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# EXPLORING THE OPTIONS FOR MANAGEMENT SYSTEM STANDARDS AND INTEGRATION LEVELS

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## Abstract

The objectives of this paper are to investigate whether the integration levels achieved by Catalan companies are related to their choice of the options for Management System Standards (MSSs) and to research the relationships of the perceived adequacy of using new MSSs and Business Excellence Models (BEMs) with Integrated Management Systems (IMSs). To test these relationships, data was obtained from 76 organizations which responded to a survey on IMSs, the options for MSSs and the possibilities regarding the addition of new MSSs and/or BEMs. The data was analyzed by means of a Multinomial Logistic Regression and Wald and Kruskal-Wallis tests, showing that one of the options, namely "rewrite the different standards with identical requirements", was related to the integration level. However, no significant relationship between the options for using new MSSs and/or BEMs and the integration level was found. This paper contributes to the body of knowledge of MSSs and IMSs by relating the existing options for companies regarding their present and future usage of MSSs to their IMSs. Empirically, the results lead to the conclusion that efforts to increase the compatibility of MSSs should be made by all interested parties.

*Keywords:* Quality Management Systems, Environmental Management Systems, Integrated Management Systems, ISO 9001, ISO 14001, Spain

## 1. Introduction

To be competitive, an organization should focus on different outcomes related to business performance, such as the quality of the products, the environmental impact, the satisfaction of customers with the products, the process performance, internal business outcomes, and the satisfaction of people working in the organization, among others (IAT, 2008). Organizations can implement Management Systems (MSs) that can help them achieve these objectives. Many organizations use standards, such as ISO 9001, ISO 14001 and OHSAS 18001, to help them establish, document and maintain their MSs in a structured and systematic way (Bernardo et al., 2012b). ISO 9001 for quality management and ISO 14001 for environmental management are the two ISO standards that have obtained the most impact at the international level, regarding the number of certificates worldwide, with over one million certificates for ISO 9001 and over 285,000 for ISO 14001 (ISO, 2013).

Regardless of the number of certificates reached, the fact is that many companies have to deal with more than one MS and they have the possibility to integrate them in a unique system, an Integrated Management System (IMS) (Asif et al., 2009; Bernardo et al., 2009; Douglas and Glen, 2000; Jørgensen et al., 2006; Karapetrovic et al., 2006; Karapetrovic and Casadesus, 2009; Salomone, 2008; Simon et al., 2011; Simon et al., 2012a; Zeng et al., 2007 or Zutshi and Sohal, 2005). Therefore, the main purpose of this paper is to study the perceptions of Quality Management System (QMS) and Environmental Management System (EMS) managers about some possible options in the field of Management System Standards (MSSs) and to analyze the relationship between these options and the level of integration of their organizations' MSs. Also, the objective is to study whether managers would like to use new standards and/or Business Excellence Models (BEMs) in their companies and relate it to the MSs integration level.

This paper is based on the results presented at the 16-ICIT & 8-C&C conference (see Simon et al., 2012b), which illustrated the preliminary results of the study by exploring the relationships between the options for MSSs and the companies' integration levels. In this paper, a more in-depth analysis of these relationships is shown and a new topic is investigated, that is, whether the integration levels are related to the preferences of firms regarding the implementation of new MSSs and/or BEMs. The paper begins with a literature review on six different options firms can choose when implementing different MSSs and/or BEMs. To analyze the survey data, several multivariate techniques were used, such as the Multinomial Logistic Regression and Wald and Kruskal-Wallis tests. The results show that, in general, the integration levels are little related to the options chosen by organizations for the MSSs, with the exception of one of the options proposing to rewrite the

standards with identical common requirements. This leads to a conclusion that further studies on how the standards can be made more simple and integrated are needed.

## **2. Literature review**

Empirical studies regarding the scope of integration confirm that a lot of companies are using IMSs (Bernardo et al., 2009; Bernardo et al., 2012 a, b; Karapetrovic and Casadesus, 2009; Salomone, 2008; Simon et al., 2011 or Zeng et al. 2007). For example, Karapetrovic et al. (2006) find that 85% of organizations had integrated their systems to some degree. When studying the degrees of integration, Douglas and Glen (2000) also found that out of the 28 companies in the sample, (71%), had integrated some aspects of the QMS and EMS. Bernardo et al. (2009) found that 86% of companies of their study had either partially or fully integrated their MSs and Simon et al. (2011) encountered 84% of the organizations with an IMS. Karapetrovic and Willborn (1998b) define three main elements of a standardized MS which can be integrated at different levels, namely goals, processes, and resources. These elements were found to be integrated at different levels by empirical studies, such as the ones of Karapetrovic et al. (2006), Bernardo et al. (2009) or Simon et al. (2011), with the human resources and the systems objectives as the elements found to be integrated at the highest extent in those three studies.

Next, some of the studies on the possibilities that firms face when implementing multiple MSs or MSSs together are reviewed, which have been researched by several authors (e.g., Jorgensen et al., 2006; Karapetrovic, 2002; Karapetrovic et al., 2006; López-Fresno, 2010).

### *2.1. Use separate MSSs for an IMS*

Although many MSSs now coexist, firms can implement them separately and still benefit from their similarities, while continuing such separate implementation (Karapetrovic, 2002; López-Fresno, 2010). Currently, MSSs often incorporate common elements such as the control of documents and records, internal audits, corrective and preventive action, management review and continuous improvement (Asif et al., 2010). In fact, the Plan, Do, Check, Act (PDCA) improvement cycle (Deming, 1982) has become the foundation for many of these standards (López-Fresno, 2010). However, in a study performed in 2006, Karapetrovic et al. found that firms would prefer other options which involve more integration of the standards. Therefore, as companies that have different standards to comply with are likely to increase their costs from extensive paperwork and confusion between demands of the individual standards, they find it more appropriate to merge

quality, environmental and occupational health and safety management systems and standards into one, because it reduces duplicate work and bureaucracy (Jorgensen et al., 2006).

## *2.2. Add a methodology for integration*

A different option regarding MSSs that companies could choose is to use a methodology for integration. Although no international standards for integration methodologies are available, a book called *"The Integrated Use of Management System Standards"* (ISO, 2008) covers this lack of such standards. At the national level, different guidelines for integration have been developed by several countries, for example in Australia and New Zealand: AS/NZS 4581: 1999 (SAI Global, 1999), in Denmark: DS 8001: 2005 (Dansk Standard, 2005), in Spain: UNE 66177: 2005 (AENOR, 2005), and in the United Kingdom: PAS 99: 2006 (BSI, 2006).

However, despite the guidance of national standards regarding the integration of MSs, the combination and effective integration of these systems is not always clear, often lacking a real structure on which to build an integrated system (Asif et al., 2010; Griffith and Bhutto, 2008; Karapetrovic and Jonker, 2003). In order to solve this challenge, Karapetrovic et al. (2006) suggest that companies adopt the use of the models and tools to integrate MSs in companies, namely a framework already used in one or more of the standards being implemented, such as the PDCA cycle, a detailed analysis of the common elements, a process map or a company-specific model (Lopez-Fresno, 2010).

Therefore, under this second perspective, emphasis is made on defining a methodology to implement an IMS. Increased compatibility and alignment between standards is recommended to support the development of an IMS methodology (Bernardo et al., 2011; Karapetrovic, 2002; Wilkinson and Dale, 1999), either based on a process model, such as the one used by ISO 9001, on a PDCA cycle, as the one used by ISO 14001, or on a systems approach (Karapetrovic, 2002; Karapetrovic and Willborn, 1998a).

However, many factors differ from one organization to another, so it is difficult to develop "the universal methodology" that will work in all cases (Jonker and Karapetrovic, 2004), but a set of guidelines and principles to guide organizations towards an IMS can be established.

## *2.3. Use MSSs with the same common requirements*

It can currently be seen how the areas of quality management, environmental management, occupational health and safety, among others, have many commonalities, including (Fresner and Engelhardt, 2004):

1. The existence of common management principles or fundamentals (process-based approach, focus on achieving results and continuous improvement).
2. A similar structure in the standards, based on the continuous improvement cycle.
3. The existence of similar requirements (in some cases, almost identical).

In fact, ISO 9001, ISO 14001 and OHSAS 18001, the most implemented standards, contain the same basic principles and a general common structure (Fresner and Engelhardt, 2004). They all require the definition of roles and responsibilities, to train personnel, to define written procedures, to control and keep records of documentation and data, to continuously improve and to perform internal audits (Wright, 2000; Zeng et al., 2007).

According to Jorgensen et al. (2006) about 80% of the work is common to all three disciplines: quality, environment and occupational health and safety. Jorgensen et al. (2006) also state that the similarities between these management systems refer to top management commitment; documentation and records control; policy definition; planning objectives; procedures for communication and for training employees; audits; control of non-compliance; corrective and preventive actions; and management review.

If they choose this option, companies can use the MSSs written according to ISO Guide 83 (ISO, 2011b) which helps them align all MSSs by providing a common structure and text (Smith, 2011). However, according to this option, the existing standards must be changed and it has been shown not to be a preferred option for companies (Karapetrovic et al., 2006).

#### *2.4. Use an integrated base and separate specific requirements*

The fourth possibility that companies could choose regarding MSSs would again involve profiting from the similarities of the different MSSs through the integration of their common requirements (see MacGregor Associates, 1996 cited in Wilkinson and Dale, 1999; ISO, 2008). The specific requirements that were not possible to accommodate within this common framework would then be included separately for each MS (see Fresner and Engelhardt, 2004; Lopez-Fresno, 2010; MacGregor Associates, 1996 cited in Wilkinson and Dale, 1999; Wilkinson and Dale, 1998). This could be a viable option since it seems to have the support of companies, as empirically demonstrated in Karapetrovic et al. (2006), whose sample of companies chose this as their second preferred option. Moreover, and from a theoretical point of view, some authors state that because MSSs such as ISO 9001, ISO 14001 and OHSAS 18001 are very similar in structure, their alignment should not be too complex (Fresner and Engelhardt, 2004) as long as the concepts of

integration and alignment are clearly distinguished (MacGregor Associates, 1996 cited in Wilkinson and Dale, 1999; Wilkinson and Dale, 1998, 1999).

### 2.5. *Use an integrated MSS*

The last option involves the creation and usage of a single MSS that would go through all the organizations' requirements (Lopez-Fresno, 2010). Nevertheless, in practice, this would be a very complex option to achieve, given the number of existing and to-appear standards (Karapetrovic, 2002, 2003). A more realistic possibility would be a single standard covering only some of the MSSs, such as UNE 66177: 2005 in Spain (AENOR, 2005) or PAS 99: 2006 in Great Britain (BSI, 2006). However, in an empirical study of Casadesus et al. (2009), the authors found that the companies' preferred option was to *"integrate the different standards into only one"*.

### 2.6. *Use of new MSSs and BEMs*

Companies also have several options regarding the introduction of new standards and models in their company. According to Rocha et al. (2007), the most common options for MSs are 'ascension', in which the *'organization may choose to enhance the level of satisfaction for a particular stakeholder'*, (for example, a company could implement a business excellence model or industry-sector standards) and 'augmentation', in which an organization may *'develop a more in-depth understanding in some specific issues or part of the system'* (for example, considering ISO 9001, the company could implement the ISO 10000 standards for customer satisfaction, which are augmentative standards). This direction has been recognized as a viable and beneficial one by authors such as Dee et al. (2004) or Karapetrovic (2005) due to the flexibility of such standards, both for independent and integrative use. Finally, companies can also choose not to add any new standard or model (Karapetrovic et al., 2006). However, this alternative of not pursuing the implementation of any further standard is considered as improbable by Karapetrovic (2005), due to the number of newly published and to appear standards. Finally, it is worth mentioning that both ascending and augmenting standards are considered to have a good future given that the vast majority of companies intend to use new standards in the future according to Karapetrovic and Willborn (1998a), Karapetrovic et al. (2006) or Casadesus et al. (2009).

### 3. Methodology

The objectives of this study are to explore whether there exists a relationship between the firms' integration levels and their preferences towards the options regarding MSSs. In order to analyze this, a survey was carried out in 2010 among Catalan companies registered to ISO 9001 and ISO 14001 (see Simon et al., 2011, 2012a). The questionnaire used questions on the integration of MSs and the directions regarding the introduction of new MSSs and BEMs, among other questions unrelated to this study's objectives. A pre-test process was applied to refine the survey instrument which was sent to the QMS and/or EMS manager. To follow up, a telephone call and an additional e-mail were used to communicate with the organizations. Below, we show the questions of the survey that were used in this study in Figure 1.

Which of the standards implemented in your company are integrated into a single Management System?

- ☐ None
- ☐ The following ones: .....
- ☐ All of them

Prioritize (1 to 4) which of these options you think is the best option for your company? (4 is the best option, option 1 is the least appropriate)

- ☐ Add new area standards (Corporate Social Responsibility, Health and Safety, ...)
- ☐ Add new augmentative standards (Customer complaints, ...)
- ☐ Use business excellence models (EFQM, ...)
- ☐ Do not use any new standard or model

Given the proliferation of new management standards, various options to revise these standards are currently being considered. Prioritize (1 to 5) which of these options you think is better? (5 is the best option, option 1 is the least appropriate)

- ☐ Leave as is (Independent standards)
- ☐ Leave as is but add a methodology or guidelines for integration
- ☐ Rewrite the standards with identical common requirements
- ☐ Create a base standard and reduce the rest of standards (quality, environmental) to specific additional requirements
- ☐ Integrate different standards in only one (ISO 9001 and ISO 14001, for instance)

**Fig. 1.** Survey questions

The survey obtained 76 responses out of the 176 firms that the questionnaire was sent to (and that had already responded to a survey in 2006, the results of which can be found in Karapetrovic et al., 2006), thus achieving a 43% response rate with a 93% reliability and a 95% confidence (Simon et al., 2012b). Regarding the answering companies, 22% were classified as large companies, 42% as medium-sized companies and 36% as small companies.



In 2010, Spain was a country with one of the highest number of ISO 14001 and ISO 9001 certificates in the world (ISO, 2011a), when there were 59,854 Spanish companies that had ISO 9001 and 18,347 with ISO 14001 according to the “ISO survey of certifications” (ISO, 2011a). More specifically, Catalonia was one of the leading regions in Spain regarding the number of certifications of ISO 9001 and ISO 14001, together with the regions of Madrid, the Basque Country and Andalucia (Forum Calidad, 2010).

The data analysis included the integration level of the firms’ MSs, as well as the degree of integration of the different elements of an IMS, namely, the integration of the human resources, documentation, goals and procedures. Data was also provided on the options that firms would choose regarding the integration of MSSs and the directions they would take regarding the introduction of new standards and models. To test the proposed relationships between the integration levels and the options for MSSs, a multinomial logistic regression (Hosmer and Lemeshow, 1989) was chosen after the descriptive analyses were performed. Further, a Kruskal-Wallis test was also used to analyze whether the options for adding new standards and models and the integration level are related.

## **4. Results and discussion**

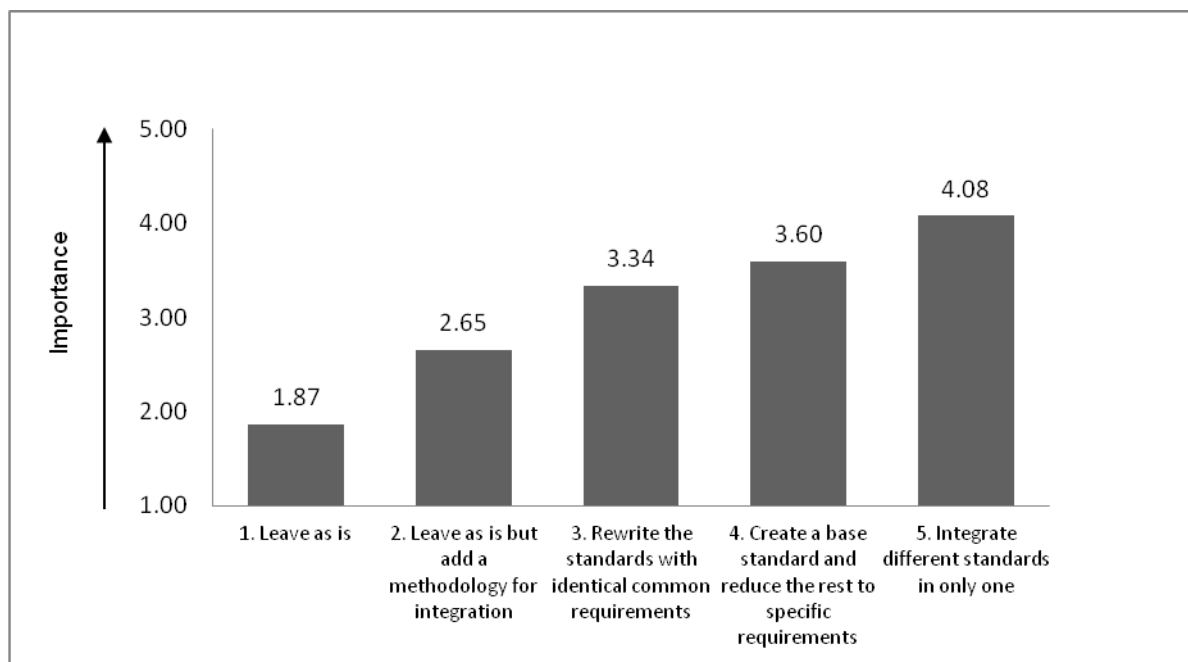
### *4.1. Descriptive analysis of the options for MSSs*

The survey asked whether organizations integrated their MSs, with answers ranging from no integration to full integration (see the first question in Figure 1). The detailed results regarding the overall integration level of the MSs can be found in Simon et al. (2012b). In order to further study the integration levels, the survey included questions related to the degrees of integration specific to each MSs element which, according to Karapetrovic and Willborn (1998b), needs to be integrated, namely the MS resources, goals and processes. In the first analysis related to the integration of goals (policy and objectives) and documents (manual, procedures, instructions and records), the majority of firms have all the items measured fully integrated, although this proportion is considerably higher for the organization’s policy, objectives and the manual, than for the procedures, instructions and records (see Simon et al., 2012a). The second group of questions, related to the integration of human resources, involved questions about whether or not the responsibility for managing one MS fell to the same person that managed other MSs. This aspect was analyzed taking into account three different levels of responsibility: top management, functional level and the “shop-floor” level. The level of integration was found to be much higher at the top management level than at the shop floor level. Finally, with reference to processes, the extent to which procedures were integrated was

analyzed. High levels of integration were found in MS procedures, such as record and document control or preventive and corrective actions, while the elements integrated to a lesser extent were product realization and audits (see Simon et al., 2012a).

The managers also expressed their opinions about which MSSs were the most appropriate to be implemented in their organizations (see the second question in Figure 1) and the options related to the formatting of MSSs (see the third question in Figure 1) (Casadesus et al., 2009).

As can be seen in Figure 2, the option to integrate MSSs (#5) was the most preferred, while the two least preferred options both involved leaving separate MSSs (#1 and #2, respectively). Looking more in detail into these results can be helpful in understanding the reason for the options chosen. For example, the option to integrate MSSs into one can be understood, because Catalan companies have been shown to be unaware of the existing guidelines for integration (Karapetrovic et al., 2006; Casadesus et al., 2009). Therefore, considering this fact and the difficulty of combining all the standards into one, this option would probably not become the most preferred one if companies were more aware of the existing integration guidelines.



**Fig. 2.** Managers' perceptions of the options for MSSs

#### 4.2. Integration level of IMS elements and options for MSSs

In order to analyze the relationship between the two variables relevant for this study, that is the options for MSSs and the integration levels, we conducted a chi square test (SPSS version 17). The relationship, with a probability of the model  $P=0.100$  and a chi square of 15.856 was not rejected at a level of 1.000 (Simon et al., 2012b).

We also used the classification accuracy which is useful to assess the multinomial logistic regression. This classification showed that the dependent variable related to the integration levels predicted the independent variables "options for MSSs" well (Simon et al., 2012b).

This result demonstrates that firms that have achieved different levels of integration may hold different views regarding the options for integrating existing and new standards. Thus, it is interesting to study whether firms choose different options according to their level of integration.

#### 4.3. Individual tests for the variables

We used a likelihood ratio test and a Wald test to measure the relationships between the variables of study (Simon et al., 2012b). The first test was used to see whether the integration level was related to the options for MSSs. The second test was useful to determine if there were differences between the groups related to the independent variables (options for MSSs).

Table 1 shows the likelihood ratio tests for the integration levels and the options regarding the MSSs.

**Table 1.** Likelihood ratio tests for the integration levels and the options for MSSs

Effect	Model fitting	likelihood ratio tests		
	-2 log likelihood of reduced model	Chi-square	df	Sig.
	67.535	2.230	2	0.328
<b>Option 1</b>	66.915	1.610	2	0.447
<b>Option 2</b>	65.749	.445	2	0.801
<b>Option 3</b>	70.355	5.050	2	<b>0.080</b>
<b>Option 4</b>	66.748	1.443	2	0.486
<b>Option 5</b>	67.389	2.084	2	0.353

The results do not show significant differences regarding the options for MSSs and the integration levels, with the exception of the option "rewrite the standards with identical common requirements" and the level "all MSSs integrated into a single MS", which had a significance of  $0.080 < 0.1$ . This relationship can be interpreted in terms of confusion from firms with multiple MSSs who would be willing to simplify the management of all these individual standards into a single one. Nevertheless, in general, companies seem to be indifferent regarding the options for MSSs regardless of the integration level they have achieved. This is in line with the findings of Casadesus et al. (2009), who attribute this attitude to the fact that companies do not know the existing integration possibilities and tools well.

Table 2 shows the Wald test values for each individual variable.

**Table 2.** Parameters estimates

(1) No standards integrated into a single MS <sup>a</sup>	B	St. err	Wald	df	Sig.	Exp(B)
	Inferior limit	Superior limit	Inferior limit	Superior limit	Inferior limit	Superior limit
(2) Some standards integrated into a single MS	9.074	6.413	2.002	1	0.157	
Option 1	0.062	0.564	0.012	1	0.913	1.064
Option 2	-0.346	0.591	0.344	1	0.558	0.707
Option 3	-1.614	0.825	3.830	1	0.050	0.199
Option 4	-0.218	0.599	0.133	1	0.715	0.804
Option 5	-0.263	0.470	0.313	1	0.576	0.768
(3) All standards integrated into a single MS Intersection	7.071	5.649	1.567	1	0.211	
Option 1	-0.408	0.486	0.703	1	0.402	0.665
Option 2	-0.110	0.522	0.045	1	0.833	0.896
Option 3	-0.955	0.752	1.613	1	0.204	0.385
Option 4	-0.542	0.533	1.032	1	0.310	0.582
Option 5	0.299	0.414	0.522	1	0.470	1.348

<sup>a</sup> The reference category is "no standards integrated into a single MS".

The Wald test compared, for each individual variable regarding the options, whether there were differences between the groups of firms with some MSSs integrated and with all MSSs integrated into a single MS, on one hand, and the reference group of companies with no MSSs integrated into a single MS, on the other.

The interpretation for an independent variable focuses on its ability to distinguish between pairs of groups and the contribution which it makes to change the odds of being in one dependent variable group rather than the other (Hosmer and Lemeshow, 1989). From Table 2, it can be seen from the significance and odds ratio interpretation that the option "rewrite the standards with identical common requirements" significantly distinguishes the group of firms who had all the MSSs integrated into a single MS from the group that had not integrated these MSSs into such a MS. The difference with the other group that had integrated only some MSSs was not supported and could mean that these firms are more likely to prefer a single MSS as they have already started their integration process (see Simon et al., 2012b).

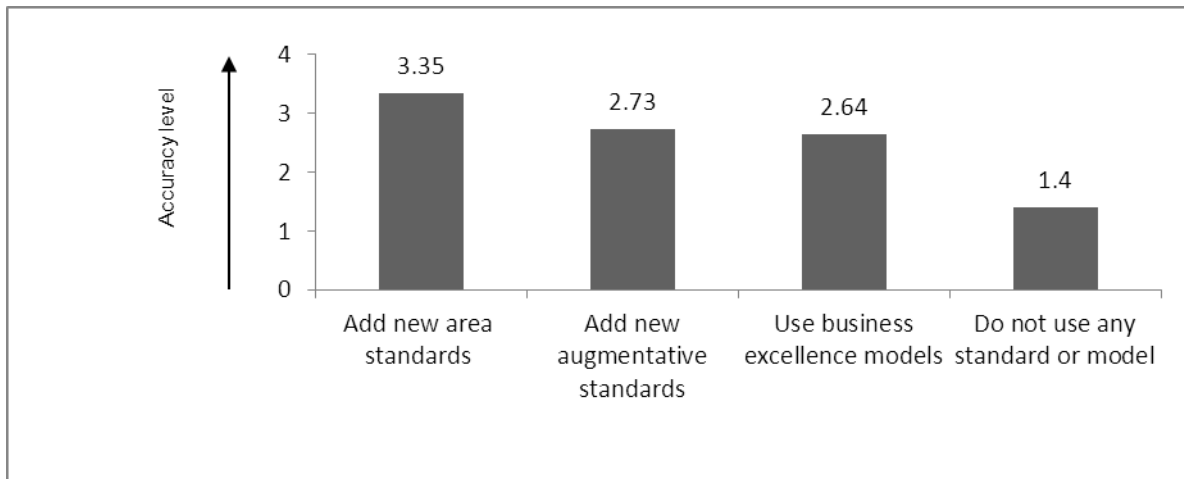
#### *4.4. Integration level of IMS elements and options for MSSs*

The second analysis of this study measured, by means of Multinomial Logistic Regression, whether there is a relationship between the integration level of the elements of an IMS (goals, human resources and procedures) and the options for MSSs.

The statistical significance of the final model was tested for the human resources, the goals and the procedures. In this analysis, the probability of the model was 0.376, 0.301 and 0.352 respectively, values higher than the level of significance of 0.05. Therefore, the existence of a statistically-significant overall relationship between the independent variables “options for MSSs” and the dependent variables “integration level of the human resources”, “integration level of the goals” and integration level of the “procedures” was not supported. Again, the MSs integration level in the companies does not seem to influence their preferences regarding the options for standards. This result suggests that organizations integrate their MSs regardless of their preferences for the options regarding MSSs. Therefore, MSs integration is seen as the only efficient way to deal with and benefit from the increasing spread of standards.

#### *4.5. Integration level and options for new standards and/or models*

Regarding the perceptions of managers about the options for using new standards or models, the survey provided four options and the managers prioritized the ones that were the most adequate for their companies (Casadesus et al., 2009). Figure 3 shows that they prefer option #1 (add new area standards (e.g., for Corporate Social Responsibility and Occupational hazards)) over the rest, with a score of 3.35. They choose option #3 (use business excellence models) as the second in preference (a score of 2.73). The third preferred alternative is option #2 (add new augmentative standards), obtaining a score of 2.64. Finally, option #4 (do not use any new standard or model) received a score of 1.40. The results obtained show the importance of the development of new standards and therefore, their implementation in Catalan companies. It must be mentioned that most companies that took the survey are interested in using the standards in the future, since there are many more companies that suggest they will add new standards or models in comparison with those who indicate that they will do nothing in this field as a first priority.



**Fig. 3.** Managers' perceptions of the options for new standards or models

A Kruskal–Wallis test was also used to analyze whether the variables about adding new standards and/or models and the integration level are related. The Kruskal–Wallis test is a non-parametric method for testing whether samples originate from the same distribution. It is used for comparing more than two samples that are independent, or not related (Kruskal and Wallis, 1952). The parametric equivalent of the Kruskal-Wallis test is the one-way analysis of variance (ANOVA). When the Kruskal-Wallis test leads to significant results, then at least one of the samples is different from the other samples (Kruskal and Wallis, 1952). Table 3 shows the results of the test.

**Table 3.** Kruskal-Wallis test for the options for standards/ models and the integration level

	Add new area standards	Add new augmentative standards	Use business excellence models	Do not use any new standard or model
Chi-square	1.466	1.401	1.164	0.005
df	2	2	2	2
Sig.	0.480	0.496	0.559	0.998

a. Kruskal-Wallis test

b. Grouping variable: integration level

The results of the test indicate that that there are no differences between the three groups regarding the integration level (no integration, partial and full integration) and the options for new standards or models. The Kruskal-Wallis test shows whether the groups differ in some way. However in this case, the interpretation is that the integration level does not affect whether the companies would like to add new standards or models.

#### *4.6. Discussion*

The aim of this paper was to explore the perception of QMS and EMS managers about the options for MSSs, focusing on the different directions that firms could choose when implementing them, and the existing relationships between these options and the integration level of the companies' MSs. From the results provided in this paper, some conclusions can be drawn.

Currently, the different MSs which are integrated in a unique system are characterized by the fact that they share some common requirements even if they remain as separate components of the IMSs. However, the results of Simon et al. (2012b) show that companies would prefer all the standards unified in order to have only one standard covering all aspects of the different MSs. This result is somewhat surprising as various studies (Karapetrovic et al., 2006; Casadesus et al., 2009) have shown that it is not beneficial to establish a single integrated standard that covers all company's main concerns. However, the answers provided by the Catalan companies suggest exactly the opposite as the simplicity of having a sole standard was considered the most relevant option.

This paper also investigated whether the variables of the integration level and the options for MSSs were related in some way. The results of the Multinomial Logistic Regression showed that these variables were significantly and positively related. In particular, the Likelihood ratio tests revealed a significant relationship between the level "all MSSs integrated into a single MS" and the option "rewrite the standards with identical common requirements" and this same variable distinguished the groups with no integration and the full integration level in the Wald test, revealing the awareness of the difficulties in the integration process of the companies that have achieved a high integration level. These companies would prefer a simpler option like having one standard covering all possible requirements in order to avoid the costs of integrating multiple MSSs.

The third analysis of this study meant to analyze whether there exists a relationship between the integration level of the different elements of an IMS (goals, human resources and procedures) and the options for MSSs. No significant relationship between these elements was found, leading to the conclusion that organizations integrate their MSs regardless of their preferences for these options.

Finally, no significant relationships were found between the integration level and the different directions that firms could choose regarding the introduction of new standards and models. However, managers manifest their preference towards adding new area and augmentative standards as well as using business excellence models rather than not using any new standard or model. This finding shows the potential for the application of new standards in companies which already have implemented more than one MS. This is an important contribution in the field of IMSs as firms willing to add new standards to the existing ones should have a clear view about the possible

directions that companies may face in the future regarding the implementation of new standards and models.

## 5. Conclusions

Given the preferences that the firms participating in this study seem to have regarding the options for MSSs, some thought by the standard-writing bodies, the practitioners and the academics alike should be given to accommodate these opinions in the future. Firms clearly would choose to implement only one MSS covering all the requirements of the existing and future standards. However, this is a very complex option in practice, so it would be recommended to try to reconcile these two views with the provision of more guidelines and training options for managers in order to facilitate the implementation and integration of MSSs.

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## Annex 1. Descriptive statistics of the survey questions

**Table 1. Integration level**

	N	Min	Max	Mean	St. dev.
Integration level	76	1.00 (no integration)	3.00 (full integration)	2.02	0.87

**Table 2. Integrated standards**

Integrated standards	Freq.	%	Valid %	Cum. %
Some standards	18	19.4	23.7	23.7
All standards	48	51.6	63.2	86.8
None	10	10.8	13.2	100
Total	76	81.7	100	

**Table 3. Options for integration**

	Option 1	Option 2	Option 3	Option 4	Option 5
Mean	1.86	2.81	3.46	3.60	3.88
St. dev.	1.38	1.16	1.01	1.26	1.50
Min	1.00	1.00	1.00	1.00	1.00
Max	5.00	5.00	5.00	5.00	5.00

**Table 4. Addition of new standards and models**

	Add new area standards	Add new augmentative standards	Use business excellence models	Do not use any new standard or model
Mean	3.32	2.77	2.63	1.51
St. dev.	0.96	0.90	0.92	1.08
Min	1.00	1.00	1.00	1.00
Max	5.00	4.00	4.00	5.00