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Chapter

Key Aspects of Occupational Health and Safety towards Efficiency and Performance in Air Traffic Management

Dimitrios Dimitriou and Stylianos Zantanidis

Abstract

This paper/chapter deals with the key drivers for adopting and developing an Occupational Health and Safety System (OHS) with a special focus on air traffic management and traffic controller's workplace. A such system includes regulation and legal compliance procedures, actions and monitoring for ensuring workplace safety, incentives and motivation for the air traffic controller and associate personnel health and wellbeing. By a systemic approach, the key characteristics of OHS towards air traffic management are presented, highlighting the key aspects for implementing a quality management system in air traffic control, which is the cornerstone of airport operation efficiency and productivity on one hand; and the nature of job and the intensive working environment is well recognised. Based on air traffic providers functional analysis the key occupational aspects for air traffic control are taken into consideration, providing the benefits for implementing quality management systems (QMS) and OHS is real business. Conventional wisdom is to highlight the importance for establishing and incorporating a modern custom-made OHS system in accordance with the requirements addressed by OHSAS 18001 to develop and implement a QMS for air traffic services. Contribution of this paper is to highlight the key priorities for managers and decision makers in field of air traffic services providers, depicting ways and recommendation for adopting an efficient path for implementing OHS in a QMS environment.

Keywords: occupational health and safety, air traffic management, quality management, performance management

1. Introduction

In general, Occupational Health and Safety (OHS) deals with the provision of safe and secure working conditions for all employees of a company or business units. Institutionally, occupational safety refers to the comprehensive safety efforts, plans, and implementations throughout the entire organization, considering health and safety risks for the employees driven by both sides the inside working and the outside business environment. Especially for the air traffic providers, due to the complexity and multitasking air traffic controlling procedures, the dedicated infra-structures, and high use of electronic equipment, as well as their communication

interrelationship with different functions of airport business, the need for evaluation, review, and secure OHS is essential.

The investment in personnel expertise, skills, and abilities are essential for air traffic providers, considering the special skills and abilities are required for delivering air traffic control services. Therefore, for air traffic providers, even in units/airports that the volume of traffic controllers is not large, there is a tendency for shifting from personal OHS responsibility delivered by managers to a more horizontal and institutional action providing harmonization achieved by institutional safety framework promoting innovation and standardization across this business sector. This clearly demonstrates the significance of complete OHS, where the term "total" denotes that safety issues must be considered at all levels of the organization and in all operations, without dismissing or eliminating any organizational, production, or service-related issues.

The commitment of public and private organizations to improve their competitiveness through service or product quality has resulted in the need for a new management system that considers their operations. Moreover, different approaches are required due to the diversity of production processes and business sectors. The increase in these requirements has highlighted the importance of a systematic approach to dealing with them. In numerous cases, the practice has shown that modern management standards for the development of relevant management systems can provide efficient and effective operation and a working environment while also having the inherent ability to support continuous quality improvement [1].

When an organization has a quality management system (QMS) in place, it can provide the proper context for a systematic approach to standardizing aspects such as quality, environmental protection, occupational health and safety, social responsibility, and possibly many others. A QMS frequently shares various stakeholders, resources, and processes; thus, system integration is critical for organizations to save time, effort, cost, and resources [2].

The drivers for implementing an appropriate Occupational Health and Safety (OHS) System within the operational framework of an existing QMS can be classified as regulatory, financial, marketing, operational, and social. The most important motivations for them include complying with the legal framework, ensuring workplace safety, personnel health and motivation, responding to government appeals, and remaining competitive or gaining a competitive advantage [3].

It is noteworthy that the International Civil Aviation Organization (ICAO) guidelines and obligations, as well as other aviation institutions' recommendations and regulations, highlight a continuing trend of air transport growth in Europe in many reports. Air Navigation Services Providers' (ANSPs') operational and administrative efficiency and effectiveness are critical to the quality of air traffic management (ATM). The Occupational Health and Safety (OHS) of ANSPs operational workplace is one of the main parameters that support the quality of services and plays an important role in the new era of air transport development and sustainable aviation growth.

The OHS management system is at the top of the agenda in relevant national and international discussions, particularly in countries where aviation growth is directly related to productivity, the attractiveness and competitiveness of the business environment, and economic stability. This paper deals with the framework and the characteristics of the two management systems (QMS and OHS). It is presented the needs and the challenges to improve OHS in the management systems of ANSPs, by implementing a modern OHS system based on relevant international standards and best practices. By a systemic analysis, the characteristics of QMS and OHS are given, providing the benefits towards integration and highlighting the main objective to develop an OHS system adapted to the operational characteristics and the quality management system of the Hellenic Air Navigation Services Provider (HANSP).

2. Quality management system objectives and outputs

2.1 Definitions and key principles

Quality management system (QMS) is a collection of all the actions are concerned with the quality decisions of an enterprise or business unit. It is a procedural manual associate with tools and applications that impact the development and delivery processes, services, and products. Therefore, QMS could be defined as "the manual" that clarify responsibilities in the organizational chart but also inside each business unit, illustrate the production procedures and services processes, and present the necessary resources to implement and deliver and all those to connected and represented with the quantitative and qualitative outputs and business objectives of an enterprise/unit business or action plan.

Effective implementation of a QMS is to be an essential component of management and production. A well-executed QMS will not make an organization more profitable, efficient, or customer-focused in and of itself, but it will provide an organization with the inherent ability to improve its operations from production to sales. Particularly for businesses that operate and manage assets, infrastructures, and networks, where competition and business performance are concerned with customer satisfaction and operational efficiency [4, 5].

Furthermore, QMS is a significant contributor to authorities, organizations, enterprises, and business units focusing on their objectives and goals on the one hand and ensuring that production activity output provides a higher level of service to customers, minimizes waste time, provides necessary resources to employees, and follows a continuous improvement approach to all actions and deliverables on the other. The following are the key drivers of a modern QMS in accordance with the International Organization for Standardization (ISO) requirements (as determined by a review of the ISO 9000 series) [3]:

- Clear, coherent, and positive commitment towards management quality and decision-making process;

- Bidirectional action between top management and all levels or group of employees promoting a corporate stigma representing the working environment culture and initiatives, linked with the personal performance, skills, and improvements;

- Implementation of a performance and procedural monitoring system, supporting decisions and depicting the internal working environment including employees behavioral over actions and miscommunication (a critical issue especially for the air traffic controllers);

- Introduce and maintain Human Resources (HR) procedures meeting the needs of each job/task, promoting innovation and support training to meet occupational and personal needs for all employees.

2.2 QSM benefits

Literature supporting the key benefits of a QMS is growing, promoting the need for adopting OHS to achieve performance in air traffic providers. In other words, research in the aviation sector recognized that air traffic controllers OHS conditions and aviation business performance are strongly linked. The direct benefits in aviation business operation could be summarized in the following's issues [3]:

- Customer satisfaction;

- Quality of service;

- Employee satisfaction and commitment to the management targets and goals;

- Operational management and a more effective workforce operation;

- Improved supplier relations; and

- Improved corporate stigma and brand.

In the aviation sector, all the above are crucial also in terms of traffic demand and destination marketing, as airports are the gates of a region to the international market, and the level of service promotes the image of a city or a region or an industry [6].

In terms of management performance, there are also essential opportunities towards:

- Achievement of corporate goals and assess the cost and benefits to meet those goals;

- Reduce bureaucracy, misunderstandings and promote fairness in responsibilities allocation and task delivery;

- Clarify responsibilities and expectations, promoting bonus schemes towards efficiency and productivity;

- Clarify mechanisms for multi-objective and multitasking decisions promoting cooperation, team working and effective communication;

- Award and recognize the performance of the employee and involve them in the review and improvement of their work.

ISO 9000 is a set of quality management and quality assurance standards designed to assist all types of business structures, promoting the QMS key elements in broad use as it is not industry-specified, providing flexibility to be applied. The ISO 9000 group of protocols includes the following standards [7–9]:

- ISO 9000: 2015: quality management systems—fundamentals and vocabulary (definitions).

- ISO 9001: 2015: quality management systems—requirements.

- ISO 9004: 2009: quality management systems—managing for the sustained success of an organization (continuous improvement).

- ISO 19011: 2011: guidelines for auditing quality management systems.

The ISO 9000: 2015 and ISO 9001: 2015 standards are based on the seven quality management principles listed below, which senior management can use to improve their organizations. The field of QMS is concerned with [9]:

- Customer satisfaction

- Leadership

- Engagement of people

- Process management

- Performance improvement

- Evidence-based decision making

- Relationship management

ISO 9000 is a process-oriented approach to documenting and reviewing the structure, responsibilities, and procedures required to achieve effective quality management in an organization. It is based on the Plan-Do-Check-Act (PDCA) methodology. Organizations find that using ISO 9001 helps them because it specifies the requirements for an effective quality management system [8, 9]:

- Organize a QMS.

- Create satisfied customers, management, and employees.

- Continually improve.

2.3 QMS implementation and certification

Professionals involved in the development, implementation, auditing, and management of an ISO quality management system, as well as quality professionals interested in updating their documented ISO 9001-based QMS, can enroll in ISO 9000 training courses, which include ISO 9001 and quality management system courses. Furthermore, organizations seeking to improve employee performance and employees seeking to continuously improve will find ISO 9000 training useful [9].

The QMS recommended in ISO 9001: 2015 quality management systems—requirements is still process-based, its focal point is management leadership, which is linked by feedback loops to the enterprise's planning, support, and operational activities, as well as results assessment and improvement. The PDCA cycle (Plan-Do-Check-Act) underpins the entire quality management system concept. Building a management system in accordance with the new ISO 9001: 2015 guidelines requires an organization to analyze its context based on knowledge and understanding of its operational essence in relation to its immediate and distant environment. This aids in the efficient management of the created system, allowing the strategic business objectives to be met [9, 10].

Certification in accordance with the ISO 9001 standard can boost an organization's credibility by demonstrating to customers that its products and services meet both standards and expectations. In some cases, certification is required or mandated by law. The certification process entails implementing ISO 9001: 2015 requirements and then successfully completing a registrar's audit confirming the organization meets those requirements. Training can provide an opportunity to review the ISO 9001: 2015 standard as well as apply quality management principles in a practical setting [9].

3. Occupational health and safety system (OHS)

3.1 Objectives and outputs

OHS is a term that refers to providing a safe and secure working environment for all organization's employees. Employee safety concerns are becoming increasingly important, not only in the workplace but in all aspects of our societies' activities and it's the cornerstone for corporate social responsibility plan for most of the high "branded" enterprises. Theoretically, there are two directions for managing safety: (a) institutional safety and (b) individual safety. Institutional safety refers to the total safety efforts and implementations throughout the entire organization, taking into account both the inside and outside environments [11].

Due to the complexity of processes, infrastructures, and equipment, as well as their interrelationship between different sectors of the organization, there is now a profound need for safety to be expanded from individual to institutional safety. This clearly demonstrates the significance of total OHS, where the term "total" means that safety issues must be considered at all levels of the organization and in all activities, without disregarding or excluding any organizational, production, or service-related issues [12].

OHS has several inherent characteristics for providing a safe environment, the most important of which are [13]:

- Management commitment;

- Employee involvement;

- Hazard identification and control;

- Training, including soft skills training programs for abilities in communication and personal development;

- Education; and

- Risk management assessment and continuous improvement process all of the above.

Aside from those, there is a slew of other factors to consider for efficient and effective OHS management. They include, among other things, worksite cleanliness, emergency preparedness, contingency planning, employee OHS training procedures, and so on. OHS must be regarded as an integral part of work-system design, development, and training. Especially, the issue of training should be analyzed in terms of training hours per employee but also regarding the content of training, where the development of personal soft skill is in high priority [12, 13].

OHS processes are just as important as the rest of the manufacturing and operational processes (design, production, manufacturing and marketing, etc.). Improving manufacturing processes without also improving working conditions will not result in a productive and safe manufacturing environment [11].

Employee involvement is a critical component of OHS implementations. A number of formal approaches, similar to process improvement, have been developed to encourage employee participation. The majority of these approaches are also important sources of data for quality improvement [13].

OHS is primarily concerned with reducing employee errors that may be caused by the environment and working conditions. OHS, through

behavior-based safety management programs, does not treat accidents as performance errors but rather attempts to identify the fundamental causes of the errors. Employees are not permitted to use defective equipment or inappropriate methods. It may be possible to create more realistic tasking into account that daydreaming and boredom on the job frequently result in incidents or even more accidents caused by malfunctions in the perception system or distraction by others. In relation to the foregoing, OHS may [13]:

- Reduce insufficient equipment;

- Empower employees to be responsible for their equipment;

- Establish an ergonomic approach to workplace design;

- Reduce insufficient procedures;

- Establish an ergonomic work environment; and

- Reduce workplace risks, incidents, or accidents.

The issue of hazard prevention and accident control measures is essential crucial towards efficiency and successful OHS implementation. The analysis should be based on historical real data, and it should be based on comprehensive job safety or job hazard analyses over the business risks and the values at risk in the corporate environment [12, 13].

3.2 OHSAS 18001

OHS represents conditions and factors that already affect or could affect the health and safety of employees, other workers, visitors, or any other person in the workplace in any type of organization. Early in the 20th century, for the first time, standards and guidelines for OHS management were developed [14].

Moreover, ISO hosted a discussion in 1996, inviting many nations to develop international OHS Management Systems. The discussion included representatives from six international organizations, including ISO and the International Labor Organization (ILO), as well as governments, labor unions, employers, worldwide safety and health administrations, and insurance institutes. The Occupational Health and Safety Assessment Series—OHSAS 18000 was published in 1999 by the US Occupational Health and Safety Administration in collaboration with international certifying bodies from 15 countries across three continents. This set of standards is divided into two parts: OHSAS 18001 and OHSAS 18002. Several documents and standards were used in the development of these standards, including BS 8800: 1996, Technical Report NPR 5001:1997, Draft LRQA SMS 8800, and so on [14, 15].

Over the years, OHSAS 18001 has gained widespread acceptance, with firms of all sizes and industries implementing and certifying it. The standard has been updated, and the most recent version is BS OHSAS 18001: 2007 "Occupational Health and Safety Management Systems." Some countries refused to accept OHSAS 18001 and instead developed their own standards, which were mostly modifications of the International Labor Organization's "Guidelines on Occupational Safety and Health Management Systems" [15].

According to [15], the Occupational Health and Safety Assessment Series (OHSAS) Standard, as well as the accompanying OHSAS 18002, Guidelines for the Implementation of OHSAS 18001, were created in response to customer demand

for a recognizable occupational health and safety management system standard against which their management systems could be assessed and certified. OHSAS 18001 was created to be compatible with the ISO 9001: 2000 (quality management) and ISO 14001: 2004 (environmental management) management system standards, allowing organizations to integrate quality, environmental, and occupational health and safety management systems if they so desire. In practice, the OHSAS Standard is reviewed and amended as needed.

The OHSAS Standard specifies the requirements for an OHS management system that allows an organization to develop and implement policies and objectives that take into account legal requirements and information about OHS risks. It is intended to apply to organizations of all sizes and types, as well as to accommodate a wide range of geographical, cultural, and social conditions [1, 4, 5, 16].

The system's success is dependent on commitment from all levels and functions of the organization, particularly top management. This type of system enables an organization to develop an OHS policy. The overall goal is to support and promote good OHS practices while keeping socioeconomic needs in mind. It should be noted that many of the requirements can be addressed at the same time or at a later date. The second edition of this OHSAS Standard focuses on clarifying the first edition and has taken into account the provisions of ISO 9001, ISO 14001, ILO-OSH, and other OHS management system standards or publications to improve compatibility for the benefit of the user community [15].

The OHSAS standard is based on the Plan-Do-Check-Act methodology (PDCA). PDCA can be summarized as follows [15]:

- Plan: define the objectives and processes required to achieve the desired results in accordance with the organization's OH&S policy;

- Do: put the processes in place;

- Check: monitor and measure processes in relation to OH&S policy, objectives, legal requirements, and other requirements, and report the results; and

- Act: take steps to improve OH&S performance on a continuous basis.

OHSAS 18001 is an international standard that specifies the requirements for an occupational health and safety framework. The key target is of this protocol deals with effective management of workplace risks and hazards to health and safety. It encompasses the organization's structure, planning activities, responsibilities, practices, directives, processes, and resources for designing, implementing, maintaining, and reviewing the organization's system and policy. For this system, everything is based on Deming's PDCA cycle for continuous improvement [13, 15].

The OHSAS 18001 standard underwent a significant revision in 2007, which resulted in the current structure and content of the standard is established. Many advantages can be gained from implementing this management system, including lower incident and accident rates, improved performance monitoring and accident reporting, better control of occupational health and safety risks, lower overall costs of accidents, lower insurance premiums, improved levels of compliance with health and safety legislation, reduced likelihood of fines and prosecutions, which may, in turn, result in less expensive insurance premiums, financial benefit, improved reputation, and long-term viability [13, 16].

According to the ILO and other organizations, 2.2 million workers die globally each year as a result of work-related accidents and diseases, 4 percent of the world's gross national product (GNP) is lost as a result of work-related accidents and diseases, and 6.300 workers die every day as a result of occupational accidents

or work-related diseases. These statistics demonstrate that there is an urgent need for organizations all over the world to improve their health and safety management systems. Many consumers and customers expect businesses to be ethical in all aspects of their operations, including how they treat their employees [15, 16].

3.3 OAS accreditation

The implementation of OHS and certification in accordance with OHSAS 18001/ISO 45001 has a significant impact on operational performance. Certification has been shown to have significant benefits for the safety and economic components of abnormal operational performance, even for firms operating in environments with stringent safety regulations that already had above-average safety performance in comparison to their industry.

The practice has shown that as complexity and coupling increased, so did the benefits of certification. OHSAS certification resulted in significant increases in abnormal operational performance, with the greatest benefit accruing to firms with highly complex or coupled production systems. The relationship between safety certification, safety performance, and other operational performance outcomes was also clarified by operational evidence [15].

According to the institutional theory viewpoint, certification may be pursued primarily as a signaling device. The findings provided some support for this claim, with all of the significant increases in abnormal sales growth occurring after certification, despite the fact that the firms had above-average safety performance in their industries prior to certification.

However, the results revealed significant increases in abnormal performance in terms of safety, return on assets (ROA), sales growth, and productivity, indicating that certification provided more than just ceremonial benefits. The existence of increased abnormal safety and economic performance also sheds light on the ongoing debate over the relationship between safety and the economic components of operational performance [16].

OHSAS certification is unique in that firms seeking certification must replace existing OHSMS, so there is no reason to expect certification to improve operational performance. However, the findings are broadly consistent with previous research on other types of certification, implying that certified management systems that instill the processes and cognitions will improve operational performance in general.

4. QMS and OHS integration

4.1 Benefits and implementation challenges

Many businesses conduct QMS and OHS reviews or audits to evaluate their management performance. However, the outcomes of reviews and audits may not be a motivator for a sufficient and well-managed organization, owing to the fact that the majority of audits were contacted internally and focused on regulation and constitution compliance. As a result, performance-oriented messages to management are severely limited. A structured management system in which QMS and OHS are integrated within the organization, on the other hand, maybe more effective in promoting changes and reviewing performance [17].

It is worth noting that OHSAS Standards for OHS management are intended to improve business culture and benefit from the synergies of the combined management system. An organization may adopt its existing management system(s) to establish an OHS management system that meets the requirements of this OHSAS

Standard. However, it is noted that the application of various elements of the management system may differ depending on the intended purpose and the parties involved. The level of detail and complexity of the OHS management system, the extent of documentation, and the resources devoted to it are determined by a series of factors, including the system's scope, an organization's size and the nature of its activities, products, and services, and the organizational culture [15–18].

Integration of Management Systems (MS) could be partial or complete, as well as documental harmonization. The key issue is the degree of integration varies between two theoretical extremes [19]:

- The "zero" level, in which individual standardized MSs coexist in completely different ways; and

- Full integration, in which all elements and aspects of individual standardized MSs operate within one system.

These two extreme conditions are possible, but in practice, the level of integration will be somewhere in the middle. There is some evidence that QMS and OHS are successfully integrated, though OHSMS is perceived as less flexible, and there is less interest in integrating OHSMS with other systems [19].

There are two main methods for implementing and integrating MS. In the first, standards are implemented one at a time and then integrated. The other option is to implement multiple MSs at the same time and integrate them during the implementation process. When it comes to the two most popular management standards (QMS and EMS), the most common implementation and integration strategies are [19]:

- The QMS is implemented first and OHS second;

- The OHS is implemented first and QMS second and

- The QMS and OHS are implemented simultaneously.

The number of possible combinations grows as more systems (such as OHSAS 18001) are considered, but the implementation of the QMS first, followed by other systems, is most popular in organizations, according to the literature. QMS serves as a platform for integration for the vast majority of businesses. Companies are increasingly opting to implement ISO 9001, ISO 14001, and OHSAS 18001 all at the same time, combining them into a single management system (**Table 1**) [18, 19].

4.2 Implementation approach

OHS and QMS standards (ISO 9001:2015 and OHSAS 18001:2007) share a fundamental principle: continuous improvement based on Deming's cycle (Plan-Do-Check-Act). In the PDCA cycle, continuous improvement and incremental problem solving are represented. These four (4) steps can be used as a plan for the implementation of an effective and efficient integrated system based on certain stages of this management method (PDCA). The following are the specific steps [18, 19]:

1. The planning process is the first thing to do. This step entails making changes and improvements while also taking stock of the current situation and considering the potential outcomes. In real life, this means defining the problem, collecting relevant data, and determining the underlying cause of the problem.

Area	Target/output	Key components
Management system	Establishing, implement, maintain and continually improve the management systems (quality of service, environmental assessment, OHS and business risks) including the processes needed in accordance with the requirements of each International Standards	• The integration shared the same objective regards to policy, legal requirement and for continuous improvement for management system; • Integrated Management System (IMS) establish, implement and maintain a procedure(s) for dealing with actual and potential non-conformity for corrective and preventive action; • Formed the IMS appropriately, understood and applied within the organization for each management system
Corporate planning and strategy	Identification and evaluation of aspect, impacts and risks. Establish, implement and maintain the process to meet the requirement and determine the risk and opportunities that need to be addressed for each management system	• Identify an integrated risk control process covering service quality, environment, occupational health and safety aspects; • An integrated risk management system; • Establish, implement and maintain the management system policy that involved all the relevant units
Human resources (HR)	The relevant roles are assigned, communicated and understood whining the organization in term of requirement of International Standard	• Integrated reporting system for the performance of the QMS and OHS; • Benefits for proposals and actions lead to productive change or innovation
Integrated system operation	The integration formed the integrated monitoring and performance measurement in term of operational control for analysis and evaluation	• Effective integrated documentation and establish the document and record control; • Effective and continuing communication in the organization; • Integrated evaluation procedure in term of record, ensure the conformity of effectiveness for each system and applicable for legal requirements
Internal audit	The integration of the system leads the organization review about each management system as one system at the planned intervals, to ensure each continuing suitability, adequacy, and effectiveness	Establish the efficient and integrated audit in term of requirement for the management system, following the international standard and provide the information for the system to effectively implement the internal audit can be done in one time audit

Table 1.
Key components of the system integration.

2. The next step is to put the plan into action, which is known as executing. In this step, you must put into action the process you have already planned, using the information you gathered in the preceding step as a guide.

3. In order to control or implement an improvement, the third step is to check the process. This phase necessitated continual process monitoring and evaluation, as well as reporting on the results in relation to the objective and specification. At this point, we have completed the check phase and can draw conclusions about how effective implementation has been so far.

4. Acting, assessing effectiveness, as well as determining the function of implementation, are all part of the fourth step. The action that needs to be taken to further improve the result is in the act phase.

As it is obvious from the previous analysis:

- The first step (Plan) is to set a milestone for what the organization hopes to achieve, and the second step (Do) is required for implementation as management provides training, inspection by the committee, and review and completion of the security and environmental management system. Finally, the process is completed.

- A gap analysis, followed by a follow-up gap analysis, and fine-tuning of the management system are all steps in the third step (Check). This step also includes conducting an internal audit.

- In the last step (Act), the management will decide on future improvements in light of the external audit, and the management system certificate will be ready at the end of this phase.

5. Concluding remarks

The need to improve business competitiveness has driven quality, while government regulations and union pressure have increased security, while law and society have done their part to improve the environment. The management philosophy for these functions was retrospective, which was based on an analysis of indicators to show what had occurred. Statistical process control based on specifications that operators and equipment must meet has evolved into participative systems QMSs and total quality management from controlling at the end of the process to eliminate defective products.

QMS and OHS are two management areas that are part of an integrated system, which has a common structure and three branches. A highly integrated system of management structures should reflect the hierarchy established at all levels to develop, implement, and maintain each branch that affects a specific area of management in terms of organizational and responsibility allocation.

Increasing flexibility, efficiency, and competitiveness are three key benefits of integrating the OHS and QMS. There are a few factors in the integration that can provide management effectiveness and the main focus is on cost-effectiveness, management improvement, and system benefits [6, 20]. Any organization that uses a management system can use the proposed methodology. For this reason, the implementation efficiency can benefit greatly from the use of the PDCA methodology [21].

An integrated QMS system requires a specific tactic for implementation because, while standards for each of the aspects show some similarities, they do not show a common methodology for integrated system development. There has been a parallel development of both quality and safety based on management strategy and priorities, and this has a significant impact on the added value of enterprise management, which will be examined as part of the company's due diligence [21].

Acknowledgements

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