

## QUALITY MANAGEMENT AND OCCUPATIONAL SAFETY AND HEALTH EFFECTS ON ORGANIZATION'S SUSTAINABLE DEVELOPMENT

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### **Abstract:**

Quality management is the attribute of successful companies who decided to implement a system able to grow and maintain consistent quality products and services in order to increase customer satisfaction, thereby increasing the company's profitability. The quality and consistent products is not sustainable unless it is supported, implemented unified and correlated with other quality management systems in the areas of occupational safety and health (OSH), environment, human resource, financial, project management that are related to important standards. Modern organizations' processes are based on the implementation of the norms and standards related to quality, occupational safety and health and environment. These three pillars are strong manage by actual modern approaches in the field of risk management and this is defined by an integrated management approach. The aim of this article is to present a comparison of the quality system (defined in accordance with ISO 9001), with the OSH system (as supported by the OHSAS 18001). The analysis will provide a perspective of the organizational system development by underlining aspects related to the logic of the three approaches implementation and the harmony generated. The theoretical analysis on the standards implementation underlines the importance of the risk mitigation initiatives. In the last part of the paper, there are shown some practical implications and results of the risk management in the case of an organization that have implemented the integrated management system (ambulance and emergency intervention service/process). The application of the Failure Modes and Effects Analysis (FMEA) method allow continuous improvement actions for risk mitigation.

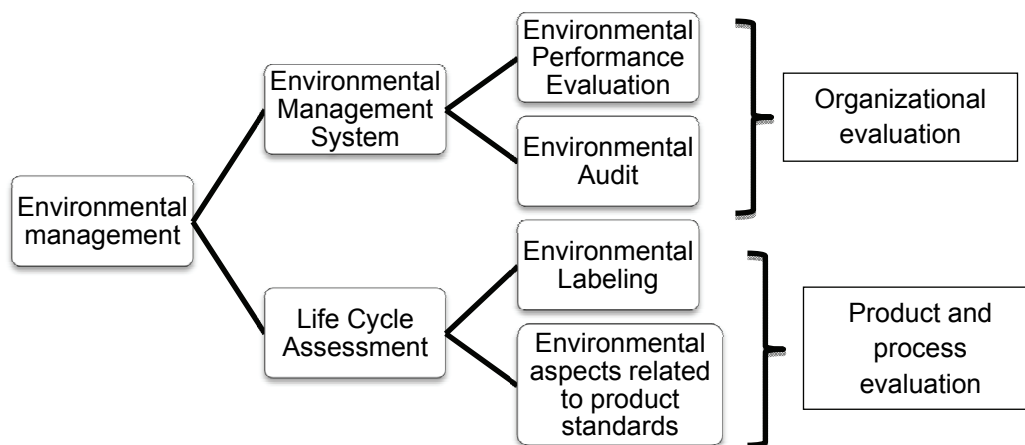
*Keywords: Quality management, occupational health and safety (OHS), integrated management, sustainability*

# 1. INTRODUCTION

In the last years organizations have increase their concerns for implementing and certification according to a defined Environmental Management System (EMS, according to ISO 14001: 2004 standard). This actions strongly support their environmental management and increase their products, services and processes competitiveness from the perspective of their impact on the environment (Picture 1). Generally, ISO 14001: 2004 standard proposes an EMS development approach that is based on the “Plan-Do-Check-Act” (PDCA) cycle, and the management system requirements are categorized as following: general requirements, environmental policy planning, implementation and operation, checking and corrective action, and management review (Bernardo et al. 2009).

However, this has standardized approach has been introduce in organization’s practice together with other management systems as those related to quality (according to ISO 9000), safety and security (according to ISO 18000 and ISO 45001), risk management (according to ISO 31000), social responsibility (according to ISO 26000), supply chains (according to ISO 28000) and other aspects or functions. Naturally, the related management systems should be implemented in an integrated manner, and thus will generate benefits from the created synergies (Bernardo et al. 2009).

**Picture 1:** ISO 14001 and the EMS



Source: adapted after (Melnyk et al., 2003)

Many practitioners and researchers have formulated a general opinion that quality and safety performance can support organization's competitiveness development, and also they can assure a solid base for the EMS design and implementation. The consequences of this practical approach will be: the minimization of financial loss, compliance with legislation, effective allocation of quality and safety responsibilities, and promotion of community goodwill (Pun & Hui, 2002).

In this context, the paper discusses and debates factors affecting safety-quality integration in quality management systems. It also debated the compliance requirements of OHSAS 18001 occupational health and safety management standard and that of ISO 9001 (quality) and ISO 14001 (environment management standards). The comparison and analysis will provide a perspective of the organizational system by underlining aspects related to the logic of the two approaches implementation and the harmony that is generated through their integration. The debated standards systems are capable of competing synergistically in order to ensure the sustainability development of the organization, along with other related systems.

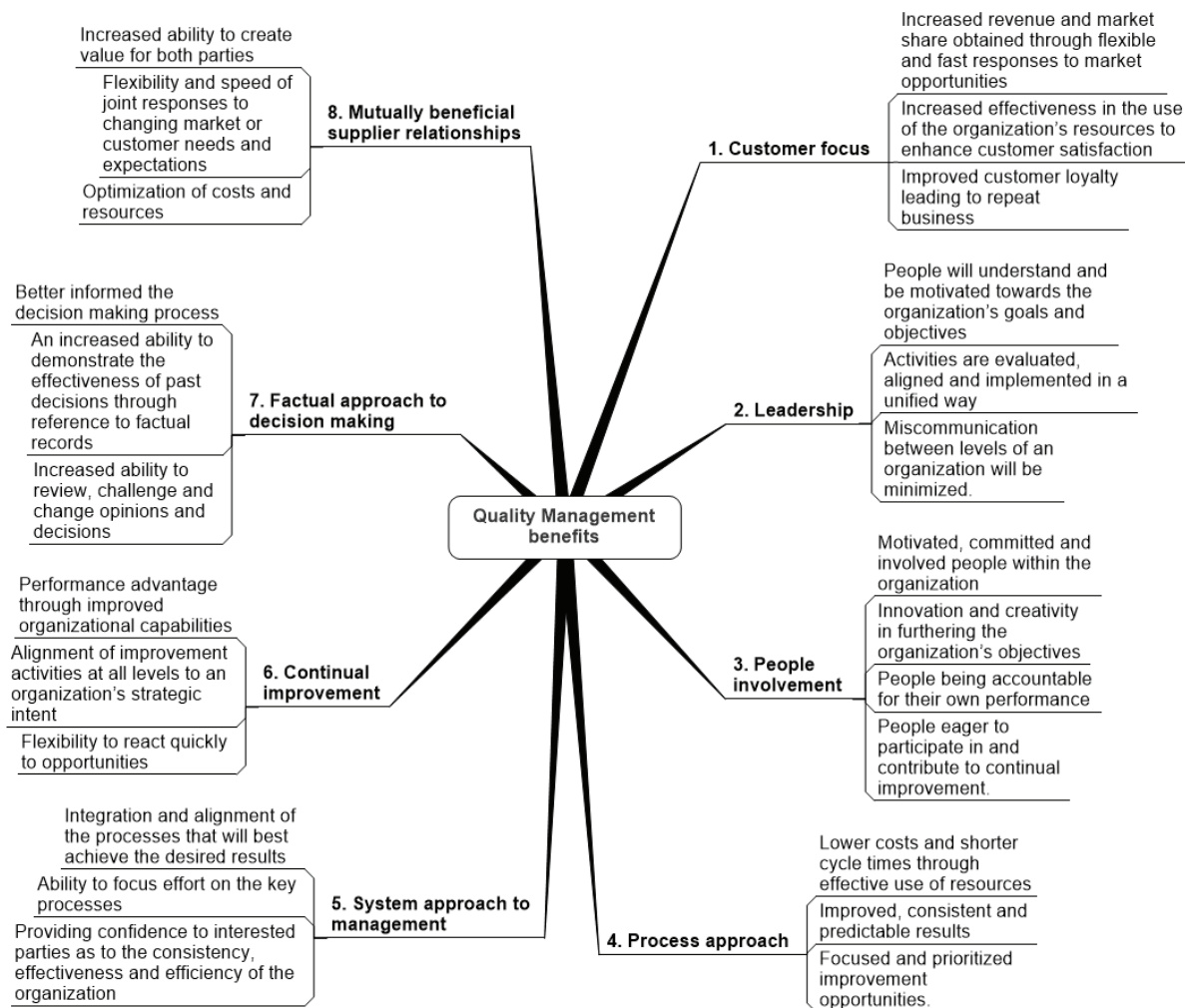
## 2. COMPARISON OF THE QUALITY AND OHS SYSTEMS

### 2.1. The quality management system

It is generally recognized that ISO 9000 standards are based on the *process approach* and eight quality management principles: customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision making and

mutually beneficial supplier relationships. In the context of the ISO 9001, management system requirements is described under five chapters: quality management systems, management responsibility, resource management, product realization, and measurement, analysis and improvement. As a synthesis of the literature and ISO 9000 standards family requirements there have been summarized the quality management benefits (assimilated with positive effects) with respect to the eight principles (Picture 2). These principles' benefits synthesis can be used by organization's management as a framework to guide the improved performance approaches.

**Picture 2:** Quality management benefits and effects in relation with ISO 9000 eight principles



Source: adapted and extended from (ISO 9001, 2005; ISO 9004, 2009)

## 2.2. The occupational health and safety management system

The OHSMS (Occupational, Health and Safety Management System) provides a set of tools that enhance safety risk management efficiency related to all the organization's work activities. This system should be considered as part of the management systems of any organization and it is a systematic means for employers to handle challenges of the risk behaviour and problems in the workplace environment. According to (Alli, 2008) synthesis, based on the actual laws, regulations, conventions and recommendations on OHS, the most important purposes of implementing strategies and tactics in the field are:

- Fundamental principles to guide policies for promotion, action and management OHS;
- General protection measures, for example, guarding of machinery, medical examination of young workers or limiting the weight of loads to be transported by a single worker;
- Protection in specific branches of economic activity;

- Protection of specific professions and categories of workers having particular occupational health needs (such as women or young workers);
- Protection against specific risks;
- Organizational measures and procedures relating to labour inspection or compensation for occupational injuries and diseases.

In relation with the above identified purposes, Table 1 shows the advantages and disadvantages of implementing an OHS management system.

**Table 1:** Advantages and disadvantages of OHS management system

Advantages	Disadvantages
<p><i>Support for risk management:</i></p> <ul style="list-style-type: none"> <li>- Can prioritise the planning, organising, control, monitoring and review of risk mitigation measures;</li> <li>- Help you allocate the correct resources, achieving effectiveness and efficiency;</li> </ul> <p><i>Focus on OHS:</i></p> <ul style="list-style-type: none"> <li>- Support employees having a greater understanding of OHS risks;</li> <li>- Strike the right balance in controlling all risks;</li> </ul> <p><i>OSH objectives will have the same importance as other business objectives:</i></p> <ul style="list-style-type: none"> <li>- Correct implementation of OSHMS will make sure that appropriate OSH objectives are set by focusing on policy and the process of setting objectives and their delivery through the management programme;</li> </ul> <p><i>Legal compliance is easier to attain and prove. Proving reasonably practicable in order to:</i></p> <ul style="list-style-type: none"> <li>- Demonstrate legal compliance and prove integration with other management systems as quality and environment;</li> </ul> <p><i>Support system integration:</i></p> <ul style="list-style-type: none"> <li>- Provide a holistic business risk management approach;</li> <li>- The formality and systematic approach to compliance encourages confidence in the organisation's internal approach;</li> </ul> <p><i>Continuous improvement:</i></p> <ul style="list-style-type: none"> <li>- Allows organisations to improve areas that aren't operating effectively or efficiently, using reviews and audits to identify systematically the opportunities for improvement;</li> <li>- Improve knowledge processes and encourage employees participation in health and safety issues;</li> <li>- Audits present an opportunity for benchmarking and identifying opportunities for improvement;</li> <li>- External certification and assurance bodies can help to identify non-compliances and necessary improvements;</li> </ul> <p><i>Visible commitment of top managers:</i></p> <ul style="list-style-type: none"> <li>- There's an ever-increasing requirement for them to follow codes of practice and meet the standards expected in public life;</li> <li>- Regular management review of audit reports</li> </ul>	<p><i>Bureaucracy and time to implement:</i></p> <ul style="list-style-type: none"> <li>- The system generates excessive paperwork;</li> <li>- Designing and implementing an OSH management system can be very time-consuming;</li> </ul> <p><i>Heavy demand on resources:</i></p> <ul style="list-style-type: none"> <li>- OSH requires resources to be allocated in all functions and at all levels throughout the organisation;</li> <li>- This can be offset by the inclusion and involvement of employees, key managers and safety representatives;</li> <li>- If some of the work is contracted out, take care to check that the results match the organisation's needs;</li> </ul> <p><i>Human behaviour may not be fully addressed:</i></p> <ul style="list-style-type: none"> <li>- The human behaviour change can be difficult if there's too much emphasis on the paperwork requirements of a formal OSH management system implementation;</li> </ul> <p><i>Certification and assurance bodies are still learning:</i></p> <ul style="list-style-type: none"> <li>- There can be conflict when auditors' interpretations of health and safety are different from those of the sector or organisation being audited;</li> <li>- The pressure to achieve certification for OSH management system can create stress on managers and employees;</li> </ul> <p><i>Integration:</i></p> <ul style="list-style-type: none"> <li>- There's a risk of diluting health and safety effort or creating inequality between management of quality, health and safety, and environment;</li> </ul> <p><i>Change resistance:</i></p> <ul style="list-style-type: none"> <li>- Barriers to change are invariably erected in the way of new systems;</li> </ul> <p><i>Managers do not understand the OHS system:</i></p> <ul style="list-style-type: none"> <li>- They require time, training and motivation to make sure they become advocates of the system and not enemies within;</li> <li>- They require effective communication to win people over;</li> <li>- There's a tendency to write down what's currently done and adopt through OSH management system.</li> </ul>

and results meets governance requirements.

OHSMS certification makes it possible for organizations to document a certain pattern of working conditions to demonstrate to both public and its own customers that they are living up to established production standards (Santos et al., 2013). According to (Granerud & Rocha, 2011), the OHSMS certification is a form of soft regulation requiring the company to fulfil certain legal obligations, as well as engage in organizational processes to promote the continuous improvement of health and safety conditions. The OHSMS certification itself liberates companies from direct public control and can thus be regarded as a self-regulatory regime. Furthermore, in recent years, these systems have further developed, so that now companies can have their management systems certified (Santos et al., 2013).

This development is consistent with the demand of external accountability in other areas, initially exemplified by the ISO 9001 quality standard. Thus, both ISO 9001 and later standards in other fields are characterized by the establishment of an internal systems of regulation and control within companies; systems that are certified and audited by external auditing agents (Hohnen and Hasle, 2011). Additionally, regulations based on ISO 9000 have been created to guide companies in developing systems for management and prevention of worker risks. Annexes of ISO 9001 give various clauses and sub-clauses related to the necessary elements of this standard (Vinodkumar and Bhasi, 2011).

### 3. RESEARCH RESULTS OF A CONDUCTED SURVEY

In the context of the theoretical analysis of the quality, OHS and environment standards related to the definition of an integrated management system, there have been developed a research using the Failure Modes and Effects Analysis (FMEA) in order to analyse risk management for OHS, environment and quality management under the integrated management system in the case of an ambulance and emergency intervention service unit. The organization has certifications for quality, OHS and environment and the integrated management system is well defined but sometime inadequate exploit into practice. FMEA method serves for the development of the system analysis in order identify the potential failure modes, and their causes and effects on system performance. The analysis was developed in the early stage of a system, so that removal or mitigation of the failure mode is the most cost. The Risk Priority Number (RPN) was calculated, based on the occurrence of failure (O), severity (S) and detection (D) ratings as shown in equation:

$$RPN= O \times S \times D \quad (1)$$

where O is the “occurrence” indicating the probability that the failure mode will occur as a result of a specific cause; S the “severity”, an assessment of the seriousness of the effect of the potential failure mode on the process when it has occurred; and D the probability that a potential failure will be detected.

Details on the occurrence of failure, severity, and detection for OHS, quality and environmental risks are tabulated in Table 2.

**Table 2:** Explanation on occurrence, severity, and detection for potential risks

Item	O	S	D
OHS risk	The probability of accidents and dangerous events on OHS	Seriousness of the effect of accidents and dangerous events on OHS	The probability that accidents and dangerous events on OHS will be detected
Environmental risk	The probability of hazardous events to the environment	The probability of hazardous events to the environment	The probability that hazardous events on the environment will be detected
Quality risk	The probability of failure on quality	Seriousness of the effect of failure on quality	The probability that failure on quality will be detected

Source: adapted from (Zeng et al., 2015)

**Table 3:** Definition the scale table of Occurrence (O), Severity (S) and Detection (D)

Score	O	S	D
10	The problem permanent arises	The patient's life is endangered	The problem cannot be detected
9	The problem arises on 1/10 cases	The legislation is not applied	No existing measures for the problem detection
8	The problem often arises on 1/50 cases	Major additional medical problems occur	The detection problem is done by the client (patient) through complaints (dissatisfaction)
7	The problem often arises on 1/100 cases	Minor additional medical problems occur	The problem detection is done by random checks
6	The problem often arises on 1/500 cases	Medical procedure with no positive effect	The problem detection is done by internal audit
5	The problem occurs occasionally, on 1/1000 cases	Failure in applying organizations' own/internal rules, norms	The detection problem is done by planned checking actions
4	The problem occurs occasionally, on 1/5000 cases	Medical procedure with minimal positive effect; problems in communication with the patient	The detection problem is done at a later stage
3	The problem is rare, it arises on 1/20000 cases	Medical procedure with minimal positive effect	The detection problem is done using a control or checklist
2	The problem occurs on 1/100000 cases	Slightly disgruntled patient	The detection problem is almost certain
1	The problem never appears	No effect on patient	The problem is certainly detected

Source: Authors own development

In the case of the ambulance and emergency intervention service unit there have been established the assessment criteria that will be used as shown in Table 3. There have been adopted a scale with 10 points (in which 10 represents the most possible in occurrence, the most serious in severity and most detectable and 1 is the least) in order to evaluate risks. The team members of FMEA (researchers and responsible person of OHS and quality in the organization) were requested to provide their scales on evaluation of occurrence, severity, and detection for potential risks, which were averaged for calculating RPN (RPN = 160 was established as the acceptability limit). The analysis done have underlined 183 risks having a RPN  $\leq$  160 and 11 risks have a RPN  $\geq$  160 (from 194 total identified risks). The acceptability of risks typology determine four scenarios: acceptable (RPN  $\leq$  99), moderate ( $100 \leq$  RPN  $\leq$  159), undesirable ( $160 \leq$  RPN  $\leq$  199), and unacceptable ( $200 \leq$  RPN  $\leq$  280). For the risks categories with RPN  $\geq$  160 (undesirable and unacceptable) there were identified 9 cases unacceptable, as presented in Table 4 together with the measures for their management.

**Table 4:** Identified causes for risks with RPN  $\geq$  160 and the risk mitigation measures

RPN	The problem	Causes	Effect	Risk type	Measures for risk management	
280	Unacceptable risks	Inadequate patient transportation to the healthcare unit	Insufficient medical knowledge and/or medical equipment	Medical, healthcare service delivered improperly	Quality	Qualification audit and equipment checking
216		The ambulance and the medical team reach with delay the patient	Negligence of the dispatch personnel	The nearest medical team was not identified	Quality	Quality and processes checking

210		Deliver an inadequate medical, healthcare service on request (during application)	Inadequate professional training	Medical, healthcare service delivered improperly	Quality	Quality and processes checking Proper training
200		Failure in confirming the technical verifications of the ambulance when takeover	Logbook un-completed (no fill-up)	The ambulance is technically non-functional	OHS	Qualification audit and equipment checking Safety precautions
196	Undesirable risks	Use inadequately the disinfected instruments	Breaking the asepsis rules	Instrumentation disinfected and the possibility of infected the patient, medical staff and the environment	Quality, OHS, Environment	Qualification audit and equipment checking Environmental management procedures and training
189		Unsafe transportation for the patient to the medical care unit (hospital)	Failure to observe traffic rules	Inadequate transportation of the patient by ambulance	OHS	Safety training Qualification audit and equipment checking
168		Use disinfected instruments	Failure disinfection	High possibility of infected the patient	Quality, OHS, Environment	Qualification audit and equipment checking Environmental management procedures and training
160		Inaccurate identification of patient location	Insufficient knowledge of the territory	Inaccurate identification of the patient location and delay in arriving at the requested place	Quality	Quality and processes checking Training and checking
160		Delays in the identification of the applicant requirements	Insufficient time (time crisis)	Delay in retrieving the call	Quality	Quality and processes checking Training and checking

Source: Authors development

#### 4. CONCLUSIONS

With a wider acceptance of ISO 18001 for OHS management, ISO 14001 for environmental management and ISO 9001 for quality management, the defined integrated management system based on the mention standards implementation, has become a usually practice for today's organizations. In this context, the paper has presented (based on literature review) benefits, advantages and disadvantages of implementing ISO 9000 and ISO 18000 family standards. Important statements were made in order to underline the managerial aspects of their implementation in order to define the related management system.

The integration of different management system, as the quality, OHS and environment are, is a difficult approach from the practical perspective. The difficulty of integration rises from alignment of these management systems with organizational strategies, too. These issues has been underlined by the research results in the case study. The main aim of the applicative research was to discover the impact of the defined integrated management system (based on quality, OHS and environment related management systems integration) on risk management in the particular case of the ambulance and

emergency intervention service unit. Furthermore, this aim was related to the achieving of continuous improvement in the case of the chosen organization, when implementing an integrated management system, through the risks management and control (in the case of quality, OHS and environment aspects).

Using FMEA method and the involvement of the authors of this paper with representative staff from the investigated organization, there have been discovered gaps in risk management. The main cause of the phenomena is related to low level of procedures checking and the low activity of personnel training in applying and respect the quality, OHS and environment procedures (according with the implemented integrated management system).

In the ambulance and emergency intervention service unit practice, the unacceptable risks should be minimized through prevention or protection measures (see Table 4). The main goal of risk management is to keep risks at an acceptable level by maintaining the tolerable risks and following the programs in moving unacceptable risks to an acceptable level. Furthermore, risk management must involve risk mitigation measures so as to fulfil OHS, environmental and quality management programs, leading to a reduction of risk levels. All these are designed to avoid accidents, incidents, injury, or occupational diseases. In the event of an accident that has already occurred, a necessary part of risk management is the management of crisis for minimizing of losses/impacts, aspects that have to be considered in the case of the investigated organization (urgencies for being designed and implemented).

Accordingly, measures for risk management for the nine undesired and unacceptable potential risk factors of OHS, environment and quality were listed in Table 4. In addition, from the results of the investigation, it is revealed that training programs have to be prioritized to be the most effective measures in an integrated risk management. Effective trainings could help personnel carry out various activities, establish a positive safety attitude, and integrate safety with environmental and quality goals.

There are some limitations in the research described in this paper. FMEA method has been focused on integrating OHS, environment and quality risks. The issue of quality of urgency medical services and the related processes to achieve the required quality levels have only been lightly touched upon although there must be many important quality issues waiting to be discussed.

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