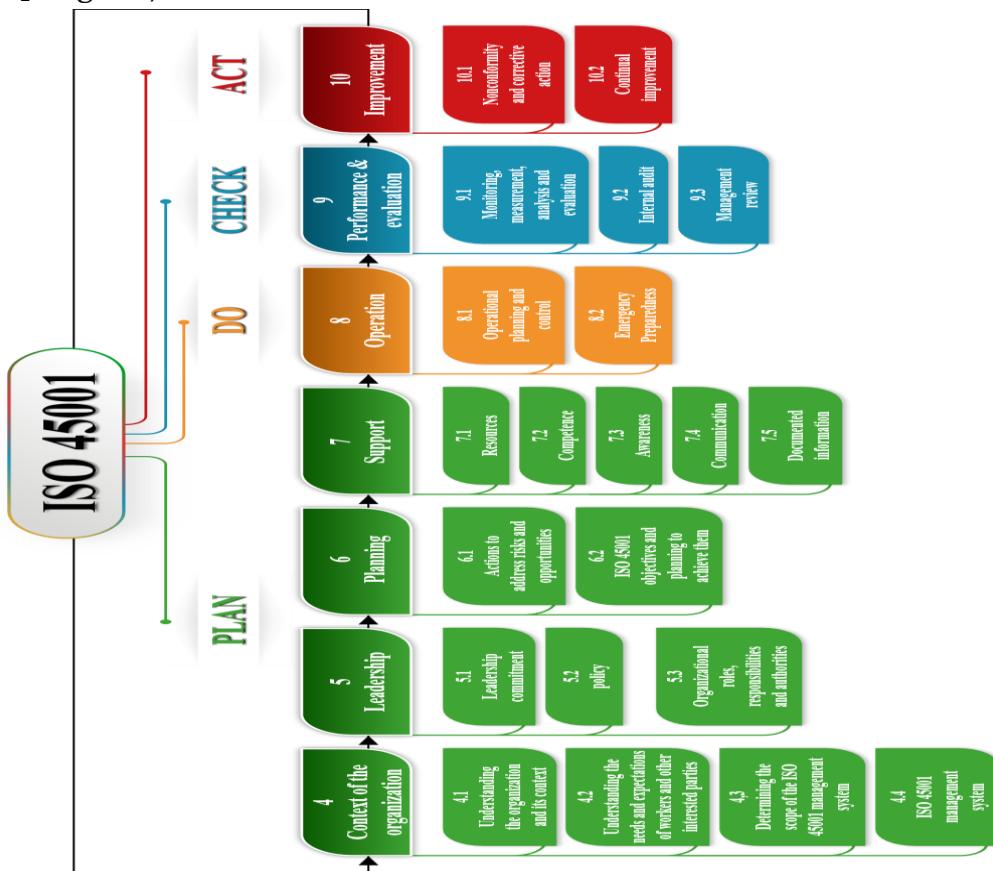
Comprehensive safety standards are the first building block on which tasks and practical practices can be built, whether in a factory, organization, school, hospital, or any other product field. Comprehensive safety standards are the foundation for all

tasks and procedures in a business, organization, school, hospital, or another industrial field.

Occupational health and safety are topics that have drawn the attention of many countries globally because of its direct impact on workers' morale, their productivity, and the region in general.

This influence extends to the national muscle and affects society's economic and social development. Organizations of all types have become increasingly interested in achieving and demonstrating superior occupational health and safety performance by controlling occupational health and safety risks per their objectives and policies in this field.

Organizations do so in response to strict legislation and their endeavor to achieve competitive economic policies and other measures that encourage best practices in the field of occupational safety and health and its implementation through the PDCA cycle [18]. Figure 7.



## 2.6 Other Management Systems that rule the activities of the Nuclear Materials Authority

1. "Leadership and Management for Safety" IAEA General Safety Requirements No. GSR Part 2, IAEA, Vienna, 2016. [19]
2. "The Management System for the Processing, Handling, and Storage of Radioactive Waste," Safety Guide No. GS-G-3.3, IAEA, Vienna, 2008. [20]

3. "Predisposal Management of Radioactive Waste," IAEA General Safety Requirements Part 5, No. GSR Part 5, IAEA, Vienna, 2009. [21]
4. "Methods for Maintaining a Record of Waste Packages during Waste Processing and Storage" IAEA Technical Reports Series No.434, IAEA, Vienna, 2005. [22]
5. "Handling and processing of Radioactive Waste from Nuclear Applications" IAEA Technical Reports Series No. 402, IAEA, Vienna, 2001. [23]
6. "Retrieval and Conditioning of Solid Radioactive Waste from Old Facilities," IAEA Technical Reports Series No. 456, IAEA, Vienna, 2007. [24]
7. "Terminology used in nuclear safety and radiation protection," IAEA Safety Glossary, 2007 Edition, IAEA, Vienna, 2007. [25]
8. Development of a Feasibility Study including a Remediation Plan for retrieving legacy radioactive waste from near-surface Disposal Facility – RADON type, located in Chisinau, the Republic of Moldova (IAEA, July 2015, based on the contract with TS Enercon Kft. according to Request for Quotation No 24633-LB,). [26]

### **3-Methodology**

To achieve this goal, scientific publications were analyzed on means of applying to the standards of ISO 9001: 2015, ISO 14001: 2015, ISO 45001: 2018, and IAEA's safety standards on management systems. Among the methods that were used to measure this impact were a complete revision of standards of ISO and the preparation of complete controls to be followed during construction and management in all its stages and merged with standards of IAEA, to formulate the process for design, implementing the IMS in accordance with the PDCA cycle.

The article was based on the general descriptive, analytical, and quantitative approach based on information, publications, studies, scientific periodicals, and available electronic information sources.

This work concludes with the proposed Timetable for implementing (IMS) according to whit IAEA standards; the international requirement of ISO starts with number 4 intentionally, and the statutory and regulatory requirements in conjunction with A set of standards defined and described in this paper.

The adequacy of the systems is not simple, and the nuclear sector finds difficulties in this area.

### **4- Discuss the research results. Or Results and discussion.**

#### **4.1. Proposal to integrate and start the IMS.**

The three systems, environment, quality, and health, have common parts and distinct and special parts among them, as they carry intersecting elements and may be able to be coordinated within the framework of a comprehensive management system by determining the angle to be focused on, so the technical and legal approach to problems and risk management in an independent administrative system is adopted. Alternatively, work is done with integrated systems that enable avoidance of

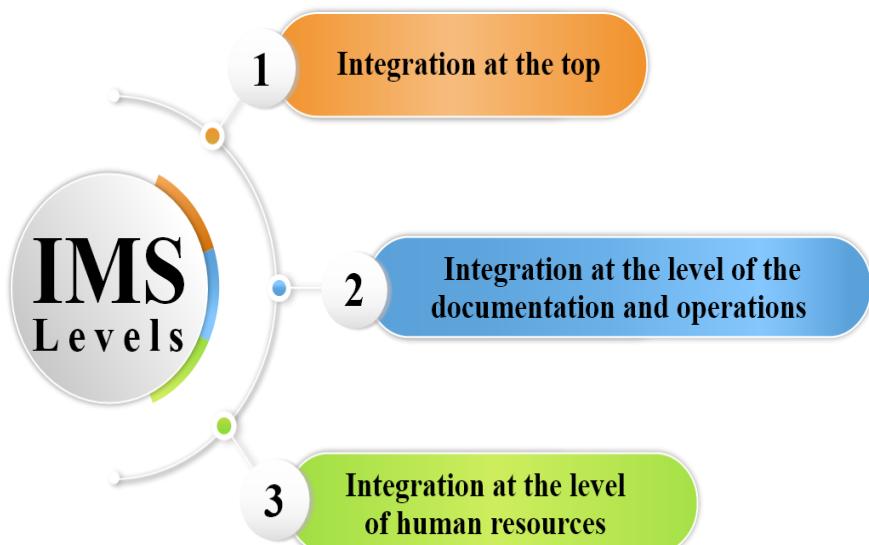
repetition, eliminate inconsistency, lack of verification and valuation of efforts, and facilitate training and integration with developments.

#### **4.1.1 The levels of integration between the three systems:**

**1- Integration at the top:** at the level of policies in one document or several separate documents derived from the same reference, the administration's commitment or the organization's project.

**2- Integration at the level of the documentation and operations system:** at the level of horizontal operations, where the majority of procedures, instructions, and documents are common, while in vertical operations, integration means that common requirements are taken into account at the same time across the stages of the product/service life cycle, starting from the expression The needs until the final delivery and the accompanying services, passing through all the intermediate stages, and the integration at the level of documents allows the summit a set of common guides that carry a set of procedures and instructions to be transformed at the base into common documents in a detailed form of the process with defining the scientific method.

**3- Integration at the level of human resources:** It is represented in the movement of human resources, which is the cornerstone of the success of the process and the achievement of its goals, where work is done to motivate workers to think seriously about the requirements of the system and continuous search to improve operations, and in the case of expanding the system to other systems, awareness is raised. Workers in the relations between systems and the need to bring about convergence must also undergo continuous training to ensure harmony and conformity with common methods and tools.



**Figure 8.** Levels of integration between the three ISO (Prepare by Author)

#### **4.2 The method, steps, and requirements for integrating the three sub-systems into the Nuclear Material Authority are:**

The integration of the three systems can be achieved through the implementation of integrated management systems (IMS) that follow a total quality approach and are appropriate to the environment of the Nuclear Material Authority because it offers more potential than reducing audit and management costs and allows for a more effective realization of the IMS information management system, as well as additional benefits. Many beneficiaries are looking for a common basis among the three systems, namely that the Quality Management System (ISO 9001), Environmental Management System (ISO 14001), and Occupational Health and Safety System (OHSAS 45001) are characterized by the presence of a common basis among them, which is continuous improvement of business, innovative solutions to problems, and the adoption of a method Integration of the Deming cycle's three sub-systems (plan, do, test, and act (PDCA)).

#### **4.3 Accordingly, the steps to achieve integration between the three sub-systems in the Nuclear Material Authority are as follows:**

**The first step** includes the formation of a team of leaders working in the Nuclear Materials Authority and some workers who have attested to their efficiency and excellence in performance, and the task of this team is to design the integrated management system in the Authority.

The tasks of this team begin by spreading awareness among all employees of the Authority of the need to adopt the integrated management system by holding workshops to explain to them the advantages that can be achieved through integration, in addition to holding meetings for them and specialized training courses in this regard.

In this step, the team also analyses the current situation of the three sub-systems in Authority and the practices they include, intending to monitor **the following:**

- A: The changes that need to be made in these three systems to integrate.
- b) Identifying the root causes of any problems that may arise due to integration.
- C: Determining the common elements between the three systems is the basis for achieving integrated integration.

D-Identifying the distinct elements among the three systems that can be coordinated within the integrated management system framework.

E-teaching performance standards in each integration step until the evaluation is done, and based on the above, a plan for integrating the three systems is formulated.

#### **The second step**

includes implementing the plan that resulted from the previous step. Perhaps the implementation of the plan for the objectives of integration also includes the following procedures:

A: We are amending the Authority's organizational structure in accordance with the consequences of the integration between the three systems of merging jobs, creating jobs, and canceling other jobs.

B: Activating the means of communication between the users of the three systems so that communication between them is effective in a way that ensures control over documents and operations.

C: Educating employees on how to integrate the three systems.

D-Here, it must be taken into account that integration takes place at **different levels**:

1- Integration at the top of the organizational structure at the policy level, in one document or several separate documents, expresses the commitment of the Authority's management to the integration project.

2- Integration at the level of documents and processes.

- As for the operations on a horizontal level, most procedures, instructions, and documents are shared through the integrated management system.

- As for the operations that are carried out vertically (in which different administrative levels participate) in which, integration is achieved at the level of documents by making available to the Authority a set of common guides carrying a set of procedures and instructions, which are transformed at the base into detailed joint documents for each operation.

3- Integration at the level of human resources can include moving human resources, which are the cornerstone of the success of the integration process. Here the management makes a remarkable effort to motivate workers to think deeply about the requirements for implementing the proposed integrated system and strive towards achieving harmony and congruence between common methods and tools.

E. Bringing about integration between the various processes in the administrative systems that will be integrated entails the formulation of a document that includes integrated instructions for work.

F- Integrating performance improvement mechanisms (performance measurement - correction of deviations - continuous improvement).

**The third step:** In which the integration between the three systems is tested through the following:

A- Comparing the results obtained based on the merger with the previously set goals in the first step.

b- Writing a report on the results to indicate whether corrective actions and revisions are required again.

C- Make a comprehensive study on the results that have been reached to implement the changes resulting from merging the three systems, and write conclusions related to the effectiveness of implementation and the procedures that must be adopted in terms of training and communication to reach the required outputs.

**Step Four:** The administration implements the agreed-upon amendments and then revises them in proportion to what was planned in the first step, and here the organizational structure of the Authority is reviewed again to determine the jobs and the tasks, responsibilities, and duties that are necessary to bring about the integration process.

### 3.4 Proposed model of IMS in NMA and schedule Timetable for implementation

#### 3.4.1. Proposed IMS in NMA

The three ISO systems were integrated with the two issued publications within the IAEA Safety Standards for Management Systems to make an integration between systems and the Proposed model for (IMS) in Nuclear Materials Authority, Egypt.

**Figure 9**

Those publications issued by the International Atomic Energy Agency were chosen because they are the most appropriate and most integrated with ISO standards.

1. "Leadership and Management for Safety" IAEA General Safety Requirements No. GSR Part 2, IAEA, Vienna, 2016. [19]

2. "The Management System for the Processing, Handling, and Storage of Radioactive Waste," Safety Guide No. GS-G-3.3, IAEA, Vienna, 2008. [20]



**Figure 9.** PDCA relationship to the standards of ISO and IAEA's safety standards on management systems (Prepare)

### 3.4.2. Proposed schedule Timetable for implementation of IMS

As a result, the paper generated des implementation schedule presented in Table 1 of the top management.

Some tasks can run concurrently, and others have before, but in this table, only the tasks are listed

**Table 1. Proposed schedule Timetable for implementation of IMS**

Activity	Lead time
1 - Definition of organizational structure	Two week
2 - Defining the Scope of IMS	Two week
3 - Structuring the documentation of the IMS as requirements of ISO 9001:2015 ISO 45001:2018, the standards applicable, IAEA standards and requirements of environmental laws and agency regulations and statutory requirements: Quality Policy; Quality Manual; Quality Assurance Program; general and specific procedures; Work instructions and; Records.	Two month
4 - Selection of the external documentation applicable, in particular, environmental legislation	Two month
5 - Training of auditors and experts.	Three month
6 - Preparation of documentation	Six month
7 - Review and approval	Two month
8 - Training of personnel involved	Two week
9 - Implementation and maintenance of the IMS	Five week
10 - Internal Audits	Three month
11 - Critical analysis by top management	Two week
12 - Improvement of the IMS	Six week

### 4. Conclusion

In this research, the ISO 9001: 2015, ISO 14001: 2015, ISO 45001: 2018, and IAEA's safety standards on management systems were integrated into the IMS for the NMA Egypt through the integration of the documentation, the integration of the process map and the integration of the organizational structure.

The process for implementing the IMS in the NMA Egypt was formulated using the PDCA cycle, and the implementation steps and the specific work for each step were defined as and Timetable for the implementation of IMS.

## 5. Recommendations:

Requirements for implementing the proposed integrated management system Implementation of the proposed IMS requires the following:

A. Supporting the senior management represented by the Authority's senior leadership in implementing the integrated management system through the following:

1- Providing experts and specialists to convince and increase workers' awareness of the feasibility of integrating the sub-systems and the expected return on the Authority.

2- They are preparing the human resources in the Authority to implement the integrated administrative system by subjecting them to specialized training programs that meet their training needs related to the steps and procedures for integrating the administrative systems.

3- Granting the heads of sectors more financial and administrative independence would enable them to invest the available resources and capabilities in the integration process.

4- Ensuring the availability of the necessary resources to monitor and control the integration processes.

B. The Authority's management should set an internal regulation through which it becomes clear the procedures that the Authority can adopt to overcome the problems and risks that may appear within the framework of integration between the various administrative systems.

C. To manage the Commission with folders and brochettes, including simple and clear formulations on the concept of an integrated management system and its importance to the Authority and its beneficiaries.

D. The Authority's management is obligated to submit periodic reports on the progress of the proposed system.

E. Making job description cards for the employees of the Authority, according to what the integrated management system has resulted in merging jobs, canceling jobs, and replacing other jobs so that the job description card shows the expected results from the job.

F. Designing the amended organizational structure of the Authority in accordance with the requirements of implementing the integrated management system and advertising in all vital places in the Authority.

G. Forming a committee at the level of the Authority to undertake the internal reviews of the integrated management system so that all activities that affect the quality of the application of the system are monitored, and corrective, preventive measures are taken to prevent any problems.

H. Issuing a document that includes integrated instructions for working in the administrative systems and integrating resources.

I. Adopting an effective system to motivate the employees of the Authority, in which motivation is linked to good performance.

## 6. Conflict of interest declaration.

The author reported no potential conflict of interest.

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