

MANAGEMENT SYSTEMS: INTEGRATION DEGREES. EMPIRICAL STUDY

Merce Bernardo
Universtitat de Barcelona, Barcelona, Spain
merce.bernardo@ub.edu

Marti Casadesus
Universitat de Girona, Girona, Spain
marti.casadesus@udg.edu

Stanislav Karapetrovic
University of Alberta, Edmonton, Canada
s.karapetrovic@ualberta.ca

Iñaki Heras
Universidad del País Vasco, San Sebastián, Spain
iheras@ehu.es

Abstract

Purpose: The aim of this research is to study the degrees of integration of different Management systems (MS) within organizations.

Methodology: A questionnaire was mailed to 362 Spanish organizations asking about the level of integration of resources, documentation and procedures. All companies of the sample have, at least, ISO 9001:2000 and ISO 14001:2004 implemented. Multivariate statistical analysis was used to test the hypothesis: first reduction of data and then a cluster analysis in order to classify the organizations of the sample into few groups representing the levels of integration.

Findings: Companies are classified into three groups, each of them integrating at different levels: harmonization, cooperation and amalgamation. In harmonization (8 organizations) the level of integration is partial and cooperation (41 companies) is the next step, that is, more than partial integration but not full integration yet. Finally, the last group of companies (310 organizations) has full integration of their management systems. A great number of companies integrate their MS but there is a lack in understanding the concept of integration.

Research limitation: The sample is made up by Spanish companies. The regions participating in the study have an intensive level of certification, but the results cannot be applied to the rest of Europe before knowing other countries behavior in practice.

Practical implications: This study contributes in knowing what levels of integration companies can have. It can be useful in the creation of an internationally recognized guideline for integration.

Originality: This study is one of the first empirical researches about integration degrees.

Key words: *Integrated Management System (IMS), ISO 9001:2000, ISO 14001:2004, Management System (MS)*

Type of paper: Research paper

Introduction

In recent years many organizations have implemented Management Systems Standards (MSS) in order to improve their management.

The most common standards implemented are those proposed by the International Organization for Standardization (ISO), ISO 9001:2000 for quality management systems (QMS) and ISO 14001:2004 for environmental management systems (EMS). For the first one, more than 897,000 companies are certified all over the world and more than 129,000 organizations are certified by SIO 14001:2004 all over the world (ISO, 2007). This EMS proposes a management system based on a PDCA model (Plan-Do-Check-Act), with certain requirements classified under 6 chapters: general requirements, environmental policy, planning, implementation and operation, checking and corrective action and management review (ISO, 2004).

This EMS has very often been implemented, in parallel or consecutively, in organizations which already used some other MS. This is usually ISO 9001:2000, generated by the same ISO, as shown in Casadesus *et al.* (2008). This standard is an MS focused on Quality Management Systems (QMS), and is based on the eight quality management principles: customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision making and mutually beneficial supplier relationships (ISO, 2005). In this case their requirements are classified under five different chapters: quality management systems, management responsibility, resource management, product realization, and measurement, analysis and improvement (ISO, 2000).

These two standards together undoubtedly make up the MS which are having the most impact at global level, with more than a million certifications all over the world and a 16% increase in the last year (ISO, 2007). However, the MS being implemented in organizations which already use an EMS by no means stop here. So, for example, MS have been developed for occupational, health and safety management systems, corporate social responsibility, accountability, information systems, etc. At this point we should ask ourselves whether all these systems should be implemented individually, or whether we could benefit in some way from the possible synergies present.

In the literature we find the answer from a theoretical point of view, since all these MS, certifiable or not, can be integrated into a single MS: an integrated management system (IMS). The definition of an IMS varies, but some academics have defined them in theoretical terms. So in Karapetrovic and Willborn (1998) an IMS is defined as a “system of systems”, a single system with the complete loss of the unique identities of function-specific subsystems. Later, in Karapetrovic (2003), the same concept is defined as a set of interconnected processes that share a unique 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. The most recent definition we have found is provided by Beckmerhagen *et al.* (2003), according to whom an IMS is: “a process of putting together different function-specific management systems into a single and more effective integrated management system”. Combining these definitions, we can summarize

an IMS as a process of linking different MS into a unique system with common resources aiming to improve stakeholders' satisfaction.

In fact, although IMS have been studied in detail from a theoretical point of view, there has been very little empirical research. We found only 5 relevant studies of this type (Fresner and Engelhardt, 2004; Zutshi and Sohal, 2005; Karapetrovic *et al.*, 2006; Zeng *et al.*, 2006 and Salomone, 2008), all of them very recent. However, they do not address the question we are about to pose here. It seems quite clear that organizations which implement an EMS must integrate it, or subsequently integrate it, with other systems: but do all organizations integrate in the same way? In other words, are all organizations fully integrating documentation, resources and procedures? Or, for example, are they integrating only some of these aspects, or even partially integrating some of them?

The main aim of this paper is to provide an empirical response to these questions. It must be borne in mind that none of the small number of earlier empirical studies is centered on this issue, which is of particular relevance, given that the majority of the organizations involved in implementation and management of an EMS find themselves involved, at one time or another, with implementing another MS in parallel.

In the next section we provide a literature review, followed by a presentation of the methodology. Empirical results are discussed in the following section and the final section sets out our conclusions.

Literature review

The integration of MS has been analyzed, from a theoretical viewpoint, from a number of perspectives. In summary, organizations wishing to implement an EMS jointly with another MS have to concentrate, in general terms, on the following aspects: integration strategies, methodology of integration, advantages and disadvantages of the IMS and degrees of integration. The main results related to each of these aspects are set out below.

Implementation strategy

The first aspect to analyze is the implementation strategy, i.e. which MS the organization is going to integrate and in what order. The most common and accepted in the literature is provided by Karapetrovic and Willborn (1998) who propose an integration based on two main MS: QMS and EMS. They propose a two-step strategy. In the first step, there are three options:

1. Integrate first QMS and second EMS
2. Integrate first EMS and second QMS
3. Integrate QMS and EMS simultaneously

Karapetrovic and Jonker (2003) subsequently proposed an integration strategy for when companies have more than QMS and EMS implemented. Based on the first option, integrating first QMS and then EMS, the sequence should be:

1. Integrate quality-related MS (process approach)
2. Integrate EMS first and then other MS based on a PDCA model

3. Link function-specific MS; align them or make them compatible, and integrate these MS

The empirical study of Salomone (2008), based on research in Italian companies, shows how in practice a small majority of organizations implemented first QMS and then EMS (52% of the sample companies). These results are much the same as those provided by Karapetrovic *et al.* (2006) from a study of organizations in the Spanish region of Catalonia, although in this case the percentage of cases was as high as 86%.

Integration methodology

The methodology used in the integration process is another important characteristic. The methodology depends on each organization's own decision, because there is no international ISO standard to act as a guideline for the process nor any other commonly accepted reference. In this case, it should be pointed out that the Spanish standardization body, a pioneer at the global level, has developed a guideline, *UNE 66177: Management Systems. Guide for the integration of management systems* (AENOR, 2005). Based on the principle of process management, this standard provides a guide to integrating different MS, aiming to develop a global vision of the organization, improving efficiency and business performance; it is a tool for senior management to design and implement the IMS and identify methods to do so. The integration process is structured according to a PDCA model and has 3 stages: development of the integration plan, implementation of the integration plan, and review and improvement (AENOR, 2005). This guideline focuses on the integration of QMS, EMS and health and safety management systems (HSMS) because these are the most common, but it can be extended to other MS implemented or to be implemented.

As a result of the lack of internationally accepted guidelines, authors have proposed a variety of different methodologies. Karapetrovic and Willborn (1998) and Karapetrovic (2003), suggest one that includes the following steps:

1. To assess objectives regarding organization mission, design the set of processes, resources, requirements, technology, timing, etc. and their interrelation
2. To obtain resources and training, deploy resources in processes, monitor performance
3. To proceed in processing as planned, control progress and take corrective and preventive actions
4. To assess the output of individual processes against suitable criteria, and compare final output against original objectives and individual requirements and characteristics

Another model, proposed by Wright (2000), is based on 5 steps:

1. To assemble all relevant documents connected with the organization's operation
2. To note what equipment could have any bearing
3. To assess the significance of what has been identified
4. Objectives and targets set for each effect
5. Review and continual improvement

Zeng *et al.* (2006), in an empirical research project in China, analyzed the internal and external factors that condition this IMS implementation: human resources and organizational structure are the most important internal factors, and technical guidance and certification bodies the external factors. Based on that, they propose a three-level synergetic model to enhance the integration process: strategy synergy (level 1), organizational synergy (level 2) and documentation (level 3).

Advantages and disadvantages

Once the IMS has been implemented, some studies analyzed the advantages and disadvantages of integration. Following the theoretical-based research of Karapetrovic and Willborn (1998), Beckmerhagen *et al.* (2003) and Jørgensen *et al.* (2006), the main factors are presented in table I.

Table I. Advantages and disadvantages of IMS

Advantages	Disadvantages
Simplification of requirements	Difficulties in finding common denominators Disappearance of unique identities Fear of job loss through amalgamation Misalignment of operational goals
Reducing auditing and registration costs	
Integrated audits	
Each organization chooses what to implement	
Simple transition	
Reducing costs	
Harmonization of MS documentation	
Alignment of objectives, processes, resources in different areas	
Positive for small business	
Reducing paperwork	
Synergy effects	
Elimination of effort and redundancies	
Improvement of effectiveness and efficiency	

Source: Karapetrovic and Willborn (1998), Beckmerhagen *et al.* (2003) and Jørgensen *et al.* (2006)

From an empirical point of view, the advantages and disadvantages of integration have only been considered in a small number of case studies. Specifically, Fresner and Engelhardt (2004) analyze the situation based on the analysis of IMS implementation in 2 small companies located in Austria, while Zutshi and Sohal (2005) study it based on 3 small and medium sized Australian organizations.

Degrees of integration

The final characteristic to highlight is the degree of integration. In fact, the decision as to what degree of integration an organization is going to meet depends on the organization itself. According to the literature, there is no unique model for all organizations, although academics have defined different degrees of integration.

Table II summarizes all the models found, grouping into 4 levels those aspects which (disregarding the differences involved) indicate approximately the same thing.

Table II. Degrees of integration according to the main authors

Integration Degrees	Wilkinson & Dale (1999)	Karapetrovic (2002)	Karapetrovic (2003)	Beckmerhagen <i>et al.</i> (2003)	Pojasek (2006)	Jørgensen <i>et al.</i> (2006) & Jørgensen (2007)
Level 0	Individual MS				Combined	
Level 1	Combination based on linkages	Documentation integration	Partial Integration	Harmonization	Integratable	Correspondence
Level 2	Integration of selected parts without linkages	Alignment of core processes, objectives, resources		Cooperation	Integrating	Generic

Level 3	Integration of systems certified and uncertificated	“All-in-one” system	Full Integration	Amalgamation	Integrated	Integration
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Source: Own elaboration from the literature

The first authors to deal with this subject were Wilkinson and Dale (1999) and Karapetrovic (2002), describing quite similar levels of integration, as shown in the table above. So according to Karapetrovic (2002) three types of organizations can be found: those which have integrated only the documentation, those which have aligned the processes, aims and resources and finally those which have all parts of MS integrated in a single MS. The process is summed up in Karapetrovic (2003) where two levels are defined: (1) partial integration: this level can range from a simple collaboration to alignment and harmonization of objectives, processes and resources of separate MS and (2) full integration: constituting systems lose their unique identities, resulting in complete integration to a single multipurpose IMS. Finally, a very similar idea is presented in Beckmerhagen *et al.* (2003). These authors argue for three degrees of integration, defined as follows:

1. Harmonization: organizations have integrated the documentation at a partial level. This could mean two things: companies have partially integrated either some of the documentation regarding MS or all of it.
2. Cooperation: organizations have partially integrated the documentation, internal audits and resources. This degree of harmonization goes one step further, because companies have integrated internal audits and human resources, which are considered important elements in the integration process.
3. Amalgamation: this takes place when full integration of documentation, resources and procedures is achieved.

In the same way, they label each of the levels, in accordance with the British Standards Institution (BSI) classification. According to Pojasek (2006) the degrees are:

1. Combined: separate MS are used at the same time in the same organization
2. Integratable: identification of common elements
3. Integrating: integration of common elements
4. Integrated: one system incorporating all common elements

Finally, Jørgensen *et al.* (2006) and Jørgensen (2007), define three different levels of integration. These are: (1) correspondence – cross references and internal coordination, (2) generic – understanding of generic processes and tasks in the MS, and (3) integration – creation of a culture of learning, stakeholders’ participation and continuous improvement.

Bearing in mind that the main aim of this paper is to establish the degree to which companies integrate their EMS with other MS, and that we have not detected any empirical research focused on this area, this work will be the first empirical contribution in the field. Thus it will analyze the extent to which the various levels of integration proposed make sense in reality, and what these levels really include.

Methodology

The objective of this paper is to study to what extent companies integrate their MS already implemented. In order to do so, we carried out an empirical study in Spain, one of the

countries with most ISO 14001:2004 and ISO 9001:2000 certifications at global level (ISO, 2007). Specifically, in the case of ISO 14001:2004, Spain is in third position, after Japan and China, while in the case of ISO 9001:2000 certifications it is fourth after China, Italy and Japan (ISO, 2007).

In order to answer the questions posed, in February 2006 a questionnaire was sent to 1,615 companies that have, at least, EMS and QMS implemented in accordance with ISO 14001:2004 and ISO 9001:2000 respectively. This was sent to organizations located in those Spanish autonomous communities with the most intensive levels of certification (see Heras and Casadesus, 2006), addressed to the MS managers of the organization. Details of the fieldwork are set out in Table III.

Table III. Survey information

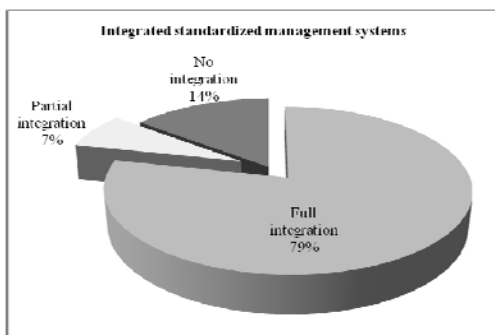
	Spain
Study date	February 2006
Study population (approx.)	2,706
Study sample	1,615
Number of responses	435
Response rate	27%
Confidence level (p=q=0.5)	96%

Source: Own elaboration

Responses were received from 435 organizations, representing 27% of the sample. The survey had 16 different sections, based on aspects such as the reasons for non-integration, MS already implemented in the organization, tools used in the integration process, the main difficulties faced in this process, integration of internal and external audits, the future of certifications, etc. Most of these aspects go beyond the specific aims of this article, but a descriptive analysis of the answers obtained can be found in Karapetrovic *et al.* (2006).

As to the degree of integration of MS implemented within these organizations, as shown in Figure 1, these were self-classified into 14% of businesses which did not integrate their MS, 7% which did so partially, and 79% which did so totally. This first classification of the level of integration of MS was based only on a simple direct question to each organization.

Figure 1. Integrated standardized management systems



Source: Own elaboration

The in-depth analysis of the remaining data obtained from the survey shows us to what extent these responses coincide with reality. In order to achieve this, we included questions related to degrees of integration specific to each of the elements which, according to

Karapetrovic and Willborn (1998), are susceptible to integration: resources, goals and processes.

According to the definitions of ISO 9000 (ISO, 2005), goals or objectives are something sought or aimed for, in this case, related to quality; a process is a set of interrelated or interacting activities which transforms inputs into outputs; and resources, although not defined by ISO 9000, could be defined as goods used as factors for a process in order to obtain other goods to satisfy human necessities. In an IMS the goals are common for all MS and are the first aspect that needs to be integrated (Karapetrovic and Willborn, 1998; Karapetrovic, 2003; Karapetrovic and Jonker, 2003). Processes are interconnected and use the same pool of resources (Karapetrovic, 2003).

These three main elements of the integration process are the basis for the question studied here. The first group of questions was related to the integration of resources, given that it is important to know to what point the human resources involved are integrated or not. That is, whether or not the responsibility for managing EMS falls to the same person who manages other MS. This aspect was analyzed taking into account three different levels of responsibility: top management, asking for the executive, functional level, asking for the organization representative, and shop-floor, asking for the inspector of the various MS.

The second group of questions, related to goals, was focused on the degree of documentation integration. Specifically, we wished to learn whether or not they had integrated the documents which are indispensable to an MS, such as the objectives, policy, manual, procedures, instructions and records.

Finally, with reference to processes, we analyzed the extent to which common procedures were integrated between the EMS and other MS. We asked, for example, about the degree of procedural integration for document and record control, product realization, internal auditing, etc.

Following a descriptive analysis of the data obtained, further multivariate analyses were carried out: multiple correspondence analysis (MCA) and a cluster classification. The MCA was carried out in order to minimize the qualitative information into few quantitative axes to help in the interpretation of the data (Bénzecri, 1973; Greenacre, 1993). The cluster analysis was done to group the organizations, with the aim of discovering the different types according to their degree of integration. The results are presented in the following section.

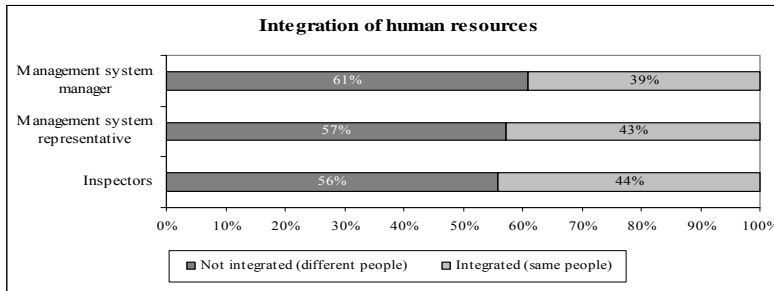
Results

The sample analyzed was made up of 362 companies which claimed to have some level of integration, specifically 86% of companies in the sample whose MS were partially or fully integrated. Thus those companies that do not integrate any of their MS were not considered further in this study.

The question studied in this paper, as previously mentioned, is divided into three parts: human resources, documentation and procedures. A preliminary descriptive analysis considers each of these aspects separately.

Figure 2 shows the personnel involved in the integration process. At all three hierarchical levels it is most common to have different people involved in the process, although inspectors always make up the lowest percentage. If we bear in mind that the great majority of companies consider their systems to be fully integrated, the results obtained do not agree with those of Karapetrovic (2002), according to whom a level of integration was expected for all hierarchy levels. It is clear that there is a large percentage of organizations, almost half of the cases, which may have the various MS integrated in many respects, but not in those related to human resources at any level.

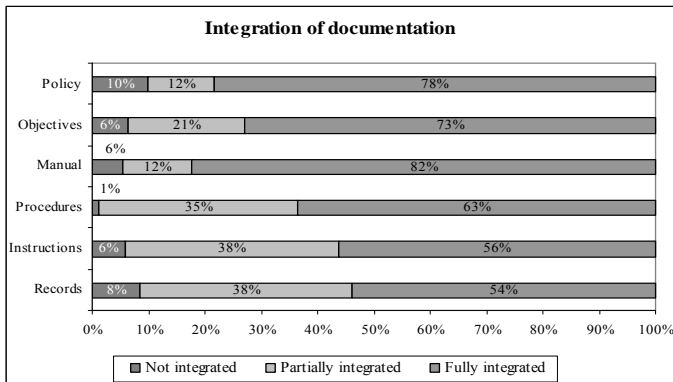
Figure 2. Integration of human resources



Source: Own elaboration

Regarding documentation integration (figure 3), the majority of companies have all the items measured fully integrated, although the frequency is considerably higher for the organization's policy, objectives and manual. Records and instructions have a lower frequency of full integration. This undoubtedly shows that the first documentation to be integrated is that which relates to the most strategic areas of the management system, moving on later to that which relates more to operations. These results, however, are clearly aligned with the findings of Karapetrovic and Willborn (1998), Winder (2000), Karapetrovic (2002) and Jørgensen *et al.* (2006), according to whom integrating policy and objectives is the first step for the implementation of an IMS.

Figure 3. Integration of documentation



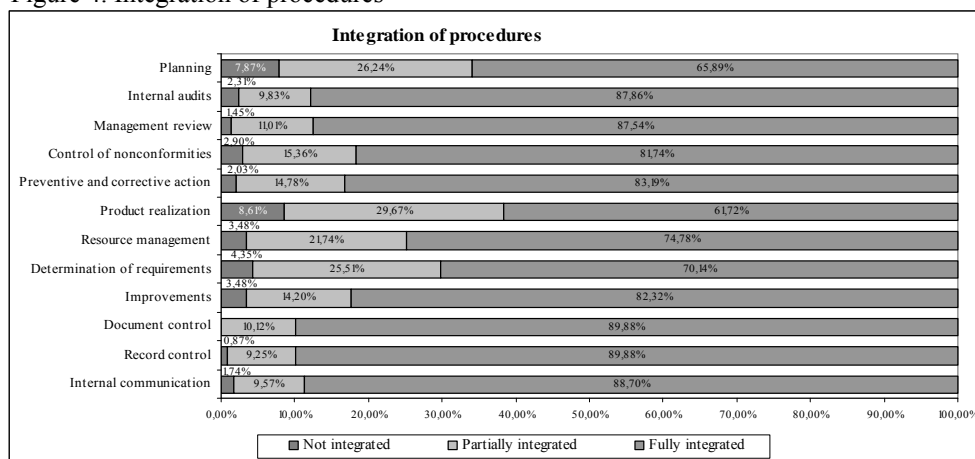
Source: Own elaboration

Finally, figure 4 presents the frequency of integration of procedures. It can be observed that the majority of companies have 4 of the procedures under study mostly integrated: internal audits, management review, document and record control and internal communication.

If we take into account that all these procedures can be classified under the different requirements of ISO 9001:2000 (ISO, 2000), i.e. following the sections of the standard in

quality management systems (Chapter 4: control of documentation, record control), management responsibility (Chapter 5: planning, management review, internal communication), resource management (Chapter 6), product realizations (Chapter 7: product realization, determination of requirements) and measurement, analysis and improvements (Chapter 8: internal audits, control of nonconformities, preventive and corrective action, improvements), it is easy to see in the above figure that procedures related to product realization are the least integrated while procedures related to measurement, analysis and improvements have a higher degree of integration. Again, using the analysis of another element, we reach a similar result to that obtained in the case of human resources involved: procedures which relate to the more operational aspects, such as those related to product realization (Chapter 7 of ISO 9001:2000), are the last to be integrated. Those which could be considered more strategic are integrated first, possibly because of the greater difficulty in standardizing each organization's operational working procedures.

Figure 4. Integration of procedures



Source: Own elaboration

Multiple Correspondence Analysis

In order to facilitate understanding of the results of the study with a smaller number of variables, a Multiple Correspondence Analysis (MCA) was carried out. For the MCA, the 21 original variables were ordered into a matrix: 3 variables ask about the people involved in the process, 6 about documentation and 12 about procedures. The data processing produces 2 quantitative axes (extracted factors), explaining 80% of the total variance. Each axis is explained by a number of variables which make the greatest contribution to that axis. The contribution or percentage of a variable in an axis depends on the number of variables and the percentage values. The minimum percentage of contribution in order to take a variable into account is 3% in this study. Table IV sets out the contribution of each variable to each axis, with those which form part of each axis shown in bold.

The first axis represents a partial degree of integration, because all the main contributors are variables at this level of partial integration. The second axis, summing up the information of the original data, represents a full degree of integration because the variables that most contribute to its creation are from this level of full integration. These degrees of integration coincide fully with the classification in Karapetrovic (2003): partial and full.

Axis 1 can provide us with an idea of which aspects are important in organizations which only partially integrate their MS, given that this axis, explained by a total of 10 variables, is formed only by variables which represent a partial level of integration. Apart from integration of the organization's policy, the variables that most contribute are related to procedures, specifically those of documentation control, preventive and corrective action, control of nonconformities, record control and improvements. Under careful analysis, it can be seen that the majority are related to chapters 4 (quality management system) and 8 (measurement, analysis and improvements) of ISO 9001:2000. That is, once again we see that those organizations which partially integrate do so mainly in the more strategic aspects of the organization, leaving the more operational areas such as "product realization" until later.

Table IV. Variables contributing to the creation of each axis.

		Axis 1			Axis 2		
		Not integrated	Partial integrated	Fully integrated	Not integrated	Partial integrated	Fully integrated
Human Resources	Management system manager	0.04%	-	0.09%	0.39%	-	0.08%
	Management system representative	0.05%	-	0.07%	0.16%	-	0.09%
	Inspectors	0.14%	-	0.24%	0.14%	-	0.27%
Documentation Resources	Policy	0.23%	3.30%	0.76%	0.45%	0.43%	6.23%
	Objectives	1.13%	1.44%	0.90%	1.44%	2.14%	2.72%
	Manual	1.86%	2.91%	1.02%	1.70%	3.52%	5.50%
	Procedures	0.05%	3.42%	2.03%	1.93%	0.10%	6.47%
	Instructions	0.05%	0.46%	0.18%	3.85%	0.09%	0.88%
	Records	1.32%	1.77%	2.51%	0.35%	2.50%	3.35%
Procedures	Planning	1.37%	1.91%	1.60%	4.74%	2.60%	3.61%
	Internal audits	1.52%	3.18%	0.63%	3.03%	2.88%	6.02%
	Management review	0.15%	3.94%	0.62%	1.20%	0.28%	7.44%
	Control of nonconformities	1.43%	4.68%	1.35%	1.18%	2.71%	8.86%
	Preventive and corrective action	1.74%	5.06%	1.32%	2.54%	3.29%	9.57%
	Product realization	1.95%	1.96%	2.12%	2.50%	3.68%	3.71%
	Resource management	0.32%	2.30%	0.90%	4.01%	0.60%	4.35%
	Determination of requirements	2.05%	3.48%	2.19%	1.70%	3.88%	6.59%
	Improvements	2.80%	4.16%	1.41%	4.15%	5.29%	7.87%
	Document control	0.00%	6.45%	0.72%	0.00%	2.66%	12.19%
	Record control	0.92%	4.33%	0.58%	1.37%	1.75%	8.18%
Internal communication	1.48%	2.88%	0.52%	1.10%	2.80%	5.46%	

Source: Own elaboration

The second axis defines organizations which fully integrate the various MS which have been implemented. This is defined by 16 variables, the majority in a full degree of integration. The greatest contributors are those variables related to procedures, as in the first axis and are, in order: document control, preventive and corrective action, control of nonconformities, record control, improvements and management review. Four variables related to documentation are fully integrated: procedures, policy, manual and records. As in the other axis, the people involved do not contribute to the creation of this axis. It should be noted that in this axis there are some variables that are not integrated or are integrated at a partial level. Although they are taken into account, the greater contributions are related to full integration and we use these as the variables to define of this axis.

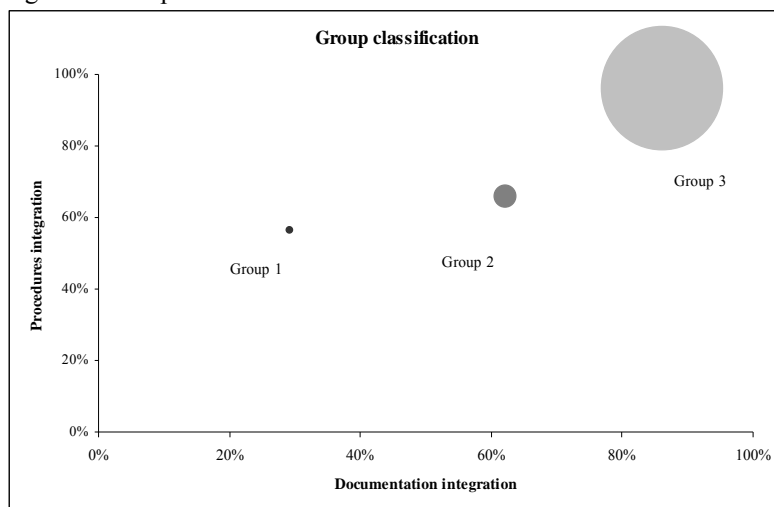
One of the most important aspects of this analysis, which can be seen in the table above, is that in neither of the two axes do we see any variable related to human resources forming part of the main axis. This indicates that the integration of these resources does not affect

the level of integration of the systems that have been implemented. To put it another way, whether the system is partially or fully integrated, the human resources which manage it may be the same or different for each of the systems concerned. No differences are detected with respect to these resources. This aspect, which does not correspond with the findings of the main theoretical studies (e.g. Karapetrovic, 2002) means that the possible integration of these resources will not be taken into account in the following sections.

Cluster classification

In order to classify the organizations into different groups, to discover the nature of the integrating companies, we used the 2 axes resulting from the MCA as original variables for this analysis. We measured the similarities or dissimilarities between individuals using distances, applying hierarchical methods (Johnson, 1967) because our objective was to group all individuals into a small number of groups. To detect outliers that might condition the classification, we applied the single linkage method (Sneath, 1957) and 3 cases were eliminated (n=359). The method used to obtain the groups was the Ward method (Ward, 1963), because is one of the most robust methods and because it creates homogeneous groups with minimum variance. The result was a 3 group classification. To verify whether the relation between the classification and the axes is strong enough to consider the classification to be acceptable, the mean of the eta square (η^2), measure of relation must be high. In our case, the mean is $\eta^2 = 0.655$, which is acceptable.

Figure 5. Group classification



Source: Own elaboration

Figure 5 shows the 3 groups obtained. In order to make it easier to understand and to be able to adjust it to the elements integrated by the companies, rather than defining them and showing them in functions of the axes detected, we have represented them by two different axes: level of documentation integration and level of procedural integration are the aspects which contribute to the creation of the two axes. These new axes account for 79% of the variance, slightly less than in the previous section but nevertheless very significant. In order to find out the contributions of documentation and procedures in each group, we used a percentage codification in which organizations which claimed to have partial integration of documentation or procedure were taken to be 50% integrated. This aspect of the work is not entirely rigorous, since the organization might have partially integrated at a level of 60% or 40%, for example. However, given that what we were aiming for was a simple,

graphical representation of the relative importance of each of the groups detected; this does not have too much effect on the results. In this same Figure, the surface area of each cluster is represented in function of the number of companies which make up each group.

The first thing one notice in Figure 5 is the formation of three separate groups, which we will call according to the names given to them by Beckmerhagen *et al.* (2003): harmonization, cooperation and amalgamation, given that, as will be seen in their description, the results are very similar to those definitions. The characteristics of each group are described below.

Group 1: Harmonization

In this group there are only 8 companies, representing 2% of the sample. Organizations in this group have partially integrated their documentation and procedures, possibly at a level equivalent to the harmonization level defined by Beckmerhagen *et al.* (2003). This group is not homogeneous, in the sense that in some respects the 8 organizations behave in a very different way from one another and cannot be jointly defined, as is the case for the other groups. This is a result of the relatively low level of importance of this group and therefore the small number of companies which make it up; as a consequence, all the data here must be analyzed with caution.

Documentation is integrated at an average level of 29% while procedures are integrated at 56%. The difference between these two averages is considerable and it can therefore be claimed that these businesses pay more attention to integration of procedures than documentation.

The most highly integrated documents are procedures in general (50%), management system policy (37%) and operating instructions (33%). Objectives are 25% integrated records 13% and, finally, the least integrated item is the management systems manual. These results are not particularly logical if one takes into account the pyramid structure of standard management systems. The cause is evidently the low number of companies which make up this group.

As for procedures, those with the highest level of integration are record control, which is fully integrated, management review (94%), resources management and internal communication (81%), internal audits (75%) and documentation control (69%). The remaining procedures have a level of integration below 45%. In this case we see similarity to the chapters of ISO 9001:2000 (ISO, 2000), since chapters 4, 5, 6 and 8 are the most integrated. As noted in the descriptive results, procedures related to chapter 7 are the least integrated.

Group 2: Cooperation

This group is made up of 41 companies representing 11% of the sample. Companies in this group have a medium level of integration, making them equivalent to the second level proposed by Beckmerhagen *et al.* (2003): cooperation. Procedures in this group of organizations are integrated at a slightly higher level than documentation, with documentation at 62% and procedures at 66%. However, as these percentages are very similar one can conclude that on average, management systems are integrated by more than 62%.

In documentation, the most integrated items are policy (78%), objectives (66%) and the manual (67%), while procedures are 58% integrated and instructions and records 55% and 53% respectively. It can be noted in this case that the results do make sense, if we take into account the documentation pyramid of management systems. At the first level of the pyramid we find objectives and the manual, which are the most integrated aspects, procedural documents, are lower and finally instructions and records, which form the final level, are the least integrated. This shows once again how organizations begin to integrate management systems, starting with the more strategic aspects, slowly moving towards tactics and finally to operations.

For procedures, the most integrated are internal communication (74%), internal audits (71%), management review, resources management and documentation control (70%) and improvements and records control (66%). As in group 1, procedures corresponding to chapters 4, 5, 6 and 8 of ISO 9001:2000 are those with a higher percentage of integration, while those in chapter 7 are least integrated. This confirms the findings in the descriptive results shown earlier.

Group 3: Amalgamation

The group is made up of 310 companies representing 87% of the sample, the largest by far of the groups identified. Companies in this group are characterized by a high degree of full integration, placing them within the definition of amalgamation provided by Beckmerhagen *et al.* (2003). These organizations have, on average, documentation integrated at a level of 86% and procedures at 96%.

The documents most integrated are policy and objectives (87%) and the management system manual (94%). Procedural documents are integrated at 86%, while instructions and records are at 78%. These results, like those of the previous group, correspond with what could be expected, given the structure of the documentation pyramid.

As for procedures, these are integrated at a level of 96%. The most integrated are document and record control (99%), internal audit, internal communication and preventive and corrective action (97%), management review and improvements (96%) and control of nonconformities (95%). It can be noted that the procedures corresponding to chapters 4, 5 and 6 of ISO 9001:2000 are those with the highest level of integration. As noted in the other groups, those from chapter 7, which are more difficult to integrate have a lower level of integration, even though it is very high in this group.

Conclusions

Many organizations need to implement a MS, such as QMS and an EMS jointly, in parallel or sequentially with another MS. When this happens, there is the option of integrating all the systems in a single IMS. Thus the aim of this study is to discover the degree of integration within companies. In order to do so, an empirical study was carried out on more than 400 companies which are certified under both the environmental management standard ISO 14001:2004 and the quality management standard ISO 9001:2000.

From the results obtained we can conclude, first, that there are a great number of companies (86% of the sample) integrating their MS at various levels. Secondly, the results

are aligned with the classification by Beckmerhagen *et al.* (2003), confirming the existence of 3 groups of organizations in function of the degree of integration of the various MS implemented. Of these 3 groups a clear majority, 87% of organizations which integrate management systems, carry out full integration of the systems. Only 11% carry out partial integration (more than 60% of procedures and documentation integrated), and a very low 2% integrate their systems to a very low degree.

As well as confirming the existence of these different groups, it is also quite clear from the data that organizations follow a pattern regarding the documentation and procedures they integrate the most. It seems clear that they begin with the most strategic documents and procedures (policy, objectives and manual in the case of documents, and record control, internal audits and internal communication for procedures), integrating tactics and operations later on.

There is, however an element confirmed in our research which differs from what is claimed in the theoretical literature: the role of the people involved in integration of management systems. In our study this variable is not significant for either partial or full integration. That is, there are no differences between the involvement of personnel in MS in function of the level of MS integration. This would confirm, for example, that the responsibility for the environmental and the quality management systems often falls on the same person, even though the systems are not integrated, or even that two different people may manage integrated systems. Karapetrovic (2002) suggests that the hierarchy level is related to the degree of integration, but this could not be compared in our study.

For future research, given the large number of companies with implemented MS integrated within a IMS, it would be interesting to discover what difficulties they face during the integration process and, particularly, whether the implementation model followed conditions the process. Neither of these two characteristics of IMS has been compared empirically.

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Acknowledgements

This article was written as part of a research project entitled "The integrated management system (IMS) in Spanish companies" (SEJ2006-00682/ECON) financed by the Ministry of Science and Technology within the aid program for R+D projects.

The first author received a grant from de Catalan Government to work with Dr. Karapetrovic in Canada for four months.