Investigating the Impact of QSE Integration on Process Performances: An Empirical Study in Moroccan Companies

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Nowadays, companies implemented multiple Management System Standards (MSSs) to improve organizational performance in quality, security and environment functions. However, there is no unify integration standard to use, that's why companies use different approaches in order to manage quality, security and environment (QSE) integration. The first aim of this article is to analyze the extent to which QSE Management systems are really integrated and which methodologies are used by enterprises, the second aim is to analyze the impact of this integration on process performance. To this end, an empirical study was carried out on 100 companies in Morocco.

Keywords : Integrated Management System (IMS), Quality, Integration Level, Security, Environment, Process Performance

1. Introduction

The ever-increasing tendency of the International Organization for Standardization to publish new management systems has driven many organizations to multiple certification implementing two or more systems with different scopes, such as quality management, environmental management, occupational health and safety, etc, as confirmed by Wiengarten et al., (2017).

The structural similarities between these systems have prompted organizations to try to unify them into a single system, instead of implementing them separately, according to Pano. T (2018).

In fact, although integration and IMSs have been studied in detail from theoretical point of view, there has been very little related empirical study. However, these researches do not explicitly study the relation between the integration of MSs and the enterprises efficiency, in other words what is the impact of the integration of QSE management systems on the processes performance? Also, is the approach used for integration influence the processes performance?

The main aim of this paper is to provide an empirical response to these questions. So, 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 an empirical study realised on 100 Moroccan companies.

2. Literature Review on QSE Integration Management System

Karapetrovic & Willborn, (1998); Beckmerhagen, Berg, Karapetrovic, and Willborn, (2003) defined an Integrated MS (IMS) as a 'set of interconnected processes that share a pool of human, information, material, infrastructure, and financial resources in order to achieve a composite of goals related to the satisfaction of a variety of stakeholders'.

Organisations may have multiple MSs implemented and has the option to manage them either separately or in an integrated manner as tested by Bernardo. M, Gotzamani. K, Vouzas. F & Casadesus. M (2016).

In the literature, Bernardo (2016) attested that the process of integrating multiple MSs can be divided into four main aspects namely integration strategy, integration methodology, integration level and systems' auditing integration.

In this paper, we will focus on two aspects of integration: methodology and level or degree of integration; and their relation on processes 'performance.

2.1 QSE Integration Approaches

Several approaches of QSE integration allow unifying the three-management systems quality, safety and environment, many authors have suggested various integration methodologies

First, we find the Plan, Do, Check, Act (PDCA) logic which constitute one of the pillars of all management systems and allows them to be dynamic instead of static, and constantly improving. This finding is also confirmed by Savino and Mazza (2014), who explained how integrated environmental and quality continuous improvement can occur through a practical implementation of PDCA cycle.

Secondly, 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. A (2004), this integration methodology based on risk management is done in seven stages.

In this case, Bennouna. F, Sekhari. A, and Amegouz. D (2014) proposed an integration methodology based on the Quality Function Deployment (QFD) and risk approaches.

Thirdly, a survey conducted in Spain by Simon. A, Karapetrovic. S, Casadesus. M (2012) shows that the analysis of common elements of standards and process map are the most common methods used during the integration process.

In addition, we find the notion of generic processes, a new concept that supports and facilitates the integration of systems, as confirmed by Harmand and Eckl (2007). This model supports various management systems related to quality, environment and safety. This model provides the company with sufficient flexibility to incorporate with different types of requirements in a single system. The generic processes as defined by Eckl (2004):

- Responsibility, Commitment and Leadership;
- Conception / planning;
- Resource management;

- Realization;
- Measures, Audits and Reviews;
- Analyses / studies;
- Corrective and preventive improvement.

Also, Puri. S (1996) proposed a “ten phase road map for developing and implementing an integrated EMS/Total Quality Management system”, Karapetrovic and Willborn (1998) discussed a system based approach with seven integration steps, Wright (2000) presents “the key elements” to integrate MSs based on ISO 14001 (five steps) and OHSAS 18001 (four steps) with ISO 9001, and Zeng et al. (2006), in an empirical research project in China, proposed a three-level “synergetic model for implementing an IMS”.

2.2 Integration Level

Another 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.

Wilkinson and Dale (1999) describe a four-level model. The first level “applies to individual MSs, where the system is integrated into every function and activity” of the organization. The second level is a combination of “systems based on the identified linkages between MSs”. The third level “involves integrating selected parts” of MSs “with other certificated systems, but without using identified linkages”. The fourth level “is to integrate both certificated and uncertificated systems with the overall MS”, with the policies and objectives “aligned to and supporting the overall strategy, policy and objectives of the business.”

Seghezzi (1997) describes three "different paths to system integration: adding, merging and integration." For "addition", the sub-systems for quality, environment and safety, 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 integrated management systems. 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" which combines all the systems into one common system.

For Karapetrovic (2002), there are three degrees of integration: those which have integrated only documentation, those which have aligned processes, objectives, and resources and finally those which have integrated all parts of management systems in a single management system.

Bernardo et al. (2012a) argue that those organizations that implement QMS and EMS simultaneously achieve higher levels of integration, while those implementing more MSs separately achieve lower levels of integration.

2.3 IMS and Process' Performance

Many authors studied the link between IMS and companies' performance. Bernardo

et al. (2012) attested that Incorporation of objectives, resources, procedures, and strategic goals of a firm can be a good way to tackle problems, create competitive advantage and sustainable development. Also, Bernardo et al. (2015) conducted a literature review in the Web of Science, Science Direct, Scopus and Emerald databases to identify the benefits and difficulties arising from implementation and use of IMSs. In all, 18 empirical articles were analyzed and the results showed that the companies which integrate their management systems have obtained more benefits when compared with companies that choose to manage the systems separately.

In this case, the correlation between safety, environment and improvement of productivity has been studied by Savino and Mazza (2014) and Savino et al., (2017). In addition, Savino and Batbaatar (2015) confirmed that the understanding that productivity can be increased with better health and safety conditions and with the consideration of social issues has been linked to production and operational performances as well as to the health, safety and social issues of workers and employees. Some investigations were also directed towards safety and ergonomics issues (Savino and Batbataar, 2015; Savino et al., 2017), exploring how safety and working environment may influence production performances.

More recently, Bernardo et al. (2018) confirmed that top management consider integration as a strategic toll to gain competitive advantage.

Thus, the idea of forming integrated MSs has become a strategic decision and has attracted the attention of both practitioners and scholars because of its relevance in achieving competitiveness and sustainability as conclude by (Rebelo et al., 2016).

The main conclusion that can be drawn from this literature review is that the question of integration has been approached by several authors using different methods. Also, level of QSE integration were related in different works and discussed from different point of view. In addition, several authors studied benefits of integration of quality, safety and environment in one management system and confirmed the positive impact of integration on competitiveness. However, the questions of the impact of QSE integration on process' performance and which methodology of integration impact more efficiency and performance, especially in Moroccan companies, are not enough studied. So, we are going to present an empirical study that can contribute to answer to these questions.

3. Methodology

A questionnaire was sent to 100 companies that can have or not an ISO certificate. These companies are located in Morocco. This study was carried out over 8 months to allow collecting maximum data.

The questionnaire was addressed to the MS managers of the organization. It was divided in three sections:

- Certificates that enterprises have or not;
- Integration approaches used by enterprises and reasons that push them to integrate management system;
- Impact of integration on processes' performance.

We will present and interpret the various information collected in the survey in order to respond the questions mentioned in introduction.

4. Results

To know the position of Moroccan companies relative to integrated management and their degree of commitment to an integrated management system QSE, we conducted an exploratory study of Moroccan companies and multinationals companies in Morocco. A questionnaire was sent to small, medium and large companies in different sectors of activity.

The objective of this study is to determine the existing management systems in companies, analyze the willingness of companies to move towards an IMS or not and to study integration approaches used by enterprises and the impact of QSE integration on process' performance.

4.1 Descriptive Analysis

4.1.1 Certifications

The first result of this survey shows that over 100 Moroccan companies who responded so far, 90% of them are for the establishment of a QSE integrated management system, knowing that 92% of the companies surveyed have opted for at least one certification or they consider starting another one.

Figure 1 *Certifications of the Companies*

The first axis we have analyzed is certifications obtained by these companies. We can see through the figure above that more than 62% of companies are ISO 9001 certified with 22% who received three certifications ISO 9001, ISO 14001 and OHSAS 18001, as we can see in the chart above.

These results reflect necessarily the interest of companies for quality, safety and environmental aspects.

An integrated management system will allow significant time savings in terms of development, especially when we have multiple management systems. According to the results of the survey, a certification project requires an average of 18 months for each system.

4.1.2 Integration Approaches

The second axis allows us to analyze which integration approaches are more used by companies.

As explained in literature review, there are many integration methodologies. In this case, we asked companies about approaches that are used.

The figure below shows that over 45% of respondents used the Plan, Do, Check and Act principle (PDCA) as an integration methodology. In the second position, we find risk management as integration approach. Thirdly, 20% of respondents attested that they use synergic models based on standards, especially ISO standards (ISO 9001, ISO 14001 and OHSAS 18001) as integration approach.

Figure 2 Integration Approaches

4.1.3 Integration Level of Processes

We started by asking companies about integration level of processes in order to identify processes that have higher integration levels. We asked MS managers to affect an integration degree to the most important processes, by using this classification (Table1):

Table 1 Integration Level

Integration level	Processes
Fully integration	Processes that are totally managed by considering the three aspects quality, security and environment.
Partially integration	Processes that are partially integrated
No integration	Processes which don't consider integration and quality, security and environment are managed separately.

Figure 3 Integration Level of Processes

The results presented in Figure 3, show that the majority of enterprises use fully integration to manage “documentation” (90% of enterprises) and “Ressources management” (92%) processes. Managers justified this choice by many reasons such as saving time, avoid redudancy especially in documentation process,etc. Reasons of integration are more detailed in the next paragraph.

4.2 Correspondence Analysis: Linking Integration Level with Process Performance

In order to establish the correspondance between impact of integration and processes’ performance, we asked managers about performance of the processes studied previously.

The performance was studied by using the Key performance indicator (KPI) that evaluate the success at reaching the main target of the process.

In order to facilitate the questionnaire analysis, we classify process performance into three categories:

- High performance: for processes that reach more than 70% of their main goal.
- Medium performance: for processes that reach more than 40% of their main goal and less than 70%.
- Low performance: for processes that reach less than 40% of their main goal.
- The results presented in Figure 4 show the percentage of companies opting for high, medium or low performance for each studied process.

Figure 4 Performance of Processes

We observed that 80% of enterprises attested that “Documentation process” have a high performance, also 85% of them confirmed that “Resources Management process” have also high performance.

In order to establish the link between processes’ performance and integration level, we studied the proportionality of these two data by calculating the coefficient of proportionality (P.C.) that is the ratio between the percentage of enterprises that answer ‘high performance’ on the percentage of enterprises that respond ‘fully integration’ for each process.

Considering that more than 50% of enterprises answer ‘fully integration’ for all processes; we calculate the proportionality coefficient (P.C.) for these enterprises.

Table 2 Proportionality Coefficient (P.C.)

Process	% enterprises High performance	% enterprises fully integration	P.C.
Planning	76%	72%	1,06
Internal audit	60%	60%	1,00
Control	40%	50%	0,80
Documentation	80%	90%	0,89
Production realization	60%	62%	0,97
Continous improvement	50%	68%	0,74
Maintenance	70%	78%	0,90
Resources management	85%	92%	0,92

We can observe from the results presented in Table 2 that for all processes $0.74 \leq P.C \leq 1.06$ and for 7 processes out of 8, the P.C is higher than 0.8. This result proves that for the majority of enterprises (more than 50%), high performance is proportional to fully integration, because percentage of companies that answer ‘fully integration’ is almost the same percentage that answer ‘High performance’, for all processes.

This result shows that as long as the integration level is high, the processes’ performance is also high.

We can see this proportionality in the Figure 5 that presents the correspondence between fully integration and high performance of process.

Figure 5 Correspondance between Integration and Performance

In order to deepen our analysis, we asked managers about the integration methodology used, more than 75% of them attested that PDCA method (45%) and risk management (30%) as presented in Figure 2, are the main approaches used in order to integrate and manage these processes. This respond explained the high performance of these processes.

The main conclusion that can be drawn from these results is that QSE integration impact processes’ performance because the integration approaches used permit at the same time, to integrate quality, security and environments aspects and to improve processes continuously. Schema 1 synthesizes this conclusion:

Schema 1 Correlation between Integration and Performance

This conclusion can be justified by the benefits of integration that impact seriously many key performance indicators. For this reason, we asked managers about reasons and benefits of QSE integration.

We presented the main benefits mentioned by asked managers in an “Ishikawa diagram” in order to classify the reasons that are at the same time benefits, on the five categories of Ishikawa (5M): Method; Ressources and documents; Man; Machine; Environment.

The choice of this diagram can be justified by the fact that Ishikawa diagram application areas are continuously expanding. For example, nowadays the method is also being applied in the medical field (Kam cheong, 2011). So, we develop an ishikawa diagram in order to show that the 5M of processes are concerned by integration benefits.

Schema 2 Ishikawa Diagram

This diagram (Schema2) synthesizes reasons that push asked enterprises to integrate QSE management systems.

We can observe that QSE integration benefits impact the 5M of processes, which can explain the impact on process performance.

In terms of method, for example, asked managers explained that is more complex to manage MSs separately, because internal audits, management reviews, etc, need a lot of time, if non-integrated.

Documentation and methods are ones of the aspects that are more affected by integration, because of redundancy and bureaucracy that increased if management systems are managed separately.

Also, for machine maintenance, asked managers attested that it is better to manage the maintenance by taking into account the three Management systems in order to save time and costs. This kind of maintenance improves security of operators.

As confirmed by Zeng et al. (2007); Griffith and Bhutto (2008); Almeida et al. (2014); Poltronieri et al. (2018), economic benefits can also arise from better allocation and utilization of financial, material or informational resources.

These results are in line with the results of Simon, M. Bernardo, S. Karapetrovic, M. Casadesus (2013) and the conclusions of Ribeiro.F, Santos.G, Ferreira.M, Silva.R

(2017), where it was concluded that integration of MSs promotes synergies and costs savings.

5. Discussion

From the results obtained, we can conclude that there is a great number of Moroccan companies which had already integrated their MSs at various levels.

The main conclusion that can be highlighted is the proportionality between high processes performance and high integration level (fully integration) that we observed for the majority of enterprises.

Also, there is one element that was studied in our research, which differs from what we found in literature review, the impact of QSE integration approaches used by enterprises on process performance. The results showed that the majority of enterprises use PDCA and risk management as integration approaches. This can be justified by the fact that quality management and risk management are largely interrelated (Samani, 2017). The recent consideration looks at quality management and risk management as two important interrelated key performance indicators (KPIs) for performance management (Arena & Arnaboldi, 2014; Popescu & Dascalu, 2011).

In addition, we observed that, it's the integration methodology used in processes that have a high integration level, that influence their performance. This conclusion was confirmed by 75% of asked managers.

These findings explained the multiple benefits of QSE integration, that we classified in an "Ishikawa Diagram" in order to show that integration impact positively the 5M of processes which improve their performance.

According to the majority of participants' companies, the integration of MSs helped them in becoming more efficient and take advantage of the potential synergies of the MSs, as mentioned in other researches (Bernardo et al. (2015); Karapetrovic & Casadesu's (2009); Karapetrovic & Willborn (1998); Zeng et al (2007)).

On the one hand, this empirical study explains the impact of integration on process performance and MSs' efficiency observed in the survey presented.

On the other hand, it allowed understanding that QSE integration can be used as a tool to improve processes' performance and key indicators of quality, security and environment, especially if the integration methodology used, is based on PDCA and risk management.

6. Conclusions

In this research, we noticed that several companies are spontaneously moving towards the integration of management systems, but not all of them are aware of impact of this integration on the processes' performance. In addition, each company approaches this integration with a different method. However, we found in this study that integration has a direct influence on performance indicators and that the choice of approach also impacts the processes' performance. In this case, this study can encourage companies to move towards an integrated management system by giving importance to the method used.

So, from this study, we made many conclusions:

- Many integration approaches are used by Moroccan companies.
- The integration approach used impacts the level of performance.
- The integration of processes is done on various levels.
- The level of integration impacts processes' performance.

Finally, the main conclusion that can be highlighted from the findings, is that quality, security and environment integration have become necessary because it impacts efficiency and performance of companies, whatever the MSs are certified or not. The added value of this paper was the establishment of correlations between integration level, performance, and integration approaches used.

This study enables researchers and academicians to conduct future research in number of areas relevant to integrated management systems, integration approaches and performance.

As a perspective of this work, it would be interesting to compare the results obtained in Morocco with other countries in order to study the impact of social factor.

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