

An empirical study on the integration of management system audits

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ABSTRACT

The objective of this paper is to analyze how internal and external audits of standardized management systems are conducted, with specific focus on the actual integration of audits performed against different management system standards. The research is based on a survey of 435 organizations registered to, at a minimum, both the ISO 9001: 2000 and ISO 14001: 2004 standards. A multivariate cluster analysis is applied in order to obtain distinctive typologies of the organizations participating in the study. The results show that the majority of organizations registered to multiple standards integrate their internal audits and are also externally audited in a similar manner. In addition, three distinct groups of organizations are detected, characterized and compared with respect to their audit conduct and integration.

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1. Introduction

In recent years, the number of available management system standards with an international and universally-applicable character has increased substantially. It is widely known that these standards began with the publication, by the International Organization for Standardization (ISO), of the ISO 9000 family for quality management in 1987 and continued with the ISO 14000 series for environmental management in 1996. Both ISO 9001 and ISO 14001, in their various versions, have since become the most extensively-registered management system standards in the world. In 2007, the number of ISO 9001: 2000 certificates was 951,486, while there were 154,572 certificates for ISO 14001: 2004, with an annual growth respectively of 6% and 21% in 2007 (ISO, 2008a). However, although these two management system standards have the most registrations, they are certainly not the only such international and generic standards being implemented in organizations. For example, ISO 27001: 2005 on information security has experienced a 33% increase in registrations in 2007 to reach 7732 (ISO, 2008a), while ISO 28000: 2007 on supply chain security was also

introduced as a specification standard. In addition, ISO announced that a new management system standard on energy management (ISO 50001) would be developed (ISO, 2008b).

At the national level, other standardized management systems have also appeared. For instance, occupational health and safety management systems are covered by national management system standards, such as the Canadian CSA Z1000: 2006, the American ANSI/AIHA Z10: 2005, and the British OHSAS 18001: 2007. Furthermore, industry sector-specific standards appeared, such as the ISO 22000: 2005 for food safety, ISO 16949: 2009 for the automotive industry, and ISO 13485: 2003 for the medical device sector. Finally, ISO 10001: 2007 for Customer Satisfaction Codes of Conduct and ISO 14031: 1999 for Environmental Performance Evaluation are examples of standards focused on a specific component of a quality and an environmental management system, respectively.

The emergence of all these standards has naturally promoted research into their diffusion. Several academic studies on the diffusion of ISO 9001 and ISO 14001 have found that the increase in registrations to these two management system standards can eventually arrive at the point of saturation. For example, Franceschini et al. (2004), Marimon et al. (2006) and Casadesus et al. (2008) model this diffusion in different countries and forecast when saturation points will be reached in each country. The results indicate that in certain countries, for instance in the European Union, this point has already been reached or will be reached in

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a few years, while in others, such as in the United States, saturation will not occur that soon, due to a later time when registrations picked up in those countries. For other management system standards, since they are mostly new and yet unknown (see, e.g., Karapetrovic et al., 2006), the current situation is quite different. Namely, it is logical to expect that they will be applied in more organizations in the immediate future (see, e.g., ISO, 2008a).

This proliferation of management system standards has created a need for the establishment of the respective auditing systems (e.g., see Willborn and Cheng, 1994; Willborn, 1994). The first international quality management system auditing standard was ISO 10011 (ISO, 1991), although other national auditing standards already appeared in the 1980s, for example in Canada and the United States. Since financial auditing standards had been in use for a long time before, Willborn (1994) performed a comparative analysis of the various then-existing auditing standards. In 1996, ISO published a series of three standards for environmental auditing (ISO 14010, ISO 14011, and ISO 14012). These audit standards, specifically ISO 10011 and ISO 14010/11/12, were compared by Karapetrovic and Willborn (1998a). Although differences in the content and structure of these function-specific standards were found, the authors also discussed the integration of audits of quality and environmental management systems (Karapetrovic and Willborn, 1998a). In 2002, guidelines for auditing quality and environmental management systems were “integrated” into a single standard, namely ISO 19011 (ISO, 2002). This standard is currently under revision, with one of the objectives being the provision of more generic guidance, in other words, for the auditing of all standardized management systems (ISO, 2008c).

Following the significant proliferation of standardized management systems, which does not seem to be anywhere close to completion, many questions on the auditing of these systems emerge, for example:

- ‘How do organizations realize audits of their standardized management systems?’,
- ‘Do they integrate the audits against quality, environmental and other management system standards?’, and
- ‘Are internal and external audits integrated at the same level or in the same way?’.

The objective of this paper is to determine if there are typological differences in organizations with respect to the integration of both the internal and external management system audits. The following section contains a review of the existing literature on the integration among quality, environmental and other standardized management system audits. Subsequently, the methodology and the results of the related empirical investigation are described. Finally, conclusions obtained from the study are discussed.

2. Literature review

The existence of multiple Management System Standards (MSSs) that organizations can and have already implemented brought about the issue of whether or not the corresponding Management Systems (MSs) can be unified into a single or “Integrated Management System” (IMS). One of many possible definitions of an IMS is that of 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” (Karapetrovic and Willborn, 1998b). Integration of standardized MSs has been a much-studied topic of research and practical studies, particularly when its theoretical aspects are considered (for a review see, for example, Wilkinson and Dale, 1999a). Overall, these aspects included the various

integration strategies (e.g., Karapetrovic and Willborn, 1998b; Douglas and Glen, 2000; Karapetrovic and Jonker, 2003), methodologies (e.g., Puri, 1996; Karapetrovic and Willborn, 1998b; Zeng et al., 2007; ISO, 2008d), and levels (e.g., Seghezzi, 1997; Wilkinson and Dale, 1999b; Kirkby, 2002; Karapetrovic, 2003; Beckmerhagen et al., 2003; Pojasek, 2006; Bernardo et al., 2009).

However, literature on the integration of internal auditing subsystems or external function-specific audits is much sparser, especially for the latter type of audits. Since such integration is the main theme of this paper, it is important to define some related concepts. An ‘audit’ is defined in ISO 19011: 2002 and ISO 9000: 2005 vocabulary standard as a ‘systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled’ (ISO, 2002, 2005). According to the same standards, an ‘internal’ or ‘first-party’ audit is ‘conducted by, or on behalf of, the organization itself for management review and other internal purposes, and may form the basis for an organization’s declaration of conformity’ (ISO, 2002, 2005). ‘External’ audits encompass the so-called ‘second-party’ (‘conducted by parties having an interest in the organization, such as customers, or by other persons on their behalf’) and ‘third-party’ (‘conducted by external, independent auditing organizations, such as those providing certification/registration of conformity’) audits (ISO, 2002, 2005).

Evidently, organizations with more than one implemented management system, regardless of whether these systems are integrated or not, can realize the audits against the corresponding management system standards in an integrated manner. It is expected that organizations that have integrated their management systems to a certain degree will also conduct integrated internal audits to some degree, as internal audits are a subsystem of the overall management system. Studies of Karapetrovic et al. (2006) and Bernardo et al. (2009) provide empirical evidence that internal audits have levels of integration in accordance with the level of integration of management systems. In this sense, the ISO 19011 standard may provide some help to an organization that is integrating its management system audits. In addition, generic audits of management systems are discussed in the literature (e.g., Karapetrovic and Willborn, 2000; Karapetrovic, 2002; ISO, 2008d). Some guidance on integrated auditing can also be found in different documents on management systems integration, such as the related ISO handbook (ISO, 2008d), as well as national standards, for instance the Australian/New Zealand AS/NZS 4581: 1999 (SAI Global, 1999), the Danish DS 8001: 2005 (Dansk Standard, 2005), the Spanish UNE 66177: 2005 (AENOR, 2005), and the British PAS 99: 2006 (British Standards Institution, 2006).

It stands to reason that integrated audits bring about a series of benefits to the organizations using them, for example, the optimized use of resources (e.g., Karapetrovic and Willborn, 1998b; Douglas and Glen, 2000; Karapetrovic, 2002; Zeng et al., 2005, 2007; Zutshi and Sohal, 2005a; Pojasek, 2006; Salomone, 2008) and the establishment of auditor competence for different management system standards (Douglas and Glen, 2000; De Moor and De Beelde, 2005; Kraus and Grosskopf, 2008). Taking these into account, the majority of the available literature on the integration of management system audits is focused on internal auditing (e.g., ISO, 2005), although a paper by Wilkinson and Dale (1998) investigates five registrars, and thus external auditors, on the audits of integrated management systems.

Unfortunately, empirical studies on the integration of standardized management systems generally, and therefore on the subtopic of audit integration specifically, are few and far between, namely Douglas and Glen (2000), Fresner and Engelhardt (2004), Zeng et al. (2005, 2007), Zutshi and Sohal (2005a), Karapetrovic et al. (2006), Salomone (2008) and Bernardo et al. (2009). From this

group of papers, only Douglas and Glen (2000) and Salomone (2008) touch upon the integration of audits of standardized management systems, while Karapetrovic et al. (2006) study this issue in more detail. The research of Douglas and Glen (2000), with a sample of 28 companies that had implemented ISO 9001 and ISO 14001 found that in 20 companies from the sample, 13 of which had integrated management systems, the auditors were the same for both standards. In an investigation of 103 organizations registered to ISO 9001, ISO 14001 and OHSAS 18001, Salomone (2008) presented the optimization and/or unification of internal and external audits as one of the benefits obtained from the implementation of an integrated management system. 78% of the studied companies integrated their internal audits, while this fraction was 65% in the case of external audits (Salomone, 2008).

As can be seen from the above review, there are limited studies into the practice of the integration of audits of standardized management systems. This is perhaps because such audits, regardless of whether they are integrated or not, are not widely researched in general, or because many management system standards against which they are conducted are new. Therefore, the investigation illustrated here is focused on studying the possible existence of distinctive practices with respect to the integration of internal and external management system audits in organizations registered to multiple management system standards. The methodology used in the investigation is described next.

3. Methodology

With the objective of analyzing the levels of integration of quality, environmental and other management system audits, this study uses the same methodology as presented in Bernardo et al. (2009) for determining the levels of integration of standardized management systems. In essence, the application of this methodology allows for the differentiation among the groups of organizations depending on their audit integration. In other words, organizations with similar audit integration practices will be categorized into the same group, while organizations with such distinctive practices will be placed into different groups.

The data used in the study comes from a survey of organizations that were, at the minimum, registered to both ISO 9001: 2000 and ISO 14001: 2004. The survey questionnaire was sent to the management system representatives of 1615 organizations in Spain during 2006 and 2007. The surveyed organizations are located in Catalonia, the Basque Country and Madrid, the three autonomous communities with the highest “certification intensity” in Spain (Heras and Casadesus, 2006). It is interesting to point out that Spain is one of the countries with the most management system standard certificates in the world. Specifically, it is in fourth position in terms of the number of ISO 9001: 2000 registrations, after China, Italy and Japan, and holds third place for ISO 14001: 2004 certificates, after China and Japan (ISO, 2008a).

A total of 435 valid responses were obtained, representing the response rate of 27%. Overall survey characteristics are presented in Table 1. Apart from having registered their quality and environmental management systems to ISO 9001 and ISO 14001, respectively, some of the surveyed organizations also had certificates for other management systems. For example, 75 companies from the sample were registered to OHSAS 18001, while 47 organizations implemented a corporate social responsibility standard.

Additional information on the participating organizations was also collected, including each organization's size, industry sector and customers. Regarding the number of employees, four different categories have been defined, specifically from 1 to 250 employees, from 251 to 500 workers, from 501 to 1000 employees, and more than 1000 workers. 69.83% of the organizations belong to the first

Table 1
Survey characteristics.

Characteristic	Value
Location	Spain
Time of the survey	2006–2007
Estimated population ^a	2530
Sample size	1615
Number of responses	435
Response rate	27%
Confidence level ($p = q = 0.5$)	96%

Source: Own elaboration.

^a Estimate of the number of organizations with ISO 9001 and ISO 14001 certificates in the Spanish regions of Catalonia, the Basque Country and Madrid from Forum Calidad (2005).

category, while the other three categories all present very similar percentages, namely from 8.31% to 11.88%. Twelve different sectors were defined. A large number of organizations operate in the production sector (41.73%), followed by the construction sector with 16.07%. Organizations belonging to sectors such as education, financial services and public administration were represented by low percentages. Finally, information about the users or customers of the products or services provided by the participating organizations was collected. Almost 50% of the companies have intermediate users, while 18.25% provide their products or services to the final user. 32.46% of the participants have both types of users, i.e., both intermediate and final customers.

The actual survey had a broad coverage of the various issues regarding integrated management systems and asked questions on 16 relevant integration aspects, for example, the reasons for not integrating the systems, difficulties encountered in the process of integration, models and tools used in the integration, and the importance of using new management systems standards and further integrating the respective management systems. For Catalonia only, the initial descriptive analysis of the results can be found in Karapetrovic et al. (2006).

One of the major aspects studied in the survey referred to the practice of audits, with questions relating to both the internal and external management system audits. This particular group of questions was aimed at studying the degrees of integration of the function-specific (e.g., quality or information security) or standard-focused (e.g., ISO/TS16949 or ISO 14001) audits, as well as the manner in which these audits are conducted in organizations with multiple management system standards. The audit components whose integration was specifically studied were the objectives (e.g., audit plans), resources (e.g., auditors and audit timing) and processes (e.g., audit plans as inputs, methods used in the auditing process, and audit reports as outputs). The methodology used in the audits was investigated through the questions on the audit execution method, audit guidelines applied, frequency of individual audits, and the type of findings reported.

Table 2 describes the eight study variables, categorized into the above-discussed sets of ‘variables related to the integration’, on one side, and the ‘variables related to the methodology’, on the other. For each variable, an explanation or a definition from ISO 19011: 2002 (ISO, 2002), ISO 9000: 2005 (ISO, 2005), or ISO 9001: 2008 (ISO, 2008e) is provided, and the possible answers on each corresponding survey question are included (Table 2).

As can be observed in Table 2, the first set of variables (‘related to the integration’) includes the ones that describe the level of integration of audits. In other words, they provide for an evaluation of the degree of integration of the audit systems, from basically no integration, i.e., separate audit systems; to full or complete integration, i.e., a single audit system. These four variables can be analyzed in order to determine if different practices or behaviours

Table 2
Study variables.

	Variable	Explanation/definition	Possible survey answers
Variables related to the integration	Audit team	“One or more auditors conducting an audit supported if needed by technical experts” (ISO, 2002). Audits of different MSs can be conducted by a single or multiple auditors or teams (ISO, 2002).	<ul style="list-style-type: none"> • Same audit team for all standards • Same audit team for selected standards • Different audit teams
	Simultaneity	Audits of different MSs can be conducted at the same time or different times (ISO, 2002).	<ul style="list-style-type: none"> • Same time for all standards • Same time for selected standards • Different times
	Process	The manner in which standardized MSs implemented by the auditee are actually audited.	<ul style="list-style-type: none"> • Audited as independent systems • Audited as interrelated systems • Audited as an integrated system
	Audit plan and audit report	Audit plans [“description of the activities and arrangements for an audit” (ISO, 2002)] and audit reports [“source of information that is used for review of the MS” (ISO, 2005)] can be integrated into single documents or not.	<ul style="list-style-type: none"> • One audit plan and one audit report • One audit plan and different audit reports • Different audit plans and reports
Variables related to the methodology	Audit execution	Audits can be executed based on the process approach (ISO, 2008e; ISO, 2009), thus “process-by-process”, or on the audit criteria (i.e. MSS requirements), thus “requirement-by-requirement”.	<ul style="list-style-type: none"> • Process by process • Requirement by requirement • Do not know
	Guideline	Auditors may or may not use a guideline such as ISO 19011: 2002 to conduct an audit.	<ul style="list-style-type: none"> • ISO 19011 • Another guideline • No guideline • Do not know
	Frequency	Number of times that the audit is conducted. It depends on the audit programme (ISO, 2002).	<ul style="list-style-type: none"> • Less than 6 months • Between 6 months and less than 1 year • Between 1 and 3 years
	Findings	“Results of the evaluation of the collected audit evidence against audit criteria” (ISO, 2002). They “can indicate either conformity or nonconformity with audit criteria or opportunities for improvement.” (ISO, 2002).	<ul style="list-style-type: none"> • Only detect nonconformities • Show improvement opportunities for the implementation of each standard • Show improvement opportunities for integration • Show improvement opportunities for the implementation of each standard and integration

Source: Own elaboration.

with respect to management system audits exist among the surveyed organizations. If such differences do appear, the variables can facilitate a definition of the typologies of organizations regarding the audits. These typologies should have a certain relationship with the levels of integration of standardized management systems, as described in the literature, e.g., in Seghezzi (1997), Wilkinson and Dale (1999b), Kirkby (2002), Karapetrovic (2003), Beckmerhagen et al. (2003), Pojasek (2006) and Bernardo et al. (2009).

Variables in the second set (‘related to the methodology’) do not provide for such a clear assessment of the integration levels, but can be used in order to describe the practices or behaviours of the groups defined by the first set. In that sense, these descriptive variables will facilitate the characterization of the audit integration levels.

In the following section, a descriptive analysis of the results with respect to the integration of management system audits will be provided. Subsequently, multivariate and cluster analyses of the first set of variables (those ‘related to the integration’) will be applied to identify the distinct groups of organizations as a function of their level of integration of quality, environmental and other standardized management system audits. These analyses, together with detailed descriptions of the identified groups through the second set of variables (those ‘related to the methodology’), are illustrated next.

4. Results

4.1. Descriptive analysis

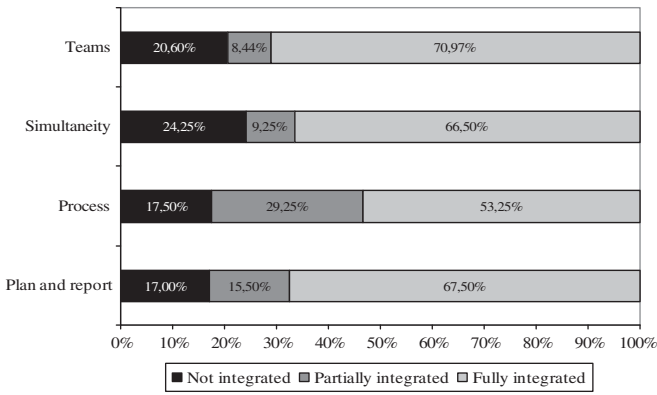
In the first instance, we present a descriptive analysis of the results related to the four integration aspects studied: audit teams,

simultaneity of audits, audit process applied, and audit plans and reports. The analysis is separated for the case of internal audits, on one hand, and of external audits, on the other, since the audit systems designed and applied in these two cases can be very different (e.g., Kraus and Grosskopf, 2008; Heras and Casadesus, 2006; Karapetrovic and Willborn, 1998b).

Based on the possible answers in the survey, three distinct levels of integration are identified, namely:

- ‘Not Integrated’, indicating different audit teams; different times when audits are conducted; audits of independent management system; as well as different plans and reports,
- ‘Partially Integrated’, meaning single audit teams and/or simultaneous audits, but only for the selected standardized management systems or against certain management system standards; audits of interrelated management systems; as well as single audit plans, but different audit reports, and
- ‘Fully Integrated’, referring to single audit teams and/or simultaneous audits for all management systems or standards; audits of integrated management systems; and single audit plans and reports.

A detailed analysis of all possible combinations of the levels of integration was done first. For example, we analyzed the percentage of companies that have “full integration” in all four audit components studied, organizations that have three components fully integrated and the fourth integrated partially or not integrated, and so on. This analysis was applied to both internal and external audits. Another kind of analysis, illustrated in Figs. 1 and 2, was performed next. Here, the study was done by each audit component, i.e., the levels of integration of audit teams, time, process, and plans and reports were analyzed separately.



Source: Own elaboration

Fig. 1. Integration aspects of internal audits.

With respect to the first type of descriptive analysis applied, for internal audits, a total of 36.77% of the organizations (132 organizations) have integrated all four internal audit components studied at the “fully integrated” level, while 0.56% (2 organizations) indicated the “not integrated” level for all four of these components. The rest show a certain level of full integration of some of the components, i.e., one, two or three of them. For example, 10.31% (37 organizations) of organizations have the audit teams, simultaneity and audit plan and report components integrated at the full level, but the process component integrated only partially (i.e., in these organizations, management systems are audited as interrelated, rather than integrated).

Fig. 1 illustrates the levels of integration of internal audits in terms of the four aspects or variables considered in the analysis. As can be observed, various levels of integration can be found in the overall audit systems and their components (e.g., see Karapetrovic and Willborn (2001)). Overall, audit teams, plans and reports, as well as audit simultaneity are the variables with the highest percentages of full integration, confirming the results of the exploratory work of Douglas and Glen (2000). However, only slightly more than one half of the respondents audit their standardized management systems as an integrated management system. This is an interesting finding, especially considering that about 80% of those same organizations reported that they had integrated management systems (Bernardo et al., 2009). Nevertheless, since Bernardo et al. (2009) actually identified three distinct levels of integration of management systems among the organizations which reported having an integrated management

system, and since close to 30% of the respondents to the questions studied in this paper, realized audits of “interrelated” management systems (Fig. 1), this finding can be related to the varying integration levels of both the audits, on one side, and the management systems, on the other.

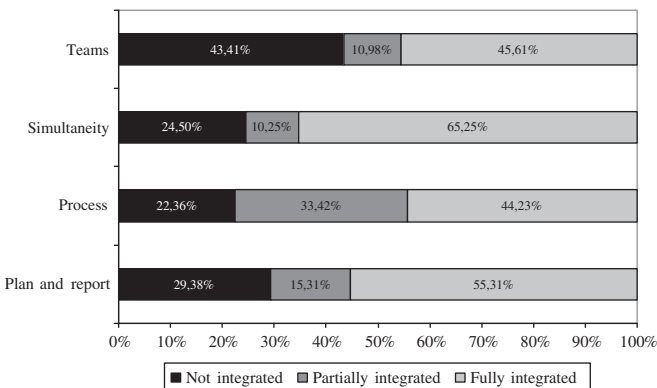
Also likely related to the results obtained from the Bernardo et al. (2009) study of the overall management system integration levels are the findings regarding the organizations that did not integrate the audit components investigated here. For instance, Fig. 1 shows that, among the four variables studied, the highest percentage of “not integrated”-type answers were obtained for audit simultaneity. Namely, close to a quarter of the respondents still conduct their internal audits at different times for different standards. For the other three variables, these values range between 17.00% (61 organizations) and 20.60% (74 organizations), which is slightly higher than the 14% (71 organizations) of companies that reported having separate management systems, but makes sense in the context of the varying levels of integration of management systems among the organizations registered to multiple standards (Bernardo et al., 2009).

For external audits, the results of the first type of descriptive analysis show that 17.10% of the organizations indicated “full integration” of external audits for all four variables studied, while 9.74% of organizations indicate “no integration” across all variables. The same percentage (9.74%, representing 41 organizations) was indicated for external auditors who audit the management systems of the studied organizations as integrated systems, but reported the ‘no integration’ level for the other three variables. Therefore, according to these results, organizations are using separate audit teams, plans and reports, and conducting quality, environmental and other management system audits at different times, although the auditees apparently have integrated management systems.

Fig. 2 depicts the results obtained from the second type of analysis, i.e., illustrating the integration levels of the specific components of external audit systems. The simultaneity in the realization of audits is the variable with the highest percentage of ‘fully integrated’-type responses (65.25%), followed by the integrated audit inputs and outputs (i.e., audit plans and reports) at 55.31%. A significant number of second-party auditors and registrars, according to these results, audit the management systems of the responding organizations as integrated or interrelated, namely, close to 78%. However, audit teams are fully or partially integrated in only about 56% of the cases, indicating that many organizations (almost 44%) are externally audited by separate audit teams for each standard. In addition, close to 30% of organizations receive separate audit plans and reports from the external auditors.

When comparing the internal versus the external audit results (Figs. 1 and 2), apart from the simultaneity of audits, which is showing almost identical percentages, the other variables show fairly large differences. Especially telling is the difference in audit teams, where 70.97% of the respondents have a single internal audit team for all standards, while external auditors do the same for only 45.61% of the participating organizations. In addition, internal audits have about a 12% advantage in terms of the integration of the audit plans and reports. These differences can be explained with the distinct objectives internal and external audits are set to achieve (e.g., Fa, 1997; Bamber et al., 2004; Power and Terziovski, 2005; Darnall et al., 2009). Namely, internal audits aim to improve the organization itself and increase its efficiency, while external audits are undertaken for external purposes (Fa, 1997; Darnall et al., 2009).

In general, for both the internal and external audits, integrated audits are clearly prevalent in the responding organizations, compared to separate audits, across the studied variables. The integration of internal audits also is at a higher overall level than the integration of external audits, at least from the perspective of



Source: Own elaboration

Fig. 2. Integration aspects of external audits.

Table 3
Definition of the axes with the variables and contribution percentages.

		Axis 1:	Axis 2:	Axis 3:
		No integration	Integration	Integration
			[Teams/ simultaneity]	[Implementation/ plan and report]
Internal audits	Teams	4.98%	21.06%	1.63%
	Simultaneity	10.46%	17.64%	0.15%
	Process	7.38%	0.05%	21.17%
	Plan and report	11.65%	1.28%	12.99%
External audits	Teams	4.55%	17.64%	0.10%
	Simultaneity	11.42%	22.87%	0.07%
	Process	9.15%	0.05%	21.47%
	Plan and report	8.10%	0.25%	13.48%

Source: Own elaboration.

the audited organizations. Interestingly, Karapetrovic and Willborn (1998b) forecasted the opposite result, since they expected a higher level of integration for the second-party and third-party audits.

4.2. Multivariate analysis

With the objective of determining whether distinct groups of organizations exist in terms of the integration of management system audits, we performed the Multiple Correspondence Analysis. This analysis was done in order to summarize the first set of qualitative variables, i.e., the ones related to audit integration, in a few numerical axes that allow for a more effective interpretation of information (Benzécri, 1973; Greenacre, 1993). As a result, we obtained three quantitative axes, which provide a satisfactory explanation of the studied variables, namely 82.59% of the total variance. These axes were created from the contribution percentages or weights of each variable included in the analysis. In other words, variables with the highest percentages are the ones that help define or that contribute to the creation of each axis the most. Table 3 illustrates the variables and the percentages of their contribution to each of the three axes, with the variables exhibiting a major contribution highlighted.

The first axis is clearly characterized by a lack of integration of the four auditing aspects studied, regardless of whether internal or external audits are taken under consideration. Therefore, this axis is labeled 'no integration'.

The second axis is formed by the variables representing the integration of the audit teams and the simultaneity of the audits, for internal and external audits alike. These two aspects are related in terms of audit integration (e.g., Karapetrovic and Willborn, 2000), since it can be expected that integrated audits are conducted at a single instance in time and by a single team of auditors, i.e., that they are both 'joint' and 'combined' (ISO, 2002), for instance in order to optimize audit resources. However, as can be seen from the descriptive results in Figs. 1 and 2, such integration is being more pronounced in internal audits, considering that about a fifth of the surveyed organizations are externally audited by different teams at the same time (Fig. 2).

The third axis is constituted by the remaining variables, namely the ones not included in the second axis. The variables that contribute the most to this axis correspond to the process of auditing management systems as independent, interrelated or integrated, as well as the integration of the audit inputs and outputs, i.e., plans and reports. Therefore, we can consider that the second and third axes are formed by the variables related to the

integration of the audit resources and the audit processes, respectively.

These results provide an insight into the orientation of the characteristics underlining the specific groups of organizations with respect to the integration of management system audits. Consequently, it is likely that a group of organizations characterized by a low level of integration or basically non-existent integration of audits will be found. In parallel, a group with a high degree of integration among the audit resources will probably exist. Finally, a third group with integrated process aspects is likely to be detected, as well.

In addition, two interesting points stemming from the results of the multiple correspondence analysis should be noted. Firstly, the analysis did not offer a specific axis that would characterize "total integration", indicating that a significant number of organizations which conduct fully integrated audits, as defined in, for example, Karapetrovic and Willborn (1998b, 2001), was not found. Secondly, the analysis did not point out significant differences between the internal and the external audits in the formation of any of the three axes. This illustrates a separation into the same three groups or organizations, i.e., the ones with no integration, with the integration of audit resources, and with the integration of audit processes, regardless of whether audits are internal or external.

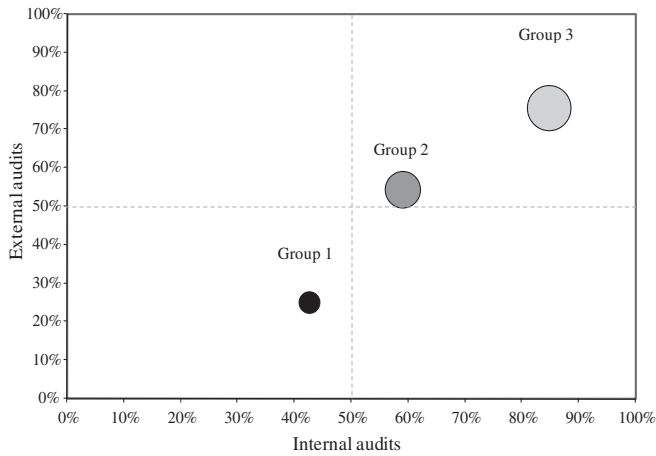
4.3. Cluster analysis

Finally, we performed a cluster analysis using the three axes obtained from the multiple correspondence analysis as variables. The clusters were created using hierarchical methods (Johnson, 1967), in which a similarity or dissimilarity among individuals is measured as a function of certain determined distances. These distances are defined by the 'Ward method' (Ward, 1963), a robust method allowing for the creation of homogenous groups with minimal variance (Ward, 1963). Additionally, a 'Single linkage' method (Sneath, 1957) was applied to detect outliers that can influence the results of the classification. In this way, it is possible to classify all individual organizations in a few groups that are heterogeneous amongst themselves, but each containing homogeneous members (Johnson, 1967).

Following this methodology, and after detecting 12 organizations which were atypical and thus were not included in the classification, the results show the existence of three principal groups of organizations. The goodness of fit of the classification is measured by the median of the eta-squared (η^2), an indicator of the intensity of the relationship between the groups and the axes formed by those. In this case, the median is $\eta^2 = 0.429$, which is considered sufficiently high for this type of study.

The resulting groups were subsequently linked with the variables 'related to the methodology' (Table 2). Only the 'Findings' variable was significant at the 95% confidence level (p -value = 0.000) for both the internal and external audits. Consequently, this is the only variable that is used, together with the ones 'related to the integration', in the interpretation of the detected groups of organizations.

The three groups resulting from the cluster analysis indicate three types of organizations in terms of the integration of audits of standardized management systems. In order to facilitate the interpretation of the results, a graphical representation was used. In it the three groups are described through the level of integration of internal audits on one side and external audits, on the other, instead of a description through the axes illustrated in the previous section. Overall, the difference between these two representations is minimal. Specifically, the representation through internal and external audits explains 80.85% of the variance, which is slightly lower than the previous analysis, but still very significant.



Source: Own elaboration

Fig. 3. Cluster classification.

With the objective of a better understanding of each of the groups detected in the analysis, an ‘integration level’ was defined for both the internal and external audits conducted in each organization; basically in the same way as such a level was defined in Bernardo et al. (2009) for the integration of standardized management systems. Namely, if separate audits are undertaken in an organization, the integration level was considered to be 0%. In the case that integrated audits are conducted for some, but not all, management systems in an organization, this level was denoted at 50%. Finally, integrated audits for all standardized management systems meant a 100% integration level. These considerations allowed for the drafting of Fig. 3, in which each circle represents one group and its size indicates the number of organizations forming the group. Therefore, an initial approximation of the importance of each of the groups was obtained. These groups are briefly described next.

4.3.1. Group 1

This group is formed by 89 organizations representing 21% of the sample. The majority of these organizations (55.90%) belong to the production sector. The most common size is having 250 employees or less (64%) and two types of customers form the majority: intermediate (40.40%) and both users, i.e., intermediate and final (42.70%).

On average and in an approximate sense, internal and external management system audits are integrated at the levels of 42.70% and 25%, respectively. These percentages, as can be observed in Fig. 3, confirm that this group is characterized by the lowest degree

of integration of the three identified groups. In addition, Group 1 is the smallest in terms of the number of organizations belonging to it. Specific integration aspects of management system audits for the organizations belonging to this group are illustrated in Fig. 4.

In terms of the audit teams, the organizations from Group 1 exhibit significant differences between the internal audits, on one side, and external audits, on the other. As Fig. 4 shows, internal audit teams are integrated at almost three times the fraction of the external ones, specifically 63.48% to 21.91%. On the other hand, the results related to the simultaneity of audits are much closer, with a little more than a third of organizations from this group conducting the various internal audits at the same time, while about 8% fewer organizations from this group are externally audited in a simultaneous manner for different standards. However, it seems that in only one out of every nine cases, the management systems are externally audited as a single integrated management system, while this percentage is more than doubled for internal audits. With respect to the audit plans and reports, the level of integration is much higher, with close to 50% for internal and 37% for external audits. Finally, referring to the audit findings, the results are similar for these two types of audits, as internal auditors specify the opportunities for improvement of the implementation of each management system standard at the level of 47.60%, while in 23.20% of the cases, they also identify such opportunities for the integration of management systems. For external audits, these percentages are 62.70% and 21.70%, respectively.

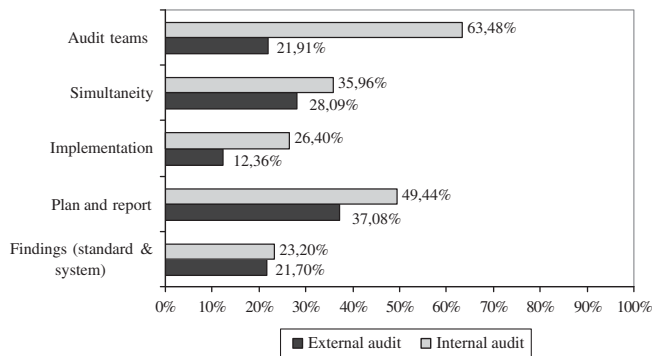
In general, this group is characterized by what seems to be a higher level of integration of internal MS audits, compared to the external such audits, in contrast with the discussions given in Karapetrovic and Willborn (1998b), and a relatively low level of integration overall. The organizations belonging to this group are likely the ones that have a low degree of integration of their underlying management systems or have not integrated these systems at all. Specifically, 33.71% of companies (30 organizations) from this group have not integrated their management systems (e.g., see Bernardo et al., 2009).

4.3.2. Group 2

There are 148 organizations in this group or 35% of the sample. As in the previous group, the production sector is the most common (39.90%), and 9.50% of the organizations operate in the construction sector. Again, these organizations employ 250 or less workers in most cases (68.80%). The intermediate user is the most common customer (54.70%) for the organizations in this group. In difference to the previous group, the proportions of organizations that integrate management system audits are much closer between the internal and external audits, basically more than one half in each case and for each aspect studied (Fig. 5). In this sense, the degree of integration is superior to Group 1, especially in terms of external audits. Effectively, in the majority of the aspects studied, the levels are within 2–3% of each other for internal and external audits, except for the audit teams and simultaneity, where they differ by about 10% and 6%, respectively.

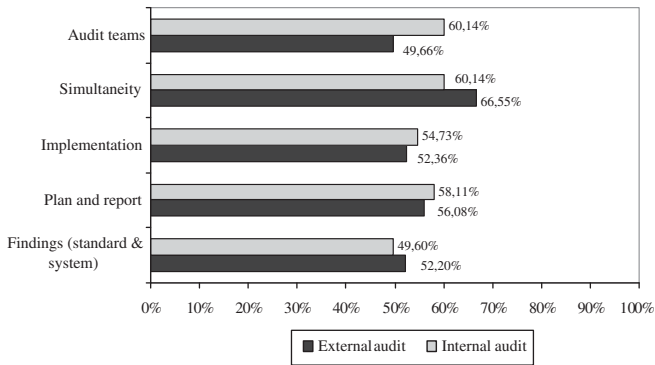
Internal audit teams are more integrated than the external ones (Fig. 5). Interestingly, the results on the simultaneity aspect show a higher degree of integration for external audits, namely 66.55% compared to 60.14% for the internal audits. Taking into account the results of the study related to the type of audit findings, the external audits of this group of organizations are in line with some theoretical discussions (e.g., Karapetrovic and Willborn, 1998b; Kraus and Grosskopf, 2008).

Specifically in relation to the audit findings, internal auditors detect improvement opportunities for both the implementation of each management system standard and the integration of management systems in 49.60% of the surveyed organizations,



Source: Own elaboration

Fig. 4. Group 1 internal and external audit characteristics.



Source: Own elaboration

Fig. 5. Group 2 internal and external audit characteristics.

while this percentage is 52.20% for external audits. The tendency of higher proportions for internal audits comes back in the case when the auditors only provide improvement opportunities for the implementation of each management system standard, although the difference is fairly small. Namely, this occurs in 27.50% and 24.60% of organizations in Group 2, respectively.

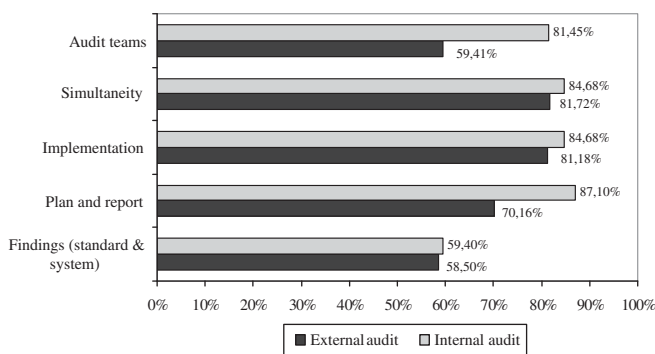
4.3.3. Group 3

The last group is also the largest. It consists of 186 organizations (44% of the sample). These companies are small-sized organizations, since they have 250 employees or less in 74.30% of the cases. The sectors where they operate the most are production (34.40%) and construction (23.70%), as is the case in the other groups. With respect to their customers, 45.20% of Group 3 organizations have intermediate users and 32.80% have both the intermediate and final users.

These organizations have the highest level of integration of both internal and external management system audits. On average and in an approximate sense the organizations from Group 3 are characterized by integration levels of 84.68% for internal and 75.67% for external audits (Fig. 3). The aspects studied here are represented in Fig. 6 for this group.

As is the situation in the other two groups, the organizations from Group 3 exhibit a higher degree of integration of internal compared to the external audits, although the proportions are still quite similar. In two aspects, specifically the integration of audit teams and the integration of audit plans and reports, this difference is fairly large, at about 22% and 17%, respectively (Fig. 6).

The other results are fairly similar when internal and external audits are compared. Therefore, internal auditors show opportunities for improvement in the implementation of each individual



Source: Own elaboration

Fig. 6. Group 3 internal and external audit characteristics.

management system standard and in the integration of management systems in 59.40% of organizations, which is very similar to the percentage in the case of external audits, i.e., 58.50%. For the audit findings only relating to the opportunities for improvement of management system standards implementation, these percentages are 16.30% and 17.70% for internal and external audits, respectively. When these results are contrasted with Group 2 outcomes, it is clear that organizations from Group 3 are characterized by a much greater orientation towards integration. Namely, in the case of internal audits, there are about 43% more organizations that benefit from findings containing the opportunities for improvement of management systems integration in Group 3, with only 22% more in Group 2.

5. Conclusions

The main objective of this paper was to determine if different typologies of organizations registered to multiple management system standards exist with respect to internal and external management system audits. In order to accomplish this objective, one of the first empirical studies on the integration of management system audits was undertaken, with the participation of more than 400 organizations. All the surveyed organizations had quality (ISO 9001) and environmental (ISO 14001) management system certificates, while a significant proportion also had other such certificates, for instance for occupational safety and social responsibility. Three distinct groups of organizations were found in the analysis, including the smallest group (21% of the total) with the lowest level of the integration of management system audits, a larger group (35% of the total) characterized by a medium audit integration level, and the largest group (44% of the total) with the highest such level. In addition to clustering these groups, several other conclusions were drawn from the study.

Firstly, we could not identify a group of any significance that did not integrate quality, environmental and other management system audits to a certain degree. In other words, organizations with multiple standardized management systems, regardless of whether or not these systems are integrated themselves, integrate the corresponding internal audits or are externally audited in an integrated manner, at least to some degree or for some audit components or aspects. Therefore, as contemplated in the related literature (e.g., Karapetrovic and Willborn, 1998a; Wilkinson and Dale, 1999b; Douglas and Glen, 2000; Karapetrovic and Jonker, 2003; Zutshi and Sohal, 2005b; Karapetrovic and Casadesus, 2009), organizations prefer integration of management system audits to managing and conducting them separately. As reported in Bernardo et al. (2009), 362 of the surveyed organizations (or 86% of the sample) integrated their standardized management systems, with internal audits being one of the most integrated procedures.

Secondly, the results show that there are significant parallels between internal and external audits (e.g., Cortemanche, 1989). For instance, in the three identified groups, the levels of integration of the audit systems of both types are fairly similar. However, internal audits have a lead in most of the aspects studied, which could be related to the level of integration of the overall management systems, as pointed out previously. The reason behind this empirical finding can be related to the management capacity and a quick pace of decision making in organizations registered to multiple management system standards, which, together with the need for the optimization of resources and efficiency, makes the integration of internal audits more likely. On the other hand, external audits are mostly undertaken by registrars, which are generally larger organizations, and hence may require more time to adapt to the changes in the environment or

to the auditees' integrated management systems (Kraus and Grosskopf, 2008). Another important point to take into account is the stakeholders' influence and pressure to perform one type of audit or the other (Darnall et al., 2009).

Thirdly, in all three detected groups of organizations, internal audit teams are integrated at a much higher level than the corresponding external audit teams. Undoubtedly, the difficulty in the formation of a single audit team for different management system standards and the related management systems is higher in the case of a registrar needing to obtain the capacity to audit different types of organizations, which is not the situation in internal audits of a single organization (Wilkinson and Dale, 1998; Douglas and Glen, 2000; Power and Terziovski, 2005). Therefore, Renzi and Capelli (2000) argue that it 'would be better to keep the two jobs (quality and environmental auditors) separate, due to the peculiar skills of each system', while Kraus and Grosskopf (2008) emphasize that finding an auditor or team of auditors with all the knowledge and skills necessary to simultaneously audit different management systems is difficult. In-depth knowledge of the organization's processes is another advantage for internal auditors (De Moor and De Beelde, 2005; Darnall et al., 2009).

The major limitation of this empirical study is the focused perspective used in the survey. Namely, the questionnaires were sent to the managers of the registered organizations only, and not to the registrars who undertake external audits of those organizations. Therefore, the information on external audits was obtained from the audited organizations (see Power and Terziovski, 2007). However, the information solicited in the survey should not have depended on whom it was asked from, since all the aspects or variables studied were objective. Nevertheless, consulting the registrars themselves could have enriched the study.

Taking into account the results of this investigation, in which a significant proportion of organizations integrated the audits of their standardized management systems, further study of the integration of both the underlying management systems and their audits is warranted, especially since not all of the surveyed organizations have applied integrated management systems. Hence, an empirical analysis of the motivation, methods and difficulties encountered in the integration process, and the impact on management effectiveness and efficiency of both the integration of MSs and integrated audits, among other related aspects, can be a future direction of research. In addition, the results obtained and presented here can be compared with the related empirical findings on the integration of standardized management systems, for example Bernardo et al. (2009), to examine the relationship between the levels of integration of management systems and of the corresponding audits.

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