

## EMPIRICAL ANALYSIS OF INTEGRATION WITHIN THE STANDARDS-BASED INTEGRATED MANAGEMENT SYSTEMS

Stanislav Karapetrović<sup>1</sup>  
Martí Casadesus<sup>2</sup>  
Iñaki Heras<sup>3</sup>

<sup>1</sup>University of Alberta,  
Edmonton, Canada

<sup>2</sup>Universitat de Girona,  
Girona, Spain

<sup>3</sup>Universidad del País Vasco,  
San Sebastian, Spain

**Abstract:** *The overall goal of this paper is to empirically analyze the augmentation and integration of ISO 9001 - based quality management systems with ISO 14001 - based environmental and other standardized management systems. Results from a survey of 298 organizations headquartered in the Spanish regions of Catalonia and the Basque Country are presented. All surveyed organizations were registered to both ISO 9001: 2000 and ISO 14001: 2004, while some had further management system standard certificates, for example in occupational health and safety and social responsibility. Various aspects of augmentation and integration, such as the usage of additional subsystem standards, the process of integration and the conduct of audits, are discussed through largely descriptive analyses.*

**Keywords:** *ISO 9001, IMS, ISO14001, empirical analysis*

### 1. INTRODUCTION

On a number of occasions in the past, including the 2007 edition of this conference in Montenegro (see Karapetrovic, 2008), we have presented arguments for augmentation and integration as a future in both the development and use of standardized Quality Management Systems (QMSs). Namely, ISO 9001-based QMSs should be augmented with a new group of Management System Standards (MSSs) that focus on a single component of the QMS, e.g., customer satisfaction codes of conduct or complaint handling, and also integrated with other standardized Management Systems (MSs) which focus on different organizational functions or stakeholders, e.g., information security or energy management. In Karapetrovic and Casadesus (2007), for instance, this argument was mostly based on a theoretical analysis, but was also supported by empirical evidence from the surveys of ISO 9001-registered companies and their changing perceptions of the importance of the ISO 9001 standard over time, as well as the priorities given to the implementation of the specific groups of MSSs.

Since the 2<sup>nd</sup> *International Conference of Quality Management and Environment (ICQME)* in 2007, groups of MSSs related to both the augmentation and integration of QMSs have expanded. New “augmentative” standards on customer satisfaction codes of conduct (ISO 10001: 2007) and dispute resolution (ISO 10003: 2007) were published, while the work on other standards is either drawing to a close, such as in the case of the ISO 10004 technical specification on customer satisfaction monitoring and measurement, or continuing, for instance on ISO 10018 regarding the people aspects of QMSs. Earlier augmentative standards include ISO 19011: 2002 on MSs auditing, ISO 10012: 2003 on measurement in a QMS, and ISO 10002: 2004 on complaint handling. On

the integration side, in the span of a couple of months in early 2008, the International Organization for Standardization (ISO) has announced the development of MSSs for road safety and energy management, complementing ISO 14001: 2004 on environmental MSs (EMSs), OHSAS 18001: 2008, CSA Z1000: 2006 and ANSI Q10: 2005 on occupational health and safety MSs (OHSMSs), ISO 27001: 2005 and ISO 28000: 2005 on security MSs, and other similar MSSs.

Unfortunately, such an expansion in terms of academic studies did not occur, especially regarding augmentative standards, where there are only a few, if any, theoretical or empirical papers. In general, the integration of standardized MSs has been studied in detail from a theoretical point of view, with a small, but still significant, number of empirical research studies, such as Douglas and Glen (2000), Fresner and Engelhardt (2004), Zutshi and Sohal (2005), Karapetrovic et al. (2006), Zeng et al. (2006), Salomone (2008) and Bernardo et al. (2009). Obviously, research is required to better understand the perceptions of organizations regarding the application of subsystems based on augmentative standards and the process of integration of these and other systems in cases where multiple MSSs have been implemented. Consequently, this paper discusses the augmentation and integration of ISO 9001 QMSs with environmental and other standardized MSs from the perspective of an empirical survey of 298 organizations, all of which were registered to both ISO 9001: 2000 and ISO 14001: 2004 standards. The paper is largely based on the Karapetrovic et al. (2006) book and the Karapetrovic and Casadesus (2009) paper, which discussed the results of the survey from one Spanish region, namely Catalonia, and included 176 companies. Here, responses of 122 organizations based in another region, specifically the Basque Country, are added and contrasted with the Catalanian results. A description of the survey methodology is provided first, followed by a

presentation of the results on the importance of specific standards, sequence and motivation for the implementation of MSSs, integration problems and tools, as well as auditing. The paper is concluded with a brief summary of the research outcomes.

**2. SURVEY METHODOLOGY**

*(This section is based on Karapetrovic and Casadesus (2009).)*

Due to the differences in the availability of the registration data and the overall number of registered organizations in the two regions covered in this paper, the methods used to identify which organizations the survey would be sent to differ between Catalonia and the Basque Country. However, the total number of organizations that were asked to respond was almost the same in both regions.

The method used in Catalonia is explained in detail in Karapetrovic and Casadesus (2009), and will be summarized here. The survey was conducted in the first half of 2006. Therefore, the population data on ISO 9001 and ISO 14001 - registered companies included the most recent public record at that time, which was a Forum Calidad (2006) publication for the end of 2005. There were 8,746 and 1,237 organizations registered to ISO 9001: 2000 and ISO 14001: 2004 in Catalonia, respectively (Forum Calidad, 2006). Addresses of 3,513 companies from the first group and 561 from the second group were obtained from a total of four registrars. It

turned out that, of the ISO 14001 - registered organizations, 96% or 535 were also registered to ISO 9001: 2000. Upon further analysis, it was estimated that the same percentage would hold in organizations whose addresses had not been obtained, therefore yielding the number of 1,191 organizations with both the ISO 9001 and ISO 14001 certifications and the conclusion that the study should be representative of this population.

The Basque Country is another region of Spain with a major impact of ISO 9001 registrations, according to Heras (2006). The collection of data in this region was much simpler, because Euskalit, the Basque Foundation for Excellence, possesses a database of all the existing MSS certificates in the region. Therefore, the exact size of the study population, namely 525 organizations with both the ISO 9001: 2000 and ISO 14001: 2004 certificates, was known and the addresses of these organizations were obtained directly from Euskalit.

Based on this data, an extensive field study was carried out in February 2006 in Catalonia and in November 2006 in the Basque Country, using a questionnaire addressed to a sample of organizations which were registered to both ISO 9001: 2000 and ISO 14001: 2004. The study was carried out by means of a mail survey, which was previously pilot-tested on a reduced group of companies. The survey was addressed to the person responsible for the QMS / EMS of the organization, and was subsequently followed up with a telephone call. The profile of both surveys is given in Table 1.

Table 1: Survey Profile

Population characteristic	Organizations registered to both ISO 9001: 2000 and ISO 14001: 2004	
	Catalonia	Basque Country
Approximate study population	1,191	525
Sample size	535	525
Survey time	February 2006	November 2006
Obtained responses	176	122
Response rate	33%	23%
Confidence level (p=q= 0,5)	93%	92%

**3. SAMPLE CHARACTERISTICS**

*(This section is adapted from Karapetrovic and Casadesus (2009).)*

Three main characteristics of the samples obtained from the surveys in Catalonia and the Basque country are discussed next, namely the size of the responding organizations, indicated by the number of employees, the industry sector to which these organizations belong to, and the position in the supply chain, identified

through their external customers. In terms of the number of employees, the majority of the organizations in the sample are small, with 58% having less than 100 employees (Figure 1).

The number of ISO 9001 and ISO 14001-registered companies that employ between 101 and 500 workers was 29%. A total of 13% of the organizations had more than 500 employees. There are no statistical differences between the Catalanian and Basque samples regarding the number of employees.

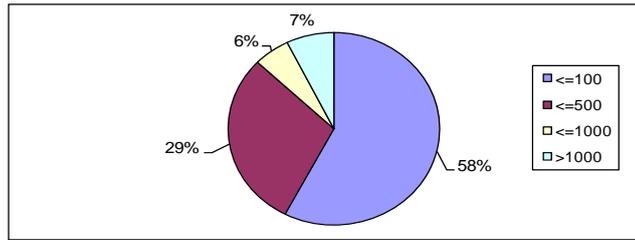


Figure 1: Number of Employees in the Surveyed Organizations

Figure 2 illustrates the industry sector of the responding organizations. As with the previous characteristic, no significant differences were detected between the two regions. More than 50% of the responding organizations came from the production sector, 15% were construction companies, and the rest were in the service industries. Evidently, standardized

QMSs and EMSs seem to be used to a greater extent in the production than in the service sector. This is pronounced even further when the importance of the service industry in Spain is taken into account. In turn, the impact of the corresponding MSSs on public administration is still not very relevant, with only 1% of the respondents belonging to this sector.

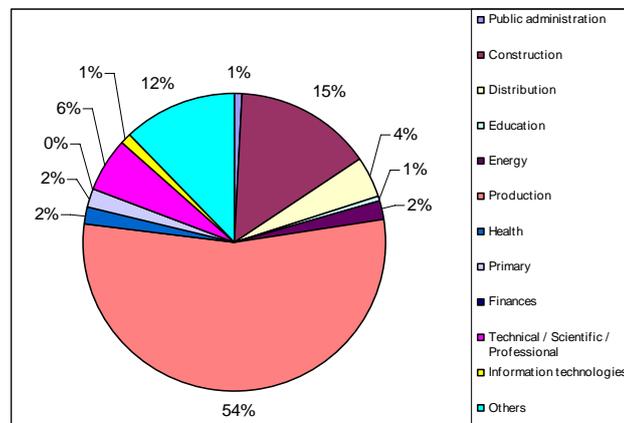


Figure 2: Industry Sectors of the Surveyed Organizations

Finally, for 54% of the organizations in the sample, the main external customer is another company, while for 19%, it is the final user of their product (Figure 3).

Again, we have not detected any statistical differences between the data collected in the two regions.

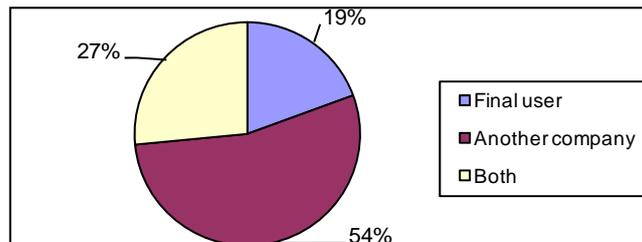


Figure 3: External Customers of the Surveyed Organizations

Overall, there were no differences in the main characteristics of the organizations included in the samples from Catalonia and the Basque Country.

companies (22%) in Catalonia and 23 firms (19%) in the Basque Country reported that they had registered to OHSAS 18001.

Due to the survey purpose and design, all of the responding organizations were registered to both ISO 9001 and ISO 14001. In addition, a total of 38

These numbers are much lower for other MSSs, e.g., only a few companies in both regions used social responsibility MSSs.

#### 4. IMPORTANCE OF STANDARDS

(This section is adapted from Karapetrovic et al. (2006), based on the addition of the Basque Country data.)

One objective of the study was to better understand the past, present and future status of specific MSSs in organizations. Notwithstanding ISO 9001 and ISO 14001, the use of these standards, especially the augmentative ones, is rarely empirically researched, despite a great need for such studies. Therefore, the survey questionnaire sought responses regarding seven augmenting and a number of other overall function- or stakeholder-specific MSSs, with a focus on the awareness of each, as well as the related implementation actions. Figures 4 to 6 present the findings related to the selected augmentative and assimilating standards in Catalonia and in the Basque Country, respectively. It is not possible to directly compare the obtained results, since the design of this specific question was slightly different in the surveys sent in the two regions. As can be seen from Figure 4, the majority of the respondents in Catalonia were either not aware of most of these standards, or were unsure whether or not they would implement them in the future. The situation was similar in the Basque Country (Figure 5), where the majority of the respondents indicated that they were familiar with only two out of the fourteen MSSs, namely the auditing guideline ISO 19011: 2002 and the safety specification OHSAS 18001: 1999. The Spanish national guide for integration UNE 66177 received close to one half of the responses indicating familiarity, while all the other standards got the level of familiarity of a third or less. Since some of these standards were either brand new at the time of the survey (e.g., ISO 10002 was published in 2004, while ISO 27001 appeared in 2005) or had not even been published yet (for instance, ISO 10001 and ISO 10003 appeared a year after the Basque Country

survey), this finding is not surprising. Logically, the standards that have been around for a while, such as ISO 19011 and OHSAS 18001, or deal with the integration of standardized MSs, such as UNE 66177, are the best known (see Figures 4 and 5) and seemingly most widely used (see Figures 4 and 6).

In addition, although it appears that a larger proportion of companies has indicated that they will not use most of the selected standards in the future, compared to the companies that intend to or have already applied them or the corresponding MSs, the low level of current awareness and the underlying nature of augmentative standards still make them very important for future use. For instance, in Catalonia, even with 27% of respondents who indicated that they will not implement ISO 10002, 33% said that they either have already done so, or intend to do it in the future. For ISO 10001 in the Basque Country, the proportion of intended and accomplished applications among the companies familiar with ISO 10001 is even higher at about 40%. Furthermore, in Catalonia, more than 40% of all the respondents indicated that they consider it important to implement or were already using ISO 19011, while in the Basque Country, slightly more than 50% of the companies familiar with this guideline had either implemented it or indicated that they would in the future. If these fractions are taken against the total number of ISO 9001 registered companies in the two regions and worldwide, the significant potential application of augmentative standards becomes evident, regardless of the fact that they only cover a single component of a MS. Two thirds of the respondents who marked that they had either implemented or will apply OHSAS 18001 in Catalonia and the corresponding close to 90% of companies familiar with this standard in the Basque Country are an indication of such a potential for overall MSSs, as well, although other standards from this group did not obtain such high numbers

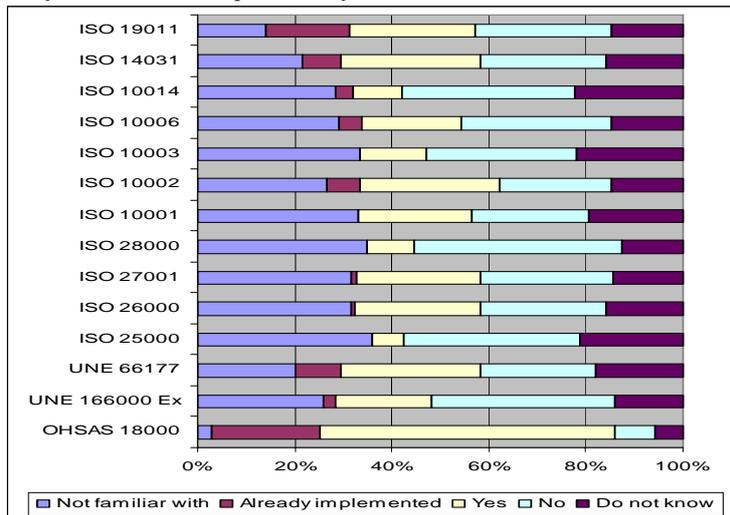


Figure 4: Familiarity with and Importance of MSSs in Catalonia (Karapetrovic et al., 2006)

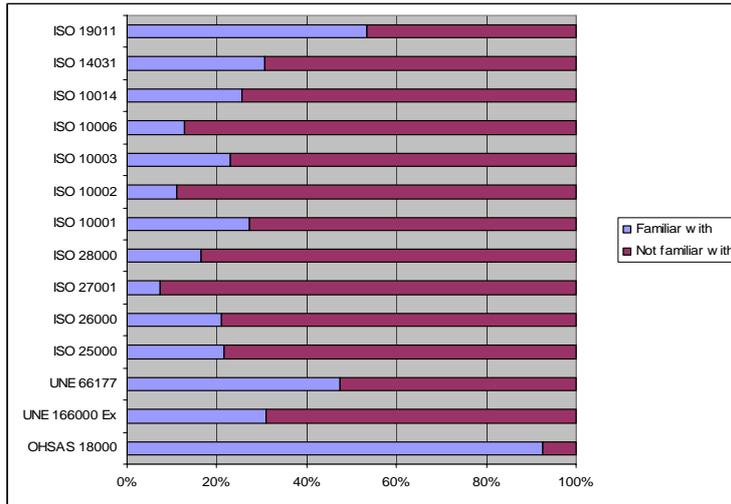


Figure 5: Familiarity with the Standards (Basque Country)

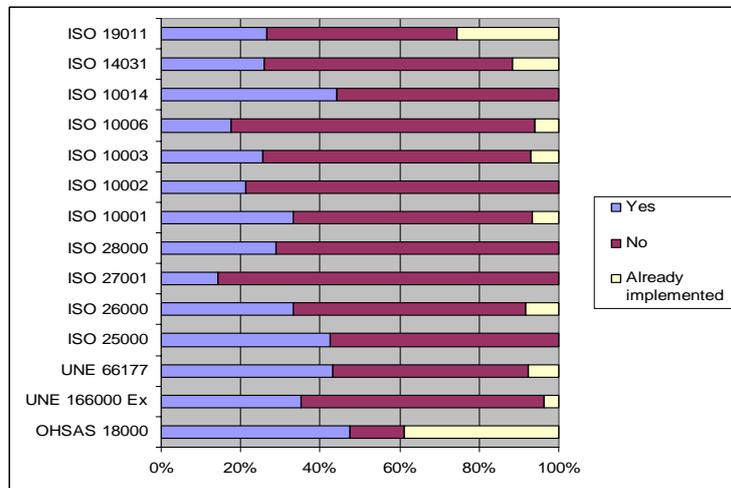


Figure 6: Importance of Implementing the Standards (Basque Country)

### 5. IMPLEMENTATION SEQUENCE

(This section is adapted from Karapetrovic and Casadesus (2009), with the addition of the Basque Country data.)

The order of implementation of various MSSs in the organizations from Catalonia and the Basque Country are presented in an aggregate format in Figure 7. As expected (e.g., see Seghezzi, 1997, Beechner and Koch, 1997, and Karapetrovic and Willborn, 1998A), most organizations (93%), implemented ISO 9001: 2000 first. ISO 9001 was followed by ISO 14001: 2004, which was applied as the second MSSs in 85% of the cases. Of all organizations that reported the implementation of further standards, 37% registered to OHSAS 18001: 1999 as the third MSS.

However, when the strategy with respect to the implementation of the two standardized MSs characterizing the study population (QMS and EMS) is analyzed, an interesting finding, discussed in, e.g., Karapetrovic and Willborn (1998A), is obtained. A total of 25 responding organizations (8%) implemented an EMS and QMS simultaneously. On the other hand, 3% actually implemented an EMS before a QMS.

As mentioned in Karapetrovic and Casadesus (2009), these results differ from those found by Zeng et al. (2006) in China and by Douglas and Glen (2000) in the United Kingdom, in both of which the organizations that had initially implemented a different MSs than the QMS were not detected.

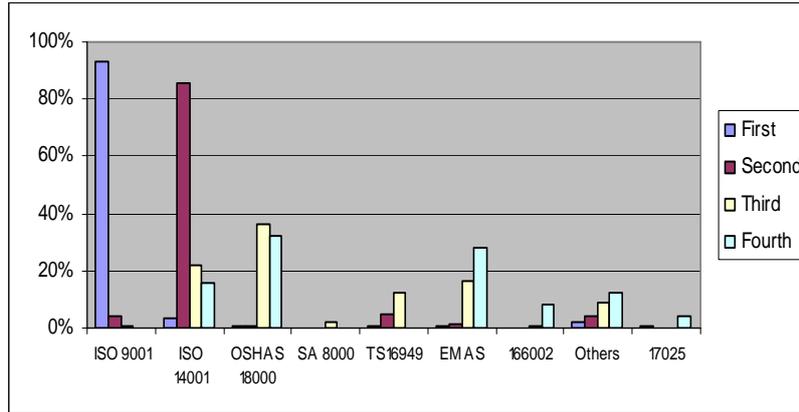


Figure 7: Sequence of Implementation of MSSs

## 6. REASONS FOR IMPLEMENTATION

*(This section is adapted from Karapetrovic et al. (2006), based on the addition of the Basque Country data and a further statistical analysis.)*

Regarding the motivation to implement new MSSs, it makes sense to assume that much of the same reasoning valid for the application of the initial standard would still hold (e.g., Karapetrovic and Casadesus, 2005A and B). However, a larger number of stakeholders to satisfy and more functions to cover

with additional standards than before may provide supplementary reasons for further implementation (e.g., Karapetrovic, 2002A and 2003).

Figure 8 provides a list of the provided reasons and importance attached to each. The most important factor to implement additional MSSs was clearly the “improvement of the company’s image and social impact”, with the median importance level of 4.23 out of 5. This was followed by the “improvement of the organizational efficiency and control” (3.85), the “provision of competitive advantage” (3.78) and “reducing problems and accidents” (3.74).

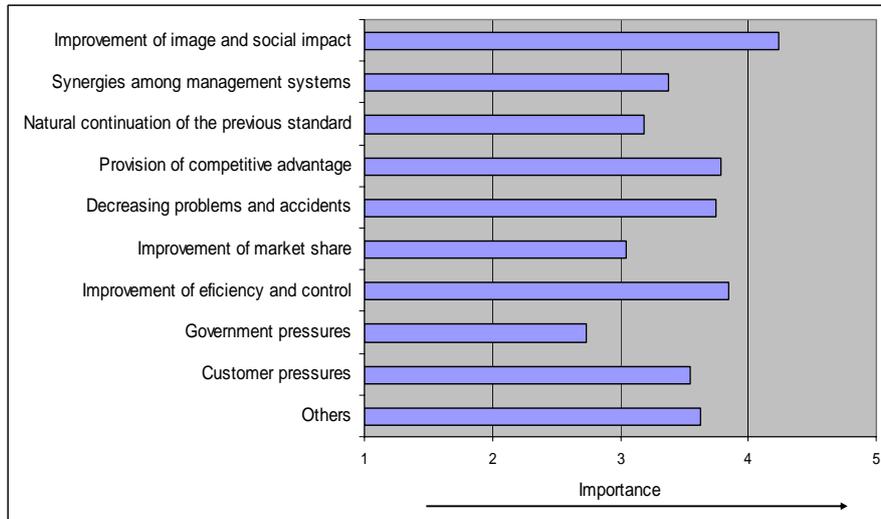


Figure 8: Motivation to Implement the Second and Further MSSs

An additional statistical analysis was performed to compare the results from the two regions. In 7 of the 10 analysed factors, there are statistical differences between the samples. The most interesting point is that

in all seven factors, the importance detected in Catalonian companies was higher than in the organizations from the Basque Country.

Table 2: Regional Differences in the Motivation to Implement the Second and Further MSSs

Factor	Factor importance		Analysis		
	Catalonia	Basque Country	Mann-Whitney U	p-value	Significant ? ( $\alpha=0.05$ )
Improvement of image and social impact	4.425	4.018	8306	0.002	Yes
Customer pressures	3.675	3.375	9644	0.269	No
Government pressures	2.878	2.535	8649	0.035	Yes
Improvement of efficiency and control	3.900	3.770	9568	0.359	No
Improvement of market share	3.166	2.854	8427	0.026	Yes
Decreasing problems and accidents	3.852	3.567	9054	0.048	Yes
Provision of competitive advantage	3.925	3.548	8196	0.020	Yes
Natural continuation of the previous standard	3.318	2.986	8702	0.036	Yes
Synergies among management systems	3.644	3.061	7776	0.000	Yes
Others	3.000	4.500	17	0.117	No

**7. REASONS FOR SEPARATION**

(This section is adapted from Karapetrovic et al. (2006), based on the addition of the Basque Country data and a further statistical analysis.)

Although the integration of standardized MSs generally makes sense, organizations naturally encounter difficulties in the process (e.g., Karapetrovic and Willborn, 1998A and Karapetrovic, 2003). These difficulties seem to have basically evolved around two distinct issues, namely the integration of standards, on one hand, and of the related internal MSs, on the other (e.g., Karapetrovic, 2002A). However, the latter concern was contemplated to be the much more consequential of the two (e.g., Karapetrovic, 2002A and ISO, 2008).

To better understand the causes of integration problems in reality, the survey contained a question aimed at the organizations which chose not to integrate their standardized MSs and asked for the identification of the main reasons not to integrate. The results are shown in Figure 9 and seem to largely follow theoretical discussions. Specifically, MSS-related issues (top three bars in the figure) are clearly dominated by the internal MS issues (bars four to six from the top). The fact that standardized MSs are covered by separate departments in the respondents' organizations is the main cause of leaving the MSs disconnected (median importance of 3.61), followed by the lack of interest (2.89) and resources (2.76) to integrate.

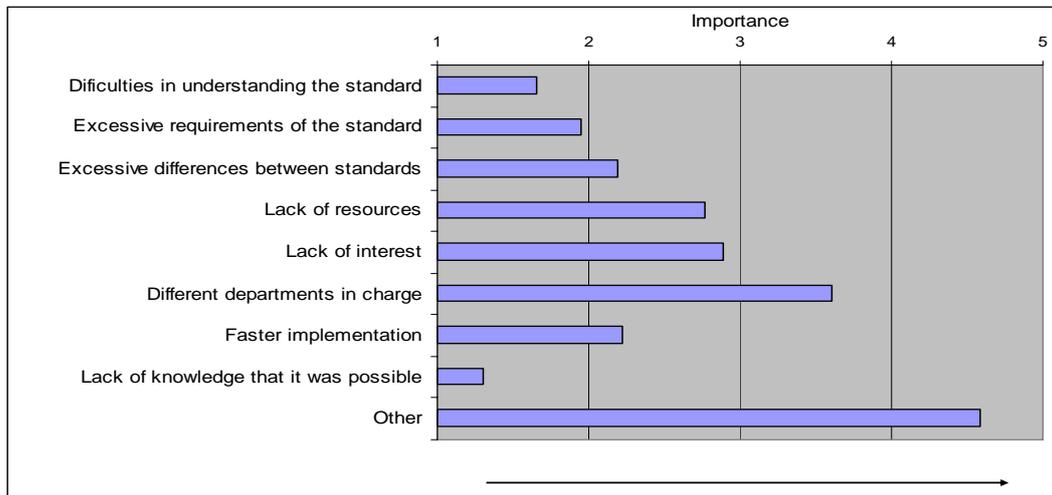


Figure 9: Motivation for Having Independent Standardized MSs

A further statistical analysis was conducted in order to compare the related results from Catalonia and the Basque Country. Only in two of the analyzed factors, namely the “difficulties in understanding the

standard” and the “lack of knowledge that integration was possible”, are there differences between the results obtained in the two regions

Table 3: Regional Differences in the Motivation for Having Independent Standardized MSs

Factor	Factor importance		Analysis		
	Catalonia	Basque Country	Mann-Whitney U	p-value	Significant? ( $\alpha=0.05$ )
Difficulties in understanding the standard	2.000	1.222	220	0.002	Yes
Excessive requirements of the standard	2.100	3.375	327	0.143	No
Excessive differences between standards	2.237	2.536	367	0.420	No
Lack of resources	3.056	3.772	300	0.064	No
Lack of interest	2.889	2.855	400	0.804	No
Different departments in charge	3.938	3.568	327	0.097	No
Faster implementation	2.444	3.549	309	0.122	No
Lack of knowledge that it was possible	1.650	2.987	250	0.003	Yes
Others	4.500	3.061	8.5	0.433	No

### 8. TOOLS AND MODELS USED FOR INTEGRATION

(This section is adapted from Karapetrovic et al. (2006), based on the addition of the Basque Country data and a further statistical analysis.)

Integration of standardized MSs usually involves an adoption of a fundamental model for the integrated MS, followed by a superimposition of the MSS criteria based on the model (see, e.g., Karapetrovic and Willborn, 1998A and ISO, 2008). The survey explored the use of “process maps” as tools related to the process

model underlining many MSSs, together with the “PDCA cycle” and organization-specific models, as well as the analysis of the common elements of MSSs. Karapetrovic et al. (2006) provide a further explanation and details on the rationale behind the specific question asked and the inclusion of the four possible responses.

The results (Figure 10) demonstrate the dominance of the analysis of common elements of MSSs and the application of process maps, used by 93% and 88% of the respondents, respectively. 69% and 58% applied their own model and the PDCA approach, respectively.

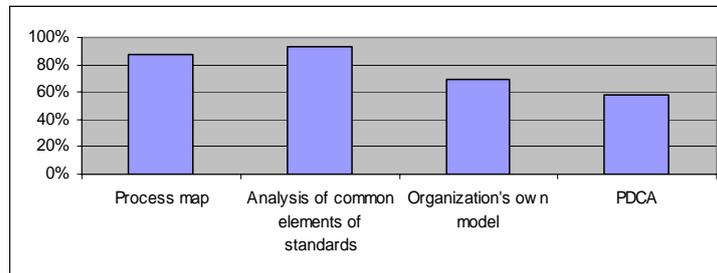


Figure 10: Models applied in the integration process

Table 4: Regional Differences in the Models and Tools Applied in the Integration Process

Tool / Model Used	Percentage of companies		Analysis		
	Catalonia	Basque Country	Mann-Whitney U	p-value	Significant? ( $\alpha=0.05$ )
Process map	91%	82%	5571	0.055	No
Analysis of common elements of standards	93%	93%	6603	0.918	No
Organization's own model	71%	66%	5759	0.560	No
PDCA	50%	69%	4331	0.005	Yes

Table 4 illustrates the regional differences. Only in the case of the PDCA cycle are the differences between the samples statistically significant. In the Basque Country, 69% of the companies surveyed used this tool, compared to 50% in Catalonia.

**9. INTEGRATION OF AUDITS**

*(This section is adapted from Karapetrovic et al. (2006), based on the addition of the Basque Country data.)*

Although an integrated audit of MSs brings numerous benefits, and organizations need it internally and even require integration of external audits, several problems of both the theoretical and practical nature may impede the accomplishment of the integration goal (e.g., Karapetrovic and Willborn, 1998B and 2000; Karapetrovic, 2002A and 2002B; Beckmerhagen et al.,

2003). A part of the survey was therefore aimed at examining the extent to which auditing subsystems (in the case of internal audits) and external audits are actually integrated across the audit system components, namely audit goals, processes and resources (e.g., Karapetrovic and Willborn, 2000).

Figures 11 and 12 show the findings related to the time and human resources through a study of the execution of “simultaneous” and “joint” audits, respectively.

Evidently, a large majority of the responding organizations (67%) conducted their internal audits in a simultaneous manner for all implemented MSSs.

Almost the same percentage was obtained for external audits. Only about one fifth of MS audits are conducted at different times for different function- or stakeholder-specific MSs (Figure 11).

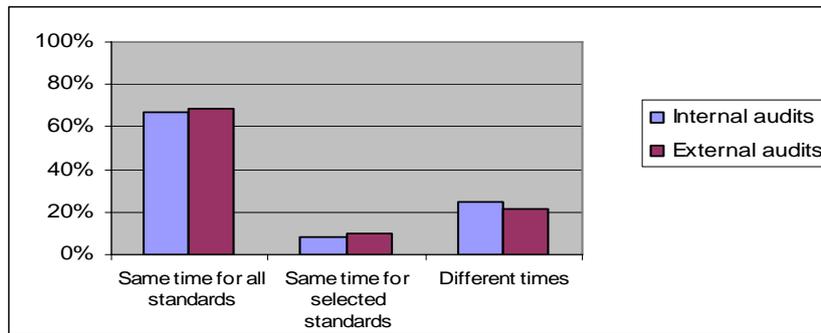


Figure 11: Integration of Audit Resources with Simultaneous Audits

A similar level of integration of audit teams seems to have been achieved (Figure 12). However, such integration is more prevalent in internal audits (72%).

Thus, a large fraction of registrars (40%) still conduct audits with separate audit teams for different MSSs.

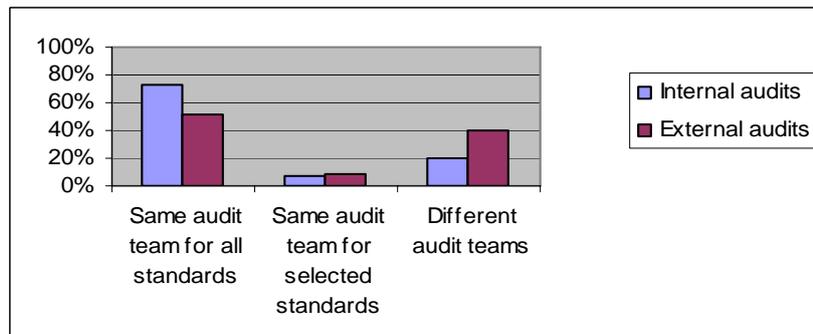


Figure 12: Integration of the Audit Resources with Joint Audits

Figure 13 illustrates the integration of the audit process inputs, namely the audit plans, and its outputs, specifically the audit reports. As with the audit resources, most audits contain a single plan and a single report (67% for internal and 54% for external audits).

However, similarly to the results for the integration of audit teams, this fraction is larger for internal audits. Consequently, a significantly larger percentage of external audits still have separate plans and reports. This difference is about 15% (Figure 13).

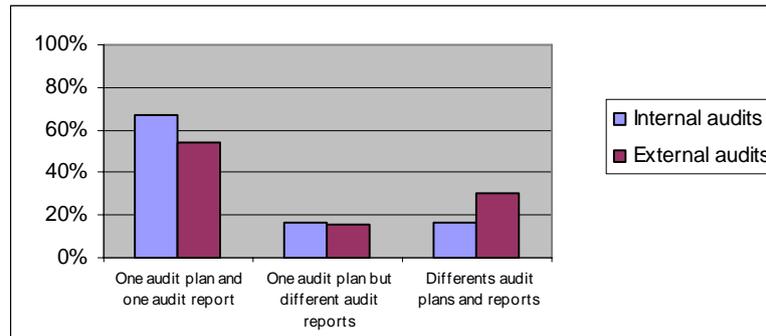


Figure 13: Integration of Audit Inputs and Outputs

## 10. CONCLUSIONS

This paper illustrated selected results from a survey of organizations with at least two MSS certificates, namely ISO 9001: 2000 and ISO 14001: 2004. The survey included 298 organizations based in two regions of Spain, 176 of those in Catalonia and 122 in the Basque Country. The paper was focused on a number of aspects related to the integration of standardized MSs. It contained mostly descriptive analyses of the results with respect to the respondents' familiarity with, and the perceived importance of, the selected MSSs, the order in which these MSSs were applied, reasons for applications, challenges and models used in the integration process, as well as the integration of specific components of audit systems.

Overall, it seems that ISO 9001 - and ISO 14001 - registered organizations are largely not familiar with many MSSs, except OHSAS 18001 and, to a certain

degree, guidelines for auditing (ISO 19011) and integration (UNE 66177). Still, a significant percentage of the respondents indicated the importance of usage of a number of specific MSSs. The "QMS - EMS - OHSMS and other MSs" sequence is prevalent in the surveyed organizations, although a fraction of the companies implemented the QMS and EMS simultaneously, and some even applied the EMS first. In terms of the reasons for implementation of the second and additional MSs, improvement of image and social impact was given the highest level of importance, albeit to a higher extent in Catalonia than in the Basque Country. Problems related to the integration of internal MSs dominated the reasons cited for leaving standardized MSs as separate, while most organizations used process maps and the analysis of the common elements of MSSs in the integration process. Finally, the organizations reported a significant level of integration of internal MS audits.

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Received: 15.09.2009

Accepted: 20.02.2010

Open for discussion: 1 Year