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► **To cite this version:**

Fatima Bennouna, Aicha Seklouli-Sekhri, Driss Amegouz. Methodology of implementation of a QSE integrated management system. 7th International Conference on Software, Knowledge, Information Management and Applications (SKIMA2013), May 2013, CHIANGMAI, Thailand. hal-04170838

HAL Id: hal-04170838

<https://hal.science/hal-04170838>

Submitted on 27 Jul 2023

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Methodology of implementation of a QSE integrated management system

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Abstract: Nowadays, under the pressure of the globalization and the competition, the companies use more and more quality, security and environment process management and certifications. In this sense, we observe several practices of quality, security and environment but established separately, due to the lack of reference table. Currently, there is no repository for the Integrated Management System (IMS); companies must rely on repositories of three management systems: quality, safety and environment, which can engender contradictory situations and redundancy in terms of actions of improvement. At the international level several standards were introduced but remain very complex to implement. Consequently a need in terms of methodology is imperative. For that purpose, we are going to adopt the following plan: we are going to present the models and the existing theories through the literature review, after that we will suggest the developed methodology and finally we are going to test this methodology through a case study.

Keywords: integrated management system; IMS; risk management; quality function deployment; continuous improvement; quality; security; environment.

1 Introduction

In a current demanding situation, in front of aggressive and constantly developing competition and in a context of sustainable development, companies should now take into account a range of factors relating to the quality, security and environmental (QSE).

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This cannot be done without the juxtaposition of several systems, which is difficult and complex, and can lead to contradictions and inconsistencies or poor visibility goals.

Several areas of management have been formalized, precisely to meet the needs of managers and help them review their organization and management practices. However, it is important today to propose a methodology for integrating the three management systems (quality, security, and environment). It will seek the sustainability of business development because the QSE management has become a strategic priority for enterprises.

In the present work, we will at first, present the various theoretical approaches of the integrated management system quality, security, and environment. In a second step, we will present a methodology of implementation process of an integrated system. And finally we will conclude with case study realized in a company.

2 Literature review

Throughout our readings, we have seen several approaches of QSE integration which allow the fusion between the three management system quality, security and environment.

2.1 Approaches of QSE integration

First, the risk management as it has been used for OHSAS 18001. Indeed, the approach to risk assessment represents a major axis of similarities found in the logic of integration of management systems. Leaders must manage and foremost assess. To do this, they must be identified and minimized. Any economic activity generates risks.

According to Labodova (2004), this integration methodology based on risk management is done in seven stages:

- 1 description of the production system and its environment
- 2 identification of sources of danger and possible target systems
- 3 combinations of scenarios and identification of possible actions
- 4 risk assessment in terms of probabilities and consequences
- 5 implementation of the objectives
- 6 definition of means of prevention
- 7 management of human, financial and material resources to achieve the planned objectives.

Risk management must involve all company procedures.

Secondly, we find the notion of generic processes, a new concept that supports and facilitates the integration of systems, as confirmed by Ekcl and Harmand (2007).

This model supports various management systems they are related to quality, environment and security. This model provides the company with sufficient flexibility to incorporate different types of requirements in a single system.

A final point is the degree of integration of each process, because there is no single way to integrate QSE process for all companies, but each company has its specificity and its characteristics. That is why we have found through our reading that there are several levels or degrees of integration.

Seghezzi (1997) describes three "different paths to system integration: adding, merging and integration." For "addition", the sub-systems for quality, environment and security, and are kept separate «Described in separate documents." For "fusion" work instructions are fully integrated, but not procedures and the manual "total system is created, but the subsystem is still visible." For "integration", companies can choose or develop a generic management system as their general system and include all sub-systems. "

Kirkby (2002) proposes an approach that has three main models of IMSs. The first level is "separation" where the systems are independent; the second is "alignment" in which different

systems may have common points such as internal audit and management review. The third level is the "integration" it combines all the systems into one common system.

For Karapetrovic (2002), there are three degrees of integration only documentation process alignment, objectives, and resources and finally the integration of all parts of management systems in a single repository.

Having presented the literature review, we are going to introduce the proposed methodology.

3 Methodology of integration

Before presenting the methodology which we propose, it is necessary to define the basic notions on which it bases.

3.1 Basic concepts

- The QSE customer: the client orientation is a common principle in the three management systems ISO 9001, ISO 14001 and OHSAS 18001. However, for the QSE IMS which we propose, we consider the customer as all the persons who receive and who use the result of the work of the company. The target consumer is an essential customer, the retailer is a customer; but also inside the organization every department is at the same time the internal customer and the supplier of the other departments. Every person is at the same time the internal customer and the supplier of his colleagues.
- The QSE need: it is all that is needed and required; he can be explicit or implicit and emanates from the internal or external customer, as mentioned in the international standards. It takes into account the three domains quality, security and environment.
- The QSE risk: in a system approach of integrated management, Afnor AC X50-200 (2003) defines the risk as: "a sudden or deferred event which can pull a non-satisfaction of needs and waits of one of the interested parties".

The analysis of the risk can be led basing on the process approach. It has to take into account all the consequences for all the interested parties.

3.2 Methodology

The proposed methodology aims at defining the QSE actions which answer to the quality, security and environment needs in a correlated way and without incoherence. To answer these objectives, we combined three principles:

a. The process approach:

Strongly advanced by the ISO9001 standard, the process approach is a tool of quality management which consists in describing methodically a company, by a set of process.

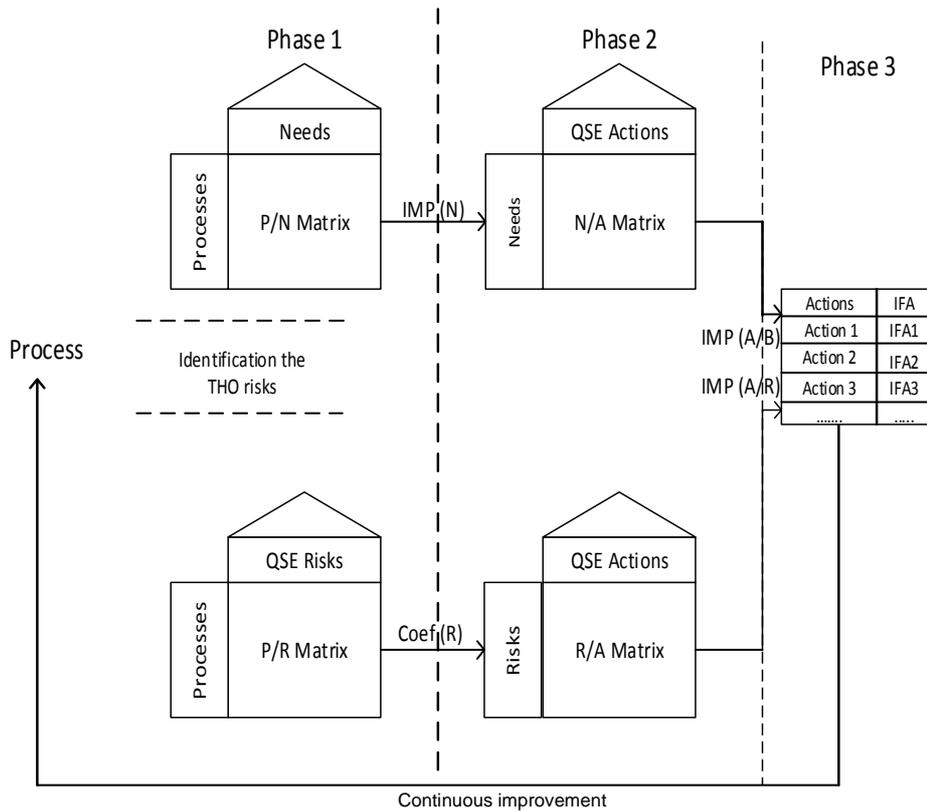
Faucher (2007) suggests that it can be interesting for the company to have a global process approach by integrating the listening of needs and expectations of all the interested parties with the consideration of the quality, security and environment aspects.

In an IMS, it is a question of modeling the cartography of the processes of the company by representing set processes relative to the quality, the security and the environment and their interactions in a global vision.

- b. The principle of the deployment of the QSE need:
We were inspired by the method of deployment of the quality function DQF developed by Akao.Y (1993). This method allows bringing continuous improvements to the defined QSE needs.
- c. The principle of the continuous improvement, guaranteed by the principle of the iterative deployment of matrices of the DQF method. We identify the most important QSE actions of our integrated management system.

As illustrated in this synoptic schema.

Figure 1: The synoptic schema of the developed methodology



3.2.1 Phase1: The process approach

This first phase of our methodology can be declined in 4 stages:

- Identification of the processes

- Identification of the needs related to the processes
- Identification and quotations of the risks of every process
- Calculation of the coefficient of the risks for every process.

Having identified all the quality, security and environment processes of the company and their interactions.

The stage of the identification of the needs for the company and for the customer expectations comes.

The three domains quality, security and environment answer to the needs of the customers:

- The quality to those of the external customer.
- The security to those of the internal customer.
- The environment to the customer as citizen.

However the question that can be asked is how to make so that quality needs do not compromise security and environment needs and conversely.

We start by the construction of a process/ needs matrix for every management system separately. This matrix will allow us to analyze the relations between processes and needs related to every process and to establish the correlations between these needs.

So that, we calculate the importance of every need related to the three systems:

- The degree of integration of the process (PID): represent the relative impact of every process on our QSE system, ranked according to balanced coefficients which can be determined by the company.

- The relations processes/needs: the matricial expression of the correlations takes the shape of symbolic conventions. We identify three types of correlations: a strong correlation, an average correlation and a low correlation. We represent them successively by: ⊙, ○ and △. After that, valuable balances are used to quantify each of these symbols. The scale (1, 3, 9) quantifies for example a relation (low, average, strong).

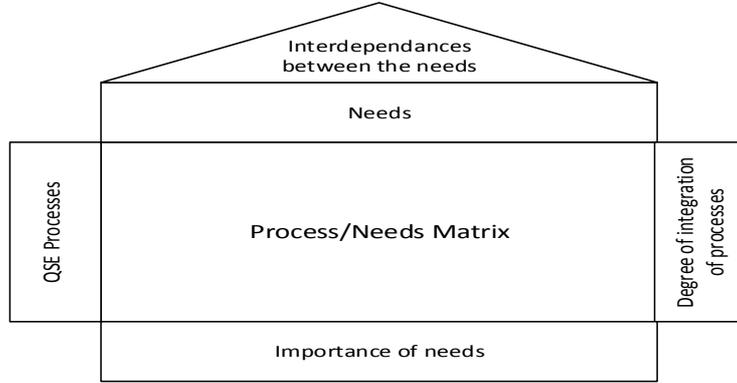
- The interdependence between the needs: in the same way, we have to highlight the correlations between risks, and specially the conflicting relations. By inspiring us of the classic DQF approach, we identify four degrees of technical impact: ++ strong positive impact; +Average positive impact; < > No impact; - average negative impact; -- strong negative impact.

- The importance of a need "j" (IMP (N_j)) is calculated by the formula (1):

$$IMP(N_j) = \sum_i \left[(PID)_i \times correlation(process_i / need_j) \right] \quad (1)$$

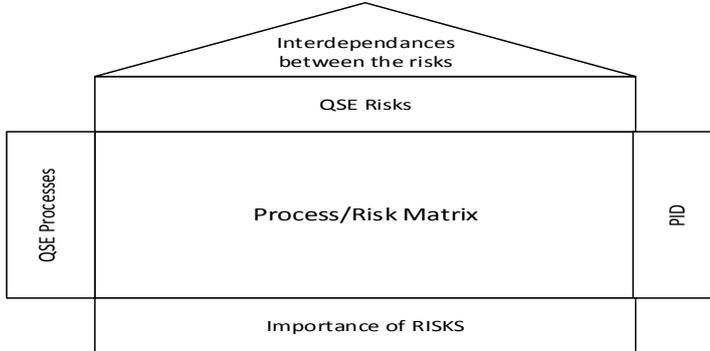
The calculation of the importance of every need allows us to determine the priority needs which present a strong QSE correlation.

Figure2:Process/needsmatrix



To master our QSE processes, it is necessary to integrate the risk notion in our approach. The risk assessment constitutes a crucial stage of the approach of prevention of the contradictions and the incoherence which can exist in our integrated system. We begin with the identification of the technical, human and organizational risks as we find in the CEI 31010 (2009), then we shall proceed to the analysis and the classification of these risks. The risk assessment must be regularly renewed.

Figure3: Process/risks matrix



The evaluation of risks is done by calculating a score (S) according to three parameters: the frequency of the risk; the gravity; and the possible consequences.

$$S = \text{frequency score} \times \text{gravity score} \times \text{possible consequences score} \quad (2)$$

Scores of the three parameters vary on a 1 to 5 scale according to the importance of the parameter.

After that, we place the major QSE risks and the process identified in the previous stage in a (Process/Risks) matrix and establishes the relations and the correlations.

Then, we calculate the importance of the risks by using the formula (3):

$$IMP(R_j) = \sum_i \left[(PID)_i \times correlation(process_i / risk_j) \right] \quad (3)$$

By taking into account the score of every risk, we determine the risk coefficient risk Coef (R) obtained by the following formula:

$$Coef(R) = S(R) \times IMP(R) \tag{4}$$

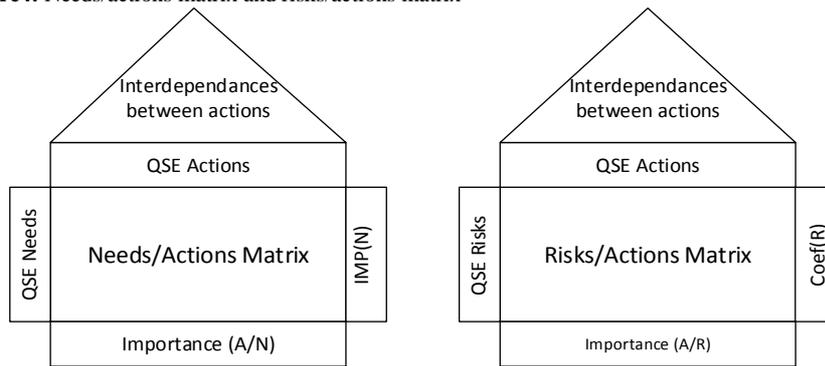
This risk coefficient indicates the factor risk of every process by taking into account correlations between the QSE processes, to determine the most critical processes.

3.2.2. Phase2: The deployment of QSE needs

At first, we establish the (needs / actions) matrix as illustrated in Figure 4 which allows us to calculate the importance of every action related to the needs IMP(A/N). So that, we estimate the capacity of every QSE action to answer to the QSE needs.

Secondly, we establish the correlations between these QSE actions and the risks identified and evaluated in the first phase of our methodology. So that, we can be sure that our QSE actions contribute in reducing all the risks without incoherence. For that purpose, we establish the (risks/actions) matrix (Figure4):

Figure4: Needs/actions matrix and risks/actions matrix



The importance of the action 'j' related to the needs IMP(A_j/N) is calculated by the following formula:

$$IMP(A_j / N) = \sum_i \left[IMP(N_i) \times correlation(need_i / action_j) \right] \tag{5}$$

The importance of the action 'j' related to the risks IMP(A_j/R) is calculated by the following formula:

$$IMP(A_j / R) = \sum_i \left[Coef(R_i) \times correlation(risk_i / action_j) \right] \tag{6}$$

This, will allow us to identify the QSE integrated actions which meet the expectations of the three management systems quality, security and environment by taking into account the risks of our integrated system.

3.2.3. *Phase3 : continuous improvement*

From the obtained results, we deduct the impact factor (IF) of every QSE action, which we calculate by the following formula:

$$IF(A) = IMP(A/N) \times IMP(A/R) \quad (7)$$

This factor indicates the level of the impact of every action on our QSE system by taking into account the QSE needs, the QSE risks and the correlations and interdependences which exist between three management systems quality, security and environment. Once the QSE integrated actions that we identified implemented, this will allow us to exceed a level of risk, to reach expectations of the customer and to join the process of continuous improvement. That's, because all the management systems are based on the principle of the continuous improvement.

4 Case study

In order to validate the methodology suggested, we tested it in a company.

4.1. *Results*

After analyzing the process cartography of the company and identifying the QSE processes and needs. We deployed our methodology in order to determine the priority integrated actions by calculating their QSE impact factors.

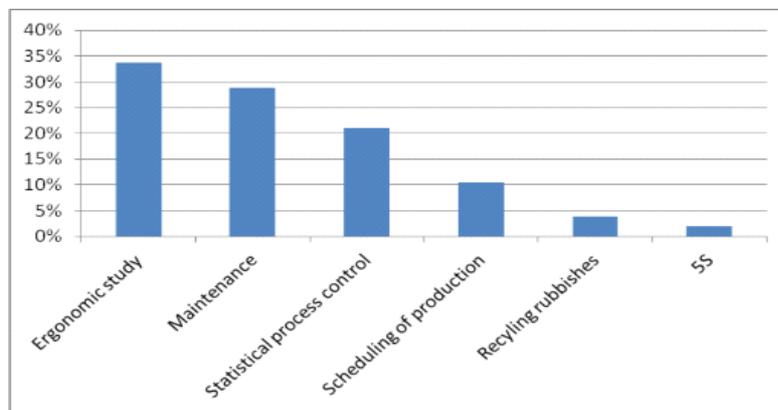
For that purpose, we established the four matrices presented in the methodology developed. For example, we present the results of the needs/actions matrix in the Figure 5.

Finally, we combine the results obtained in the needs/actions matrix and the results of the risks/actions matrix by using the formula (7). Then, we calculate the impact factors of the QSE actions. The results are presented on the histogram below to visualize better the most urgent QSE actions:

Figure 5: Needs/actions matrix

Needs/QSE Actions							
		SPC	Maintenance	Ergonomic study	Recycling rubbishes	5S	Scheduling
	IMP						
Conformity of products	37,3	○	○	○	○	△	
Ergonomy	25		○	○		○	
Recycling	15,5				○		○
Cleanliness	7			△		○	
Respecting deadlines	15,2	○	○				○
IMP(A/N)		381,3	458,1	567,7	251,4	175	183,3
		19 %	23 %	28 %	12 %	9 %	9 %

Figure6 : Histogramm representing the impact factors of QSE actions



4.2. Interpretation of the results

According to the obtained results, we noticed that the integrated action to implement first is an ergonomic study of the operations realized by the operators because this has an important impact on the variability of the process and engenders musculo-scrawny disorders. This action also influences the security aspect as illustates the matrix.

Both actions which follow and which have an important factor are the quality control and actions of maintenance. These actions have impacts on the various shutters quality, security and environment simultaneously.

This, will allow to integrate afterward a process of continuous improvement QSE.

5 Conclusions

Today the implementation of an IMS is the main pillar for an approach of sustainable development in companies. In this frame, we proposed a methodology of integration of the quality, security and environnement concepts which bases on three stages: the process approach; the analysis of QSE needs and risks and continuous improvement. As perspectives of this work it would be interesting to test the methodology on other types of companies and other business sectors.

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