



Universitat de Girona

# AN EMPIRICAL ANALYSIS OF INTEGRATED MANAGEMENT SYSTEMS

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## **Doctoral Thesis**

# **An Empirical Analysis of Integrated Management Systems**

**Alexandra Simon i Villar**

2012

**Doctoral Thesis**  
**An Empirical Analysis of Integrated Management Systems**

**Alexandra Simon i Villar**

2012

PhD Programme "Tourism, Law and Business"

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Memòria presentada per optar al títol de doctora per la Universitat de Girona

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CERTIFY

that Alexandra Simon i Villar carried out the dissertation entitled "An Empirical Analysis of Integrated Management Systems" under our supervision and that it fulfills the requirements for the degree of Doctor Europeus (University of Girona).

Therefore we sign the present certificate.

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Doctoral Dissertation framed within the reference project ECO2009-12754-C02-01: "Mejora de la satisfacción de los clientes en las empresas españolas mediante la estandarización", in which the candidate is a researcher and within the programme "Formación del Profesorado Universitario (FPU)", financed by the Spanish Ministry of Education and Science as a part of the R&D projects aid programme.

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## **Intermediate contributions**

I would like to highlight that all the essays included in the present dissertation contain results that have been accepted and some already published in indexed journals of the Journal Citation Report and presented in international conferences:

- Simon, A., Karapetrovic, S. and Casadesus, M. (2012). Evolution of Integrated Management Systems in Spanish Firms. *Journal of Cleaner Production*, 23 (2012), 8-19. **Impact factor: 2,425, first quartile.**
- Simon, A., Karapetrovic, S. and Casadesus, M. (2012). Difficulties and Benefits of Integrated Management Systems. *Industrial Management and Data Systems*, 112 (5), 828-846. **Impact factor: 1,569, second quartile.**
- Simon, A., Bernardo, M., Karapetrovic, S. and Casadesus, M. (2012). Implementing integrated management systems in chemical firms. *Total Quality Management & Business Excellence*. Accepted. **Impact factor: 0,387, fourth quartile.**
- Simon, A., Bernardo, M., Karapetrovic, S. and Casadesus, M. (2011). Integration of standardized environmental and quality management systems audits. *Journal of Cleaner Production*, 19 (17-18), 2057-2065. **Impact factor: 2,425, first quartile.**

This dissertation is part of the project ECO2009-12754-C02-01: "Mejora de la satisfacción de los clientes en las empresas españolas mediante la estandarización", in which the candidate is a researcher.

The realization of this dissertation has also allowed making a research visit of six months to the Liverpool John Moores University with Dr. Alex Douglas. Secondly, it has led to the participation of a European funded project entitled "SHEQA. Strategic Management of Higher Education Institutions Based on Integrated Quality Assurance System" (EU code: 511262-TEMPUS-1-2010-1BE-TEMPUS-SMGR) and to the participation of some national and international conferences and publication of diffusion articles, as follows:

- 14th QMOD conference on Quality and Service Sciences ICQSS, San Sebastian, August 2011.  
Presentation: Simon, A., Karapetrovic, S. and Casadesus, M. Integrating Management Systems: A dynamic study of Spanish firms.
- Simon, A., Karapetrovic, S. and Casadesus, M. (2011). Integrating Management Systems: A dynamic study of Spanish firms. Book of Full Papers of the 14th QMOD conference on Quality and Service Sciences ICQSS, "From *Learnability* and *Innovability* to *Sustainability*", pp. 1578-1597 (ISBN 84-8081-211-7).
- 5th International Conference on Industrial Engineering and Industrial Management, Cartagena, September, 2011.  
Presentation: Simon, A., Karapetrovic, S. and Casadesus, M. Evolution of Integrated Management systems in Spanish Firms.
- 4th International Conference on Industrial Engineering and Industrial Management, San Sebastian, 2010.  
Presentation: Simon, A. and Bernardo, B. Una aproximación cualitativa a la integración de auditorías de los sistemas de gestión estandarizados.
- Simon, A. and Bernardo, B. (2010). Una aproximación cualitativa a la integración de auditorías de los sistemas de gestión estandarizados. Book of Full Papers of the 4th International Conference on Industrial Engineering and Management, "Industrial Engineering as University Third Mission Agent", pp. 1593-1604 (ISBN: 9748-84-95809-79-7).
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- Bernardo, M., Simon, A., Gotzamani, K. and Casadesus, M. (2011). La dimensión geográfica de la integración de sistemas de gestión. Conference proceedings of the XXI National ACEDE Conference, "Creatividad: El futuro de la empresa", pp. 103 (ISBN: 97-84-615-3531-6).
- Simon, A., Bernardo, M. (2010). Auditorías ISO 9001 e ISO 14001. ¿Existe una integración real?. Forum Calidad, 213, 30-33.



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## **Resum**

L'objectiu principal d'aquesta tesi doctoral és estudiar empíricament la integració dels sistemes de gestió. En concret, l'objectiu és investigar com les organitzacions duen a terme el procés d'integració, els beneficis i els reptes que troben en aquest procés, així com analitzar com s'integren les seves auditories.

Les dades per aquest estudi van ser obtingudes a través d'una enquesta i un estudi de casos d'empreses a Catalunya. L'enquesta es va dur a terme en empreses registrades, com a mínim, amb les normes ISO 14001: 2004 i ISO 9001: 2008 de qualitat i gestió ambiental. En l'estudi de casos es revela el procés d'integració, així com els beneficis i els reptes afrontats per les organitzacions estudiades.

Els resultats mostren els nivells d'integració i l'ús de diferents estratègies i metodologies d'integració. També es presenten resultats respecte als beneficis i dificultats d'integració i sobre com les companyies van integrar les seves auditories.

L'estudi ofereix una contribució original per a la comprensió de com els sistemes de gestió es poden integrar en un únic sistema. Aquest és un tema rellevant per a la competitivitat de les empreses, especialment per a les empreses que han implementat diverses normes ISO per als sistemes de gestió, que s'han convertit en una part clau de les organitzacions i un requisit per sobreviure al segle XXI.

## **Abstract**

The main objective of the present dissertation is to empirically study the integration of management systems (MSs). Specifically, we aim to investigate how organizations carry out the integration process, which benefits and challenges they encounter during this process and whether and how they integrate their audits.

Data for this study were obtained through a survey and a case study analysis of companies in Catalonia. The survey was carried out in organizations, registered to, at a minimum, both ISO 14001: 2004 and ISO 9001: 2008 standards for quality and environmental management systems. Additionally, some detailed case studies are illustrated, revealing the process of integration as well as the benefits and challenges encountered by the organizations.

Results are analysed and show responses on the levels of integration and the use of different integration strategies and methodologies regarding the integration of MSs. Some results regarding the benefits and difficulties of integration and about how companies integrated their audits are also presented.

The study provides an original contribution to the understanding of how management system standards can be integrated into one single system in the organizations with more than one MS. This is a relevant issue for the competitiveness of companies, willing to increase their performance, especially for companies which have implemented several ISO based systems, which have become a key part of the organisation's lifeline and a prerequisite for survival in the twenty-first century.

## **Chapter 1. Introduction**

The emergence and the use of the so-called Management Systems (MSs) has been one of the major recent developments in the field of management practice. Through them, firms commit to improve their quality, environmental or other management practices. These MSs can be certified with, for example, the quality standard ISO 9001 or the environmental standard ISO 14001. ISO 9001 for quality management and ISO 14001 for environmental management are the two standards of the ISO series that have obtained most impact at international level, regarding both the number of certificates worldwide, 1,109,905 certificates to ISO 9001 and 250,972 to ISO 14001, and the relative increase in the number of certificates, with a 4% and a 12% increase for ISO 9001 and ISO 14001 in 2010, respectively (ISO, 2011).

As new MSs appear frequently, companies are implementing standardized MSs other than ISO 9001 and ISO 14001, such as the ones for occupational health and safety (e.g., OHSAS 18001 and CSA Z1000), for corporate social responsibility and accountability (e.g., SA 8000 and AA 1000), for security of information systems (ISO 27001), as well as for supply chains (ISO 28000), among others.

Given the proliferation of these international management standards, it is important to notice their international diffusion (Corbett and Kirsch, 2001). On the global level, a number of authors have studied the diffusion of Management System Standards (MSSs) (Casadesus et al., 2009). For example, and in the case of the ISO 14001 standard, Corbett and Kirsch (2001) state that the degree of ISO 14001 registration in a particular country depends, among other factors, on the degree of ISO 9001 registration in that country. Pan (2003) explores the motivation of firms registering to ISO 9000 and ISO 14000 in four far eastern countries and Marimón et al. (2006) present a model that explains the international dissemination of ISO 9001 and ISO 14001, both by country and by industry sector. However, several academic studies on the diffusion of ISO 9001 and ISO 14001 suggest that the number of certificates worldwide presents a "saturation effect", that is, when the number of certified organizations reaches a certain limit, certification loses its connotation and becomes less attractive for the remaining companies (see i.e., Franceschini et al., 2004; Marimon et al., 2006; Casadesus et al., 2008).

Regardless of the number of certificates reached in many countries, the fact is that many companies have to deal with more than one MSS. Therefore, the diffusion of these and other

standards among many countries leads to the question of whether these standards should be managed individually or jointly in order to benefit from existing synergies among them. The answer to this question can be found in the academic work done on Integrated Management Systems (IMS), which confirms that firms prefer integration over keeping their MSs separated (e.g. Karapetrovic and Willborn, 1998b; Zeng et al. 2007; Salomone, 2008; Karapetrovic and Casadesus, 2009 or Bernardo et al. 2009, 2012). The proliferation of MSs has also created the need of establishing the respective audit systems. Therefore, the two main objectives of this dissertation are the study of the integration of management systems and the integration of their corresponding audits. The specific detailed objectives are provided in the next section.

This dissertation contributes to narrowing the gap between theory and practice in the field of MSs integration by providing examples of the steps, strategies, benefits and challenges that organizations can encounter when implementing IMSs and their audits. The study tries to open up the view on some relevant and so far under-researched areas of the management systems landscape.

### **1.1. Research objectives**

The main objective of this dissertation is to empirically analyze how organizations with more than one standardized management system integrate these as well as their audits.

In order to do this, the following sub-objectives are pursued:

- Analyze the process of integration in several companies, determining their integration level, strategies and resources used as well as the benefits and challenges encountered during the process.
- Explore whether the integration level of standardized MSs is related to the benefits and difficulties found by organizations registered to multiple MSSs during the integration process.
- Study the evolution of IMSs experienced by ISO 9001 and ISO 14001 registered companies over time.
- Study how and to which extent organizations integrate internal and external audits against quality and environmental management system standards.

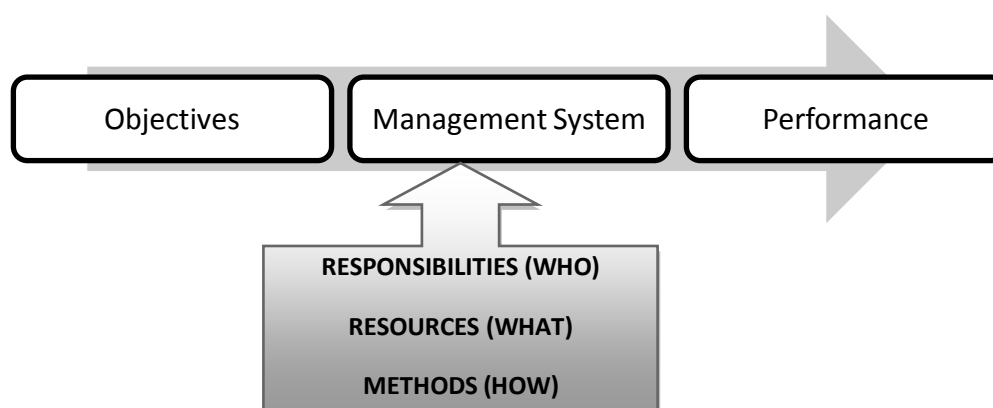
## Chapter 2. Conceptual framework

### 2.1. Management Systems

To be competitive, an organization must be oriented towards achieving business success. Usually, when talking about business results, the types of results that are first taken into consideration are the performance data of the organization (income, profits, liquidity, financial solvency, indebtedness, etc.). These are often the main concerns for any organization. However, to achieve good economic and financial results in a sustained manner over time, the organization should also focus on other outcomes: satisfaction of customers with the products, the process performance, internal business outcomes, and the satisfaction of people working in the organization, which are drivers for long-term success. Based on this reasoning, an organization must focus on getting "good business results", not only referring to economic performance but also to those other factors mentioned above, that influence or induce the behaviour of economic performance. With this in mind, we can say that to achieve "good business results" and to ensure that the products and services provided by the organization meet the requirements that are applicable (including legal and regulatory), an organization needs to manage their activities and resources, define responsibilities, establish methodologies, programs or planning, etc. This serves to configure the so called Management Systems (MSs) (IAT, 2008).

Figure 1 shows how a Management System answers the question “how to act and what to do to achieve “good business results”.

**Figure 1. Management Systems as a tool to achieve business performance**



According to ISO 9000:2005, a MS is a mutually related set of elements which interact with each other in order to establish the policy and objectives and to achieve these objectives.

Depending on the type of results and objectives which guide the management system, different types of systems can be distinguished, including:

- Quality Management System (QMS): a management system to control an organization with regard to quality, which is to meet customers' expectations and needs with products that fulfill their requirements (ISO, 2005).
- Environmental Management System (EMS): a system to manage and control an organization with respect to the environment, that is to achieve good results in a social context through a good environmental behavior (ISO, 2012).
- Occupational Health and Safety at Work Management System (OH&S): a system to manage and control an organization with respect to safety and health at work, to achieve good results regarding the relationship with the workers by eliminating or minimizing occupational hazards and damages (AENOR, 2012).

To implement these MSs, many organizations register to reference standards such as ISO 9001, ISO 14001 and OHSAS 18001, among others, to help them establish, document and maintain their MSs in a structured and systematic way.

## **2.2. ISO 9001**

The approval standard, ISO 9001:2008, uses a simple process-based structure, which fits easily the process management structure of most businesses. It contains all of the requirements which an organisation must address within their QMS if they wish to be certified against the standard. ISO 9001 is written by a committee (TC 176) and is designed for use in any type of organisation. This inevitably means that there are compromises in the wording of the standard and some interpretation is often needed. There are 8 sections in ISO 9001 (ISO, 2008a):

- Scope
- References
- Terms and definitions

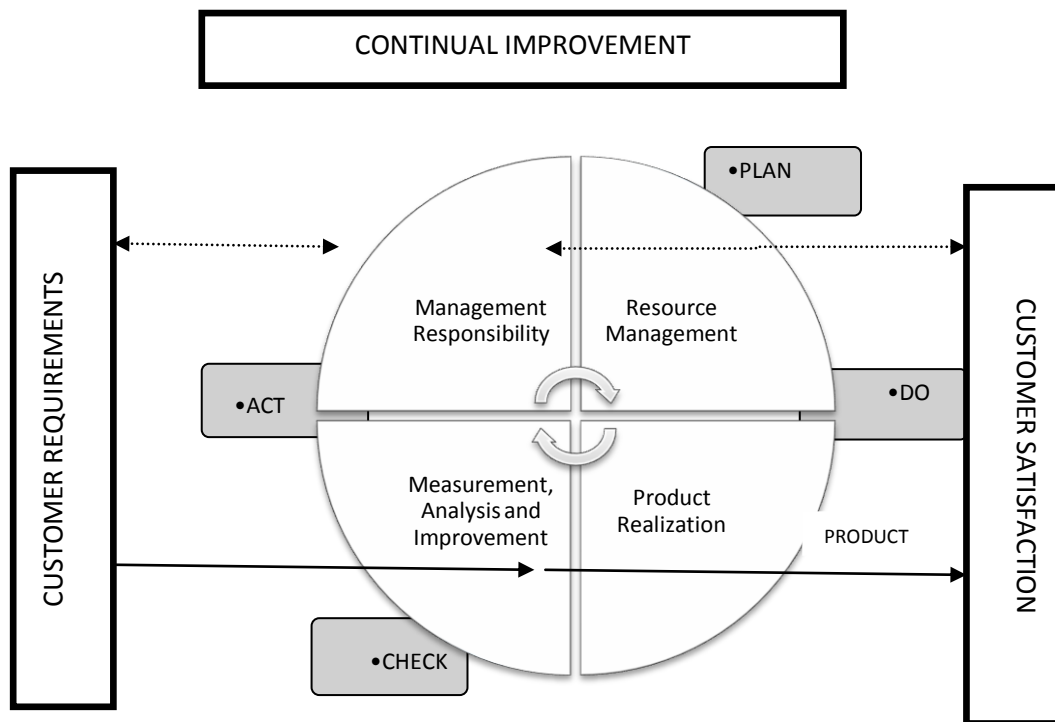


- Quality management system
- Management responsibility
- Resource management
- Product realization
- Measurement, analysis and improvement

The 2008 revision features a concept called the "process model". This means that companies should (ISO, 2008a):

- Define what the organisation does.
- Draw a process model of the organisation activities.
- Understand how those processes inter-relate.
- Decide who owns these processes and ensure they are trained and competent.
- Monitor and improve their quality system with internal audits, measuring customer satisfaction.

ISO 9001:2008 registration gives the organisation the benefit of an objectively evaluated and enforced quality management system. It is a tangible expression of a firm's commitment to quality that is internationally understood and accepted. ISO 9001:2008 registration is carried out by certification bodies (registrars), accredited organisations that review the organisation's quality manual and working practices to ensure that they meet the standard. It is important that when an organisation is certified to ISO 9001, it is clear which aspects of the organisation are covered by the certificate. This is addressed through the scope of registration, and this must clearly identify what is included so as not to mislead. It is a requirement that all elements of ISO 9001 must be addressed by the organisation. However, there are specific circumstances under which certain requirements of the standard can be excluded, yet compliance with ISO 9001 still be claimed. The company's quality manual must also clearly identify why specific requirements of ISO 9001 have been excluded and the justification for that exclusion.

**Figure 2. Elements of a Quality Management System according to ISO 9001**

Source: ISO (2008b).

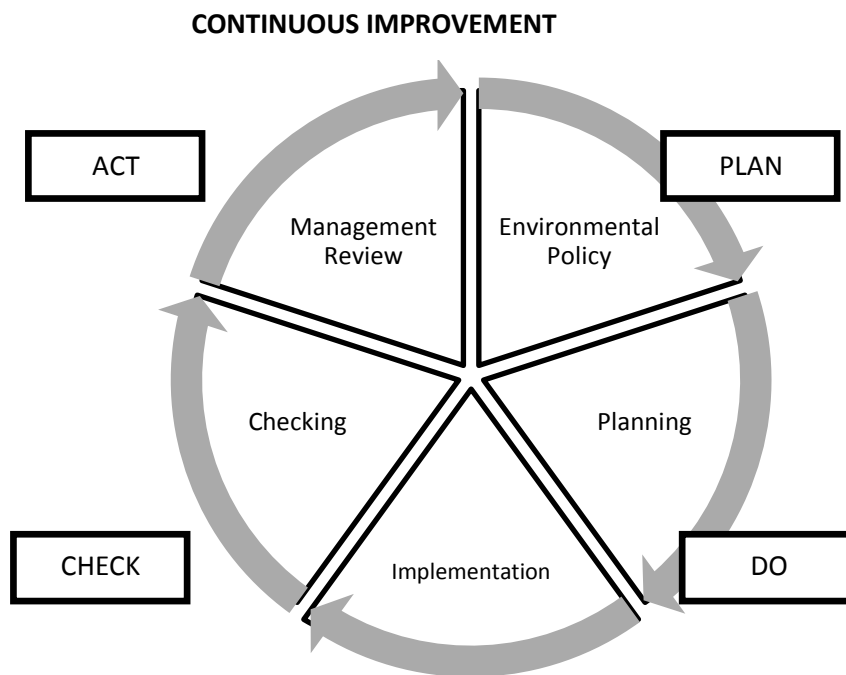
### 2.3. ISO 14001

ISO 14001:2004 is a standard with the aim of standardising environmental management programmes across industries worldwide (Bernardo et al., 2010). ISO 14001, the certifiable standard, was published in 1996, and a revised version was published in 2004. ISO 14001, which gives the requirements for environmental management systems, confirms its global relevance for organizations wishing to operate in an environmentally sustainable manner. The objective of ISO 14001 is to provide a framework for a holistic, strategic approach to the organization's environmental policy, plans and actions.

ISO 14001 gives the generic requirements for an environmental management system. The underlying philosophy is that independently of the organization's activity and environment maturity, the requirements of an EMS are the same, therefore the standard can be implemented by a wide variety of organizations, whatever their

current level of environmental maturity. However, a commitment to compliance with applicable environmental legislation and regulations is required, along with a commitment to continual improvement (ISO, 2012).

**Figure 3. Elements of a Environmental Management System according to ISO 14001**



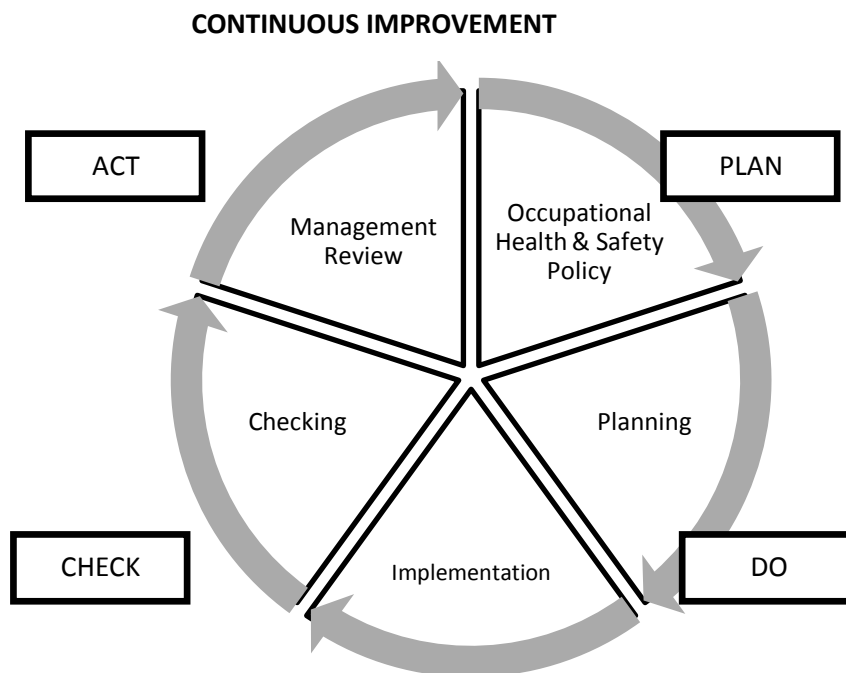
Source: ISO (2004)

#### **2.4. OHSAS 18001**

Finally, the standard on Occupational Health and Safety Assessment Series (OHSAS) 18001:2008 aims to create and to maintain a safe working environment, while protecting and maintaining the safety and health of workers (Matias and Coelho, 2002). It is important that organisations: (1) establish occupational health and safety management systems to minimise risks to their employees and other affected parties; (2) implement, maintain, and continuously improve occupational health and safety management systems; (3) assure the organization's conformance with its stated occupational health and safety policy; (4) demonstrate these conformances; (5) seek certifications/ registrations of its occupational health and safety

management system by an external organisation; and (6) make self-determination and declaration of conformance within specifications (Zeng et al., 2007).

**Figure 4. Elements of an Occupational Health and Safety Management System according to OHSAS 18001**



Source: BSI (2007)

## 2.5. Management Systems Standards published

In recent years the number of MSs and standards for such MSs has sharply increased. The objective of these MSs is to help organizations to systematically tackle with their stakeholder requirements (Asif et al., 2009). The International Organization for Standardization (ISO) has developed standards for some of the MSs, including quality, environment, customer satisfaction, corporate social responsibility and auditing, among others. Thus, there are now many companies that rely on more than one standard to establish the criteria for organizational management systems (Casadesus et al., 2009). However, the management

systems more popular worldwide are the ones which can be certified with ISO 9001 and ISO 14001 for quality and environmental management, respectively (ISO, 2011).

Throughout the 1960s and the 1970s, the first standards for quality management were created both nationally and internationally based on the military procurement standards developed during the Second World War. In 1979, the first commercial quality management standard BS 5750 was published by the British Standards Institute (BSI) in the UK (Zeng et al., 2005). In 1987, the British Standard BS 5750 was adopted with a few changes as the international standards ISO 9000 (Pan, 2003). In this same year, the respective Spanish standard UNE 66900 for ISO 9000 was published by AENOR, the Spanish organization for certification. In 1994, the ISO 9000 series were modified and there have been updates of the current standard ISO 9001 in 2000 and 2008.

Following the success of the ISO 9000 series of systems for quality management, in 1996 ISO began publishing the series of ISO 14000 for environmental management. The concept of an environmental management system had evolved in the early nineties and in consideration of environmental issues, many countries began to implement their own environmental standards (Corbett and Kirsch, 2001). Thus it was necessary to have a universal indicator to assess an organization's efforts to achieve a reliable and adequate environmental protection. In 1992, the BSI Group in the UK published the world's first environmental management systems standard, BS 7750. This supplied the template for the development of the ISO 14000 series in 1996, by the International Organization for Standardization. In Spain, the first specific standard for environmental management was UNE 77801 which was published in 1994. In 1996, the international standard ISO 14001 was recognized and adapted to AENOR, becoming UNE-EN-ISO 14001:1996. The last update of ISO 14001 was in 2004.

ISO has also published a series of standards related to quality management that are directed towards assessing and improving customer satisfaction, the ISO 10000 series. Another standard published in 2009, ISO 31000 for risk management, is becoming very popular in the global market, although it is not a certification standard (ISO, 2009b). ISO has also published ISO 26000:2010, the standard giving guidance on social responsibility (Castka and Balzarova, 2008 a,b; ISO, 2009b). Moreover, the development of other ISO standards and deliverables that adapt the generic management system approach based on ISO 9001 and ISO 14001 to specific sectors or aspects is increasing (ISO, 2009b). These standards have appeared in the automotive (ISO/TS 16949:2009), petroleum and gas (ISO/TS 29001:2007), ship recycling

(ISO 30000:2009), and supply chain security (ISO 28000:2007) sectors. Table 1 shows the standards published by ISO that adapt the generic management systems approach to specific sectors.

**Table 1. Some sector-specific ISO standards**

<b>Sector</b>	<b>Standard or series of standards</b>
<b>Automotive</b>	ISO/TS 16949:2009
<b>Customer satisfaction</b>	ISO 10001:2007, ISO 10002:2004, ISO 10003:2007, ISO 10004:2010
<b>Education</b>	IWA 2:2007
<b>Energy</b>	ISO 50001, TC 242
<b>Food safety</b>	ISO 22000:2005
<b>Information security</b>	ISO/IEC 27001:2005
<b>Health care</b>	IWA 1:2005
<b>Local government</b>	IWA 4:2009
<b>Medical devices</b>	ISO 13485:2003
<b>Petroleum and gas</b>	ISO/TS 29001:2007
<b>Risk</b>	ISO 31000:2009
<b>Ship recycling</b>	ISO 30000:2009
<b>Software Product Quality Requeriments and Evaluation</b>	ISO 25000:2005
<b>Supply chain security</b>	ISO 28000:2007

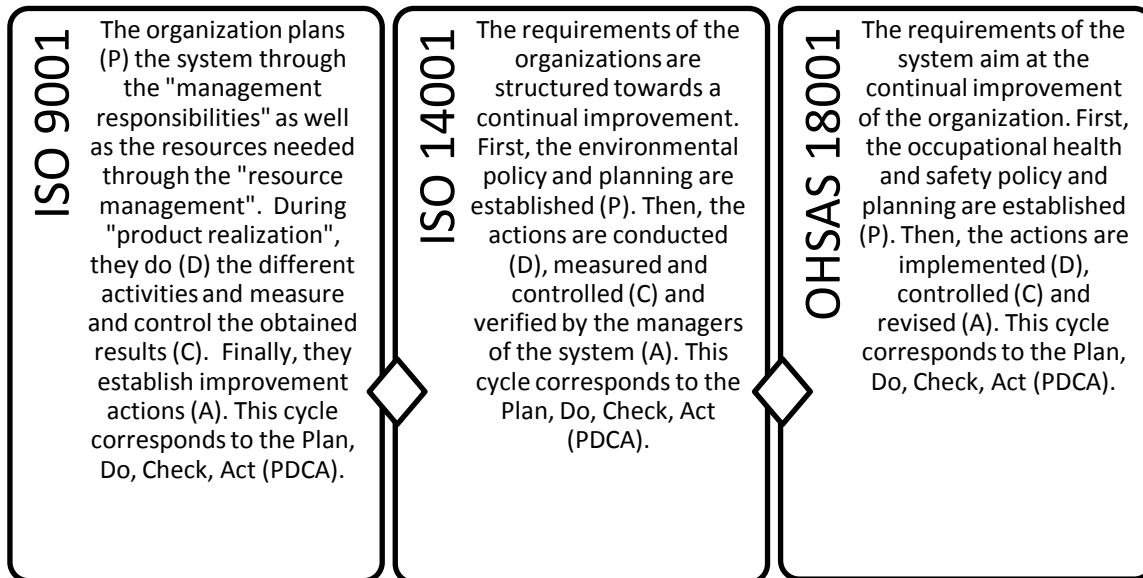
Source: ISO (2011)

## **Chapter 3. Literature review**

### **3.1. Management Systems Integration**

The topic of MSs integration started to appear in the literature more than fifteen years ago (e.g. Beechner and Koch, 1997; Wilkinson and Dale, 1998). Studies such as the ones from Hoyle (1996) and Powley (1996) analysed the differences and commonalities between the ISO 9001 and ISO 14001 standards. Some research studies examined the ways in which individual organisations have addressed the introduction and integration of environmental management systems (EMSs) and occupational health and safety management systems (OH&S) with their quality management system (QMS) (e.g. Hillary, 1993). Other investigations exist on how organizations have chosen to integrate their MSs focusing on different topics such as their integration methodologies and degrees as well as the advantages and challenges of the integration (e.g. Karapetrovic and Willborn, 1998a; Karapetrovic and Jonker, 2003; Zeng et al., 2007; Bernardo et al., 2009). Due to these research, empirical investigations on the integration of standardized MSs are becoming numerous, namely Baldi (1999); Douglas and Glen (2000); Renzi and Cappelli (2000); Fresner and Engelhardt (2004); Zeng et al. (2005); Zeng et al. (2007); Zutshi and Sohal (2005); Jorgensen et al. (2006); Karapetrovic et al. (2006); Pojasek (2006); Karapetrovic and Casadesus (2009); Salomone (2008); Bernardo et al. (2009 and 2010); Khanna et al. (2010); López-Fresno (2010); Asif et al. (2010); Leopoulos et al. (2010); Simon et al. (2011); Bernardo et al. (2012).

The integration of MSs refers to the action and the effect of combining or merging the elements of individual MSs. This implies that organizations need to take action for sharing tools, methodologies, and systematic management of different areas, and to comply with the different standards or models governing the management systems. For example, when firms integrate quality, environment and occupational health and safety, it is possible to identify several common elements that can be coupled or fused. In the following figure, the similarities among the ISO 9001, ISO 14001 and OHSAS 18001 MSs are identified.

**Figure 5. Common elements of the standards**

In view of this, we can see how the areas of quality management, environmental management and occupational health and safety have many commonalities, including:

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

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

According to Jorgensen (2004) about 80% of the work is common to all three disciplines: quality, environment and occupational health and safety. The similarities between these management systems refer to:

- Top management commitment.
- Documentation and records control.



- Definition of a policy.
- Planning of objectives and targets.
- Procedures for training of employees.
- Communication procedures.
- Audits.
- Control of non-compliance.
- Corrective and preventive actions.
- Management review.

In this sense, companies that have different standards to comply with are likely to increase their costs from extensive paperwork and confusion between demands of the individual standards. From a management system point of view, it would be more appropriate to merge the three types of management systems into one system, because it reduces duplicate work and bureaucracy (Jorgensen, 2004).

### **3.2. Scope of integration**

The joint implementation and certification of quality, environmental and occupational health and safety systems has increased in light of the pressure that organizations receive from their internal and external stakeholders including the regulatory bodies, community, customers, employees, suppliers and the government (Zutshi and Sohal, 2005). Therefore, firms are increasingly integrating their MSS (Karapetrovic and Willborn, 1998b; Bernardo et al., 2009; Douglas and Glen, 2000; Karapetrovic et al., 2006; Zeng et al., 2007). Empirical studies regarding the scope of integration confirm this idea (Zeng et al., 2007; Salomone, 2008; Karapetrovic and Casadesus, 2009 or Bernardo et al., 2009).

Three main elements of a standardized MS which can be integrated at different levels, namely goals, processes, and resources have been defined by Karapetrovic and Willborn (1998b). Karapetrovic et al. (2006) conducted an empirical study in order to study the extent of integration of these elements, and found that the majority of companies had integrated them to a high extent. Other authors found the same results in their samples of companies (Bernardo et al., 2010; Simon et al., 2011, 2012; Bernardo et al., 2012).

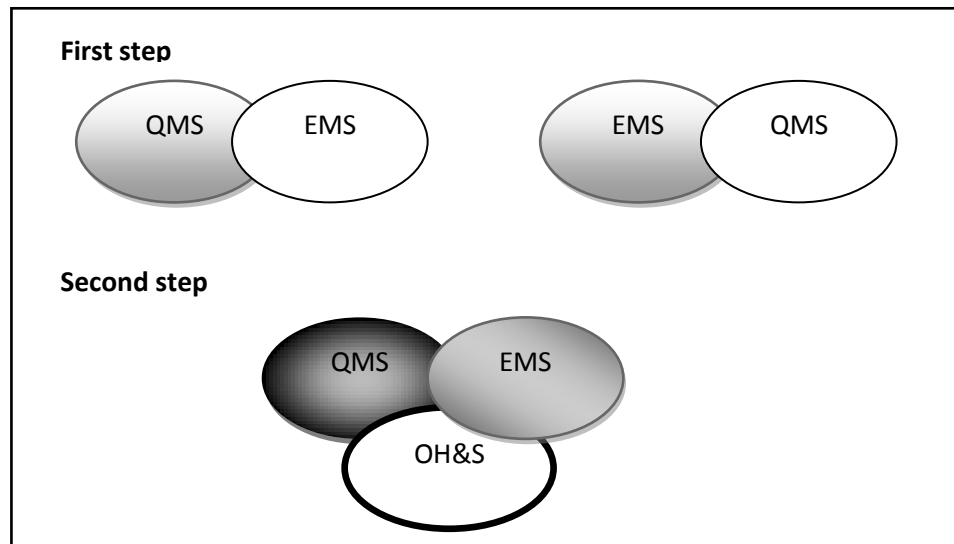
### **3.3. Integration strategy**

One of the main issues to address is the strategy firms can adopt when integrating different MSs, namely the number and sequence of MSs that the organisation decides to integrate (Karapetrovic and Willborn, 1998b; Karapetrovic et al. 2006; Bernardo et al. 2009; Asif et al., 2009; Leopoulos et al. 2010). If organizations want to procure benefits from the integration of quality, environmental and OH&S systems then the management can choose one of the available strategies to integrate QMS, EMS and OH&S successfully (Wilkinson and Dale, 1999c; Douglas and Glen, 2000). Depending on the size and nature of the company and its culture and resources available, it can use one or more methods to integrate its existing management systems (Zutshi and Sohal, 2005).

Different integration strategies have been proposed. For example, Wilkinson and Dale (1999b) suggested two approaches for the integration of quality, environmental and occupational health and safety management systems: (1) to merge documentation through an aligned approach and similarities in the standards; and (2) to implement an integrated management system through a total quality management approach. For their part, Jorgensen et al. (2006) and Jorgensen (2008), define three different levels of integration: “correspondence” refers to cross references and internal coordination, “generic” which is the understanding of generic processes and tasks in the management cycle, and “integration”, the creation of a culture of learning, stakeholder participation and continuous improvement of the performance. Karapetrovic (2002) proposed a two-pronged approach. The first prong involves the creation of a generic management system standard to support integration. The second prong relates to generating a generic audit system standard. Labodova (2004) analyses two ways of integration. The first refers to the introduction of individual systems followed by the integration of the originally separate systems, and the second involves the development and implementation of an integrated management system, integrated from the very beginning. However, the most cited strategy is the two-step integration strategy based on the QMS and the EMS revised in Karapetrovic and Willborn (1998b) who, in the first step, suggest three options for integrating those two MSs: establishing the QMS first and then the EMS, establishing the EMS first and the QMs second, or establishing the two systems in a simultaneous way. The second step would imply integrating MSs other than the QMS and the EMS. Based on the first option, Bernardo et al. (2009) suggest that the sequence could be: integrating the QMS and other MSs that are based on the “Process Approach” first, then

integrating the EMS and other MSs that are based on the ‘‘Plan, Do, Check, Act (PDCA) Model’’, and finally linking, aligning and integrating these function-specific MSs.

**Figure 6. Two step integration strategy**



Source: own elaboration based on Karapetrovic and Willborn (1998b).

From an empirical point of view, Douglas and Glen (2000) analyzed IMSs in small and medium-sized enterprises, and found that all 28 sample organizations had implemented first the QMS and then the EMS. Similarly to these results, Salomone (2008) shows how Italian companies implemented first the QMS and then the EMS (52% of the sample companies). The empirical study of Karapetrovic and Casadesus (2009), which analysed the implementation of standardized MSs in 176 companies, found that the sequence of implementation was the QMS first and the EMS second, followed by other MSs. Regarding the order of implementation of the MSs in the organizations, Salomone (2008), shows how a majority of the sample of Italian organizations implemented first the QMS and then the EMS. In this line, Karapetrovic and Casadesus (2009) found that most respondents implemented ISO 9001 before ISO 14001.

### **3.4. Integration methodologies**

Currently, an international standard covering integration methodologies does not exist. However, at the international level, ISO has published a book called ‘‘The Integrated Use of Management System Standards’’ (ISO, 2008c), which provides a reference on such methodologies. At the national level, different guidelines for integration have been developed

by several countries, for example in Australia and New Zealand: AS/NZS 4581: 1999 (SAI Global, 1999), in Denmark: DS 8001: 2005 (Dansk Standard, 2005), in Spain: UNE 66177: 2005 (AENOR, 2005), and in the United Kingdom: PAS 99: 2006 (BSI, 2006).

In particular, UNE 66177:2005 provides guidelines for developing, implementing and evaluating the process of integration of management systems. This standard states that integration depends on the level of maturity in process management, and considers process management as the best method for integration of management systems. To avoid confusion, it should also be emphasized that this standard does not intend to replace existing management system standards, but to assist in their integrated implementation. To do this, the standard provides a set of guidelines and methods structured in specific areas such as developing an integration plan, implementation, review and improvement of the integrated system (AENOR, 2005).

In the UK, PAS 99:2006 has been published to help organizations achieve benefits from integrating the common requirements of all their management system standards and specifications, and managing these requirements effectively. The standard is primarily intended for use by organizations who are implementing the requirements of two or more management system standards such as ISO 9001, ISO 14001 and OHSAS 18001 (BSI, 2006). PAS 99 is the world's first integrated management system requirements specification based on the six common requirements of ISO guide 72 (the standard for writing management system standards). It was designed in order to help organizations to align their processes and procedures into one holistic structure that enables them to run their operations more effectively (BSI, 2006).

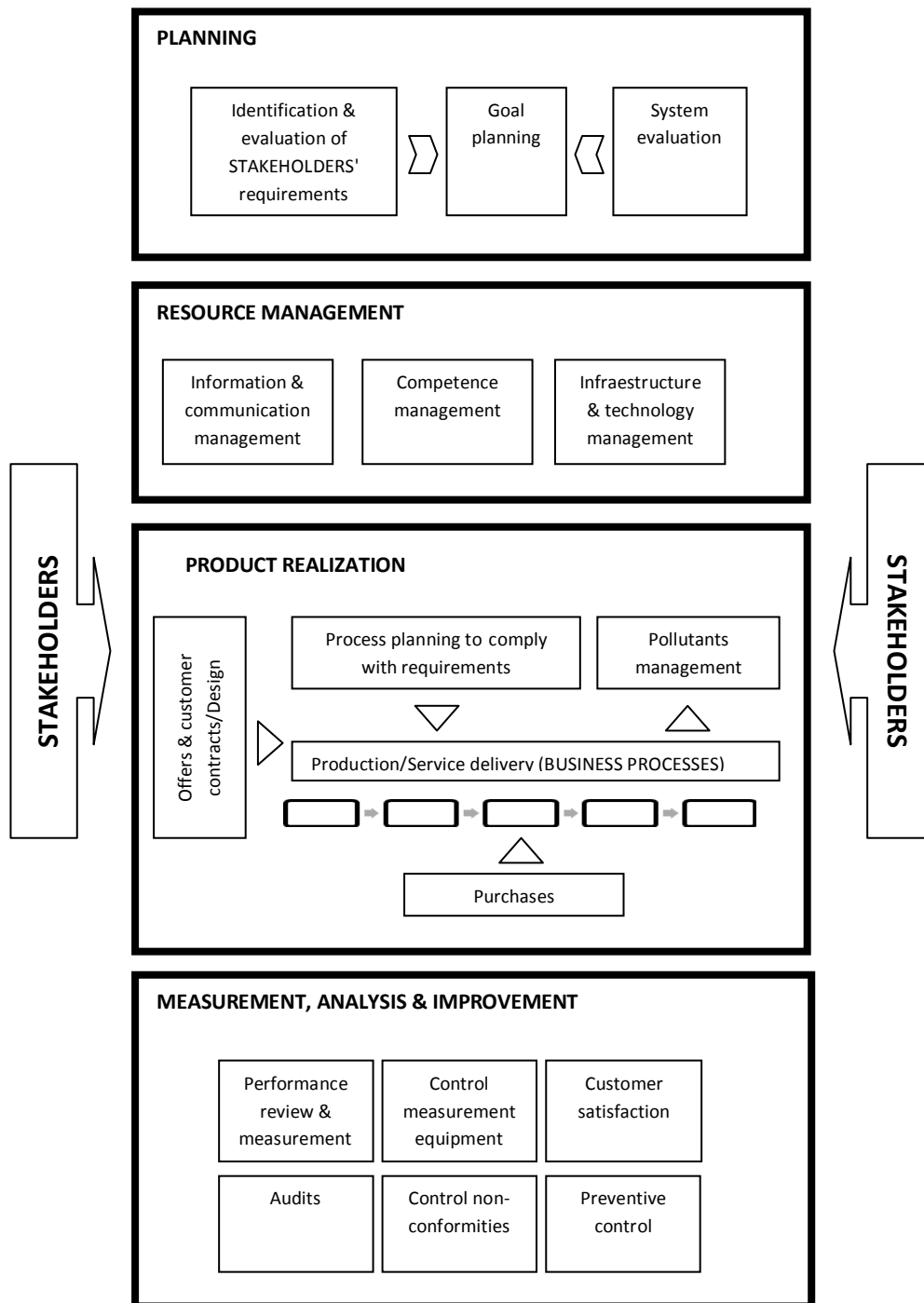
In Denmark, DS 8001:2005 describes the characteristics of good management, the common elements in an IMS and the individual elements that can be part of an IMS (Dansk Standard 2005). In the first part, regarding good management, the standard actually refers to the EFQM model for Business Excellence. In the second part, the standard addresses the common elements in an IMS and provides tools to address these. In the third part, it lists definitions for the terms used in the relevant standards, show correlations between the different standards and describes the different systems and tools that can be part of and IMS (Dansk Standard, 2005).

Finally, the Australian and New Zealand's Standard AS/NZS 4581:1999 identifies the common components to all MSs and provides an overview (SAI Global 1999). The goal is to provide a "guide for all management systems in which the common requirements of individual systems are integrated to avoid duplication and provide a uniform basis for the unique characteristics of each individual system. The common elements of MSs as the quality, safety and health, and environment can be integrated into a single system, although other systems such as human resource management or financial control can also be integrated". The standard is classified into nine components that emphasize the responsibility of management and leadership, the identification and analysis of requirements, as well as system review and improvement plans (SAI Global, 1999).

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

According to ISO (2011), the integration of quality, environmental and OH&S management systems should be based on a process approach. A "process" can be defined as a "set of interrelated or interacting activities, which transforms inputs into outputs". These activities require allocation of resources such as people and materials. The purpose of the process approach is to enhance an organization's effectiveness and efficiency in achieving its defined objectives. A process approach is a powerful way of organizing and managing activities to create value for the customer and other interested parties (ISO, 2011). Figure 7 below shows the structure of an IMS based on a process approach.

**Figure 7. Elements of an IMS based on the process approach**



Source: own elaboration based on IAT (2008).

### 3.5. Difficulties and benefits of integration

Several authors have examined the difficulties and benefits of integrating MSs. In doing so, they have also identified the internal and external challenges firms can encounter when implementing an IMS, as well as the benefits, again both internal and external, these firms can

achieve (e.g., Zutshi and Sohal, 2005; Salomone, 2008; Asif et al., 2009; Asif et al., 2010 and Zeng et al., 2011).

Studying the “context” dimension of an IMS is important as the internal and the external factors (and the internal and external benefits and difficulties) related to implementing an IMS play a crucial role in management’s decision to integrate the MSs and the subsequent implementation process (Asif et al., 2009). The internal context includes concepts such as the organisations’ resources, capabilities and culture, whereas the external context relates to economic/business factors, external politics, and social factors (Asif et al., 2009).

Following this reasoning, Zeng et al. (2007) examined the internal and external factors that affect the implementation of IMS. The internal factors (Zeng, 2007) consisted of:

- human resources,
- organizational structure,
- company culture, and
- understanding and perception.

The external factors (Zeng, 2007) included:

- technical guidance,
- certification bodies,
- stakeholders and customers, and
- the institutional environment.

Similarly, Khanna et al. (2010), find evidence that the motivation for IMS can be classified into two main categories, internal and external. These authors suggest that the internal motivating factors, related to the goal of achieving organizational improvement, are more significant for the organizations than the external factors, related to the requirements of governments or customers. Salomone (2008) studied, in particular, the internal motivations, driving forces and external pressures that companies meet when implementing different MSs.

For their part, Tarí and Molina-Azorín (2010) state that the reasons to adopt QMS and EMS systems together can be internal, thus related to the manager's wish to implement an IMS, or external, therefore related to meeting the requirements of customers and other external stakeholders. As for the benefits, QMS and EMS systems can produce them in two complementary ways: internal benefits through reform of company processes and external benefits in the market (Tarí and Molina-Azorín, 2010).

Finally, using Structural Equation Modelling (SEM), Zeng et al. (2011) examine the internal benefits obtained from implementing an IMS for enterprises which include decreased paperwork, decreased management cost, decreased complexity of internal management, simplified certification process and facilitated continuous improvement.

Today, many organizations are implementing MSs not just to fulfill the requirements of individual MSSs, but to operate in a more combined, efficient and effective way (Asif et al., 2010). And in doing so, organizations can look to achieve significant internal benefits as well as meeting any external demands (Asif et al., 2010). Thus, there has been a growing recognition of the value that IMSs can bring to the business (Karapetrovic and Willborn, 1998; Wilkinson and Dale, 1999b; Douglas and Glen, 2000; Renzi and Cappelli, 2000; Casadesus and Karapetrovic, 2005; Zutshi and Sohal, 2005; Zeng et al., 2007; Salomone, 2008; Asif et al., 2009; Khanna, 2010 and Asif et al., 2010). The major improvements related to having an integrated system presented by these authors include aspects such as costs savings, operational benefits, better external image, improved customer satisfaction and enhanced employee motivation. However, it is important that firms manage the difficulties associated to the implementation and maintenance of an IMS in order to avoid its failure (López-Fresno, 2010). These challenges are numerous and involve aspects such as the lack of human resources, the lack of government support, departmentalization of functions and individual concerns of the people involved (Karapetrovic and Willborn, 1998a; Karapetrovic, 2003; Zutshi and Sohal, 2005; Karapetrovic et al., 2006; Zeng et al., 2007; Salomone, 2008; Asif et al., 2009; Karapetrovic and Casadesus, 2009 and Asif et al., 2009).

A summary of the difficulties and benefits of integrating MSs is presented next. Following Zeng et al. (2007), Khanna et al. (2010), Tarí and Molina-Azorín (2010) and Asif et al. (2010), the difficulties and benefits presented are classified according to two dimensions:



- Internal and external difficulties and,
- Internal and external benefits.

Additionally, the internal dimension, both for the difficulties and benefits, is further subdivided into four groups, that is: strategic level, tactical level, operational level and human resources. As for the external dimension, the three subgroups are: institutional environment, stakeholder’s involvement and certification.

According to this classification, the difficulties mentioned in the literature are presented next in Tables 2 and 3.

**Table 2. Internal difficulties in IMSs**

<b>Internal Difficulties</b>	<b>Description</b>	<b>Authors</b>
<b>Strategic (general, objectives, planning)</b>	<ul style="list-style-type: none"> <li>• Lack of strategic planning.</li> <li>• Difficulties in organising an IMS.</li> <li>• Risk of creating a ranking of systems by different areas of responsibility.</li> </ul>	<ul style="list-style-type: none"> <li>• Zutshi and Sohal, 2005; Asif et al. 2009.</li> <li>• Zeng et al., 2007; Salomone, 2008.</li> <li>• McDonald et al., 2003; Jorgensen et al, 2006; Salomone, 2008.</li> </ul>
<b>Tactical (processes and systems)</b>	<ul style="list-style-type: none"> <li>• The combination and effective integration of the different systems is not always clear, often lacking a real structure on which to build an integrated system.</li> <li>• Lack of resources.</li> <li>• High costs of multiple audits.</li> <li>• Problems in the integration of the objectives, processes and resources in the MS.</li> <li>• Difficulties after the IMS implementation caused by ineffective design or implementation.</li> </ul>	<ul style="list-style-type: none"> <li>• Karapetrovic and Jonker, 2003; Griffith and Bhutto, 2009; Asif et al., 2010.</li> <li>• Asif et al. 2009.</li> <li>• Karapetrovic, 2002a.</li> <li>• Beckmerhagen et al., 2003.</li> <li>• Asif et al., 2009.</li> </ul>
<b>Operational (documentation, procedures)</b>	<ul style="list-style-type: none"> <li>• Increased bureaucracy.</li> <li>• Difficulties in preparing reports of the results of integration.</li> </ul>	<ul style="list-style-type: none"> <li>• Matias and Coelho, 2002; McDonald et al., 2003.</li> <li>• Zutshi and Sohal, 2005.</li> </ul>
<b>Human Resources</b>	<ul style="list-style-type: none"> <li>• Fear of job losses.</li> <li>• Problems related to the organizational culture.</li> <li>• Lack of knowledge of the process, resulting in integration delays.</li> <li>• Inter-functional conflicts due to different interests and motivations.</li> <li>• People’s attitudes and behaviour.</li> <li>• Loss of power by some roles in the hierarchy.</li> </ul>	<ul style="list-style-type: none"> <li>• Beckmerhagen et al., 2003.</li> <li>• Wilkinson and Dale, 1999c; Wilkinson and Dale, 2000; Zeng et al., 2007.</li> <li>• Wilkinson and Dale, 2000; Zutshi and Sohal, 2005; Zeng et al., 2007; Salomone, 2008.</li> <li>• Karapetrovic and Willborn, 1998a.</li> <li>• Matias and Coelho, 2002; Zutshi and Sohal, 2005; Zeng et al., 2007; Asif et al., 2009.</li> <li>• Matias and Coelho, 2002; Karapetrovic, 2002.</li> </ul>

**Table 3. External difficulties in IMSs**

External Difficulties	Description	Authors
<b>Institutional Environment</b>	<ul style="list-style-type: none"> <li>• Changes in regulations and guidelines.</li> <li>• Lack of government support.</li> </ul>	<ul style="list-style-type: none"> <li>• Zutshi and Sohal, 2005; Zeng et al., 2007.</li> <li>• Karapetrovic et al., 2006.</li> </ul>
<b>Stakeholders involvement</b>	<ul style="list-style-type: none"> <li>• Differing perceptions of who the main stakeholders are.</li> </ul>	<ul style="list-style-type: none"> <li>• Karapetrovic and Willborn, 1998a; Beckmerhagen et al., 2003; Zeng et al., 2007; Asif et al., 2009.</li> </ul>
<b>Certification</b>	<ul style="list-style-type: none"> <li>• Insufficient harmonisation of the standards from the ISO 9000 and ISO 14000 series.</li> <li>• MSSs are based on different models.</li> <li>• Lack of support from the certification bodies.</li> <li>• Differences in the scope of the systems.</li> <li>• Differences in the general elements of the standards and in their specific requirements.</li> <li>• Lack of experience, formation and use of consultants.</li> <li>• Existence of different methods for integration.</li> </ul>	<ul style="list-style-type: none"> <li>• Karapetrovic and Willborn, 1998a.</li> <li>• Karapetrovic, 2003; McDonald et al., 2003; Salomone, 2008.</li> <li>• Zeng et al., 2007; Salomone, 2008.</li> <li>• Karapetrovic and Willborn, 1998a; Wilkinson and Dale, 2000.</li> <li>• Matias and Coelho, 2002; Karapetrovic, 2002; Karapetrovic, 2003; Beckmerhagen et al., 2003.</li> <li>• Zutshi and Sohal, 2005.</li> <li>• Karapetrovic and Willborn, 1998a; Karapetrovic, 2002; Jorgensen et al, 2006.</li> </ul>

Despite the numerous difficulties cited above, organizations also come across many benefits in the process of integration (e.g., Jorgensen et al, 2006; Pojasek, 2006; Karapetrovic and Casadesus, 2009; Tarí and Molina-Azorín, 2010; Asif et al., 2010 and Zeng et al., 2011). Therefore, a list of the benefits most mentioned in the literature is shown in Tables 4 and 5.

**Table 4. Internal benefits in IMSs**

Internal Benefits	Description	Authors
<b>Strategic (general, planning, objectives)</b>	<ul style="list-style-type: none"> <li>• Achievement of a holistic view and better decision making.</li> <li>• Global understanding of the organization and increased efficiency.</li> <li>• Facilitates continuous improvement.</li> <li>• Value creation and improvement of the competitive advantage and the strategic planning of the organization.</li> <li>• Decreased management cost.</li> <li>• Decreased complexity of internal management.</li> <li>• Risk reduction.</li> <li>• Better acceptance by the general management of the company.</li> <li>• Simpler, more focused management systems in the organization.</li> <li>• Higher transparency.</li> </ul>	<ul style="list-style-type: none"> <li>• Lopez-Fresno, 2010.</li> <li>• Douglas and Glen, 2000; Zutshi and Sohal, 2005; Jorgensen et al, 2006; Pojasek, 2006; Karapetrovic and Casadesus, 2009; Tarí and Molina-Azorín, 2010, Asif et al., 2010.</li> <li>• Zeng et al., 2011.</li> <li>• Pun and Hui, 2002; Kirkby, 2002; Zutshi and Sohal, 2005; Salomone, 2008; Lopez-Fresno, 2010.</li> <li>• Zeng et al., 2011.</li> <li>• Zeng et al., 2011.</li> <li>• Kirkby, 2002.</li> <li>• Beckmerhagen et al, 2003.</li> <li>• Wilkinson and Dale, 1999c; Douglas and Glen, 2000; Beckmerhagen et al, 2003; McDonald et al., 2003; Zutshi and Sohal, 2005; Zeng et al., 2005.</li> <li>• Khanna et al., 2010.</li> </ul>

<p><i>Table 4 continued</i></p> <p><b>Tactical/Functional (processes and systems)</b></p>	<ul style="list-style-type: none"> <li>• Better understanding and use of systems in the organization.</li> <li>• Saves time for adopting different systems as common objective of continuous improvement are being followed.</li> <li>• Costs savings and more efficient re-engineering.</li> <li>• Better technology development and transfer.</li> <li>• Greater flexibility and opportunities to include other systems.</li> <li>• Optimising resources.</li> <li>• Avoiding duplication of effort.</li> <li>• Making greater use of the synergies among standards.</li> </ul>	<ul style="list-style-type: none"> <li>• Wilkinson and Dale, 1999b</li> <li>• Renzi and Capeli, 2000; Zutshi and Sohal, 2005; Salomone, 2008; Khanna et al., 2010</li> <li>• Karapetrovic and Willborn, 1998a; Wilkinson and Dale, 1999b; Wilkinson and Dale, 1999c; Renzi and Capeli, 2000; Griffith, 2000; Kirkby, 2002; McDonald et al., 2003; Zutshi and Sohal, 2005; Lopez-Fresno, 2010; Tari and Molina-Azorin, 2010; Khanna et al., 2010.</li> <li>• Karapetrovic and Willborn, 1998a.</li> <li>• Karapetrovic and Willborn, 1998a; Griffith, 2000.</li> <li>• Karapetrovic and Willborn, 1998a; Wright, 2000; McDonald et al., 2003; Sutshi and Sohal, 2005; Renzi and Capelli, 2000; Jorgensen et al, 2006; Salomone, 2008; Lopez-Fresno, 2010.</li> <li>• Wilkinson and Dale, 1999b; Wilkinson and Dale, 1999c; Griffith, 2000; Beckmerhagen et al, 2003; Zutshi and Sohal, 2005.</li> <li>• Karapetrovic and Willborn, 1998b; Renzi and Capelli, 2000; Beckmerhagen et al, 2003; Asif et al., 2010; Khanna et al., 2010.</li> </ul>
<p><b>Operational (documentation, procedures)</b></p>	<ul style="list-style-type: none"> <li>• Improved multiple audits.</li> <li>• Reduction in duplication of policies, procedures and records.</li> <li>• Joined operational performance.</li> </ul>	<ul style="list-style-type: none"> <li>• Karapetrovic and Willborn, 1998a and 2001; Wilkinson and Dale, 1999b; Wilkinson and Dale, 1999c; Douglas and Glen, 2000; Wright, 2000; Beckmerhagen et al., 2003; Zutshi and Sohal, 2005; Jorgensen et al, 2006; Salomone, 2008; Khanna et al., 2010.</li> <li>• Renzi and Capeli, 2000; Griffith, 2000; Douglas and Glen, 2000; Beckmerhagen et al, 2003; Zeng et al., 2005; Jorgensen et al, 2006; Salomone, 2008; Khanna et al., 2010; Zeng et al., 2011.</li> <li>• Karapetrovic and Willborn, 1998a.</li> </ul>
<p><b>Human Resources</b></p>	<ul style="list-style-type: none"> <li>• Improved company culture.</li> <li>• Higher staff motivation, lower interfunctional conflicts.</li> <li>• Improved communication and information sharing across different organizational levels.</li> <li>• Better definition of responsibilities.</li> <li>• Optimization of formative activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Wilkinson and Dale, 1999c; Wright, 2000; Lopez-Fresno, 2010.</li> <li>• Karapetrovic and Willborn, 1998a; Kirkby, 2002; Wright, 2000; Zutshi and Sohal, 2005; Lopez-Fresno, 2010.</li> <li>• Griffith, 2000; Douglas and Glen, 2000; Matias and Coelho, 2002; Zutshi and Sohal, 2005; Pojasek, 2006; Lopez-Fresno, 2010.</li> <li>• Salomone, 2008.</li> <li>• Renzi and Capelli, 2000; Salomone, 2008.</li> </ul>

**Table 5. External benefits in IMSs**

External Benefits	Description	Authors
<b>Institutional Environment</b>	<ul style="list-style-type: none"> <li>• More effective response to changes in external conditions than individual systems.</li> </ul>	<ul style="list-style-type: none"> <li>• Jorgensen et al, 2006; Zeng et al., 2011.</li> </ul>
<b>Stakeholders involvement</b>	<ul style="list-style-type: none"> <li>• Improved customer confidence and positive company image.</li> <li>• Stronger customer orientation.</li> <li>• Better scope for input by stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>• Karapetrovic and Willborn, 1998a; Douglas and Glen, 2000; Zutshi and Sohal, 2005; Jorgensen et al, 2006; Lopez-Fresno, 2010.</li> <li>• Lopez-Fresno, 2010.</li> <li>• Karapetrovic and Willborn, 1998a; Zutshi and Sohal, 2005.</li> </ul>
<b>Certification</b>	<ul style="list-style-type: none"> <li>• Simplified certification process.</li> <li>• Simplification of the standards and MSs requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Zeng et al., 2011.</li> <li>• Wilkinson and Dale, 1999c; Beckmerhagen et al, 2003, McDonald et al., 2003; Zutshi and Sohal, 2005.</li> </ul>

### 3.6. Audit integration

Organizations with more than one implemented MS have the option to integrate the audits against the corresponding MSs (Karapetrovic and Willborn, 2001; Karapetrovic and Jonker, 2003; Power and Terziovski, 2005; Kraus and Grosskopf, 2008; Bernardo et al., 2010). However, little empirical research has been done on how organizations carry out their audit process, namely only Baldi (1999), Douglas and Glen (2000), Fresner and Engelhardt (2004), Zeng et al. (2005), Zeng et al. (2007), Zutshi and Sohal (2005), Karapetrovic et al. (2006), Salomone (2008), Kraus and Grosskopf, 2008, Bernardo et al. (2009 and 2010), Simon et al. (2011 and 2012) and Bernardo et al. (2012). From this group of papers, Baldi (1999), Douglas and Glen (2000), Karapetrovic et al. (2006) and Salomone (2008), Kraus and Grosskopf, (2008), Bernardo et al. (2010), Simon et al. (2011) and Bernardo et al. (2012) study in detail the integration of audits of standardized management systems.

Concretely, firms have not systematized the integration of their audits and little advice on how to carry out this integration has been provided. Only national standards such as 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) or the ISO handbook (ISO, 2008c) on management systems integration exist to guide organization during the process of audit integration.

According to Karapetrovic and Willborn (2001), using a systems approach in auditing can lead to numerous advantages including “a more dynamic and adaptive audit, harmonization

and integration of discipline-specific audits and corresponding audit guidelines, as well as a sound conceptualization of audit quality, reliability and maintainability”. In addition, joint audits, like in the case of management systems (Karapetrovic and Jonker, 2003), can lead to more synergies and effectiveness in the audits which can be applied to improving business performance. However, a system approach requires higher effort done by the organization in terms of coordination of goals as well as human and physical resources (Karapetrovic and Willborn, 2001).

The implementation of integrated audit systems can be done in several ways. Following Karapetrovic and Willborn (2001), the first and simpler step would be ‘compatibility’, which means carrying out separate audits without contradictions when managing and performing them. The level of integration from this basic level can increase until the organization reaches the full integration of their auditing processes. In this line, efforts to facilitate the joint auditing of the different management systems have been done by the standard writing bodies who have revised the standards for auditing quality systems (ISO 10011: 1990) and for environmental management systems (ISO 14010/11/12: 1996) in order to harmonize the individual audit guidelines (Karapetrovic and Willborn, 2001), being ISO 19001:2002 the standard providing the auditing guidelines for both ISO 9001 and ISO 14001.

The first auditing standards appeared at national level in the 1980s in Canada and the United States. However, the first international quality and environmental management system audit standards were ISO 10011 (ISO, 1991) and ISO 14010, ISO 14011, and ISO 14012 respectively, all of them published by ISO and compared by Karapetrovic and Willborn (1998a). The authors found differences in the content and structure of these standards and discussed on the integration of audits of quality and environmental management systems (Karapetrovic and Willborn, 1998a). The most recent step realized regarding auditing standards was the integration into a single standard, in 2002, of the guidelines for auditing quality and environmental management systems, a standard named ISO 19011 (ISO, 2002). The standard explains the principles of management system auditing and offers advice on evaluating auditors and assessing their competence, guidance on managing audit programs, and guidance on conducting internal and external audits (Kraus and Grosskopf, 2008). This standard is currently under revision in order to provide more generic guidance and allow auditing all standardized management systems (ISO, 2008b).

An 'audit' is defined in ISO 19011: 2011 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, 2005, 2011). 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, 2005, 2011). '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, 2005, 2011). It is also important to explain what an integrated audit means. Several authors coincide that *"full audit integration necessitates the establishment of a single audit system across all functions and hence a complete amalgamation of all cross-functional goals, processes and resources"* (Karapetrovic and Willborn, 1998c; Karapetrovic, 2002 and 2003). This means that the audits need to involve the sharing of all the components among cross-functional audits, namely they need to share the time when the audit is conducted, the audit team, the plan and the report. However, practically, the integration of quality, environmental, safety and other kinds of audits can be reduced to involve the sharing of only a selected number of these components among cross-functional audits.

Many benefits and efficiencies related to the integration of audits are considered in the literature:

- optimised use of resources (Karapetrovic and Willborn, 1998b; Douglas and Glen, 2000; Karapetrovic, 2002; Zeng et al., 2005; Zeng et al., 2007; Zutshi and Sohal, 2005; Pojasek, 2006; Salomone, 2008).
- improved establishment of auditor competence for different management system standards (Douglas and Glen, 2000; De Moor and De Beelde, 2005; Kraus and Grosskopf, 2008).
- the processes under review, along with all their controls (environmental, health, safety, and quality) have to be evaluated only once (Kraus and Grosskopf, 2008).
- less duplication of effort during the planning, execution, and even follow-up phases of the audit (Kraus and Grosskopf, 2008, Simon et al., 2011).

## **Chapter 4. Research objectives and methodology**

### **4.1. Introduction**

The literature review previously presented makes it possible to state the research objectives and to formulate the corresponding research questions, propositions and hypotheses of this dissertation. Moreover, in this section, we present the methodology used in this study, which is classified in two more sections:

- Data collection
- Data analysis

Regarding the data collection, the methods used, namely the questionnaires and the case studies, will be explained. Further, we will develop on the descriptive data analysis, the use of multivariate analysis and models and on the case study analysis that have been used to test the propositions and hypotheses of this study.

### **4.2. Research objectives**

The main objective of this thesis is to empirically analyze how do organizations with more than one standardized management system integrate these as well as their audits. To do this, the following sub-objectives were studied.

#### **4.2.1. Sub-objectives**

1. Investigate how the IMSs on ISO 9001 and ISO 14001 registered companies in Catalonia evolve over time.
2. Study whether the integration level is related to the benefits and difficulties encountered by organizations during the integration process.
3. Analyze how companies integrate their MSs and whether there are differences across types of firms or across different sectors.
4. Explore how companies conduct their audits and to which extent they integrate the audit elements of their MSs.

#### **4.2.2. Objectives, research questions and propositions development**

In order to achieve the above mentioned objectives, we developed the following research questions and propositions derived from the literature review. The research questions and propositions are presented in Table 6 below.

**Table 6. Objectives, research questions and propositions**

<p><b>Objective 1.</b> The purpose of this study is to investigate the evolution of IMSs experienced by ISO 9001 and ISO 14001 registered companies in Catalonia over time. Additionally, the study aims to evaluate the impact of integration, namely the extent of integration and the difficulties experienced by firms, during the integration of MSs in companies with more than one MS.</p>	<p><b>Research Question 1</b></p>	What is the evolution of IMSs experienced by ISO 9001 and ISO 14001 registered companies over time?	<p><b>Paper 1</b></p>
	<p><b>Research Question 2</b></p>	What is the impact of integration (extent and difficulties) during the integration of MSs?	
<p><b>Objective 2.</b> The main objective of this research is to study whether the difficulties encountered by firms during the integration process are related to the level of integration of their MSs and whether their integration level affects the benefits of having an IMS perceived by organizations. In particular, we aim to study whether the integration difficulties are related to the integration level of the human and documentation resources, as well as to the procedures that are part of an IMS. Moreover, we want to determine the relationship of these elements with the integration benefits.</p>	<p><b>Research Question 1</b></p>	Is the integration level of standardized MSs related to the benefits and difficulties found by organizations registered to multiple MSSs during the integration process?	<p><b>Paper 2</b></p>
<p><b>Objective 3.</b> The main objective of this investigation is to study how chemical companies integrate their MSs and whether they do it differently from other firms, given the importance of the chemical sector in the Spanish industry.</p>	<p><b>Research Question 1</b></p>	How do chemical companies integrate their MSs?	<p><b>Paper 3</b></p>
	<p><b>Research Question 2</b></p>	Is the integration process different from other firms?	
<p><b>Objective 4.</b> This research involves in-depth case studies of four specific organizations in order to study how these companies conduct their audits and to which extent they integrate the audit elements of their MSs.</p>	<p><b>Proposition 1</b></p>	Case study organizations integrate internal audits against quality and environmental management system standards.	<p><b>Paper 4</b></p>
	<p><b>Proposition 2</b></p>	Case study organizations integrate external audits against quality and environmental management system standards.	
	<p><b>Proposition 3</b></p>	Case study organizations use ISO 19011 in their internal audits.	
	<p><b>Proposition 4</b></p>	Specific audit components are more integrated in internal than in external audits in case study organizations.	



Throughout this section, we will present the methodology for each of the papers presented in this study. The titles of the papers appear in table 7:

**Table 7. Papers presented in the study**

<b>Paper 1</b>	Simon, A., Karapetrovic, S. and Casadesus, M. (2012). Evolution of Integrated Management Systems in Spanish Firms. <i>Journal of Cleaner Production</i> , 23 (2012), 8-19.  <b>Impact factor: 2,425, first quartile</b>
<b>Paper 2</b>	Simon, A., Karapetrovic, S. and Casadesus, M. (2012). Difficulties and Benefits of Integrated Management Systems. <i>Industrial Management and Data Systems</i> . Accepted.  <b>Impact factor: 1,569, second quartile</b>
<b>Paper 3</b>	Simon, A., Bernardo, M., Karapetrovic, S. and Casadesus, M. (2012).  Implementing integrated management systems in chemical firms. <i>Total Quality Management &amp; Business Excellence</i> . Accepted.  <b>Impact factor: 0,387, fourth quartile</b>
<b>Paper 4</b>	Simon, A., Bernardo, M., Karapetrovic, S. and Casadesus, M. (2011). Integration of standardized environmental and quality management systems audits. <i>Journal of Cleaner Production</i> , 19 (17-18), 2057-2065.  <b>Impact factor: 2,425, first quartile</b>

### 4.3. Methodology

In the following sections, we present the methodology used in order to carry out the data collection and the data analysis.

#### 4.3.1. Data collection

In order to achieve the objectives of the study, we used an empirical study carried out in 2006 (see Karapetrovic et al., 2006). The study was conducted by sending questionnaires to 535 of the 1,191 certified Catalonian companies, registered at least to ISO 9001 and ISO 14001 (see Annex 1 for the 2006 questionnaire, originally sent in Catalan and Spanish), addressed to the person responsible for quality and/or environmental management in the company. The companies were randomly selected using the Spanish Industrial Codes for stratification (Karapetrovic and Casadesus, 2009). A total of 176 valid answers were obtained. The survey therefore had a 33% response rate with a 93% level of confidence. The results of this study can be found in Karapetrovic et al. (2006).

In order to continue the 2006 study on the integration of MSs in Catalonia, a new empirical study was carried out from February to July 2010, using a questionnaire addressed to the 176 firms that answered the survey in 2006 (Karapetrovic and Casadesus, 2009). The survey instrument was refined using a pre-test process.

In order to be able to compare the answers of the companies of both samples, the questionnaire used in 2010 was a new version of the one used in Karapetrovic et al. (2006) (see Annex 2 for the 2010 questionnaire, originally sent in Catalan). The surveys in 2006 and 2010 comprised a combination of semi-open and Likert-type questions with a 1 to 5 scale and included questions regarding the implementation of MSs, the integration level, the use of integration guidelines, the integration difficulties and the integration of audits. However, in 2010, regarding the integration of MSs, an additional question about the benefits of integration was included, following the literature on the topic. Questions regarding innovation and customer satisfaction were also included.

In 2010, the empirical study was conducted by means of a mail survey addressed to the person responsible for the QMS and/or EMS of the organization, and was subsequently followed up with a telephone call and an additional e-mail communication with the firms.

From the 176 companies that answered in 2006, 76 valid answers were obtained. The survey therefore had a 43% response rate and a 93% reliability, with a 95% confidence.

For enhanced consistency, this work was carried out with the same methodology, using the same firms as in 2006 and in the same region of Spain, Catalonia. Catalonia has traditionally been one of the regions in Spain with the highest rate of ISO 9001 registrations in the country and experiencing a growth in the number of certificates which is very similar to the average rate of growth in Spain (Heras and Casadesus, 2006). In 2010, Spain is a country with one of the highest number of ISO 14001: 2004 and ISO 9001: 2000 certificates in the world (ISO, 2011). And more specifically, Catalonia is one of the leading regions in Spain regarding the number of certifications of ISO 9001 and ISO 14001 together with the regions of Madrid, the Basque Country and Andalucia (Forum Calidad, 2010).

Additionally, in order to carry out the case study research, we developed a set of interview guidelines (see Annex 3 for the guidelines).

For the qualitative analyses, we selected the case studies focusing on organizations registered at least to ISO 9001:2000 and ISO 14001:2004 standards to ensure they were companies that could have integrated their management systems. The companies were selected from 176 Catalan organizations that had responded to a mail survey on the integration of management systems in a previous empirical study in 2006 (Karapetrovic et al., 2006; Bernardo et al., 2009; Bernardo et al., 2010). We chose the companies of our study based on the results of Bernardo et al. (2009) who found three groups of companies with some level of integration and one with no integration. The companies for the case studies were chosen following the criteria of diversity, as we chose firms that in the 2006 survey had different levels of integration, taking one company from each of the four groups identified by Bernardo et al. (2009).

A case study approach was adopted to allow causes, processes and consequences of behaviour of the participants to be investigated (Yin, 1989). The end result is a series of case studies in which each case is treated as a replication and follows the same structure (Yin, 1989).

The methodological process included various steps such as initial contact, sending out the presentation letter and interview guidelines, visit and transcription of the interview, coupled with the information from company websites. According to Eisenhardt (1989) a few case studies are generally sufficient if they contain enough information. We visited the four firms and interviewed the persons responsible for MSs for about one hour. Eisenhardt (1989) suggested that a researcher should have a well-developed interview protocol before making site visits. We used a structured interview protocol in all site visits. The protocol covered a number of topics such as important changes in the organization, introduction and maintenance of MSs, integration, internal and external audits and future plans.

On the interviewing side, we assured two interviewers in all the cases. Since questions about MSs might be perceived as delicate as they are a strategic aspect of the organizations, we decided not to save the interview on any recordable support, but rather to write down the participants' answers. In our view, this fact assures an environment more proper to confidence and sincerity, ingredients necessary for a more reliable information/knowledge capture of the insights of management opinions (Eisenhardt, 1989). Each interview resulted in a case study that was sent to the organization in order to validate the content.

### **4.3.2. Data analysis**

For the first study, we analyzed the integration level of firms and the tools used during the implementation of standards among firms in the 2006 and 2010 samples. Then, we studied the degree of integration of the human resources, documentation, goals and procedures of the IMS. Finally, we provided data regarding the difficulties of integration, as well as their evolution. For each of these aspects, we first provided a descriptive analysis comparing the 2006 and 2010 samples. Moreover, statistical tests, namely Wilcoxon and McNemar tests to compare the means of the variables and a logistic regression were used to analyze the significant differences of the integration variables over time (Novales, 1997). The Wilcoxon test is a nonparametric test that compares two paired groups. The test essentially calculates the difference between each set of pairs and analyzes these differences. The Wilcoxon test assumes that there is information in the magnitudes and signs of the differences between paired observations. As the nonparametric equivalent of the paired student's t-test, the Wilcoxon test can be used as an alternative to the t-test when the population data does not follow a normal distribution. The McNemar test assesses the significance of the difference between two dependent samples when the variable of interest is a dichotomy.

Moreover, in order to analyse the impact of the difficulties that firms have during the integration process on the level of integration, we used logistic regressions both in 2006 and 2010 taking the level of integration (partial and full integration) as the dependent variable and the difficulties as the predictor variables. Simple logistic regression is analogous to linear regression, except that the dependent variable is nominal, not a measurement. The objective of the logistic regression is to predict the probability of getting a particular value of the nominal variable, given the measurement variable. Simple logistic regression finds the equation that best predicts the value of the Y variable for each value of the X variable. What makes logistic regression different from linear regression is that the Y variable is not directly measured; it is instead the probability of obtaining a particular value of a nominal variable.

For the second study, we carried out an empirical analysis of the relationship between the level of integration of MSs and the benefits and difficulties of such integration. First, we performed an Exploratory Factor Analysis (EFA) in order to group the variables into latent constructs valid for interpretation and further analysis. Then, we used structural equation modeling to analyze the relationship between the benefits and the difficulties encountered during integration and the level of MS integration achieved by organizations. Structural

Equation Modeling (SEM) is used to test complex relationships between observed (measured) and unobserved (latent) variables and also relationships between two or more latent variables. SEM serves purposes similar to multiple regression, but in a more powerful way which takes into account multiple latent independents each measured by multiple indicators, one or more latent dependents also each with multiple indicators, the modeling of mediators as both causes and effects, modeling of interactions, nonlinearities, correlated independents, measurement error, and correlated error terms. Advantages of SEM compared to multiple regression include: more flexible assumptions, particularly allowing interpretation even in the face of multicollinearity; use of confirmatory factor analysis to reduce measurement error by having multiple indicators per latent variable; the desirability of testing models overall rather than coefficients individually; the ability to test models with multiple dependents; the ability to model error terms; and ability to handle difficult data such as non-normal data, and incomplete data. Moreover, where regression is highly susceptible to error of interpretation due to misspecification, the SEM strategy of comparing alternative models to assess relative model fit makes it more robust (Byrne, 2009).

The third study involved in its first part, an exploratory analysis of the survey data regarding chemical and non-chemical firms. From the 76 organizations studied, 17 belonged to the chemical sector, according to the Spanish industrial classification (FEIQUE, 2009). The analysis included questions related to the level of integration and the use of specific guidelines to conduct the integration of different MSs and presented responses on the benefits and challenges of integration and a comparison of the results between chemical and non-chemical firms. In order to compare the results for chemical and non-chemical firms, it was necessary to analyze whether the two subsamples are significantly different. We tested the assumptions of normality, linearity and equality of variances which were not confirmed. Therefore, we used non-parametric tests in order to compare the two samples. We used the Kruskal-Wallis test (Kruskal and Wallis, 1952) to compare the two independent groups of sampled data.

The fourth essay wanted to study whether and how firms integrated the audits of IMS. The analysis of the case studies included topics such as the audit objectives, resources and methods.

For the case study analyses in papers 3 and 4, a within-case data analysis, which involves “detailed case study write-ups for each site”, was conducted first by analyzing in detail the company answers (Eisenhardt, 1989). We analyzed and organized the cases according to a limited number of concepts such as the company characteristics, their management systems and integration, internal and external audits and future plans. The second step was a cross-case search for patterns, looking for similarities and differences among the four cases (Eisenhardt, 1989).

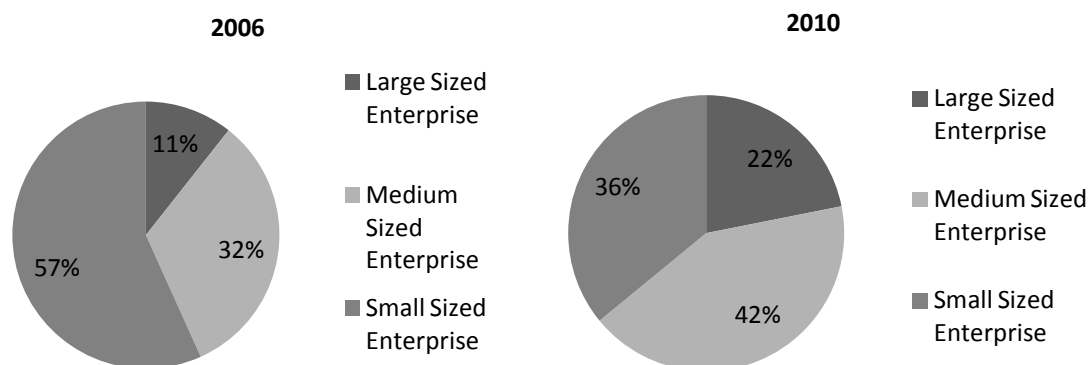
Regarding validity and reliability, the present essays meet internal validity (e.g., Yin, 1994) following three main strategies: first, by basing the research on existing literature on MSs integration; second, through pattern matching (e.g., Eisenhardt, 1989) that discusses the observed results with the predictions from previous studies; and third, through theory triangulation (Yin, 2009), verifying findings in light of the main integration theories. To strengthen internal validity, a clear research framework was designed and extensively discussed prior to the data collection process. Construct validity is pursued with different triangulations in data collection, mainly combining interviews analysis with direct observation, as the researchers themselves conducted the interviews, and with the analysis of secondary data (web pages and database information). The data gathering on site helped ensure the accuracy of the findings by providing more concrete information upon which to formulate interpretations. Moreover, an active corroboration on the interpretation of data between the author and the organizations interviewed was maintained. The descriptions provided in this methodological section are meant to be a clear chain of evidence to allow reconstruction from the initial research question to the final conclusions (Yin, 2009). External validity, or “analytical generalizability” (e.g., Eisenhardt, 1989), which refers to the generalization from empirical observations to theory (e.g., Yin, 2009; Gibbert and Ruigrok, 2010) relies on the number of cases included and, furthermore, on the extensive reporting of sampling criteria, context and the organizations’ characteristics. Reliability in this research was achieved through the use of the case protocol.

#### 4.4. Descriptive analysis of the 2006 and 2010 samples

This section includes the descriptive figures taken from the analysis of the 2006 and the 2010 samples (see Karapetrovic et al., 2006 for a more extensive descriptive analysis of the 2006 sample). The main characteristics of the firms that took part in the study are described below.

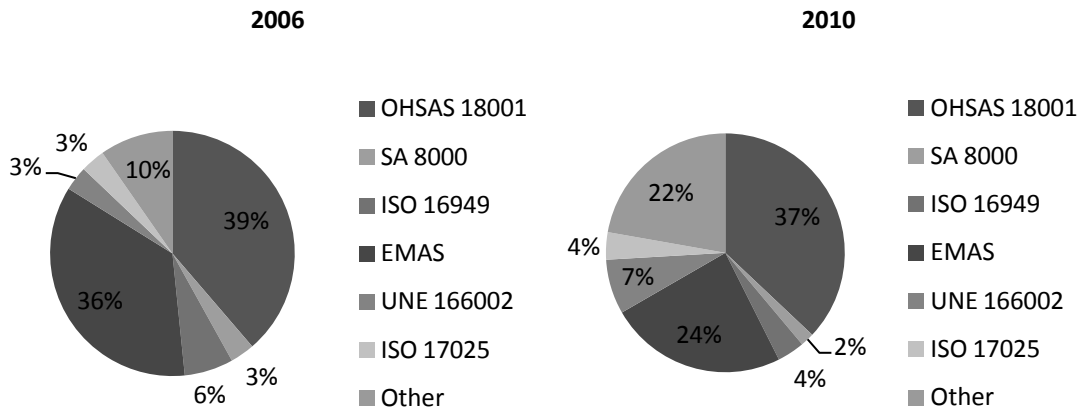
Regarding the size of the companies, most of them are small or medium sized companies, both in 2006 and in 2010, and only a minority of the companies are large (more than 500 workers). This might be either because there are not many large companies in Catalonia or because the ones that exist are not certified or certified with other standards.

**Figure 8. Organization's size**



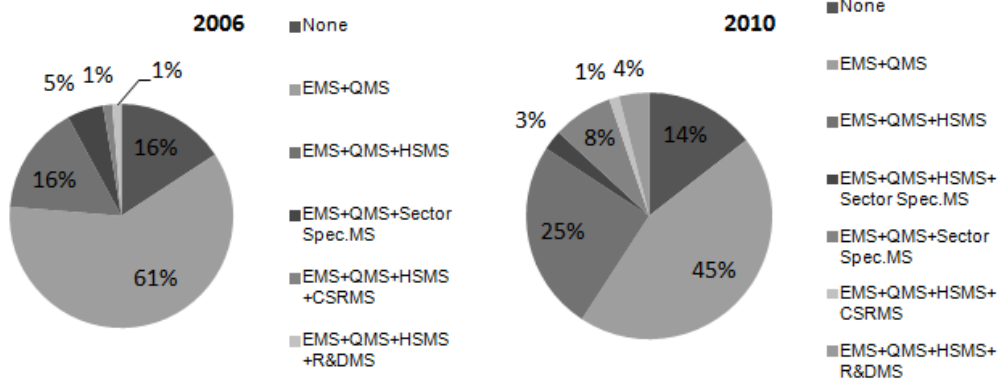
Current Management Systems Standards cover a wide spectrum of areas in organizations with a view to offering their various internal and external stakeholders a certain level of reliability. The empirical research carried out in this study confirms the idea that firms implement MSSs other than ISO 9001 and ISO 14001. Of the companies compliant with both ISO 9001 and ISO 14001, some of them had also implemented OHSAS 18001 and EMAS, among others.

**Figure 9. Implemented standards**



Regarding the number of systems that are included in a single integrated management system, most of the firms only integrate the QMS and the EMS. Some firms also integrate the Health and Safety Management systems (HSMS) and sector specific systems, and firms that integrate other MSs represent a minority of the samples.

**Figure 10. Standards in the Integrated Management Systems**



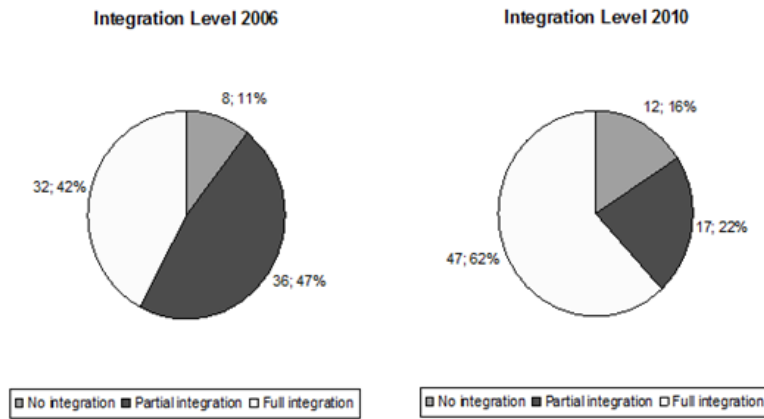
Finally, looking at the level of integration of 2006 and 2010, Figure 11 indicates that the levels of “no integration” (11% to 16%) and “full integration” have increased (42% to 62%) while the level of “partial integration” has decreased (47% to 22%).

One significant conclusion which can be drawn from these findings is that a great majority of organizations compliant with multiple standards have integrated the systems that these standards represent (Karapetrovic et al. 2006), and, as expected (e.g. Karapetrovic, 2002), the



scope of integration includes the most popular standardized MSs, i.e. quality, environment and health and safety, as shown in the previous figure.

**Figure 11. Level of Integration**



## **Chapter 5. Essay 1. Evolution of Integrated Management Systems in Spanish firms**

*Simon, A., Karapetrovic, S. and Casadesus, M. (2012). Evolution of Integrated Management Systems in Spanish Firms. Journal of Cleaner Production, 23 (2012), 8-19.*

### **Abstract**

The aim of this paper is to analyze the evolution of the implementation and integration of standardized Management Systems (MSs) such as ISO 9001 and ISO 14001. Specifically, we study the implementation of different standards during a four year period (2006-2010) and we examine the level of integration of different MS elements such as the resources, documentation, goals and procedures during this period. Additionally, the paper aims to evaluate the impact of integration on companies over time, namely the difficulties experienced by firms during the integration of MSs in organizations with more than one MS. In order to accomplish these objectives, the first dynamic study on the integration of MSs has been undertaken.

In order to compare firms that integrate their MSs in two different moments in time, two empirical studies were conducted, one in 2006 and one in 2010. These studies used a survey directed to firms with more than one MS in Catalonia (Spain).

This paper contributes to the understanding of how firms that have an Integrated Management System (IMS) integrate their standardized MSs and how they perceive the challenges related to managing the IMS over time. It also demonstrates that firms integrate their MSs rather than keep them separated, therefore showing a tendency towards integration over time.

**Keywords:** ISO 9001, ISO 14001, Integrated Management System, Standards, Evolution, Spain

### **5.1. Introduction**

Management Systems Standards (MSSs) have developed in an unprecedented manner in the last few years. The impact generated by quality, environmental and other MSSs is demonstrated by the importance of such standards worldwide, ISO 9001 and ISO 14001 (ISO, 2010). In particular, at the end of 2009, ISO 9001 accounted for 1,064,785 registered companies in more than 170 countries and ISO 14001 for 223,149 in about 150 countries (ISO, 2010). From 2006 to the end of 2009, the number of certifications has increased with

167,856 ISO 9001 certificates and 94,938 ISO 14001 certificates (ISO, 2010). However, although the importance and the diffusion of these two MSs in different countries has been widely studied by several authors (e.g., Corbett & Kirsch, 1999 and 2001; Saraiva & Duarte, 2003; Franceschini et al., 2004; Marimon et al., 2006; Lagodimos et al., 2007; Casadesus et al., 2008; Marimon et al., 2011), their main findings suggest that the number of certificates worldwide presents a "saturation effect", that is, when the number of certified organizations reaches a certain limit, certification loses its connotation and becomes less attractive for the remaining companies (Franceschini et al., 2004).

Despite the "saturation effect", these two standards act as frameworks for quality management and environmental management, respectively in a great number of organizations worldwide. Moreover, they *“provide confidence for business-to-business transactions, for consumers when choosing products, for government departments when awarding procurement contracts, and for enterprises when qualifying suppliers in global supply chains”* (ISO, 2009b).

In a context where new standardized management systems (MSs) appear frequently, *“more and more organizations are applying not only one, but a range of management system standards to satisfy their own needs as well as those of external stakeholders”* (ISO, 2009b). Apart from ISO 9001 and ISO 14001, companies can integrate standardized MSs such as the ones for occupational health and safety (e.g., OHSAS 18001 and CSA Z1000) or for corporate social responsibility and accountability (e.g., SA 8000 and AA 1000), among others.

As the aim of this article is to study the evolution of MS implementation and integration from 2006 to 2010, we look at some of the standards and other supporting elements published by the International Organization for Standardization (ISO) during this period. From 2006 on, ISO has published several new MSSs and has also revised some existing ones.

One of the most relevant publications, in 2008, is ISO 9001:2008, the fourth edition of the standard, first published in 1987, *“which has become the global benchmark for providing assurance about the ability to satisfy quality requirements and to enhance customer satisfaction in supplier-customer relationships”* (ISO, 2009b).

During this period, ISO has also published a series of standards related to quality management that are directed towards assessing and improving customer satisfaction. They all “*provide guidance for planning, designing, developing, implementing, maintaining and improving processes to increase customer satisfaction*” (ISO, 2009b). Specifically, in 2004 ISO published ISO 10002 to handle with customers’ complaints. In 2007, ISO published ISO 10001:2007, which “*address codes of conduct to organizations*”. ISO 10003:2007 focuses on “*improving an effective and efficient dispute-resolution process for complaints that have not been resolved by the organization*”. Finally, ISO/TS 10004:2010 “*defines processes to monitor and measure customer satisfaction*” (ISO, 2009b).

Another standard published in 2009, ISO 31000 for risk management, “*is experiencing a rapid take-up by the global market*”, although it is not a certification standard (ISO, 2009b). ISO 31000:2009 sets out principles, a framework and a process for the management of risk (ISO, 2009b). Recently, ISO has published ISO 26000:2010, the standard giving guidance on social responsibility (Castka and Balzarova, 2008 a,b; ISO, 2009b).

Moreover, “*the tremendous impact of ISO 9001 and ISO 14001 on organizational practices and on trade has stimulated the development of other ISO standards and deliverables that adapt the generic management system approach to specific sectors or aspects*” (ISO, 2009b). From 2006 to 2010, these standards have appeared in the automotive (ISO/TS 16949:2009), petroleum and gas (ISO/TS 29001:2007), ship recycling (ISO 30000:2009), and supply chain security (ISO 28000:2007) sectors.

Other types of ISO documents, for application in specific industry sectors are the International Workshop Agreements, such as IWA 2 on education (IWA 2:2007) and IWA 4 regarding local government (IWA 4:2009).

Regarding the integration of MSs, in order to assist organizations, ISO published in 2008 a handbook, “*The integrated use of management system standards*”, which provides a methodology and real cases as examples to help an organization carry out the integration process (ISO, 2008c).

During the last four years, both this proliferation and the increasing importance of MSSs have been demonstrated (Singh, 2008; ISO, 2010). Traditionally, organizations have focused on establishing MSs that comply with each MSS requirements individually, often in isolation

from each other and sometimes even in conflict (Karapetrovic & Willborn, 1998; Zeng et al., 2007). However, Integrated Management Systems (IMS) that address organizations' objectives jointly are becoming more and more popular as they aim to satisfy the needs of several MSs while running a business (Beckmerhagen et al., 2003). Achieving this can be beneficial to the organization's efficiency and effectiveness, as well as reducing the cost of managing each system individually (Tari & Molina-Azorin, 2010).

The purpose of this paper is to understand how the integration of MSs changes within a period of time and to relate it to the difficulties perceived by companies of having an IMS. Moreover, it aims to analyze the implementation and integration of different MSs in Spanish firms. The overall aim is to analyze the impact of integration on companies.

With the aim to survey companies on the impact of MS implementation and integration, two empirical studies were undertaken, one in 2006 and one in 2010, surveying quality and environmental system managers. The analysis carried out in this paper is based on the answers of the same firms responding to the 2006 and the 2010 surveys. This method was used in order to be able to observe the dynamics of the same sample of firms regarding the integration of their systems. This is, as far as we know, the first study reported in literature that analyses the evolution of MS integration over a period of time.

First, a review of the literature on the evolution of perceived benefits and challenges of MSS implementation is presented. As we have not been able to find any studies on the evolution of integration benefits and difficulties, we review existing research on the extent of integration and integration tools used by organizations. We follow with an analysis of the impact of integration, namely the benefits and difficulties of MSs integration in organizations. We subsequently develop the methodology used in this study, which involves a quantitative analysis of the implementation of MSs, the extent of their integration, as well as the difficulties of integration. The last part of the article includes empirical results of the investigation and a concluding section.

## **5.2. Literature review**

As we have previously mentioned, only a few studies have been found on the evolution of the impact of MSSs implementation over time.

For example, there are studies proving that firms which have been working for a longer time with certified systems perceive higher benefits than those that have just been certified (Brecka, 1994; Ferguson et al., 1996; Tang & Kam, 1999; Singels et al., 2001; Terziovski et al., 2003; Dowlatshahi & Urias, 2004; McGuire & Dilts, 2008). Other studies prove that a high number of certified firms do not perceive benefiting significantly from the certification process, and this situation does not improve over time (Jones et al., 1997; Leung et al., 1999; Casadesus & Karapetrovic, 2005; Karapetrovic et al., 2006). Some of the benefits mentioned by the authors defending the positive impact of MSSs implementation over time include lower operating costs, reduced wastage, and improved efficiency and productivity compared to the companies that had just completed the certification (Brecka, 1994; Terziovski et al., 2003; Casadesus & Karapetrovic, 2005, Karapetrovic et al., 2010).

Thus, it is very difficult to determine which benefits MSSs implementation brings over time and it is even more difficult to assess the impact of the evolution of MSs integration, as there is no existing literature on that topic. Therefore, in order to understand the impact that IMS have on organizations, it is vital to review the existing studies on the integration of MSs, especially on the benefits and challenges firms encounter during the process.

As MSSs are increasingly being implemented by companies, the structure and content of these standards are becoming very similar in order to enhance their compatibility and facilitate their joint implementation (Karapetrovic, 2002; López-Fresno, 2010). Therefore, they often incorporate common elements such as the control of documents and records, internal audits, corrective and preventive action, management review and continuous improvement (Asif et al. 2010). In fact, the Plan, Do, Check, Act (PDCA) improvement cycle (Deming, 1982), has become the foundation for many of these standards (Labodova, 2004; López-Fresno, 2010).

Therefore, IMSs are becoming more and more popular as firms find it more reasonable to integrate their MSs rather than manage them individually (Karapetrovic & Willborn, 1998b; Bernardo et al. 2009; Douglas & Glen 2000; Karapetrovic et al. 2006; Zeng et al. 2007). Moreover, empirical studies regarding the scope of integration confirm the idea that firms prefer integration over desintegration (Douglas & Glen, 2000; Karapetrovic et al., 2006; Zeng et al. 2007; Salomone, 2008; Karapetrovic & Casadesus, 2009 or Bernardo et al., 2009).

Regarding the order of implementation of the MSs in the organizations, Salomone (2008), shows how a majority of their sample of Italian organizations implemented first the QMS and then the EMS. In this line, Karapetrovic and Casadesus (2009) found that most respondents implemented ISO 9001 before ISO 14001.

Jorgensen et al. (2006) and Jorgensen (2008), define three different levels of integration: “correspondence” refers to cross references and internal coordination, “generic” which is the understanding of generic processes and tasks in the management cycle, and “integration”, the creation of a culture of learning, stakeholder participation and continuous improvement of the performance. Regarding MS integration, Karapetrovic and Willborn (1998) define three main elements of a standardized MS which can be integrated at different levels, namely goals, processes, and resources. Karapetrovic et al. (2006) conducted an empirical study in order to study the extent of integration of these elements, obtaining responses from 176 Catalan organizations with multiple cross-functional certificates like ISO 9001 or ISO 14001. The authors found a high level of integration regarding the extent of the integration of the human resources, the company policy, objectives, the management system manual, and the processes of document control, record control, auditing, and management review. However, the authors found that aspects such as the use of integrated records, instructions or procedures, found at tactical organizational levels, or the planning, determination of requirements, product realization and other internal business processes, seemed to be integrated to a lesser extent. In the same direction, Bernardo et al. (2009) empirically studied the integration of environmental with other MSs in Spain. To this end, an empirical study was carried out on 435 companies that were registered to multiple management system standards, including ISO 14001: 2004 and ISO 9001: 2000 at the minimum. Overall, 362 of those organizations indicated that they had integrated all or at least some of their standardized management systems. In particular, 14% of organizations did not integrate their MSs, 7% integrated only some of them, and 79% integrated all their MSs.

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

At the same time, there has been a growing recognition of the value that IMSs can bring to the business (Karapetrovic & Willborn, 1998; Wassenaar & Grocott, 1999; Wilkinson & Dale, 1999; Douglas & Glen, 2000; Renzi & Cappelli, 2000; Zutshi & Sohal, 2005; Salomone, 2008; Asif et al., 2009; Griffith & Bhutto, 2008; Khanna, 2010 and Asif et al., 2010). Today, many organizations are implementing MSs not just to fulfill the requirements of individual standards, but to operate in a more combined, efficient and effective way (Asif et al., 2010). And in doing so, organizations can look to achieve significant internal benefits as well as meeting any external demands (Asif et al., 2010). For instance, according to Zeng et al. (2011), the main benefits of implementing integrated management systems include decreased paperwork, decreased management cost, decreased complexity of internal management, simplified certification process and facilitates continuous improvement. Several authors also suggest the benefits of IMSs regarding the integration of their audits and find that the majority of organizations registered to multiple standards integrate their internal audits and are also externally audited in a similar manner, thus profiting from the existing synergies among standards (Karapetrovic et al., 2006; Bernardo et al., 2010).

In order to avoid the failure of MS integration, it is important that firms manage the difficulties associated with the implementation and maintenance of an IMS (López-Fresno, 2010). These challenges are numerous and involve aspects such as the lack of human resources, the lack of government support, departmentalization of functions and individual concerns of the people involved (Karapetrovic & Willborn, 1998; Wassenaar & Grocott, 1999; Matias & Coelho, 2002; Karapetrovic, 2003; Zutshi & Sohal, 2005; Karapetrovic et al., 2006; Zeng et al., 2007 and Asif et al., 2009).

In the next sections of this paper, we present the first empirical study on evolution of the integration of MSs over time. In the following section, the methodology applied will be described. Finally, the empirical analysis and the conclusions are presented.

### **5.3. Methodology**

The purpose of this study is to investigate the evolution of IMSs experienced by ISO 9001 and ISO 14001 registered companies in Catalonia over time. Additionally, the paper aims to evaluate the impact of integration, namely the extent of integration and the difficulties experienced by firms, during the integration of MSs in companies with more than one MS.



Two empirical studies, carried out in 2006 and 2010 respectively, were used in order to study the evolution of integration in companies. In 2006, the first study was conducted by sending questionnaires to 535 of the 1,191 certified Catalanian companies, addressed to the person responsible for quality and/or environmental management in the company. The companies were randomly selected using the Spanish Industrial Codes for stratification (Karapetrovic & Casadesus, 2009). A total of 176 valid answers were obtained. The survey therefore had a 33% response rate with a 93% level of confidence. The results of this study can be found in Karapetrovic et al. (2006).

In order to continue this study on the integration of MSs in Catalonia, a new empirical study was carried out from February to July 2010, using a questionnaire addressed to the 176 firms that answered the survey in 2006 (Karapetrovic & Casadesus, 2009). The questionnaire comprised a combination of semi-open and Likert-type questions with a 1 to 5 scale. The survey instrument was refined using a pre-test process.

In order to be able to compare the answers of the companies of both samples, the questionnaire used in 2010 was a new version of the one used in Karapetrovic et al. (2006). The surveys in 2006 and 2010 included questions regarding the implementation of MSs, the integration level, the use of integration guidelines, the integration difficulties and the integration of audits. However, in 2010, regarding the integration of MSs, an additional question about the benefits of integration was included, following the literature on the topic.

In 2010, the empirical study was conducted by means of a mail survey addressed to the person responsible for the QMS and/or EMS of the organization, and was subsequently followed up with a telephone call and an additional e-mail communication with the firms.

From the 176 companies that answered in 2006, with a subsequent follow-up by telephone, 76 valid answers were obtained. The survey therefore had a 43% response rate and a 93% reliability, with a 95% confidence.

For enhanced consistency, this work was carried out with the same methodology, using the same firms as in 2006 and in the same region of Spain, Catalonia. Catalonia has traditionally been of the regions of Spain with the highest rate of ISO 9001 registrations in the country and experiencing a growth in the number of certificates which is very similar to the average rate of growth in Spain (Heras & Casadesus, 2006). In 2010, Spain is a country with one of the

highest number of ISO 14001: 2004 and ISO 9001: 2000 certificates in the world (ISO, 2010). And more specifically, Catalonia is one of the leading regions in Spain regarding the number of certifications of ISO 9001 and ISO 14001 together with the regions of Madrid, the Basque Country and Andalucia (Forum Calidad, 2010).

Table 1 compares the features of this empirical work to that of the previous study. The survey profiles are presented in Table 1.

**Table 1. Profile of the 2006 and 2010 surveys**

Study factor	Year 2006	Year 2010
Location	Catalonia (Spain)	Catalonia (Spain)
Time	2006	2010
Population	1191	535
Sample size	535	176
Received responses	176	76
Response rate	33%	43%
Level of confidence p=q=0.5	93%	93%

An empirical analysis on the evolution of the implementation and integration of MSs is provided in the next section. The results are presented with the following structure. First, results regarding the implementation of standards among firms in the 2006 and 2010 samples, the integration level of firms and the tools used, are analyzed. Second, we illustrate the degree of integration of the human resources, documentation, goals and procedures of the IMS. Finally, we provide data regarding the difficulties of integration, as well as their evolution. For each of these aspects, we first provide a descriptive analysis comparing the 2006 and 2010 samples. Moreover, statistical tests, namely Wilcoxon and McNemar tests to compare the means of the variables and a logistic regression are used to analyze the significant differences of the integration variables over time.

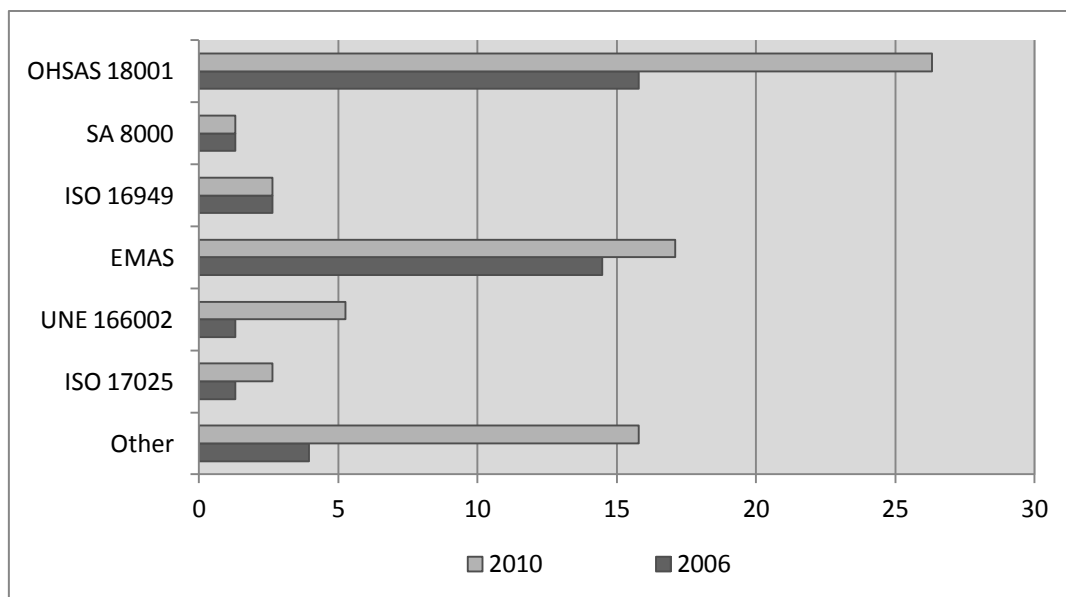
## 5.4. Findings

### 5.4.1 Evolution of implemented standards 2006-2010

Due to the survey design, all of the respondents were registered to both ISO 9001 and ISO 14001. Apart from these two standards, the most implemented one among firms is OHSAS 18001 for occupational health and safety with a 10.52% increase from 2006 to 2010 (see Figure 1). The proportions for the implementation of other function or stakeholder specific standards like SA 8000 for Corporate Social Responsibility or UNE 166002 for Research and

Development are much lower. The implementation of sector-specific standards such as ISO 16949 for the automotive sector or ISO 17025 for calibrations in laboratories has experienced no increase or a moderate increase (1.31%) respectively. Enhanced-requirement standards focused on a single organizational area, such as EMAS for the environment reported a level of implementation of 14.47% and 17.10% in 2006 and 2010 respectively, representing a 2.63% increase. The other major increase is a group named “other standards” with a 11.84 % change, which includes standards such as ISO 22000 for food safety, ISO 13485 for medical devices, ISO 3834-2 quality requirements for fusion welding of metallic materials or UNE 216301 certification for energy efficiency.

**Figure 1. Evolution of the implementation of standards 2006-2010**



#### 5.4.2. Level of integration

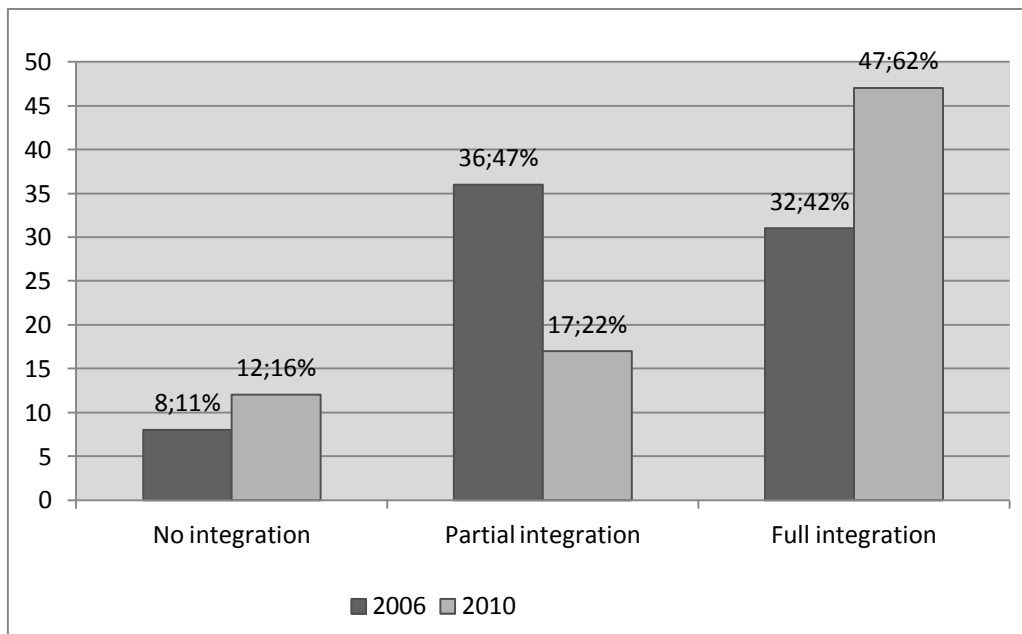
As discussed in the literature, from the 2006 survey, Bernardo et al. (2009) find three levels of integration: “no integration”, “partial integration” and “full integration”. Comparing the level of integration of 2006 and 2010, Figure 2 indicates that the levels of “no integration” (11% to 16%) and “full integration” have increased (42% to 62%) while the level of “partial integration” has decreased (47% to 22%).

One significant conclusion which can be drawn from these findings is that a great majority of organizations compliant with multiple standards have integrated the systems that these standards represent (Karapetrovic et al. 2006), and, as expected (e.g. Karapetrovic, 2002), the

scope of integration includes the most popular standardized MSs, i.e. quality, environment and health and safety, as shown in the previous section.

Moreover, these findings are especially relevant because they seem to indicate that firms tend to polarize in one of the two extremes: either they integrate all their MSs or they chose not to integrate any of them. Thus, firms perceiving the benefits of integration mentioned above in the literature prefer full integration, while firms who have probably faced or anticipated the difficulties of integration have opted to keep their MSs separated. The rest of the firms, which stay in a medium position with a partial level of integration, have decreased in number.

**Figure 2. Integration level 2006-2010**



In order to compare the two surveys regarding the level of integration, the difference degree between the two samples was analyzed, using a Wilcoxon test for dependent samples (Novales, 1997). The Wilcoxon signed-rank test is a non-parametric statistical hypothesis test for the case of two related samples or repeated measurements on a single sample. It can be used as an alternative to the paired Student's t-test when the population cannot be assumed to be normally distributed like in our samples.

The Wilcoxon test provides the statistic (Z) and the related bilateral significance. The significance level for the integration degree (0.003) is lower than 0.05, therefore we can reject the null hypothesis of equality of means and conclude that the compared variables (level of integration in 2006 and 2010) are significantly different. The Wilcoxon test subtracts one

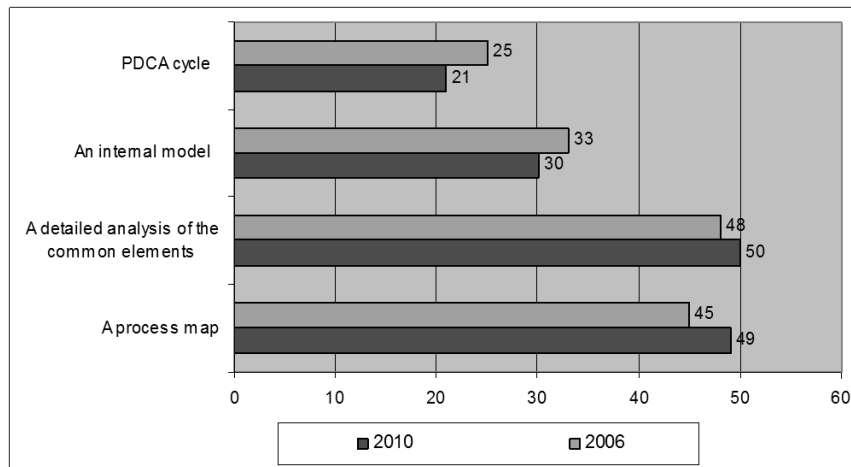
variable from another, giving positive and negative ranks as a result. In this case, the significance level is based on the positive ranks, that is, the integration level in 2010 is higher than in 2006. Therefore, we can say, with 95% confidence, that the integration level showed a statistically-significant higher level of integration in 2010 compared to 2006. This result makes sense, as firms with more than one MS prefer integration over disintegration (Bernardo et al. 2009; Douglas & Glen 2000; Karapetrovic et al. 2006; Zeng et al., 2007).

### **5.4.3. Tools used for integration**

Regarding the use of different tools during the integration of the MSs, the survey explored the use of the process, PDCA and company-specific models, as well as whether or not the companies performed an analysis of the common elements of MSSs (Karapetrovic et al. 2006). The respondents gave responses on the use of one or more of these four tools. Therefore, the application of all four types of integration tools could be assessed.

The results show the dominance of the analysis of common elements of standards (Figure 3). This method was used by 73.8% and 75.8% of the respondents in 2006 and 2010, respectively. A process map is the second most common tool used by companies to integrate their MSs (69.2% and 74.2%). On the other hand, 50.8% and 45.5% of companies used their own model, while 38.5% and 31.8% used the PDCA approach.

Although the most common tools used during the integration process were, both in 2006 and 2010 (48 and 50 companies respectively), a detailed analysis of the common elements of the standards and a process map (45 and 49 firms), the use of these tools during the integration process differs between 2006 and 2010. In 2010, there is an even higher use of the common elements analysis and the process map, which means that the use of the PDCA cycle and internal models by firms has decreased. Such outcome goes along the theoretical notions presented in Karapetrovic and Willborn (1998), as well as Karapetrovic (2003), Labodova (2004), Karapetrovic et al. (2006) and (Asif et al. 2009).

**Figure 3. Tools used during the integration process 2006- 2010**

In order to compare the two surveys regarding the tools used for integration, the degree of difference between the two samples was analyzed, using a McNemar's test for dependent samples and dichotomous variables (Novales, 1997). McNemar's test is a non-parametric test that is used when we analyze a study where subjects are accessed in consecutive time periods. In McNemar's test, significance is tested by using the chi-square table. If the  $\chi^2$  result is significant, this provides sufficient evidence to reject the null hypothesis, in favor of the alternative hypothesis, which would mean that the difference between the two related samples is significant.

McNemar results and the corresponding contingency table indicate that 36 firms were using a process map both in 2006 and 2010 to integrate their MSs. An analysis of common elements was used in both years by 20 firms, while 16 used an internal model. Only three firms used a PDCA cycle in 2006 and 2010. The  $\chi^2$  has a value of 8.036 with a p-value of 0,004 so we reject the null hypothesis and conclude that the difference between the two related samples is significant. In conclusion, firms in 2010 use different tools to integrate their MSs compared to the tools used in 2006.

#### **5.4.4. Resources involved in the different management systems**

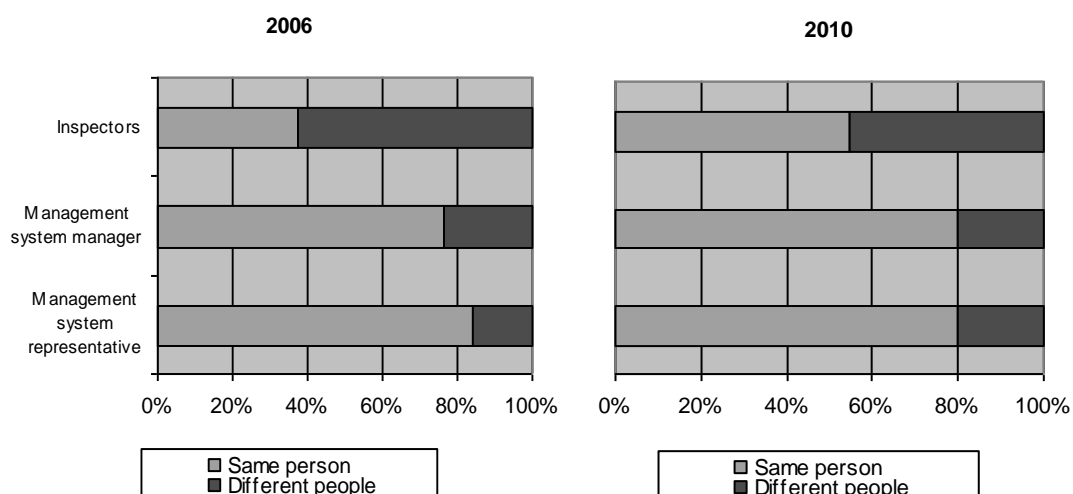
As Karapetrovic and Willborn (1998b) state, an IMS can be conceptualized as a set of three elements that can be integrated, namely resources, goals and processes. Therefore, the survey included questions related to the degrees of integration specific to each of these MSs elements.

The first group of questions, related to the integration of human resources, was focused on knowing whether the responsibility for managing different MSs falls to the same person in the firm (Karapetrovic et al. 2006). This was studied at three levels of responsibility in the organization: top management, MS representatives and inspectors of the different MSs. The second group of questions was related to the integration of the documentation resources (manual, procedures, instructions and records) and goals (policy and objectives), while the third group of questions was aimed at assessing whether the procedures were integrated or not.

**Human resources**

In terms of the human resources involved in the different MSs, Figure 4 illustrates that both in 2006 and 2010, the level of integration is much higher at the top management level than at the shop floor level. This result is probably explained by the fact that MSs representatives are more trained and committed to manage the IMS, therefore showing a higher level of integration (Zutshi & Sohal, 2005). However, the results also show a 5% increase from 2006 to 2010 at the functional level (management system managers), as well as a 20% increase at shop floor level (inspectors), which means that the level of integration of these two types of human resources is approaching to the level of management integration.

**Figure 4. Integration of human resources involved in the different MSs**



**Table 2. Wilcoxon test for human resources integration level (2010-2006)**

	<b>Z</b>	<b>Sig. (p)</b>
<b>Management System Representative</b>	-.447	.655
<b>Management System Manager</b>	-2.502	.012*
<b>Inspector</b>	-5.997	.000*

\* Statistically significant based on positive ranks

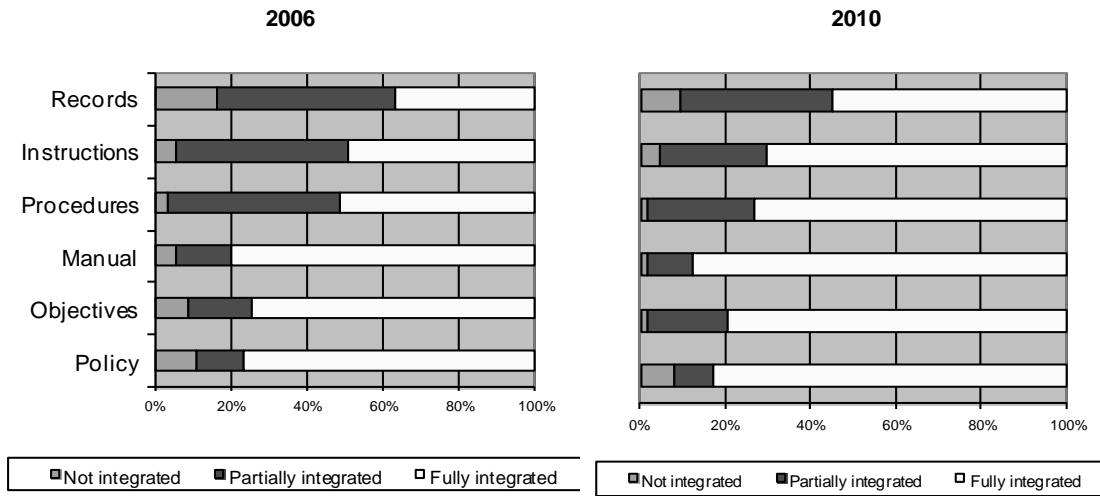
In order to compare the two surveys regarding the level of integration of the human resources, the degree of difference between the 2006 and 2010 samples was analyzed, using the Wilcoxon test. The table below shows the Wilcoxon statistic (*Z*) and the related bilateral significance for each group of human resources. Only the MSs managers and the inspectors show significant differences between years. Therefore, we conclude that the level of integration of these two groups of human resources is higher in 2010 than in 2006.

### ***Documentation and goals***

Following Karapetrovic et al. (2006), “the integration of the documentation resources, including the management system objectives, was examined at the policy, objective, manual, procedure, instruction and record levels”. The results show that most firms have both in 2006 and 2010 a single policy, set of objectives and the MS manual (Figure 5). However, in line with the results found by Karapetrovic et al. (2006), the integration level diminishes as we move towards the operational and tactical organizational levels. However, the use of integrated records, instructions or procedures significantly increases from 2006, when less than half of the firms had fully integrated these elements, to the year 2010, when between half and three quarters of the respondents had already integrated them fully (Figure 5).



**Figure 5. Integration of documentation and goals 2006-2010**



**Table 3. Wilcoxon test for documentation and goals integration level (2010-2006)**

	Z	Sig (p)
<b>Policy</b>	-1.919	.055
<b>Objectives</b>	-2.372	.018*
<b>Manual</b>	-.034	.973
<b>Procedures</b>	-1.966	.049*
<b>Instructions</b>	-.500	.617
<b>Records</b>	-3.126	.002*

\* Statistically significant based on positive ranks

Comparing the 2006 and 2010 samples, the table above shows the Wilcoxon statistic (Z) and the related bilateral significance for each group of goals and documentation. Significant differences between years are shown in the objectives (p=0.018), procedures (p=0.049) and records (p=0.002). Therefore, we can conclude that the level of integration of these three elements is higher in 2010 than in 2006. One of the most important aspects of this analysis is that the significant variables are the ones related to the operational and tactical levels of the organization (objectives, procedures and records). Therefore, these are the elements that have experienced a major increase over this period of time, whereas strategic variables such as the policy or the manual have not experienced such an increase in the level of integration.

### ***Procedures***

As in Karapetrovic et al. (2006), we examined the integration of different procedures covering activities, such as document and record control, determination of stakeholder requirements and auditing (Figure 6).

High levels of integration were exhibited both in 2006 and 2010 in MS procedures, such as record and document control or preventive and corrective actions, while the elements integrated to a lesser extent were product realization and audits. In general, the overall level of integration of the procedures involved in the different MSs has increased and, in 2010, all the procedures have been fully integrated by at least 60% of the firms. However, in 2006, less than half of the firms had fully integrated most of the procedures. However, it is important to notice the increase of the integration level of one particular element, internal audits, which was the second least-integrated element in 2006. However, it became one of the most integrated procedures in 2010, with a level of full integration in more than 80% of the firms. This finding reveals the importance of internal audits and their integration as well as the increasing awareness of organizations about the benefits of audit integration. For instance, the optimised use of resources is mentioned by Karapetrovic & Willborn, 1998a; Douglas & Glen, 2000; Karapetrovic, 2002; Zeng et al., 2005; Zutshi & Sohal, 2005; Pojasek, 2006; Zeng et al., 2007 and Salomone, 2008, and the establishment of auditor competence for different MSSs is considered by Douglas & Glen, 2000; De Moor & De Beelde, 2005 and Kraus & Grosskopf, 2008. Moreover, the processes under review, along with all their controls (environmental, health, safety, and quality) have to be evaluated only once and there is less duplication of effort during the planning, execution, and even follow-up phases of the audit (Kraus & Grosskopf, 2008).

**Figure 6. Integration of procedures 2006-2010**

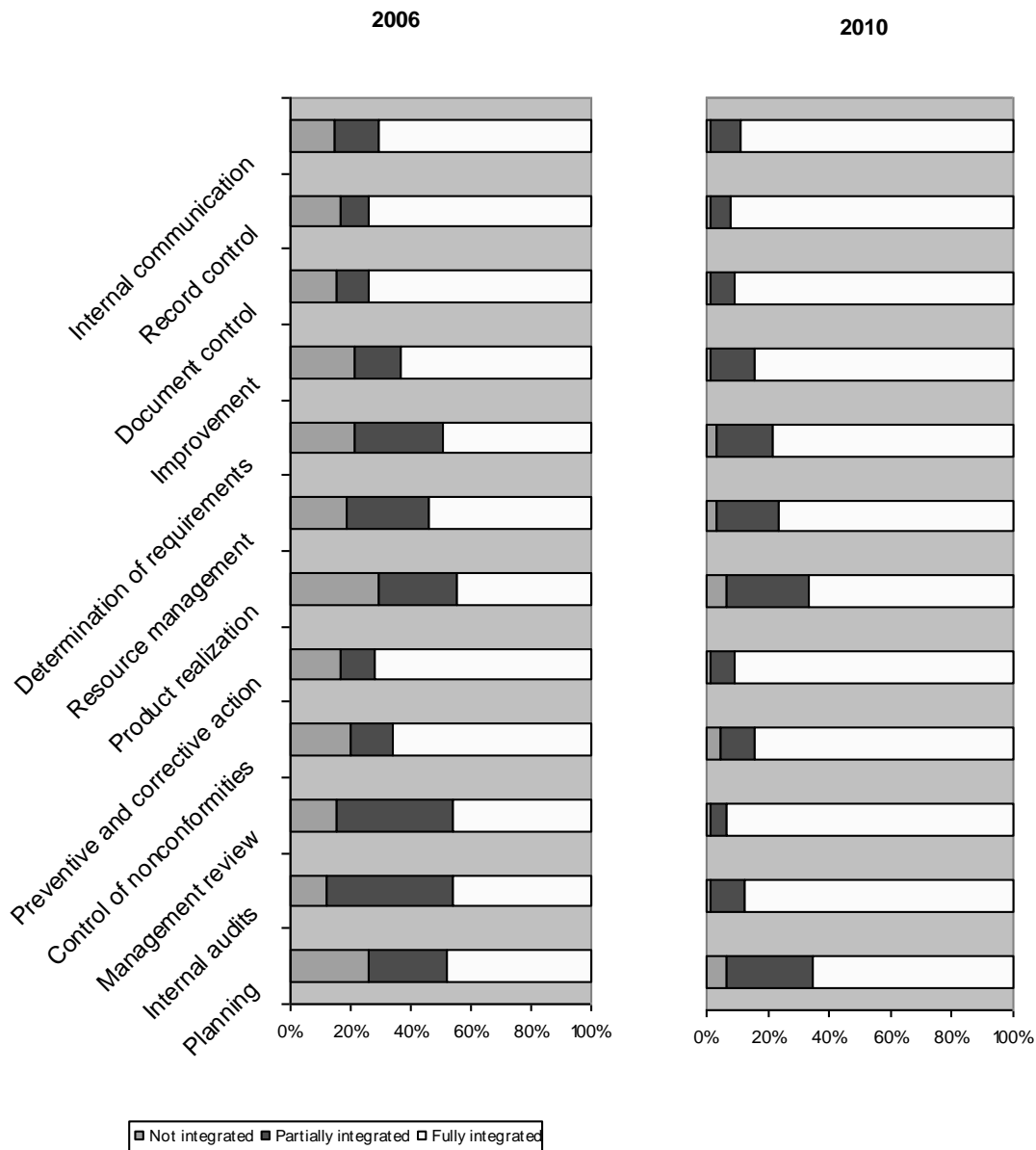


Table 4 shows the Wilcoxon statistic ( $Z$ ) and the related bilateral significance for each group of procedures in the 2006 and 2010 survey answers. Significant differences are shown in the planning ( $p=0.000$ ), control of non-conformities ( $p=0.008$ ), preventive and corrective actions ( $p=0.014$ ), product realization ( $p=0.000$ ), improvement ( $p=0.011$ ) and requirements ( $p=0.000$ ). These results show that the level of integration of these elements is higher in 2010 than in 2006 at a 95% confidence level. These procedures can be classified under the different requirements of ISO 9001: 2000 (ISO, 2000), following the specific chapters of the standard, namely Chapter 4: “Quality Management System” (control of documentation, record

control), Chapter 5: “Management Responsibility” (planning, management review, internal communication), Chapter 6: “Resource Management” (resource management), Chapter 7: “Product Realization” (product realization, determination of requirements) and Chapter 8: “Measurement, Analysis and Improvement” (internal audits, control of nonconformities, preventive and corrective action, improvements). Taking this classification into account, our results indicate that procedures related to product realization and procedures related to measurement, analysis and improvement are the ones that have experienced a higher increase in their level of integration. This results differ in some ways to the results found by Bernardo et al. (2009), who found that procedures related to product realization were the least integrated, while procedures related to measurement, analysis and improvement had the highest degree of integration.

**Table 4. Wilcoxon test for procedures integration level (2010-2006)**

	<b>Z</b>	<b>Sig. (p)</b>
<b>Planning</b>	-3.877	.000*
<b>Internal audits</b>	-1.414	.157
<b>Management review</b>	-.277	.782
<b>Control non conformities</b>	-2.652	.008*
<b>Preventive and corrective actions</b>	-2.449	.014*
<b>Product realization</b>	-3.601	.000*
<b>Resource Management</b>	-1.388	.165
<b>Requirements</b>	-3.649	.000*
<b>Improvement</b>	-2.546	.011*
<b>Document control</b>	-1.414	.157
<b>Record control</b>	-1.134	.257
<b>Internal communication</b>	-1.789	.074

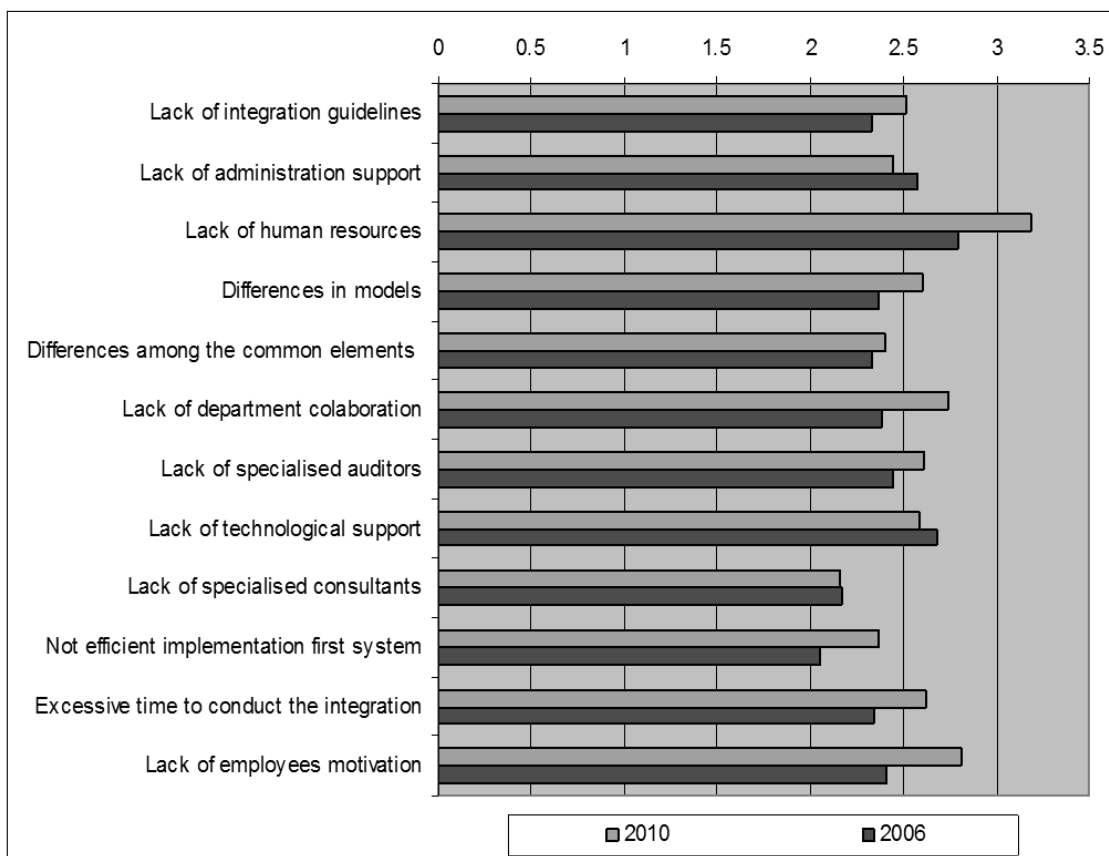
\* Statistically significant based on positive ranks

#### **5.4.5. The difficulties of integration over the years**

Although the integration of MSs generally makes sense, organizations naturally encounter difficulties in the process (Karapetrovic & Willborn, 1998b; Karapetrovic, 2003). The surveys presented in this paper included one question about the integration difficulties (1 to 5 Likert

scale), which was posed to organizations that reported full or partial integration of their standardized MSs, and explored the main difficulties encountered in the integration process (Karapetrovic & Willborn, 1998b; Wassenaar & Grocott, 1999; Matias & Coelho, 2002; Zutshi & Sohal, 2005; Karapetrovic et al., 2006; Zeng et al., 2007; Asif et al., 2009; and Asif et al., 2010). In order to evaluate the changes in the perceptions of the companies regarding the difficulties of MSs integration and address the gap in the current literature on this topic, the results obtained from 2006 and 2010 surveys are compared. The comparison of the importance of difficulties detected in both surveys is presented in Figure 7.

**Figure 7. Difficulties of integration 2006-2010**



In 2006, the difficulties most mentioned by firms regarding the integration of their MSs were the lack of human resources, with a mean importance level of 2.79, followed by the lack of technological support (2.68), and the lack of administration support (2.57). In 2010, the results change slightly, as the most-cited difficulty remains the lack of human resources (3.94), followed by the lack of employees motivation (2.81), and the lack of department collaboration (2.74). These results are specially relevant, as they show the importance of motivating and implicating the human resources in order to achieve a successful integration of

the systems. The least important difficulty is the lack of specialised consultants (2.2 and 2.1 in 2006 and 2010 respectively).

**Table 5. Wilcoxon test for integration difficulties (2010-2006)**

	<b>Z</b>	<b>Sig. (p)</b>
<b>Lack of integration guidelines</b>	-1.044	.297
<b>Lack of administration support</b>	-2.300	.021**
<b>Lack of human resources</b>	-1.173	.241
<b>Differences in the models of systems</b>	.241	1.000
<b>Differences in the common elements of systems</b>	-2.231	0.26
<b>Lack of department collaboration</b>	-.958	0.338
<b>Lack of specialised auditors</b>	-1.040	.298
<b>Lack of technological support</b>	-2.381	0.17
<b>Lack of specialised consultants</b>	-.779	0.436
<b>Inadequate implementation of the initial system</b>	-2.777	0.005*
<b>Excessive time to conduct the integration</b>	-3.173	0.002*
<b>Lack of employees motivation</b>	-1.626	.104

\* Statistically significant based on positive ranks

\*\* Statistically significant based on negative ranks

In table 5, a Wilcoxon test was performed on all twelve factors found in both surveys (three additional factors were studied in the 2010 survey only). With a 95% confidence, two factors (inadequate implementation of the initial system and excessive time to conduct the integration) indicated a statistically-higher level of perceived difficulties in 2010 compared to 2006, while one factor (lack of administration support) showed a statistically-lower level of difficulties in 2006 compared to 2010. The other eight factors showed no statistically-significant differences: lack of integration guidelines, lack of human resources, differences in the models, differences in the common elements, lack of department collaboration, lack of specialized auditors, lack of technological support, lack of specialized consultants and lack of employees motivation. From the significant results, it is possible to extract two different types

of difficulties experienced by firms regarding IMSs (Zeng et al. 2007). One of them is related to external factors (lack of government support), while the other two significant variables represent internal factors.

#### **5.4.6. Logistic regression 2006**

In order to analyse the impact of the difficulties that firms have during the integration process on the level of integration, we use a logistic regression taking the level of integration (partial and full integration) as the dependent variable and the difficulties as the predictor variables. “No integration” is not considered in this analysis, as these firms have not undertaken the process of integrating their MSs and therefore have not experienced any difficulty regarding this topic. Logistic regression is a form of regression which is used when the dependent is a dichotomy and the independents are of any type (Novales, 1997). Since logistic regression calculates the probability of success over the probability of failure, the impact of predictor variables is usually explained in terms of odds ratios. We use logistic regression as it does not assume linearity of relationship between the independent variables and the dependent does not require normally-distributed variables and does not assume homoscedasticity which is convenient for our samples. We use stepwise regression which is used in the exploratory phase of research making no a-priori assumptions regarding the relationships between the variables (Menard, 1995). Thus, our goal is to discover the relationship between the integration difficulties and the integration level.

In table 6, a likelihood ratio test is used for the overall model evaluation. We also provide a goodness-of-fit measure, the Hosmer-Lemeshow (1989) test, as an indicator of model appropriateness. Two additional descriptive measures of goodness-of-fit, presented in Table 6, are the  $R^2$  indices, defined by Cox and Snell (1989) and Nagelkerke (1991), respectively. These indices are variations of the  $R^2$  concept defined for the OLS (Ordinary Least Squares) and can be used together.

The likelihood ratio value (46.22) indicates that the model is appropriate. Regarding the goodness-of-fit, the Cox and Snell  $R^2$  (0.335) and Nagelkerke  $R^2$  (0.519) present an acceptable value and the Hosmer-Lemeshow test shows a significance of 0.555. This test is statistically significant when it takes values over 0.05; therefore we accept our model as valid.

**Table 6. Model evaluation and goodness of fit tests for the logistic regression**

Test	$\chi$	df	Sig. (p)
<b>Overall model evaluation</b>			
Likelihood ratio test	46.223		
<b>Goodness-of-fit tests</b>			
Hosmer-Lemeshow	5.869	7	0.555
Cox and Snell R <sup>2</sup>	0.355		
Nagelkerke R <sup>2</sup>	0.519		

The results of the logistic regression in 2006 provide the statistical significance of individual regression coefficients (Bs) which are tested using the Wald chi-square statistic. In 2006, there are no significant difficulties that predict the integration level. Therefore, we cannot conclude that the integration level is related to the difficulties experienced by organizations during the integration process.

#### **5.4.7. Logistic regression 2010**

Table 7 shows in 2010, a significant predictor for the integration level, which is the inadequate implementation of the initial system in the organization ( $p=0.029<0.05$ ). This difficulty is found as a significant variable in 2010 but not in 2006. This might be explained because, in 2010, although companies are more experienced in managing and integrating management systems, they might have realized how the systems work together, and this difficulty has aroused as a problem for the organizations, realizing that they should have made more efforts to implement the first system (usually ISO 9001) better in the first place, in order to avoid problems with other systems in the future.

The odds ratio for the significant variable “inadequate implementation of the initial system” is 0.103. For this variable, when it increases in one unit, the level of integration decreases by 70.7% ( $1-\text{odds} \times 100$ ).



**Table 7. Logistic regression results 2010**

2010 Predictor	B	SE (B)	Wald's $\chi^2$	df	Sig. (p)	Exp(B) Odds ratio	C.I. 95.0% for EXP(B)	
							Low	High
Constant	3.016	3.822	.623	1	.430	20.401		
Lack of integration guidelines	1.036	.635	2.655	1	.103	2.817	.811	9.786
Lack of administration support	.262	.633	.171	1	.679	1.300	.376	4.496
Lack of human resources	-.293	.615	.227	1	.633	.746	.224	2.488
Differences in models	.325	.697	.217	1	.641	1.384	.353	5.429
Differences among the common elements	-.145	.893	.026	1	.871	.865	.150	4.978
Lack of department collaboration	.201	.632	.101	1	.751	1.222	.354	4.222
Lack of specialized auditors	.380	.683	.310	1	.578	1.463	.383	5.585
Lack of technological support	.623	.721	.747	1	.387	1.865	.454	7.668
Lack of specialized consultants	-.769	.861	.798	1	.372	.463	.086	2.505
Lack of internal organizational culture	-1.228	.637	3.715	1	.054	.293	.084	1.021
Excessive time to conduct the integration	-1.007	.681	2.185	1	.139	.365	.096	1.389
Lack of employees motivation	2.194	1.156	3.603	1	.058	8.971	.931	86.434
Differences in the scope of the standards	1.489	.919	2.623	1	.105	4.432	.731	26.853
Not efficient implementation first system	-2.271	1.039	4.777	1	<b>.029*</b>	.103	.013	.791
Lack of certifying organizations support	-.058	.668	.007	1	.931	.944	.255	3.497

\* Statistically significant at 95%

Regarding the confidence interval on the odds ratio, "low" and "high" confidence values are provided. That is, when the 95% confidence interval around the odds ratio includes the value of 1.0, indicating that a change in value of the independent variable is not associated in change in the odds of the dependent variable assuming a given value, then that variable is not considered as a useful predictor in the model (Novales, 1997). Therefore, as the variable "inadequate implementation of the initial system" in our model has a confidence interval around the odds ratio which does not include the value of 1.0 (between 0.013 and 0.791), it indicates that the variable is considered as a useful predictor in the logistic model. So, when firms have difficulties when implementing the first system, they achieve a lower level of integration. This is an internal difficulty that should be solved by organizations in order to be able to achieve a high level of integration and benefit from the advantages of full integration

(Salomone, 2008; Griffith & Bhutto, 2008; Asif et al., 2009; Khanna, 2010 and Asif et al., 2010).

The results of the logistics regressions for 2006 and 2010 are especially relevant, as they have implications for the organizations willing to implement new systems and/or integrate the systems they already have. These firms should pay attention when implementing the first standard in the firm. This is the most relevant difficulty and it has an effect on the overall level of integration that organizations achieve. Therefore, organizations should introduce mechanisms such as the use of implementation guidelines, integration guidelines and the training of the systems managers responsible for the implementation and integration of the systems, in order to improve the efficiency of the implementation of these systems in the organization.

#### **5.4.8. The benefits of integration in 2010**

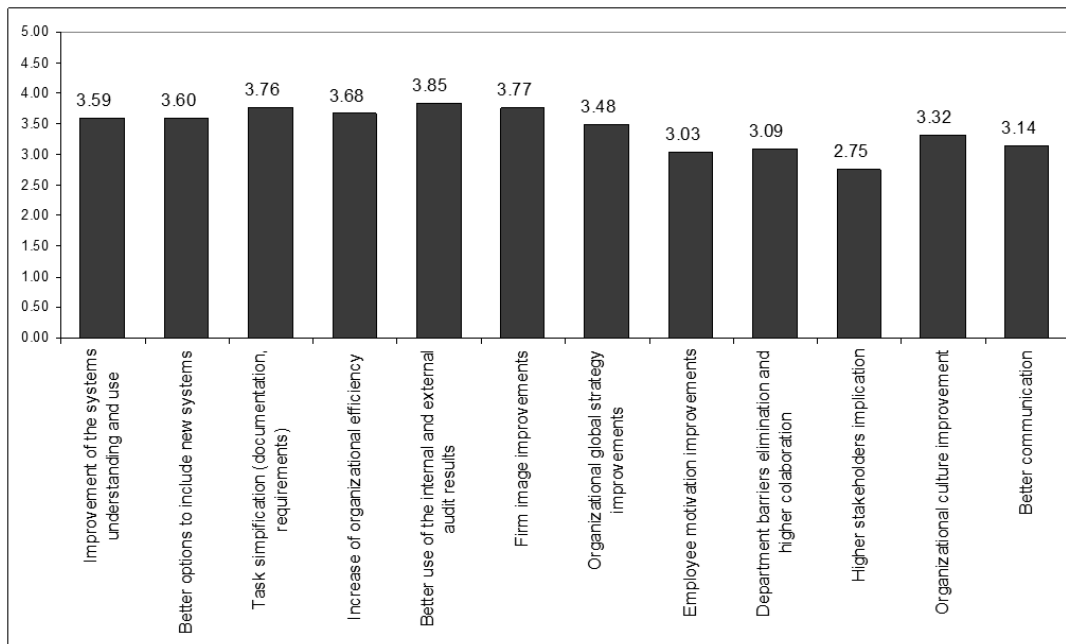
Firms can benefit from IMS which comply with several MSs requirements jointly. Figure 8 shows that integration has brought positive effects for most companies. Instead of analyzing the obtained benefits one by one, only the most important results are presented here. We show only results for the year 2010 because the benefits of integration were not included as a question in the 2006 survey. We cannot therefore study whether the benefits of integration have increased or decreased over time. However, knowing from the previous section that the majority of integration difficulties have decreased over time, we would infer that firms are positive about the integration their MSs. Some of the most positive points regarding integration of MSs are:

- Task simplification (documentation, requirements)
- Increase of organizational efficiency
- Better use of the internal and external audit results
- Firm image improvements

These points suggest that firms benefit from both internal and external aspects as they increase their organizational efficiency (more efficient tasks and internal audits) as well as they improve external characteristics such as firm image and external audits. The benefits mentioned here are in line with the benefits found by authors like Karapetrovic & Willborn (1998), Wassenaar & Grocott (1999), Wilkinson & Dale (1999), Douglas & Glen (2000), Renzi & Cappelli (2000), Zutshi & Sohal (2005), Salomone (2008) and Asif et al. (2009).

These authors present improvements related to having an integrated system similar to our findings as they highlight benefits such as simpler, more focused management systems in the organization; reduction in duplication of policies, procedures and records; improved multiple audits; and improved customer confidence and positive company image.

**Figure 8. Benefits of integration 2010**



## 5.5. Conclusions

The main objective of this research is to contribute to the understanding to how IMSs evolve over time, as well as to analyze how the perception of the challenges related to the IMSs changes within a period of time. Additionally, the paper aims to evaluate the extent of the integration and the difficulties experienced by firms during the implementation and integration of standardized MSs in organizations with more than one MS. In order to accomplish these objectives, the first study on the evolution of integration of MSs was undertaken. We conducted an empirical analysis which investigates data on the perception of quality and environmental system managers of the impact of MSs implementation and integration during a four-year period.

The first conclusion to be drawn from this study is that the majority of firms with more than one MS integrate them into a single system. Therefore, organizations seem to prefer integration over keeping their MSs separated and they evolve towards a state of complete integration (Douglas & Glen, 2000; Karapetrovic et al., 2006; Zeng et al. 2007; Salomone,

2008; Karapetrovic & Casadesus, 2009 or Bernardo et al., 2009). Specifically, 89% of firms in 2006 and 84% of the organizations analysed in 2010 decided to integrate their MSs. This is in line with the results found by Douglas & Glen (2000), Karapetrovic et al. (2006), Karapetrovic & Casadesus (2009) and Bernardo et al. (2009). These findings indicate that the majority of firms either integrate all their MSs or they choose not to integrate any of them. The rest of the firms, which stay in a medium position with a partial level of integration, are not so numerous.

Regarding the human resources involved in the different MSs, only the results of the MS managers and inspectors show significant differences from 2006 to 2010. Therefore, we conclude that, in 2010, the responsibility for managing different MSs falls to the same person more than in 2006. As for the work procedures, there is an increase of integration over time in planning, control of non-conformities, preventive and corrective actions, product realization, improvement and determination of stakeholder requirements. These results show that the level of integration of these elements is higher in 2010 than in 2006. Finally, comparing the 2006 and 2010 samples, the documentation resources and goals are shown to have different integration levels, with a higher integration level in 2010 for the objectives.

The third conclusion is that, for the analyzed samples, little relationship exists between the integration difficulties, on one hand, and the level of MS integration, on the other. The only difficulty that predicts the integration level is “inadequate implementation of the initial system”. However, although not statistically significant, the effect of time is present regarding the integration difficulties, as the perception of the difficulties we encountered was higher in 2006 than it is in 2010. Therefore, firms perceive a decline of the importance of the majority of difficulties over the four year period.

As an exploratory study, this paper opens a new line of research in the field of MS integration and contributes to the understanding on how IMSs evolve over time. However, due to the unavailability of other similar studies of the impact of IMS over time in the literature, it was not possible to compare the results of these surveys to similar surveys conducted, for example, in a different country. Nevertheless, we expect we would probably obtain very similar results in that case, since the majority of the works studying IMS effects, although obtaining static results, lead to very similar conclusions. Moreover, there are dynamic studies about the evolution of ISO 9001 that prove that organizations benefit significantly from the

certification and that these benefits increase over time (Terziovski et al., 2003; Dowlatshahi & Urias, 2004; Casadesus et al., 2005; McGuire & Dilts, 2008; Karapetrovic et al., 2010).

From the results of our study, it is essential that managers and practitioners become aware of the challenges and obstacles of systems integration. If these challenges are not addressed early in the process they can delay the completion of the integration process. Recommendations for managing IMS include obtaining commitment from the top management; using implementation and integration guidelines; having training across the organization in aspects of integration, and last but not least having integrated audits. Implementation of these recommendations may vary from one organization to another, however, it would result in less resistance for the organizations following them. Moreover, having IMSs is especially important for organizations willing to move towards continuous improvement and business excellence as it can help organizations to efficiently tackle quality and environmental issues more efficiently and systematically.

For future research, given the answers regarding the difficulties experienced by organizations, it would be interesting to further study these results and identify the relationship between the integration difficulties and financial performance measures. It would also be interesting to study how the perception of firms regarding the integration benefits evolves over time. Finally, another future research line could be directed towards exploring to which extent new standards contribute to integration, how the standards structure impacts integration and whether they have been written in order to facilitate integration.

## **Chapter 6. Essay 2. Difficulties and Benefits of Integrated Management Systems**

*Simon, A., Karapetrovic, S. and Casadesus, M. (2012). Difficulties and Benefits of Integrated Management Systems. Industrial Management and Data Systems. Accepted.*

### **Abstract**

In recent years, the number of management systems (MSs) has sharply increased. These MSs can be certified with, for example, the quality standard ISO 9001 or the environmental standard ISO 14001 and they can subsequently be integrated into one single, jointly managed system. The main objective of this research is to study the relationships between the level of system integration, on one hand, and the difficulties encountered in the integration process, as well as the related benefits, on the other.

Data for this study derives from a survey carried out in 76 organizations registered to, at a minimum, both ISO 14001:2004 and ISO 9001:2008 standards for quality and environmental management systems (MSs). A descriptive and an Exploratory Factor Analysis (EFA) are provided. Additionally, Structural Equation Modelling (SEM) is applied to the responses of these organizations to a mailed survey.

From the results, we propose a model of the difficulties related to systems integration that do have an effect on the level of integration of several specific items of the MSs involved. A model related to the effect of the integration level on the benefits is also provided.

The study provides an original contribution to the understanding of how difficulties and benefits of MSs integration relate to the level of integration achieved in the participating companies.

**Key Words:** Integration level, Benefits, Difficulties, Management Systems, ISO 9001, ISO 14001

## 6.1. Introduction

In the last few years, many organizations have chosen to implement standardized Management Systems (MSs), such as the ones based on ISO 14001 and ISO 9001 (the most certified and diffused MSSs, see ISO 2010; Piskar and Dolinsek, 2006; Llach et al., 2011). In particular, ISO 9001 accounts for 1,064,785 registered companies in more than 170 countries, and ISO 14001 for 223,149 in about 150 countries (ISO, 2010). From 2006 to the end of 2009, the number of certifications has increased by 167,856 for ISO 9001 and 94,938 ISO 14001.

The proliferation of new MSSs, such as the ones for occupational health and safety (e.g., OHSAS 18001 and CSA Z1000); for corporate social responsibility and accountability such as SA 8000 or ISO 26000 (Castka & Balzarova, 2008c); for security of information systems (ISO 27001); for supply chains (ISO 28000) or for energy management (ISO 50001); gives the option that firms integrate the corresponding MSs into a single system in order to benefit from the existing synergies among them (Labodova, 2004; Zutshi and Sohal, 2005).

Several authors have studied the integration of Quality Management Systems (QMSs) with other MSs such as the ones for Information Technology (IT), Environmental Management or Corporate Social Responsibility, among others, in order to increase business performance (Bajgoric et al., 2009; Sánchez-Rodríguez and Martínez-Lorente, 2011). Similarly, Moneva and Ortas (2010) study the impact of integrating environmental with other management systems. Park et al. (2010) propose that business integration solutions should be developed and address the key questions of how to take advantage of standards based capabilities to improve the efficiency and reliability of business integration solution development.

Some studies which relate people management and IMSs (e.g., Wilkinson and Dale, 2001; Asif et al., 2010; López-Fresno, 2010) consider that the motivation and effort of people in the organization are important factors in a successful implementation of an IMS. In this line, the "People Capability Maturity Model (P-CCM) is a maturity framework that focuses on continuously improving the management and development of the human assets of an organization" (Curtis et al., 2002). If an organization uses the P-CCM, employees should be more prepared to implement new organizational practices (Curtis et al., 2002), such as an IMS.

Many studies exist about the integration of standardized MSs. These studies focus on different topics, such as the integration advantages, methodologies, and degrees (see, for example, Karapetrovic and Willborn, 1998a; Zeng et al., 2007; Bernardo et al., 2009; Khanna et al., 2010; López-Fresno, 2010; Asif et al., 2010; Leopoulos et al., 2010).

The purpose of this paper is to analyse whether the level of integration of firms with more than one implemented MS is related to the perceived benefits and difficulties encountered by these firms during the integration process.

First, we review the literature on the topic of MS integration. Then, the methodology used in this study, a discussion of the results and, finally, the conclusions drawn from the analysis are presented.

## **6.2. Literature Review**

### **6.2.1. Integration of Management Systems**

The number of empirical investigations on the integration of standardized MSs is increasing, namely Douglas and Glen (2000), Renzi and Cappelli (2000), Fresner and Engelhardt (2004), Zeng et al. (2005, 2007), Zutshi and Sohal (2005), Jorgensen et al. (2006, 2008), Karapetrovic et al. (2006), Salomone (2008), Karapetrovic and Casadesus (2009), Bernardo et al. (2009, 2010), Khanna et al. (2010), López-Fresno (2010), Asif et al. (2010), Leopoulos et al. (2010).

Many studies have been carried out to examine the ways in which organisations have addressed the introduction and integration of quality management systems (QMSs) with environmental management systems (EMSs) and occupational health and safety management systems (OH&SMSs) (Labodova, 2004; Salomone, 2008; Bernardo et al., 2009; Karapetrovic and Casadesus, 2009).

Addressing the question about the convenience of having an IMS, as well as considering the benefits and costs of such integration is of particular importance for the purpose of this study, as all firms with two or more MSs find themselves involved in the need to address such questions (Zeng, 2007; Bernardo, 2009).



### **6.2.2. Difficulties and benefits of integration**

There have been many studies investigating firms' motivations for certification of MSs, their implementation experiences and the benefits received (Pan, 2003; Masoud et al., 2011). Many benefits and efficiencies are related to the integration of management systems. For instance, Karapetrovic and Willborn (1998b), Wassenaar and Grocott (1999), Wilkinson and Dale (1999), Douglas and Glen (2000), Renzi and Cappelli (2000), Zutshi and Sohal (2005), Rocha et al. (2007), Salomone (2008), Asif et al., (2009), Khanna (2010), Asif et al. (2010), Tarí and Molina-Azorín (2010), Simon et al. (2011) and Zeng et al. (2011) present improvements related to having an integrated system such as costs savings, operational benefits, better external image, improved customer satisfaction and enhanced employee motivation.

Despite the numerous benefits cited above, organizations also come across some challenges in the process of integration (Karapetrovic and Willborn, 1998a; Karapetrovic, 2003). The difficulties the most mentioned in Karapetrovic et al. (2006), Zutshi and Sohal (2005) and Asif et al. (2009) are the lack of human resources and the lack of government support. Internal organizational issues like departmentalization of functions, lack of resources and individual concerns of the people involved, are also mentioned by Karapetrovic and Willborn (1998a), Wassenaar and Grocott (1999), Matias and Coelho (2002), Zutshi and Sohal (2005), Zeng et al. (2007) and Asif et al. (2009).

### **6.2.3. Integration of MS elements and level of integration**

Regarding MS integration, Karapetrovic and Willborn (1998b) define three main elements of a standardized MS which can be integrated at different levels, namely goals, processes, and resources. Karapetrovic et al. (2006) and Bernardo et al. (2009) conducted two empirical studies in order to study the extent of integration of these elements. They found a high level of integration of the human resources, the company policy, objectives, the MSs manual, and the processes of document control, record control, auditing, and management review. However, they found that aspects such as the use of integrated records, instructions or procedures, found at tactical organizational levels, or the planning, determination of requirements, product realization and other internal business processes, seemed to be integrated at a lesser extent (Karapetrovic et al., 2006 and Bernardo et al., 2009).

Karapetrovic and Willborn (1998b), Karapetrovic (2003) and Asif et al. (2009) claim that *"integration makes more sense than disintegration"*. Empirical studies regarding the scope of integration confirm such an idea (Zeng et al. 2007; Salomone, 2008; Karapetrovic and

Casadesus, 2009 or Bernardo et al. (2009). For example, Karapetrovic et al. (2006) find that 85% of organisations had integrated their MSs to some degree. When studying the degrees of integration, Douglas and Glen (2000) also found that, out of the 28 companies in their sample, 71% had integrated some aspects of QMS and EMS. Bernardo et al. (2009) found that 86% of companies in their study had either partially or fully integrated MSs.

The studies reviewed in this section provide an overview on some aspects of the integration of MSs and, more specifically, on the benefits and difficulties of having an IMS, as well as on the level of integration an organization can achieve. However, from the above literature review, we find only one empirical study into the relation of the benefits of integration and the integration strategy of the companies, namely Zeng et al. (2011). Therefore, the research hypothesis of this study aims at discovering whether the level of integration of standardized MSs is related to the benefits and difficulties found by organizations registered to multiple MSSs during the integration process. In the following section, the methodology applied in the study will be described.

### **6.3. Objectives and methodology**

The main objective of this paper is to study whether the difficulties encountered by firms during the integration process are related to the level of integration of their MSs and whether their integration level affects the benefits of having an IMS perceived by organizations. In particular, we aim to study whether the integration difficulties are related to the integration level of the human and documentation resources, as well as to the procedures that are part of an IMS (Karapetrovic et al. 2006). Moreover, we want to determine the relationship of these elements with the integration benefits.

To test the proposed hypothesis of the study, we obtained data from a survey carried out from February to July 2010 in Catalonia (Spain), using a questionnaire addressed to the 176 firms that had answered the same survey, sent to 535 companies, in 2006 (Karapetrovic and Casadesus, 2009). Catalonia is one of the regions of Spain with the highest rate of ISO 9001 registrations in the country and experiencing a growth in the number of certificates which is very similar to the average rate of growth in Spain (Heras and Casadesus, 2006).

The questionnaire comprised a combination of semi-open and Likert-type questions with a 1 to 5 scale. The survey instrument was refined using a pre-test process.

The empirical study was conducted by means of a mail survey addressed to the person responsible for the QMS and/or EMS of the organization, and was subsequently followed up with a telephone call and an additional e-mail communication.

From the 176 companies that answered in 2006, with a subsequent follow-up by telephone, 76 valid answers were obtained. The survey therefore had a 43% response rate and a 93% reliability, with a 95% confidence. Table 1 provides the survey profile.

**Table 1. Survey information**

<b>Study factor</b>	<b>Value</b>
Location	Catalonia (Spain)
Time	2010
Population	535
Sample size	176
Received responses	76
Response rate	43%
Level of confidence	93%
p=q=0.5	

The survey included questions regarding the implementation of MSs, the integration level, the use of integration guidelines, the integration difficulties and benefits and the integration of audits. The current study focuses on three specific aspects of the survey, namely, the perceived difficulties and benefits of integration and the integration level of surveyed organizations based on an analysis of the integration of system objectives, resources and processes.

An empirical analysis of the relationship between the level of integration of MSs and the benefits and difficulties of such integration is provided in the next section. The results are presented with the following structure. First, we perform an Exploratory Factor Analysis (EFA) in order to group the variables into latent constructs valid for interpretation and further analysis. Then, we use structural equation modelling to analyze the relationship between the benefits and the difficulties encountered during integration and the level of MS integration achieved by organizations.

## 6.4. Findings

### 6.4.1. Exploratory factor analysis

In this study, we seek to group the variables related to the difficulties, the benefits and the level of integration of MSs in order to create a small number of unobservable latent variables (Novales, 1997). To do this, we use the exploratory factor analysis (EFA).

The first step in the analysis was to create theoretical significant dimensions related with benefits, difficulties and integration level items from the questionnaire. An EFA with varimax rotation was carried out in order to find the most adequate components for each dimension. Table 6 shows, for each dimension related to benefits, difficulties and integration level, the list of items which are chosen for each dimension, the standardized loadings and the reliability measured by Cronbach's Alpha. In the groups of constructs, the analyses performed on the correlation matrix were the Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) test.

**Table 2. Factor analysis and reliability**

Variable group	Items	Loadings*	Reliability Cronbach's Alpha	
Difficulties  Difficulties on integrating multiple MSSs	<b>1 Lack of resources for integration</b>		0.702	
	Lack of integration guidelines	0.656		
	Lack of specialised auditors	0.610		
	Lack of technological support	0.646		
	Lack of specialised consultants	0.765		
	Excessive time to conduct the integration	0.667		
	<b>2 Difficulties with standards implementation and certification</b>			0.546
	Differences in the models for the implemented standards	0.795		
	Differences in the common elements of the standards	0.842		
	Differences in the scope of the standards	0.588		
	Lack of certifying organizations support	0.682		
	<b>3 Organizational internal difficulties</b>			0.440
	Lack of employees motivation	0.914		
	Lack of internal organizational culture	0.780		

<i>Table 2 continued</i>	<b>4 Difficulties with people working with the standards</b>		0.591
	Lack of government support	0.744	
	Lack of human resources	0.698	
	Lack of department collaboration	0.584	
<b>Integration level</b>  Integration of Human resources, documentation and procedures	<b>1 Control procedures</b>		0.920
	Manual	0.582	
	Internal audits	0.845	
	Management review	0.809	
	Control of nonconformities	0.462	
	Preventive and corrective action	0.844	
	Improvement	0.818	
	Document control	0.849	
	Record control	0.786	
	Internal communication	0.797	
	<b>2 Strategic and operating procedures</b>		0.860
	Policy	0.739	
	Objectives	0.809	
	Planning	0.818	
	Product realization	0.602	
	Determination of requirements	0.648	
	<b>3 Documentation resources</b>		0.818
	Procedures	0.734	
	Instructions	0.906	
	Records	0.677	
<b>4 Human resources</b>		0.926	
Management System Representative	0.962		
Management System Manager	0.960		
<b>Benefits</b>  Benefits from implementing multiple MSs	<b>1 Internal cohesion benefits</b>		0.817
	Employee motivation improvements	0.594	
	Department barriers elimination and higher collaboration	0.711	
	Higher stakeholders implication	0.542	
	Organizational culture improvements	0.755	
	Better communication	0.891	

<i>Table 2 continued</i>	<b>2 Benefits related to better use of the systems</b>		0.739
	Improvement of the systems understanding and use	0.828	
	Better options to include new systems	0.866	
	<b>3 Organizational strategic benefits</b>		0.500
	Company image improvements	0.877	
	Organizational global strategy improvements	0.689	
	<b>4 System performance benefits</b>		0.487
	Increase of organizational efficiency	0.875	
	Better use of the internal and external audit results	0.744	

\* *Extraction Method: Principal Component Analysis.*

*Rotation Method: Varimax with Kaiser Normalization.*

Regarding the results of Table 2, we found four dimensions for the items related to the integration difficulties, four for the level of integration and also four for the benefits of integration.

When analyzing the difficulties, we obtained a total of fifteen variables. However, in the final solution of the analysis, we use fourteen variables, because “not efficient implementation of the first system” presented a very low commonality and the goodness of fit was better without it, so this variable was left out of the model. The analysis of the fourteen variables gave a statistic of  $\chi^2=276.67$  with a 0.000 level of significance, for Bartlett’s test of sphericity and a KMO of 0.649. The four constructs extracted from the analysis explain 65.96% of the total variance.

The first difficulty dimension called “lack of resources for integration” explains 19.40% of the variance and has an eigenvalue of 4.30. It is explained by five variables related to the lack of resources for integration (time, technology, auditors and guidelines). The variable with the greatest contribution or weight in the factor is the “lack of specialised consultants”. In contrast, the variable with the lowest weight is “lack of specialized auditors”. These findings are in line with the results found by Beckmerhagen et al. (2003) and Sutshi and Sohal (2005), related to the difficulties of integrating the resources used by the MSs and to the lack of specialized human resources to implement, integrate and audit the MSs.

The second difficulty dimension is called “difficulties with standards implementation and certification”. The factor, with an eigenvalue of 2.09, is composed of three variables that explain 18.21% of the variance. These variables are about the lack of specialized support

necessary for a proper deployment and certification of the IMS within the organization. “Differences in the models for the implemented standards” is the variable that contributes the most to this factor, while the “differences in the scope of the standards” contributes the least. All of the variables are related to the MSSs implemented in the company. Therefore, it is difficult for the organization to overcome these difficulties as they relate to external variables such as the characteristics and requirements of each standard, which is out of the organization’s control, as discussed by Karapetrovic and Willborn (1998a), Wilkinson and Dale (2000), Matias and Coelho (2002), Karapetrovic (2003) and Beckmerhagen et al. (2003). For this reason, the label for this factor is “difficulties with the standards implementation and certification”.

The third factor is made up of two variables, which relate to difficulties that the organisations could overcome by themselves. This factor also coincides with the “internal factors” found by Zeng et al. (2007) in their study. The factor has an eigenvalue of 1.46 and explains 10.46% of the variance. The two variables concern organizational internal difficulties related to the organizational involvement with the MSs. They were the two variables with the highest values in the descriptive analysis of the integration difficulties. The label given to the third factor is “organizational internal difficulties”.

The fourth and final factor is composed of the three remaining variables and indicates that the main obstacles to integrate MSs are problems related to the people (see Wilkinson and Dale, 2000; Zeng et al., 2007; Matias and Coelho, 2002; Zutshi and Sohal, 2005; Zeng et al., 2007; Asif et al., 2009). The factor has an eigenvalue of 1.37 and explains 9.78% of the variance. The label given to the third factor is “difficulties related to the people working with the standards”.

The analysis for the integration level used 21 variables related to the human resources, the documentation resources and the procedures. As in the previous EFA, not all of the initial variables were considered in the solution. In particular, “inspectors” and “resource management” showed very low commonality and the goodness of fit was better without them.

We performed the EFA with 19 variables and obtained a statistic of  $\chi^2=1148.479$  with a significance level of 0.000 for the Bartlett's test of sphericity, confirming linear dependence among the variables so that we could further analyse the data. The KMO value was 0.74, a value which supports the results of the analysis as valid (Novales, 1997). From this analysis, four factors were extracted, accounting for 74.90% of the initial variance, which is considered a very high proportion of information kept in the analysis. A description of the four factors is presented below.

The first factor has an eigenvalue of 8.94 and explains 47.08% of the variance (Table 2). It covers nine variables related to the work procedures used to review, audit and control the systems in the organization. Indeed, this factor groups all procedures except for planning, product realization and determination of requirements. The label for this factor is "control procedures".

The second factor is composed of five variables (Table 2), which relate to the planning of the MSs, product realization and the definition of requirements, which are included in Clause 7 of ISO 9001. Therefore, we call this factor "strategic and operating procedures". The percentage of total variance explained by the factor is 10.30%. It has an eigenvalue of 1.95.

The third factor, with an eigenvalue of 1.86 and a percentage of 9.79% of the total variance (Table 2), relates to the documentation involved in the MSs. The label for this factor is "documentation resources".

The fourth factor is "Human Resources" (Table 2). It has an eigenvalue of 1.46 and explains 7.71% of the variance. It involves the MSs representative and manager who are responsible for running the MSs.

This clustering is somewhat different from the classification proposed by Karapetrovic et al. (2006) and Bernardo et al. (2009). These authors present three elements of a standardized MS which can be integrated at different levels, namely goals, processes, and resources. In our clustering, we divide the resources into human and documentation resources. The processes and goals are redefined into control, strategic and operating procedures, differentiating like this the nature of the processes in the organizations.



About the benefits, the analysis accounted for the twelve variables arising from the survey questions. The final solution of the analysis contains eleven variables, because “task simplification” was left out of the model, as it presented a very low commonality and the goodness of fit was better without it. The analysis of the eleven variables gave a statistic of  $\chi^2=246.665$  (level of significance, 0.000) for Bartlett’s test of sphericity and a KMO of 0.746, which is considered an acceptable result (Novales, 1997). Four constructs extracted from the analysis explain 75.67% of the total variance, which is considered a very good percentage.

The first dimension called “internal cohesion benefits” explains 39.90% of the variance and has an eigenvalue of 4.39. It is explained by five variables related to the strengthening of links in the organization (see, e.g., Karapetrovic and Willborn, 1998a; Kirkby, 2002; Wright, 2000; Zutshi and Sohal, 2005b; Lopez-Fresno, 2010; Griffith, 2000; Douglas and Glen, 2000; Matias and Coelho, 2002; Zutshi and Sohal, 2005b; Lopez-Fresno, 2010 and Salomone, 2008). The variable with the greatest contribution or weight in the factor is “better communication”. In contrast, the variable with the lowest weight is “higher stakeholder’s implication”. All of the variables in the first factor reflect benefits related to a better cohesion of the people working with the standards. The label given to this factor is “internal cohesion benefits”.

The second factor, with an eigenvalue of 1.60, is composed of two variables that explain 14.58% of the variance. The variables relate to the improved use of the systems due to integration and these benefits are similar to the ones proposed by Wilkinson and Dale (1999b). For this reason, the label for this factor is “benefits related to the better use of the systems”.

The third factor is made up of two variables, and it is labeled “organizational strategic benefits”. It is a more “strategic” factor than the others, and includes aspects that are most fundamental to a firm’s identity (Zutshi and Sohal, 2005b; Salomone, 2008; Lopez-Fresno, 2010). The factor has an eigenvalue of 1.22 and explains 11.14% of the variance. The two variables concern topics regarding the strategy and the image of the companies.

The fourth and final factor is composed of the two remaining variables, which relate to the efficiency and results of MSs (Karapetrovic and Willborn, 1998a; Lopez-Fresno, 2010; Tari and Molina-Azorín, 2010; Khanna et al., 2010). The factor has an eigenvalue of 1.10 and explains 10.03% of the variance. The label given to the fourth factor is “system performance benefits”.

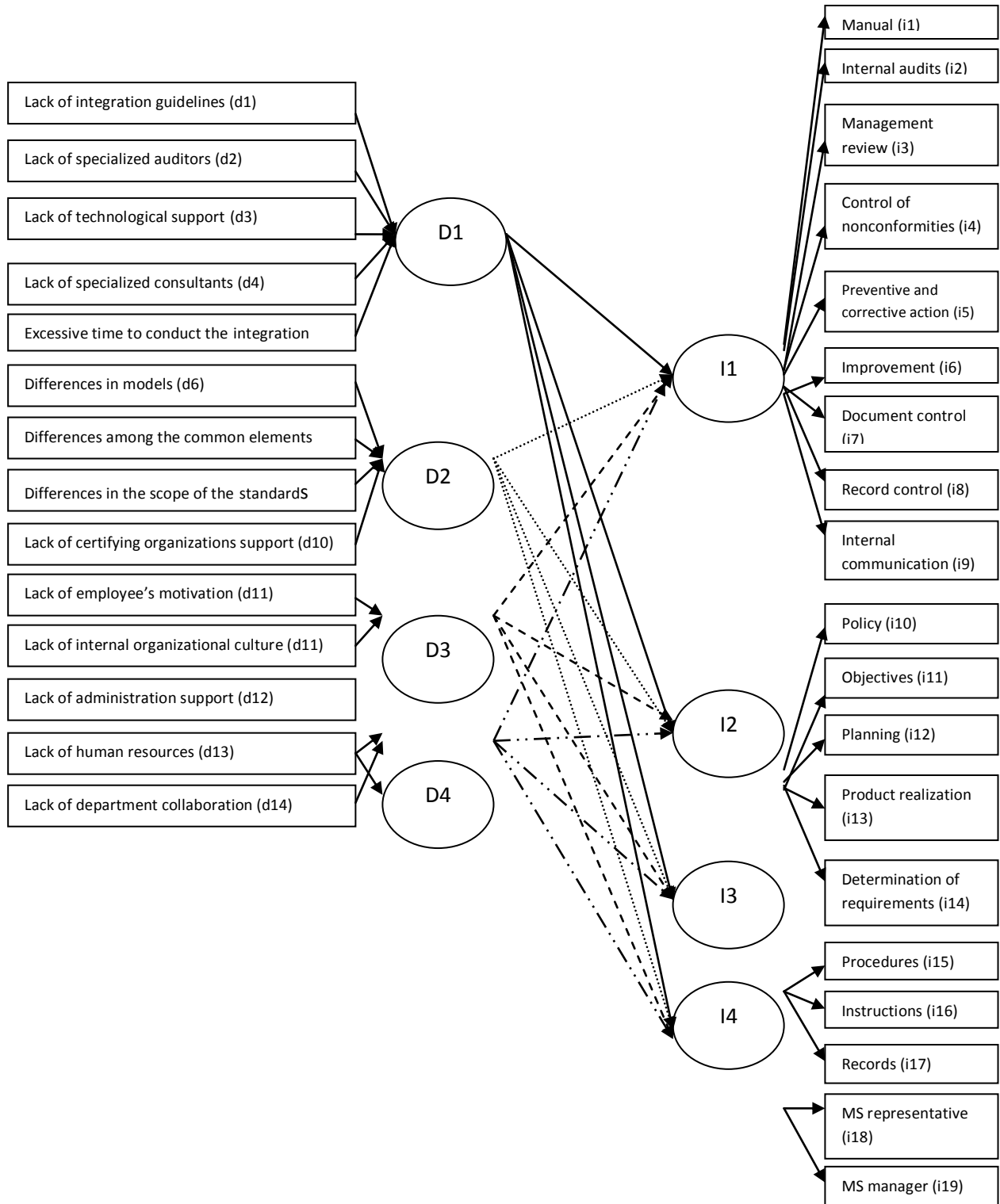
Each dimension found in this EFA has a score for internal consistency or reliability measured using Cronbach’s alpha (Cronbach, 1951). In most of the cases, the Cronbach’s alpha exceeds the value of 0.6. This is the value suggested by Malhotra (2004) as the minimum value that would be satisfactory to demonstrate internal consistency. In the cases of “difficulties with standard implementation and certification”, “organizational internal difficulties”, “difficulties with people working with the standards”, “organizational strategic benefits” and “system performance benefits”, the Cronbach’s alpha was below this value. However, according to Schmitt (1996), “even relatively low (about 0.50) levels of criterion reliability do not seriously attenuate validity coefficients”. Therefore, we proceeded with the analysis, albeit with caution regarding any final conclusions obtained. Additionally, we analyzed the unidimensionality of the factors, confirming that all the variables in each factor, when analysed individually, belong to a single factor.

In the next section, we apply structural equation modelling to our data. Once we found and defined each exogenous benefit, difficulty and integration dimension, we use these dimensions as observed variables in our specified models for the difficulties and the integration level, as well as for the benefits and the integration level. Thus, the proposed models intend to analyze whether the difficulties and the benefits encountered by organisations during the process of integration affected the level of integration of the MSs. The theoretical models are shown in Figure 1 and Figure 2.

#### **6.4.2. Structural Equation Modelling results**

The first theoretical model to be analyzed by means of structural equation modelling illustrates the relationship between the difficulties and the level of integration. Figure 1 shows the model to be analyzed.

**Figure 1. Path diagram of the difficulties and the integration level**



In order to perform a confirmatory factor analysis using the structural equation modelling software AMOS version 17, we applied the robust estimation method by maximum verisimilitude. The analysis first examined whether the four difficulty factors fit the model well, and then whether the four factors related to the levels of integration of MSs also fit this model well. Relationships between the eight factors were not taken into account.

The first analysis focused on the constructs D1 (lack of resources for integration), D2 (difficulties with the standards implementation and certification), D3 (organizational internal difficulties) and D4 (difficulties related to the the people working with the standards). A first goodness of fit measure for the global model is the  $\chi^2$  statistic to test the null hypothesis of no parameter omission, with its associated n number of degrees of freedom (d.f.) and p-value. In our model, we obtained a  $\chi^2$  statistic equal to 110.6, with 71 degrees of freedom, and a p-value equal to 0.000, which indicates the rejection of the null hypothesis. Other useful measures that quantify the fit of the model were obtained. These measures are CFI (compared fit index) equal to 0.818 (acceptable above 0.90) and RMSEA (root mean square error of approximation) equal to 0.094 (acceptable below 0.08). The last goodness of fit statistic to be analysed is Hoelter's Critical N (CN). This fit statistic differs substantially from those previously discussed in that it focuses directly on the adequacy of sample size, rather than on model fit. Its purpose is to estimate a sample size that would be sufficient to yield an adequate model for a chi-square test (Byrne, 2009). A Hoelter value that exceeds 200 is indicative of a model that adequately represents the sample data (Byrne, 2009). The 0.05 and 0.01 CN values for our hypothesized model are under 200 (53 and 58 respectively). Interpreting this finding, then, leads us to conclude that the size of our sample (n=76) is not satisfactory according to Hoelter's benchmark that the CN should exceed 200. All these measures show a poor fit of the model. Therefore, the data cannot be extrapolated to the population.

The confirmatory factor analysis for the four factors related to integration of the standardized MSs, used the constructs I1 (control procedures), I2 (strategic and operating procedures), I3 (documentation resources) and I4 (human resources). The chi-square statistic in this case is 523.997, with 129 degrees of freedom, and its probable value of chi-square is 0.000, which must be greater than 0.05 to be significant. The comparative fit index (CFI) is 0.641, which is lower than in the previous analysis and still fails to be significant. The root mean square error of approximation (RMSEA) is 0.338, which is better than in the previous analysis and within

the acceptable limit of 0.08 (Byrne, 2009). The conclusion drawn from this analysis is the same as before, i.e., that the model cannot be accepted as a good fit for the data.

The general model (Figure 1) showing the relationship between the difficulties and the level of integration has a chi-square of 1141.971, with 456 degrees of freedom, and its probable value for chi-square is 0.000. As in the previous cases, this is not significant. In this case, the CFI is 0.517. This is lower than in the previous analysis. As it does not fall within the acceptable values, it is not considered significant. The RMSEA is 0.155. As in the previous models, this number falls within the acceptable limit of 0.08 (Byrne, 2009). All these measures show a poor fit of the model. Thus, the proposed hypothesis stating that the difficulties faced by organizations during integration have an effect on the level of integration of their MSs is not supported.

Although the model presented in Figure 1 is not significant, it could help to understand, in an exploratory rather than a confirmatory way, how difficulties during integration may affect the level of integration. The equations of the model, which appear below, show the factors that are significant to 5% in bold.

	Lack of resources for integration (D1)	Difficulties with standards implementation and certification (D2)	Organizational internal difficulties (D3)	Difficulties with people working with the standards (D4)	E
Control procedures (I1) =	+0.321D1	-0.636D2	-0.026D3	+0.626D4	+ E1
Strategic and operating procedures (I2) =	<b>+0.270D1</b>	-0.603D2	-0.025D3	+0.397D4	+ E2
Documentation resources (I3) =	<b>+0.287D1</b>	<b>-0.507D2</b>	-0.033D3	+0.592D4	+ E3
Human resources (I4) =	-0.163D1	+0.199D2	-0.160D3	+3.607D4	+ E4

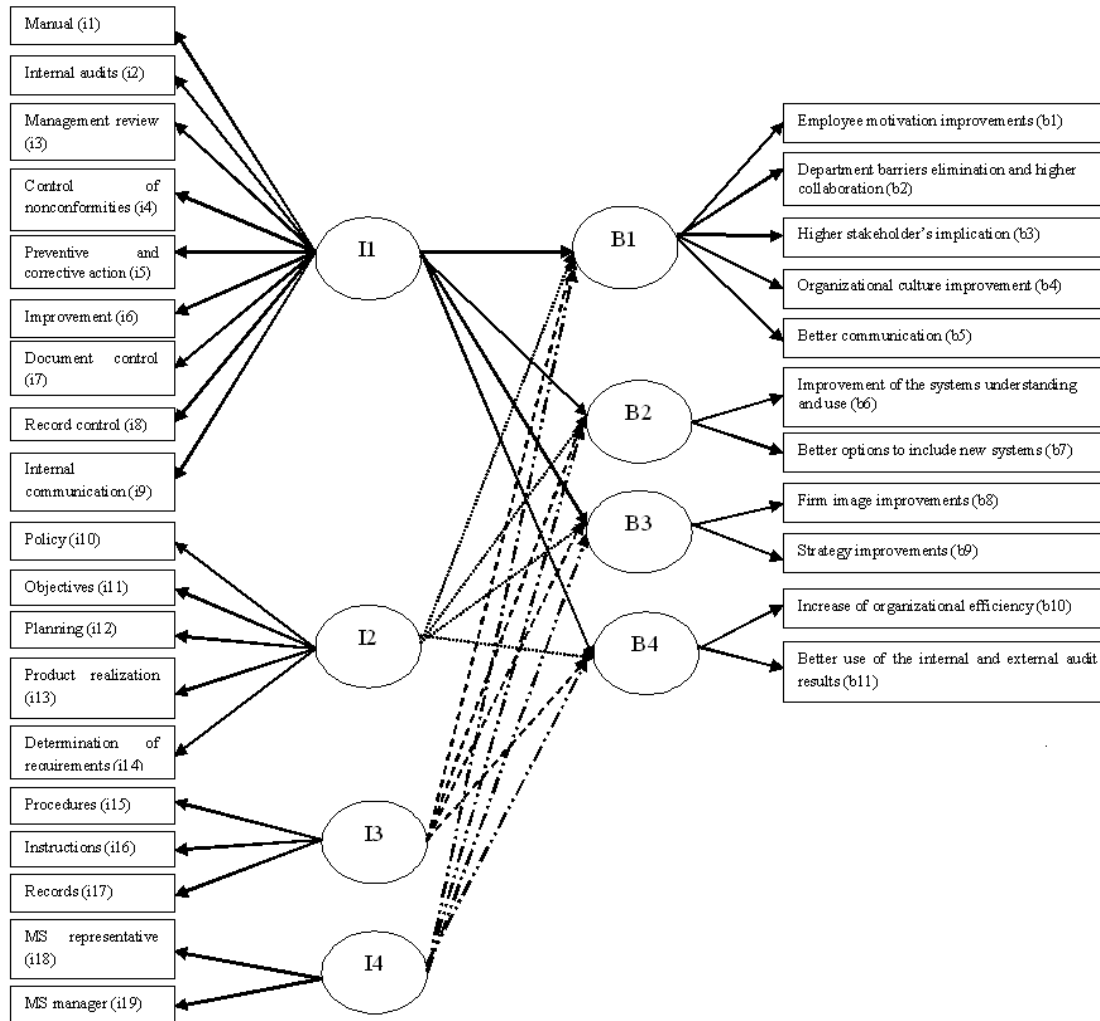
According to the equations defining the model, some of the factors are significant in several variables except for the “organizational internal difficulties” and the factor named “difficulties related to the people working with the standards”.

Results from the final model illustrate a significant positive effect from the "lack of resources for integration" on "strategic and operating procedures" and "documentation resources". This could be because effective management of the strategy and documentation of the organizations surveyed are factors which do not need many resources. The group of variables named "difficulties with the standards implementation and certification" show a significant negative effect on "documentation resources". This means that organizations experiencing difficulties with the MSSs would achieve a lower level of documentation integration.

The relationship between the integration level and the benefits of integration was also tested using Structural Equation Modelling. Figure 2 shows the model to be analyzed.

The third analysis considered the benefits constructs B1 (internal cohesion benefits), B2 (benefits related to better use of the systems), B3 (organizational strategic benefits) and B4 (system performance benefits) and gave a chi-square value of 62.3, with 40 degrees of freedom, and its probable value of chi-square is 0.000, which must be higher than 0.05 to be significant. The comparative fit index (CFI) is 0.900, which is just below the minimum acceptable value of 0.95 (Byrne, 2009). Therefore, the fit is not significant. The root mean square error of approximation (RMSEA) is 0.094, which is higher than the acceptable limit of 0.08 (Byrne, 2009). Our 0.05 and 0.01 CN values for our hypothesized model are under 200 (57 and 65 respectively). Interpreting this finding leads us to conclude that the size of our sample (n=76) is not satisfactory according to Hoelter's benchmark that the CN should exceed 200. These values rule out accepting the model as a good fit for the data.

**Figure 2. Path diagram of integration level and benefits**



The general model (Figure 2) showing the relationship between the level of integration and the benefits has a chi-square of 1051.118, with 367 degrees of freedom, and its probable value for chi-square is 0.000. The CFI is 0.523 and does not fall within the acceptable values. The RMSEA is 0.172, which falls within the acceptable limit of 0.08 (Byrne, 2009). All these measures show a poor fit of the model. Thus, the proposed hypothesis stating that the level of integration of MSs has an effect on the benefits obtained by organizations during integration is not supported. Although the model presented in Figure 7 is not significant, it could help to understand, in an exploratory rather than a confirmatory way, how the level of integration may affect the benefits perceived by organizations. The equations of the model, which appear below, show the factors that are significant to 5% in bold.

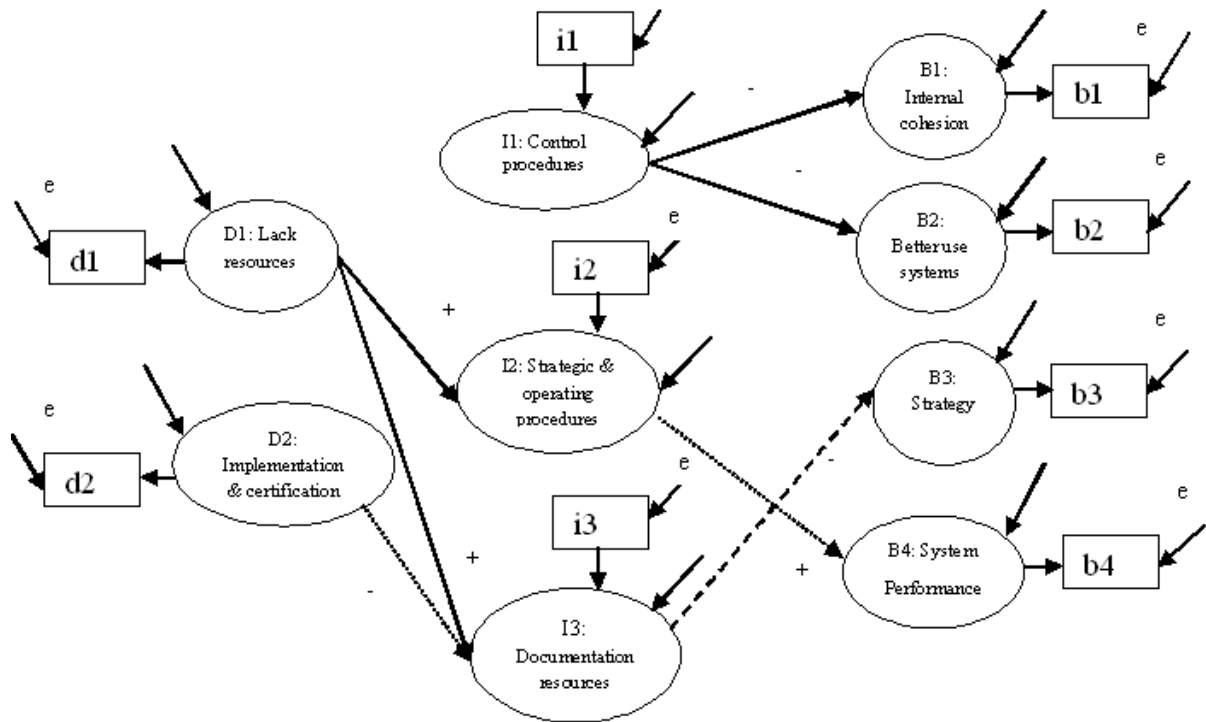
	Control procedures (I1)	Strategic and operating procedures (I2)	Documentation resources (I3)	Human resources (I4)	E
Internal cohesion benefits (B1)=	<b>-0.982I1</b>	+2.378I2	-0.157I3	-0.016I4	+ E1
Benefits related to better use of the systems (B2)=	<b>-0.843I1</b>	+1.765I2	-0.153I3	-0.216I4	+ E2
Organizational strategic benefits (B3)=	-0.580I1	+2.615I2	<b>-0.317I3</b>	-0.151I4	+ E3
System performance benefits (B4)=	-0.106I1	<b>+1.157I2</b>	+0.280I3	+0.172I4	+ E4

According to the equations defining the model, all the integration factors are significant in some variables except for the “human resources”, which do not affect any of the benefits.

The results from the final model show that "control procedures" have a significant negative effect on "internal cohesion benefits" and on "benefits related to better use of the systems". This could be because the effort that the personnel involved in the IMS has to exert during the control and audit of the systems affects negatively the relationships among them, namely their communication and collaboration. Therefore, it also makes it more difficult for them to use the systems or even to include new systems. The group of variables named "strategic and operating procedures" has a significant positive effect on "system performance benefits". This means that organizations which have reached a high level of alignment in the objectives and strategy of their different systems experience benefits regarding both the efficiency of the IMS and its audits. Finally, "documentation resources" show a significant negative effect on "organizational strategic benefits", meaning that a high integration of the documentation does not lead to strategic or image improvements for the companies.

Figure 3 shows the significant relationships in the models for the difficulties, the integration level and the integration benefits.



**Figure 3. Path diagram of significant factors for the difficulties and the benefits**

## 6.5 Conclusions

The aim of this study was to test the relationship between the difficulties encountered by organizations during the integration process, the level of integration of standardized MSs and the associated benefits.

The first conclusion to be drawn from the study is that the difficulties of integration can be grouped in four large clusters, which are "lack of resources for integration", "difficulties with the standards implementation and certification", "organizational internal difficulties" and "difficulties with the people working with the standards". This last group of difficulties is the one to receive the most comments in the literature. For example, the attitude and motivation of people is mentioned in Matias and Coelho (2002), Zutshi and Sohal (2005), Zeng et al. (2007) and Asif et al. (2009).

We have found four clusters that represent the integration benefits, namely, "internal cohesion benefits", "benefits related to better use of the systems", "organizational strategic benefits" and "system performance benefits". Again, the group related to the benefits that the human resources bring to the IMS is among the ones to receive the most attention in the literature

(see, i.e. Karapetrovic and Willborn, 1998a; Douglas and Glen, 2000; Griffith, 2000; Wright, 2000; Kirkby, 2002; Matias and Coelho, 2002; Zutshi and Sohal, 2005; Lopez-Fresno, 2010; Salomone, 2008 and Lopez-Fresno, 2010). Therefore, we can conclude that the attitude and motivation of people when working with the MSs play a vital role during the process of integration of these systems within the organizations studied.

Finally, the clustering pertaining to the IMS has four groups of variables: "control procedures", "strategic and operating procedures", "documentation resources" and "human resources". This classification is in line with Karapetrovic et al. (2006) and Bernardo et al. (2009), although a fourth dimension is added in this study to better represent the nature of the different resources that organizations can benefit from.

As we have been able to find only one study about the relationship between the integration and its benefits (Zeng et al., 2011), and about the relationship of the integration levels with the difficulties, we used cluster results to explore the effects of the difficulties of integrating MSs on the level of integration and the effects of this integration on the associated benefits. To do this, a model was presented and tested by means of SEM. The model could not be confirmed, but it was useful in interpreting some aspects of the data. Four difficulty, four benefit and four integration dimensions, as well as the relationships among them, were proposed. A significant positive effect from the "lack of resources for integration" on "strategic and operating procedures" and "documentation resources" was encountered. This finding shows that the effective management of the strategic and operating procedures does not require the resources used in other integration processes. Also, the group of variables named "difficulties with the standards implementation and certification" show a significant negative effect on "documentation resources", demonstrating a strong relationship between the standards implementation process and the level of documentation integration in the companies.

Regarding the integration benefits, "control procedures" have a significant negative effect on "internal cohesion benefits" and on the "benefits related to better use of the systems". These findings indicate the importance of the human resources motivation and the climate of the organizations when managing and controlling an IMS. The group of variables named "strategic and operating procedures" has a significant positive effect on "system performance

benefits", showing the relationship between strategy and performance. Finally, "documentation resources" show a significant negative effect on "organizational strategic benefits", meaning that a high integration of the documentation does not lead to global strategic or image improvements for the companies.

The results of our study emphasize the importance of managers and practitioners becoming aware of the benefits and obstacles of MS integration. Actions oriented towards the efficient management of the documentation resources, as well as the strategic and operating procedures, by establishing the policy and plans required for the IMS and by specifying achievable objectives to cover activities such as documentation, record control or auditing, are recommended.

Moreover, when implementing an IMS, organizations should manage employees' motivation in order to include it in their organizational strategy. Higher employees' motivation would result in a reduction of inter-functional conflicts and improve employees' reaction to change brought by the IMS.

The main limitation of our study is the sample size, 76 organizations, which could be the cause that our model is not significant. According to Byrne (2009), the sensitivity of the likelihood ratio test to sample size leads to problems of fit in the models. Also the Goodness of Fit (GFI) index values can be overly influenced by sample size. Moreover, the CN values for our hypothesized model are under 200, leading us to conclude that the size of our sample size is not satisfactory in order to find significant effects between the integration difficulties and benefits and the integration level in the analyzed companies. The Cronbach Alfa values were, in some cases, below the generally accepted threshold, therefore influencing negatively the reliability of our scales. However, we kept these measures in the model because this was the best general model possible and due to the similarity of our constructs with those theorized in other studies, such as the ones of Zeng et al. (2007), Zeng et al. (2011), Bernardo et al., (2012). Further, the sample in which this study is based was drawn from a single country, Spain, which limits the generalization of the results.

Given the answers regarding the difficulties and benefits experienced by organizations, future research could focus on identifying the relationship between the integration difficulties and

benefits and financial performance measures. It would also be interesting to study how the perception of firms regarding the integration difficulties and benefits evolves over time.

### **Chapter 7. Essay 3. Implementing integrated management systems in chemical firms**

*Simon, A., Bernardo, M., Karapetrovic, S. and Casadesus, M. (2012). Implementing integrated management systems in chemical firms. Total Quality Management & Business Excellence. Accepted.*

#### **Abstract**

The main objective of this research is to study how MSSs can be integrated into a single system in organizations from the chemical industry. Data for this study include a survey carried out in 76 organizations, registered to, at a minimum, both the ISO 9001 and ISO 14001 standards for quality and environmental management, 17 of which were from the chemical industry. Additionally, six case studies are illustrated, revealing the process of integration of three chemical and three non-chemical organizations. The first conclusion to be drawn from this study is that organizations seem to prefer integration over keeping their Management Systems (MSs) separated, with these MSs evolving towards a state of complete integration. Although there are no significant differences between chemical and non-chemical firms regarding the benefits and difficulties of integration, the interviews and survey answers illustrated a number of benefits experienced by the companies from operating one integrated system, such as synergism promotion and cost savings for the firm, as well as a reduction of the time spent when managing the systems. However, some difficulties, such as the lack of human resources and the lack of employees' motivation, also arose during the integration process.

**Keywords:** Management System Standards, ISO 9001, ISO 14001, Integrated Management Systems, Spain

#### **7.1. Introduction**

The last few years have been marked by the development and diffusion of many quality, environmental and other management system standards (MSSs). Through them, firms commit to improve their quality, environmental or other management practices.

The importance of quality and environmental assurance in both chemical and non-chemical industries is demonstrated by the impact generated by the quality and other MSSs worldwide (ISO, 2010; Marimon et al., 2009; Rocha et al., 2007; Karapetrovic and Jonker, 2003;

Karapetrovic et al., 2010). ISO 9001 and ISO 14001 standards have generated the largest impact at the international level of all similar MSSs, concerning both the absolute number of registered organizations worldwide, with 1,064,785 certificates to ISO 9001 and 223,149 to ISO 14001, and the relative increase in the number of certificates, with an 8% and a 22% increase for ISO 9001 and ISO 14001, respectively, in 2009 (ISO, 2010).

When looking at the implementation and diffusion of such standards, one wonders whether organizations could easily unify their corresponding Management Systems (MSs) into a single or Integrated Management System (IMS). In other words, does this proliferation of new standards lead to their joint management and integration in order to benefit from the existing synergies among them?

In this article, we start from the premise that MSs should not be analyzed in isolation, but in conjunction with other systems, because of the similarities and parallelisms among the different systems and the potential benefits of adopting an IMS (Zutshi and Sohal, 2005). As firms with two or more MSs need to address the question about the convenience of having an IMS as well as considering the benefits and costs of such integration (Karapetrovic and Willborn, 1998b; Zutshi and Sohal, 2005; Rocha et al., 2007; ISO, 2008c; Asif et al. 2009), the aim of this study is to analyze whether, how and why chemical firms with more than one standardized MS unify them into a unique and jointly managed IMS and to compare this integration process with the one used by non-chemical firms.

## **7.2. Literature review**

The issue of integration started to appear in the literature almost two decades ago (e.g. Beechner and Koch, 1997; Wilkinson and Dale, 1998). Since then, a number of research studies have examined the ways in which individual organisations have addressed the introduction and integration of environmental (EMSs) and occupational health and safety management systems (OH&SMSs) with their quality management system (QMS) (e.g. Hillary, 1993, Karapetrovic and Jonker, 2003; Rocha et al., 2007). Other studies exist on how organizations have chosen to integrate their MSs focusing on different topics such as their integration methodologies and degrees as well as the advantages and challenges of the integration (e.g. Karapetrovic and Willborn, 1998a; Zeng et al., 2007; Bernardo et al., 2009).

### *Levels of integration*

The integration level can range from no integration to full integration. According to Kirkby (2002), ‘no integration’ is defined as different MSs that cover their own distinct areas for each set of requirements and ‘partial integration’ refers to the fact that MSs make use of the common areas of the MSs; moreover, all the common elements such as the management review and the internal audits are routed through the same system. Finally, ‘full integration’ means that all standards are combined into one common MS (Bernardo et al., 2009), that is, the constituting MSs lose their unique identities, resulting in complete integration to a single multipurpose IMS (Karapetrovic, 1998b).

Karapetrovic and Willborn (1998b) claim that integration makes more sense than desintegration, therefore they propose that organizations will integrate rather than separate their MSs. Empirical studies regarding the scope of integration confirm such an idea (Zeng et al. 2007; Salomone, 2008; Karapetrovic and Casadesus, 2009, or Bernardo et al., 2009).

### *Integration strategies*

One of the main issues to address is the strategy firms can adopt when integrating different MSs, namely the number and sequence of MSs that the organisation decides to integrate (Karapetrovic and Willborn, 1998b; Karapetrovic et al., 2006; Bernardo et al., 2009). Different strategies have been proposed, but the most cited is the two-step integration strategy based on the QMS and the EMS revised in Karapetrovic and Willborn (1998b) who, in the first step, suggest three options for integrating those two MSs: establishing the QMS first and then the EMS, establishing the EMS first and the QMs second, or establishing the two systems in a simultaneous way. The second step would imply integrating MSs other than the QMS and the EMS.

### *Integration benefits*

Many studies have investigated firms’ motivations for registration of MSs, their implementation experiences and the benefits received. Costs savings, minimisation of financial loss, operational benefits, better external image, improved customer satisfaction, compliance with legislation, effective allocation of responsibilities, and enhanced employee motivation are among the most cited improvements related to having an integrated system

(Karapetrovic and Willborn, 1998b, Douglas and Glen, 2000, Renzi and Cappelli, 2000, Pun and Hui, 2002, Zutshi and Sohal, 2005, Rocha et al., 2007; Salomone, 2008, Khanna, 2010, Asif et al., 2010; Zeng et al., 2011).

#### *Integration difficulties*

Despite the numerous benefits cited above, organizations also come across some challenges in the process of integration. The most-mentioned difficulties are the lack of human resources and the lack of government support Karapetrovic et al. (2006), Zutshi and Sohal (2005) and Asif et al. (2009). Internal organizational issues like departmentalization of functions, lack of resources and individual concerns of the people involved, are also mentioned by Karapetrovic and Willborn (1998a), Zutshi and Sohal (2005), Zeng et al. (2007) and Asif et al. (2009).

#### *Integration of MSs in the chemical industry*

Specifically for the integration of MSs in chemical firms, Wilkinson and Dale (1998) advocate to align several MSs with the organization's strategy and objectives, integrating them into a single system, and provide examples in the chemical industry where, in 1996, guidance on joint OH&SMSs and EMSs was provided. Within the context of the chemical industry as well, Delmas and Montiel (2008) tested, in 113 countries, whether the adoption of the ISO 14001 EMS was favoured or hampered by the adoption of other quality, health, safety, and environment standards, namely, ISO 9001, Responsible Care and EMAS. Their results showed that these MSSs in the chemical industry "complete rather than compete with each other".

Bonk-Kassner et al. (1997) found that integration of quality standards and requirements was useful in a group of firms that offered chemical, biological, physical analyses and consultation services. They analyzed the implementation and integration of various standards related to quality used in laboratory testing, such as the European standard EN 45001, ISO Guide 25, GLP (Good laboratory Practice), and ISO 9001. The authors found that these standards could not be allowed to be operated in isolation and the assignment of the management was therefore to unify these systems.

According to the European Chemical Industry Council (CEFIC) (2001), QMSs based on the ISO 9001 standard are now widespread and well established within the European chemical industry. In particular, in Spain, there are 2416 companies in the chemical sector (including



chemical products, pulp and paper products and rubber and plastic products) that have an ISO 9001 certification (ISO, 2009a).

Having reviewed here the work of various authors regarding the integration of MSs, we subsequently present an empirical study in this field.

### **7. 3. Method**

The main objective of this paper is to study how chemical companies integrate their MSs and whether they do it differently from other firms. In order to do so, we carried out an empirical study in Catalonia, a Spanish region with one of the highest numbers of ISO 9001 and ISO 14001 certificates (Heras and Casadesus, 2006).

Our research is a follow-up study of the respondents to a mail survey carried out by Karapetrovic and Casadesus in 2006 in 176 companies with ISO 9001 and ISO 14001 certificates, the results of which were partially illustrated in Bernardo et al. (2009) and Karapetrovic and Casadesus (2009). A new field study was carried out during the months of February to July 2010, using the same questionnaire from the Karapetrovic and Casadesus (2009) study. However, an additional question about the benefits of integrating MSs was included following the literature on the topic.

The empirical study was conducted by means of a mail survey addressed to the person responsible for the QMS and/or EMS of each of the 176 organizations surveyed, and was subsequently followed up with a telephone call and additional e-mail communication with the firms. Valid responses were received from 76 chemical and non-chemical organizations, representing 43% of the sample, as shown in Table 1. From the 76 organizations, 17 belong to the chemical sector, according to the Spanish industrial classification (FEIQUE, 2009).

We consider that Spanish chemical firms account for 5% of the total number of companies with ISO 9001 certification among 39 sectors and that the chemical sector is 7<sup>th</sup> in terms of ISO 9001 registrations (ISO 2009). From a strategic point of view, Spain is one of the leading countries in the implementation of sustainable chemical processes, together with the USA.

**Table 1. Survey information**

Study factor	Factor value
Location	Catalonia (Spain)
Time	February-July 2010
Initial Population *	535
Sample Size	176
Number of responses	76
Response rate	43%
Confidence level	93%

\* approximate, including organizations with both ISO 9001 and ISO 14001 certificates, according to Karapetrovic et al. (2006).

In order to study the actual degrees of integration, an exploratory analysis of the survey data was performed. The survey included questions related to the level of integration and the use of specific guidelines to conduct the integration of different MSs. We also present responses on the benefits and challenges of integration and a comparison of the results between chemical and non-chemical firms. A descriptive analysis of the data obtained is provided in the following section.

Additionally to the survey exploratory results, this research provides six case studies of three specific organizations in the chemical industry and three non-chemical organizations that have integrated their systems at different levels, as we aim to compare the integration processes of the two groups of firms. The organizations studied provide different visions of the integration process as they differ from each other in terms of the management of their systems and were selected from the 76 organizations that responded to the mail survey in 2010.

A case study approach has been adopted to allow causes, processes and consequences of behaviour of the participants to be investigated (Yin, 1989). The end result is a series of case studies in which each case is treated as a replication and follows the same structure (Yin, 1989). In order to establish validity and reliability of the case study results, the investigation used multiple sources of evidence (interviews with managers, information from internet, reports and other documentation resources). The data gathering on site helped ensure the accuracy of the findings by providing more concrete information upon which to formulate interpretations. Moreover, an active corroboration on the interpretation of data between the authors and the organizations interviewed was maintained.

To protect confidentiality, the six companies are referred to as Firms 1, 2 and 3 (chemical firms) and Firms 1Nch, 2Nch and 3Nch (non-chemical firms).

## **7.4. Survey results**

### **7.4.1. Level of integration**

From the 76 companies surveyed, we find that 64 firms (84%) have either partially (22%) or fully integrated (62%) their MSs, in line with Karapetrovic et al. (2006), Karapetrovic and Casadesus (2009), Bernardo et al. (2009) and Khanna (2010). Thus, 12 companies (16%) did not integrate their MSs and were not considered further in this study. With respect to the 17 chemical firms considered, two (11.76%) have not integrated at all their MSs, whereas 13 (76.47%) had partially integrated their MSs and 2 (11.76%) firms had their MSs completely integrated.

In order to compare the results for chemical and non-chemical firms, it is necessary to analyze whether the two subsamples are significantly different. We tested the assumptions of normality, linearity and equality of variances which were not confirmed. Therefore, we used the non-parametric Kruskal-Wallis test (Kruskal and Wallis, 1952) to compare the two independent groups of sampled data. No statistical significant differences were found between both groups (Sig=0.695). Therefore, we cannot say that chemical firms integrate their MSs at a different degree than the rest of organizations at a 95% confidence level.

### **7.4.2. Use of integration guidelines**

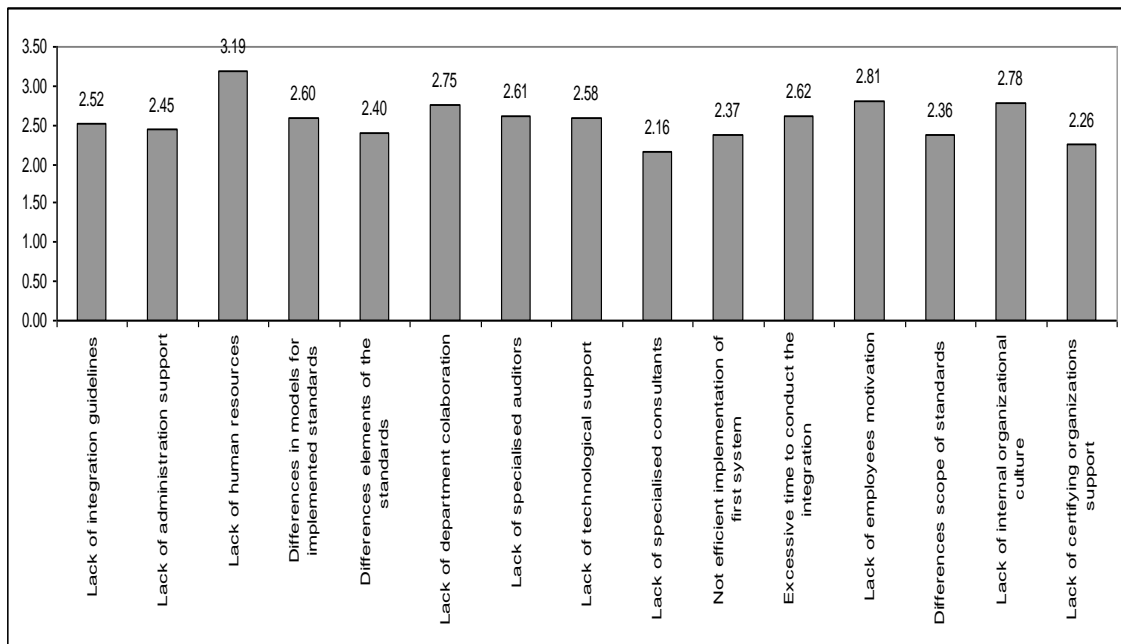
Regarding the use of different guidelines during the integration of different MSs, firms have the option to use no guidelines, to integrate their MSSs with internal guidelines or to use other published ones. The majority of chemical and non-chemical firms (77%) do not use any type of guidelines to integrate their MSs. However, some of the firms (14%) use the UNE 66177:2005 guidelines (AENOR, 2005). Fewer firms (9%) use other guidelines, namely the internal ones in the majority of these cases.

Comparing the 17 chemical firms with the rest of the organizations, we find that eight firms (47.05%) do not use any type of integration guidelines, whereas eight firms (47.05%) use UNE 66177:2005 to integrate their MSs. Finally, one chemical firm (5.88%) uses other guidelines during the integration process. Again, the results do not differ significantly from the results of the general sample (Sig=0.285). Therefore, we cannot say that chemical firms use different integration guidelines compared to the rest of organizations, at a 95% confidence level.

### 7.4.3. Integration difficulties

Regarding the impediments experienced by the surveyed organizations during the integration process, the potential challenges most commonly experienced by companies integrating their MSs are listed below in Figure 1. The answers from the survey range from 1 to 5 on a Likert scale, 1 being “not important at all” and 5 “very important”. The difficulties include, in the first place, the lack of human resources, in line with previous studies, the lack of employees motivation, and the lack of department collaboration, followed by other less-mentioned items, such as the excessive time to conduct the integration. The least important difficulties mentioned by the organizations were the lack of specialized consultants and the lack of support by the certification bodies.

**Figure 1. Difficulties of integration**

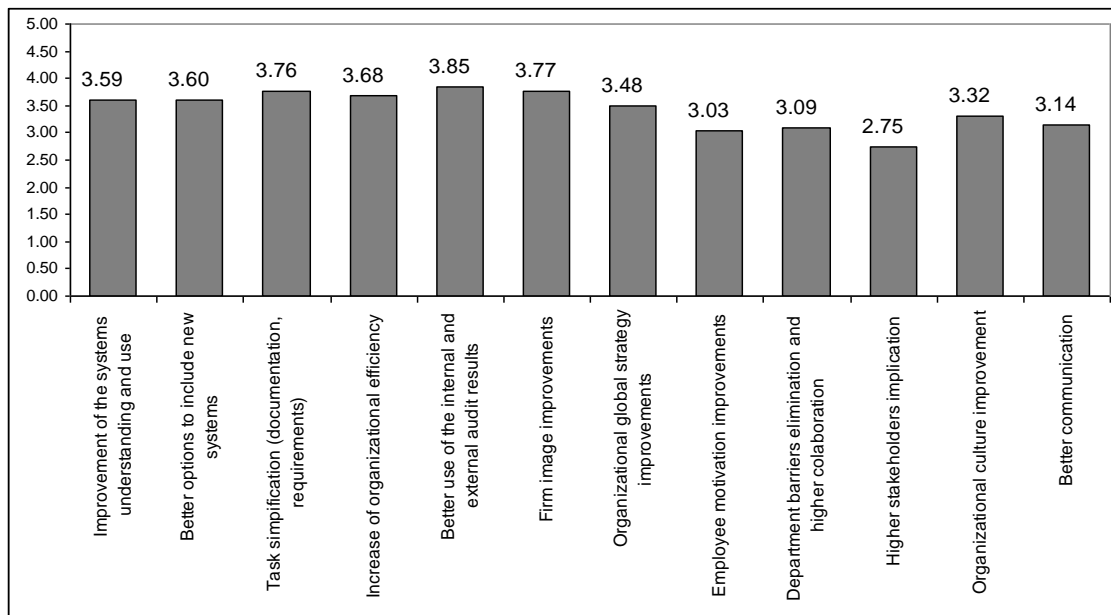


When compared to the non-chemical companies, these results do not differ significantly from the results of the general sample, with one exception for the variable *lack of administration support*, which is statistically different between the two samples (Kruskal-Wallis test significance = 0,049 < 0,05). In sum, we cannot say that, in general terms, chemical firms have different types or levels of difficulties compared to the non-chemical firms when integrating their MSs at a 95% confidence level.

**7.4.4. Integration benefits**

Integration of separate MSs into one single integrated system has provided the surveyed companies with a number of benefits, as shown in figure 2. Within a range from 1 to 5 on a Likert scale, 1 being “not important at all” and 5 “very important”, the main benefits of integration are a better use of audit results, improvement of the company image and task simplification. Again, these results match with the ones found by Zutshi and Sohal (2005), whose participants' MSs were viewed by external parties as single units, thus enhancing the credibility of the company and whose audits were reduced in number, time and cost. This results into a more dynamic and adaptive audit, harmonisation and integration of discipline-specific audits and corresponding audit guidelines (Karapetrovic and Willborn, 2001). Karapetrovic and Willborn (1998b) also mention the benefits regarding the improved company image associated with having an IMS. The benefits mentioned the least by organizations were higher stakeholders' implication and employee motivation improvements.

**Figure 2. Comparison of chemical and non-chemical companies for the benefits of integration**



Comparing the samples of chemical and non-chemical firms, a similar picture to the integration difficulties emerges with respect to the benefits of integration and none of the benefits of integration are significantly different between the two samples.

## **7.5. Case study analysis**

### **7.5.1. Firm 1**

Firm 1 has 31 employees. It develops and manufactures chemicals for process improvement in the paper and pulp industry. Its specialties and market segments include paper making, the production of cellulose, coated fine paper and recycling. The company distributes its products in 18 countries in Europe, America and Asia. Firm 1 has two standardized MSs, the QMS certified to ISO 9001:2008 and the EMS certified to ISO 14001:2004.

From the beginning, the implementation of the two systems was conducted without many problems, as the organization had formed part of a group and all the staff had already been working with the requirements established by the standards and were very involved with all the processes. Currently, the organization has fully integrated both MSs. The elements integrated to a higher extent are the human resources involved in the systems (system manager, director and inspectors), which are the same for the two MSs implemented, and the procedures, which are all fully integrated (e.g., system revision and improvement, control of non-conformities, preventive and corrective actions, planning, product realization, and documentation control). The documentation resources are also fully integrated (company policy, objectives, manual, work procedures) with the exception of the work instructions and the records which are partially integrated.

To carry out the integration, the company used tools such as a process map, an analysis of the common elements of the systems, the PDCA cycle for all the processes of the company, as well as an internal model of integration. They do not consider that integration had been a difficult process because they believe they are a small company and this constitutes a great advantage when working with the IMS. The company holds annual meetings to track the integrated system with all the heads of departments.

As for the benefits derived from integrating the two MSs, they believe that integration is necessary to simplify the two systems, because of the synergies created between them. In addition, the integration avoids duplication of efforts, especially in the electronic documentation and creation of procedures and the management of the company becomes less expensive and more methodical. The difficulties that affected the company the most during the integration process were the excessive time to conduct the integration and the differences between the standards.

The firm intends to continue renewing the certificates of the two MSs. Additionally, they intend to implement OHSAS 18001 in a period of two years integrating it in the integrated management system. This wish is mainly due to the similarity with ISO 9001 and because the firm believes that they already meet all the OHSAS 18001 requirements. In addition to implementing this OH&SMS, they want to apply the EMAS standard for environmental management, but the company is not currently focused on achieving this recognition, as it aims to register to OHSAS 18000 first.

### **7.5.2. Firm 2**

This company has 33 employees and it is dedicated to the manufacture and marketing of plastic vinyl compounds.

Currently, the firm has one single person, the quality manager, in charge of the two implemented MSSs, ISO 9001:2008 and ISO 14001:2004. The firm considers that, with time, it becomes easier to see what works and what does not work in the systems and to adapt them to the company needs, because the type of business and management determines the usefulness of the systems: *"There are aspects of the systems that we don't find especially useful, such as the process map, but instead, the record of incidents and complaints is very beneficial to us. Overall, having both systems is a positive thing"*.

Regarding the implementation of other MSs, they considered introducing OHSAS 18001 as they belong to a French group that has a safety manual, with which the firm complies, so it would be relatively easy to certify to OHSAS, because they meet the law requirements for risk prevention issues. However, for now, they have decided not to implement the system due to a lack of time and resources.

Regarding the integration level, the elements integrated to the highest extent are the human resources (with the exception of the inspectors, which are partially integrated) and the procedures, which are all fully integrated, except for the planning. The documentation resources are also fully integrated, with the exception of the company policy and objectives, which are partially integrated.

Currently, Firm 2 has partially integrated the two MSs, but tries to gradually increase the number of procedures in the integrated system. For example, they recently increased the integration of the systems in relation to record control and internal communication. To do

this, they used a detailed analysis of the common elements of ISO 9001 and ISO 14001 and an internal model.

The main benefits of integration for the firm are the reduction of bureaucracy and the exploitation of synergies between the two systems. It is also considered a good opportunity to include new systems in the company. However, the system is not considered as beneficial for the company image. One important disadvantage of running the integrated system highlighted by the company is the difficult planning and preparation of the integrated system, especially regarding the documentation, and the lack of human resources. In the future, the company plans to renew the certificates, but if ISO published an integration standard, they would not register to it because they consider that there are no benefits and that the costs would be too high.

### **7.5.3. Firm 3**

Firm 3, with 135 employees, belongs to a group leader in the manufacture of lubricants. Its products include hydraulic fluids, laminating oil and biodegradable lubricants. The firm has implemented ISO 9001:2008 and ISO 14001:2004 MSs. The quality manager is responsible for both systems and he considers that the most important benefit ISO 9001 has provided the company is the improvement of the efficiency and effectiveness in the processes. Regarding the benefits brought by ISO 14001, he emphasizes the elimination or at least the minimization of environmental impacts.

The quality manager of the company believes that the benefits from the time when ISO 9001 was implemented until now have changed in a positive way because *"working with processes requires all our employees to focus their attention to the customer"*.

Currently, the firm works with ISO 9001 and ISO 14001 as an integrated system, which has been integrated by combining the tables of contents of both standards and associating each of the points to match procedures. The company also used tools such as UNE 66177, the process map and an analysis of the common elements of the systems.

In recent years, the level of integration has not increased or decreased, and the company has not found any difficulties in maintaining the integrated system. Regarding the integration level, the elements integrated to the highest extent are the human resources (fully integrated) and the documentation resources, which are all fully integrated except for the records. The procedures are also fully integrated, with the exception of the manufacturing.



The firm considers that the main benefit derived from the integration is avoiding the fulfilment of requirements in a repetitive way. It also improves the company image, the global strategy of the firm and the communication during the interaction of the different processes.

The company plans to recertify in the future, but does not consider the possibility of registering to a standard for integration or any other standard in the short term.

#### **7.5.4. Comparing chemical case study companies' management systems and their integration**

Taking into account that the integration of MSs is a field with little empirical evidence, the research carried out here can be useful for companies aiming to integrate, or are in the process of integrating their MSs. Several relevant considerations about the three chemical companies are identified below.

In addition to all three companies having both ISO 9001 and ISO 14001 certificates, none of them implemented any other MS. However, two reported that they had considered the implementation of OHSAS 18001. All three firms achieved a high degree of integration of their human resources, objectives, documentation and goals, as suggested by Karapetrovic et al. (2006). In order to achieve this level of integration, two of them used an internal model, whereas one used UNE 66177. Regarding the integration tools, all the firms used an analysis of the common elements and in one case, the PDCA approach and the process map.

In line with previous studies, the most cited benefits of each system are the increase of the efficiency of processes, reduction of documentation and customer focus for ISO 9001 and the reduction or elimination of environmental impacts for ISO 14001.

Another relevant aspect is that these three organizations integrated their MSs, one partially and the other two completely. All of them have an IMS, which means the personnel responsible for the MSs, the documentation and the processes are integrated at some level for all the existing MSs in the firm.

One special concern of firms 1 and 2 is top management commitment, which is essential for the implementation and maintenance of the integrated management system (Zutshi and Sohal, 2005; Asif et al. 2009). In the three companies, the leaders are personally involved in communicating the company's goals and plans and in motivating the employees. The management teams also conduct periodic reviews of the system with the rest of the personnel.

This is considered necessary for any system implementation in the organizations. According to Zutshi and Sohal (2005), top management commitment provides resource savings and the reduction of costs that will result from operating an IMS.

No major challenges during the integration of MSs were found by organizations except for firm 2 which cited planning and preparation of the IMS, especially regarding documentation, as the most important difficulty, together with communication. This company encouraged internal communication among the personnel involved in the IMS as well as the communication with the company management. This resulted in better understanding across the various departments, in line with the findings of Zutshi and Sohal (2005).

All three firms consider that the integration of MSs has been beneficial and emphasize the reduction of bureaucracy and the exploitation of synergies between the two systems as the main outcomes, similarly to the findings of Khanna (2010). As for the disadvantages of having the systems integrated, as mentioned in Karapetrovic and Willborn (1998a) and Karapetrovic (2003), they encounter difficulties, especially when elaborating the documentation for the integrated system.

According to Zutshi and Sohal (2005), one of the key impediments faced by many organizations is the maintenance of their documentation system which “needs to be highly controlled so as to avoid duplication of procedures that may result in confusion among the employees”. Two of the firms commented on the importance of making the documentation electronic, to ensure that all personnel within the organization have access to the whole IMS. In spite of the benefits that integration gives to the organization, only one of the firms increased the level of integration during the last four years by adding new processes to the integrated system such as records control and internal communication.

#### **7.5.6. Case study analysis of non-chemical firms**

Next, we analyze three case studies of non-chemical firms, in order to compare their integration processes with those of chemical firms. The aspects analyzed were, integration strategy and level and the benefits and difficulties of integration. The main characteristics of the organizations can be found in Table 2, compared to chemical firms.

**Table 2. Firms' characteristics**

Firm	N employees	Firm size	Geographical scope	Sector
<b>1Ch</b>	31	Small	International	Paper production
<b>2Ch</b>	33	Small	International	Plastic vinyl compounds production
<b>3Ch</b>	135	Medium	National	Lubricants production
<b>1Nch</b>	400	Large	International	Energy management
<b>2Nch</b>	115	Medium	National	Metallic components production
<b>3Nch</b>	14,100	Large	National	Railway infrastructure management

***Integration strategy and level***

The sequence of implementation of the management systems is similar in all three organizations, as no differences were found regarding the order of implementation (see Table 3). The three organizations implemented first the Quality Management System (QMS) and then the Environmental Management System (EMS). In one of the organizations, OHSAS 18001 for occupational health and safety was subsequently implemented. Regarding the future of standards, two of the organizations showed interest in implementing sector-specific standards in the following years.

**Table 3. Integration strategy**

	1Nch	2Nch	3Nch
<b>MSs implementation and order</b>	ISO 9001 ISO 14001	ISO 9001 ISO 14001	ISO 9001 ISO 14001 OHSAS 18001
<b>Future</b>	None	ISO 3834-2 DIN-EN 15085-2	SGE 21

With respect to the integration level, higher levels of integration were exhibited in MS procedures, such as record and document control or preventive and corrective actions, while the elements integrated to a lesser extent were product realization and internal communication.

Regarding the integration of the human resources, all three companies state that they have achieved a state of partial integration, where the person responsible for the systems is the same, but the rest of the workers and inspectors are different for the different systems.

Therefore, in terms of the human resources involved in the different MSs, the level of integration is much higher at the top level than at the shop-floor level.

The process of integration was conducted using an internal model in one of the companies whereas the other two used UNE 66177, the Spanish standard for MS integration. Regarding the integration tools, all three used the process map, an analysis of the common elements of the systems, an internal model and in two of the cases, the PDCA approach.

**Table 4. Integration level**

	1Nch	2Nch	3Nch
<b>Level</b>	Partial	Partial/Full	Partial/Full
<b>-Human resources</b>	Partial	Partial	Partial
<b>-Documentation</b>	Partial	Full	Partial
<b>-Procedures</b>	Partial	Full	Full
<b>Guidelines</b>	Internal model	UNE 66177:2005 (AENOR)	UNE 66177:2005 (AENOR)
<b>Tools</b>	- Process map - Common elements analysis - Internal model	- Process map - Common elements analysis - Internal model - PDCA approach	- Process map - Common elements analysis - Internal model - PDCA approach

### *Integration benefits and difficulties*

Integration has brought many positive effects for the three interviewed companies. Some of the most positive points mentioned by the managers regarding the integration of MSs are the improvement of the systems understanding and use, better options to include new systems, increase of the organizational efficiency, task simplification (in terms of documentation control, MSSs requirements), better use of audit results and improved company image.

**Table 5. Integration benefits**

Benefits	1N	2N	3N
Improvement of the systems understanding and use			X
Better options to include new systems			X
Increase of organizational efficiency	X	X	X
Task simplification (documentation control, requirements)	X	X	X
Organizational global strategy improvements		X	X
Better use of audit results			
Organizational culture improvement			
Better communication			
Higher stakeholders implication			X
Company image improvement			

The most cited difficulties during the integration of MSs are the differences in the models of the standards, problems with the implementation of the first system in the organization, the lack of specialized auditors, the lack of human resources and the lack of employees' motivation. These results are especially relevant, as they show the importance of implementing the systems well and motivating and implicating the human resources in order to achieve a successful integration.

**Table 6. Integration difficulties**

Difficulties	1N	2N	3N
Differences among the scope of the standards			
Differences in the models of the standards	X		X
Problems with the implementation of the first MS (ISO 9001)		X	X
Lack of department collaboration			
Lack of technological support	X		X
Lack of specialized auditors	X		
Lack of human resources			X
Lack of employees' motivation			
Lack of internal organizational culture			

#### 7.5.7. Comparing chemical and non-chemical organizations

The case studies analyzed show that, in all organizations, the integration level is high in all elements of the IMS, although some differences between chemical and non-chemical firms arise. For example, the three chemical organizations seem to have integrated the human resources to a higher extent than the non-chemical organizations. Regarding the integration level of the objectives, documentation and procedures, the elements that are integrated to the highest extent are the procedures, which are fully integrated in five of the six organizations. Higher levels of integration were exhibited in chemical firms in some procedures, such as improvement and control of the systems, resource management and documentation control.

The sequences of implementation of MSs are similar in all six organizations, as they implemented the QMS first and then the EMS. The process of integration was conducted using an internal model in three of the companies, whereas the other three used UNE 66177. Regarding the integration tools, all six firms used an analysis of the common elements of the MSSs. Additionally, in some of the firms, a process map, an internal model and a PDCA approach was used.

Regarding the benefits and difficulties of integration, chemical firms perceive more benefits about environmental impacts (e.g., reduction of the documentation, elimination of environmental impact), whereas non-chemical firms are more focused on the opportunities that the IMS brings to the company regarding the integration process (e.g., improvement of the systems understanding and use, better options to include new systems, and better audits). However, some benefits are common in all firms, such as improved efficiency and external image. The most cited difficulties in non-chemical firms were the lack of communication and top management commitment, which shows that these problems are similar to those of non-chemical firms, who also state that the problems with the people involved in the systems and the lack of employee motivation were their main challenges when implementing the IMS.

## **7.6. Conclusions**

The main objective of this research was to study the integration of management systems in the chemical industry. In order to accomplish this objective, an empirical study was undertaken, with a descriptive analysis of the results of a survey and six case studies. As the results for chemical and non-chemical firms were shown not to be significantly different, the first conclusion drawn from the study is that chemical firms integrate in the same way and at the same level, that is, they highly integrate their MSs, compared to the non-chemical firms. However, although non-significant differences were found in the comparison tests, some differences between the two types of firms arose in the case study analysis regarding the integration level and the benefits and difficulties encountered during the integration process.

In the first place, from the results obtained we can conclude that the majority of firms with more than one MS integrate them into a single system. Only 13% of the organizations analyzed in the descriptive analysis decided not to integrate their MSs and we could not identify any firm that did not integrate quality and environmental MSs to a certain degree in the case study analysis. In other words, it can be concluded that the integration of systems is one of the major strategies for ensuring survival and savings for the organizations of the sample (Zutshi and Sohal, 2005). Therefore, in line with the results of Karapetrovic et al. (2006), Karapetrovic and Casadesus (2009) and Bernardo et al. (2009), organizations prefer integration of MSs to managing them separately. However, in chemical firms, the human resources and some procedures such as improvement and control of the systems, resource management or documentation control, showed higher levels of integration.

One of the most interesting contributions of this article is related to the numerous benefits that firms perceive of having an IMS (Karapetrovic and Willborn, 1998b; Karapetrovic, 2003; Sutshi and Sohal, 2005; Zeng et al, 2007; Bernardo et al, 2009). The interviews and survey answers revealed a number of benefits experienced by the companies from operating one integrated system, such as synergism promotion and cost savings for the firm as well as a reduction of the time spent when managing the systems. Integration also allows the organizations interviewed to minimize duplication and redundancy of effort, to eliminate overlapping roles and responsibilities and to increase the efficiency of resource management, to name a few of the benefits mentioned in the case studies. Regarding the differences between chemical and non-chemical firms, chemical firms perceive more benefits about environmental impacts, whereas non-chemical firms are more focused on the opportunities that the IMS brings to the company regarding the integration process.

However, for the benefits to be realized it is essential that organizations are aware of the challenges and obstacles accompanied by the integration of systems (Zutshi and Sohal, 2005). All of the firms interviewed highlight that during the integration process, some difficulties or challenges arose, with the lack of human resources and the lack of employees motivation being the most cited ones. Zutshi and Sohal (2005) outline the importance of personnel becoming aware of the inter-relations existing between the different systems and Karapetrovic and Willborn (1998b) insist on the importance of a good allocation and deployment of human resources in order to increase the efficiency and effectiveness of the interlinked systems. Another particular concern expressed by some of the companies is the lack of involvement of the rest of departments in the firm regarding quality and environmental matters. Moreover, it is worth mentioning that two of the six firms highlight the importance of top management involvement in order to implement and maintain the IMS.

This paper contributes to narrowing the gap between theory and practice in the field of MSs integration by providing examples of the steps, benefits and challenges that six firms encountered when implementing their IMS. This may have implications for other firms aiming to integrate their MSs, as well as for the consultants and auditors who help them in that process. Recommendations for other firms aiming at the integration of their MSs may include actions oriented towards the efficient management of human resources, motivation programs, top management commitment, interdepartmental collaboration as well as having integrated audits.

The major limitation of this empirical study is that the case studies analyzed only reflect the points of view of the company managers and not of the other people involved, such as the auditors or the employees. If this had been the case, the richness of the data gathered would have been higher and therefore the conclusions drawn for the study would have been more representative of the reality of these organizations. Another limitation of this empirical study is the number of organizations responding to the survey (the 76 firms analysed in the descriptive analysis), which does not allow extrapolating our results to other organizations. However, as this research aims to be an exploratory analysis of the situation of MS integration, we believe that our results can be significant for future studies conducted with a wider scope.

For future research, given the large number of companies with IMSs, it would be interesting to further study these exploratory results and develop more case studies to document the progress in the area of integration of MSs.



## **Chapter 8. Essay 4. Integration of standardized environmental and quality management systems audits**

*Simon, A., Bernardo, M., Karapetrovic, S. and Casadesus, M. (2011). Integration of standardized environmental and quality management systems audits. Journal of Cleaner Production, 19 (17-18), 2057-2065.*

### **Abstract**

In the last few years, many organizations have chosen to implement standardized Management Systems (MSs), such as the ones based on ISO 14001 and ISO 9001. However, few studies exist on how firms carry out the process of auditing these MSs.

Our goal is to study how companies with more than one standardized MSs conduct the audits and to which extent they integrate the audit elements in order to benefit from the advantages of having a sole, integrated audit system.

We provide four case studies and confirm the idea that firms with more than one MS integrate their audits. However, the degree and specific characteristics of this integration vary in the different companies analyzed.

This paper contains one of the first empirical studies regarding the integration of MSs audits. The study provides an original contribution to the understanding of whether and how the four case study organizations have integrated certain aspects of the audit systems, for instance, human resources, time, audit inputs and outputs).

**Keywords:** Integrated Management Systems; Integrated Audit Systems; ISO 9001; ISO 14001; ISO 19011; Spain

### **8.1. Introduction**

The implementation of Management Systems Standards (MSSs), for example ISO 9001 and ISO 14001 (see ISO 2010), has increased in recent years. The proliferation of new MSSs, such as the ones for occupational health and safety (e.g., OHSAS 18001 and CSA Z1000), for corporate social responsibility and accountability (e.g., SA 8000 and AA 1000), for security of information systems (ISO 27001) or for supply chains (ISO 28000), gives the option that firms integrate the corresponding Management Systems (MSs) into a single system (Labodova, 2004; Zutshi and Sohal, 2005).

Many studies exist about the integration of standardized MSs. These studies focus on different topics, such as the integration advantages, methodologies, and degrees (see, for example, Karapetrovic and Willborn, 1998a; Karapetrovic, 2003; Zeng et al., 2007; Bernardo et al., 2009; Khanna et al., 2010; López-Fresno, 2010; Asif et al., 2010; Leopoulos et al., 2010). However, little empirical research has been done on how organizations that integrated their standardized MSs actually carry out their audit process.

Organizations with more than one implemented MS, can integrate the audits against the corresponding MSs (Karapetrovic and Willborn, 2001; Karapetrovic and Jonker, 2003; Power and Terziovski, 2005; Kraus and Grosskopf, 2008; Bernardo et al., 2010). Guidance on the process of audit integration is currently provided by ISO 19011 (ISO 2002).

Many benefits and efficiencies are related to the integration of audits. For instance, the optimised use of resources is mentioned by Karapetrovic and Willborn, 1998b; Douglas and Glen, 2000; Karapetrovic, 2002; Zeng et al., 2005; Zeng et al., 2007; Zutshi and Sohal, 2005; Pojasek, 2006; Salomone, 2008 and the establishment of auditor competence for different MSSs is considered by Douglas and Glen, 2000; De Moor and De Beelde, 2005; Kraus and Grosskopf, 2008. Moreover, *“the process under review, along with all their controls (environmental, health, safety, and quality) has to be evaluated only once”* and there is less duplication of effort during the planning, execution, and even follow-up phases of the audit (Kraus and Grosskopf, 2008).

However, some problems arise regarding the integration of audits. Beckmerhagen et al. (2003) state that, due to the lack of experience for auditing IMS, audit resources and auditor competence, knowledge and expertise need to be extended. Similarly, Krauss and Grosskopf (2008) argue that one of the bigger obstacles to auditing an IMS is finding auditors with sufficient knowledge, capabilities, and experience in auditing multiple systems, especially simultaneously. Bernardo et al. (2010) mention the difficulty in the formation of a single audit team for different MSSs and the related MSs. 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”*. One particular problem regarding external audits, which are usually undertaken by large organizations, is that registrars may require more time to

adapt to the changes in the environment or to the auditees' integrated management systems (Kraus and Grosskopf, 2008).

To provide solution to some of these challenges, audit systems can be developed and implemented according to specific auditing models in a similar way to standardized MSs (Karapetrovic et al. 2006). The most recent step realized regarding auditing standards was the integration into a single standard, in 2002, of the guidelines for auditing quality and environmental management systems, a standard named ISO 19011 (ISO 2002). The standard explains "*the principles of management system auditing and offers advice on evaluating auditors and assessing their competence, guidance on managing audit programs, and guidance on conducting internal and external audits*" (Kraus and Grosskopf, 2008). This standard is currently under revision in order to provide more generic guidance and allow auditing of all standardized MSs (ISO 2008c).

There are a limited number of empirical studies regarding the integration of MS audits (e.g. Karapetrovic et al., 2006, Salomone, 2008, Kraus and Grosskopf, 2008, Bernardo et al., 2010). Therefore, the objective of this research is to study how firms with more than one standardized MS conduct the audits and to which extent they integrate the audit elements in order to profit from the advantages of having a sole, integrated audit system.

## **8.2. Literature review and propositions development**

### **8.2.1. Integration of Management Systems**

The proliferation of new standards leads to the question of whether these standards should be managed individually or jointly in order to benefit from existing synergies among them. Addressing the question about the convenience of having an integrated management system as well as considering the benefits and costs of such integration is of particular importance for the purpose of this study as all firms with two or more management systems find themselves involved in the need to address such questions (Zeng 2007; Bernardo, 2009).

Research studies have been carried out to examine the ways in which organisations have addressed the introduction and integration of environmental management systems (EMS) and occupational health and safety management systems (OH&SMS) with their quality management system (QMS) (Labodova 2004; Salomone, 2008; Bernardo et al., 2009; Karapetrovic and Casadesus, 2009). Empirical investigations on the integration of

standardized management systems are increasing, namely Baldi (1999), Douglas and Glen (2000), Renzi and Cappelli (2000), Fresner and Engelhardt (2004), Zeng et al. (2005, 2007), Zutshi and Sohal (2005), Jorgensen et al. (2006), Jorgensen (2008), Karapetrovic et al. (2006), Salomone (2008), Karapetrovic and Casadesus (2009), Bernardo et al. (2009, 2010), Asif et al. (2010), Leopoulos et al. (2010).

Moreover, empirical studies regarding the scope of integration confirm the idea that firms prefer integration over desintegration (Douglas and Glen, 2000; Karapetrovic et al., 2006; Zeng et al. 2007; Salomone, 2008; Karapetrovic and Casadesus, 2009 or Bernardo et al., 2009).

At the same time, there has been a growing recognition of the value that IMS can bring to the business (Karapetrovic and Willborn, 1998; Wilkinson and Dale, 1999; Douglas and Glen, 2000; Renzi and Cappelli, 2000; Zutshi and Sohal, 2005; Zeng et al., 2007; Salomone, 2008; Asif et al., 2009; Karapetrovic and Casadesus, 2009; Khanna, 2010 and Asif et al., 2010). These authors present improvements related to having an integrated system such as costs savings, operational benefits, better external image, improved customer satisfaction and enhanced employee motivation.

In order to avoid the failure of MS integration, it is important that firms manage the difficulties associated to the implementation and maintenance of an IMS (López-Fresno, 2010). These challenges are numerous and involve aspects such as the lack of human resources, the lack of government support, departmentalization of functions and individual concerns of the people involved (Karapetrovic and Willborn, 1998a; Karapetrovic, 2003; Zutshi and Sohal, 2005; Karapetrovic et al., 2006; Zeng et al., 2007; Salomone, 2008; Asif et al., 2009; Karapetrovic and Casadesus, 2009 and Asif et al., 2009).

### **8.2.2. Management Systems Audits Integration**

Since audit integration is the main topic of this paper, it is important to define some relevant concepts related to the auditing of standardized MSs. An 'audit' is defined in ISO 19011: 2002 and in the 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).

It is also important to explain what an integrated audit means. Karapetrovic and Willborn (1998c), Karapetrovic (2002) and Karapetrovic (2003) state that “*full audit integration necessitates the establishment of a single audit system across all functions and hence a complete amalgamation of all cross-functional goals, processes and resources*”. This means that integrated audits need to involve the sharing of all the components among cross-functional audits, for instance quality, environmental and safety audits, namely they need to share the time when the audit is conducted, the audit team, the plan and the report. However, practically, the integration of quality, environmental, safety and other kinds of audits can be reduced to involve the sharing of only a selected number of the above mentioned components among cross-functional audits (Karapetrovic et al., 2006). For example, firms have the option to conduct simultaneous audits of quality and environmental MSs, which are separate systems, conducted by separate audit teams, under separate management. When two or more MSs are audited together, this is termed a combined audit (ISO 2002). “*A joint audit is conducted when two or more auditing organizations cooperate to audit a single auditee*” (ISO 2002).

Unfortunately, empirical investigations on the integration of audits are few. Namely Baldi (1999); Douglas and Glen (2000); Beckmerhagen et al. (2003); Bamber et al. (2004); Rajendran and Devadasan (2005); Karapetrovic et al. (2006); Salomone (2008); Kraus and Grosskopf, (2008) and Bernardo et al. (2010) study in detail the integration of internal auditing subsystems or external function-specific audits, like the ones performed against a QMSS or an EMSS. Additionally, several studies exist on the integration of MSs, i.e. Zeng et al. (2005); Zeng et al. (2007); Zutshi and Sohal (2005); Bernardo et al. (2010); Khanna et al. (2010); López-Fresno (2010); Asif et al. (2010); Leopoulos et al. (2010).

In a detailed study on audit integration, Baldi (1999) identified four types of integrated audits namely fully integrated, simultaneous, overlapping, and sequential. In firms with a fully integrated audit, one multidisciplinary audit team conducts the audit at one point in time. In the case of a simultaneous audit, the management system elements are audited separately, but at the same time. Overlapping audits cover separate aspects of the integrated management system, but may overlap in terms of scheduling and areas audited. Finally, sequential audits entail auditing one management system first, followed by the next one at another point in time Baldi (1999).

The study of Beckmerhagen et al. (2003) focuses on audits as a supporting structure for system integration. They claim that auditors must possess expertise to assist the management for integrating the functions of an MS and present a procedure for attaining continuous improvement using audits.

Rajendran and Devadasan (2005) recognise the need of adopting an integrated standard for auditing QMSs along with EMSs and Safety Management Systems (SMSs) while Bamber et al. (2004) discuss the significant role of the maintenance function in an IMS in order to add value to the third party assessment process.

Douglas and Glen (2000) found in an investigation of 28 companies that had implemented ISO 9001 and ISO 14001 in the UK, that 71% of the companies had integrated the audits of both standards.

The research of Salomone (2008), with a sample of 103 organizations registered to ISO 9001, ISO 14001 and OHSAS 18001, found that the unification and simplification of the procedure of conducting internal and external audits were two of the benefits obtained from the implementation of an IMS.

Krauss and Grosskopf (2008) provide some considerations and practice tips for organizations and auditors to update their auditing skills and increase their capabilities to audit IMS.

Karapetrovic et al. (2006) obtained responses from 176 Catalan organizations with multiple cross-functional certificates like ISO 9001 or ISO 14001. They found that a large majority of respondents conducted their audits in a simultaneous manner (73% for external audits against 68% for the internal ones). Namely, they had unified auditors and audit teams and shared audit resources meaning that the different audits contain a single plan and a single final report.

The above reviewed empirical studies confirm the idea that organizations have their audits integrated. The first and the second propositions to be examined in our study are therefore:

P1: Case study organizations integrate internal audits against quality and environmental management system standards.

P2: External audits against quality and environmental management system standards are integrated by case study organizations.

Karapetrovic et al. (2006) also found that the use of ISO 19011 as the auditing guideline was more prevalent in the case of external audits while “*auditing procedures tailored to the needs and situations of a particular company*” were more used for internal audits. Namely, ISO 19011 was used by 34% of the firms in internal audits respectively while 36% of the organizations used other guidelines in internal audits. The rest of respondents did not use a particular guideline for internal audits (14%) or did not know which guidelines were used (16%) (Karapetrovic et al., 2006). The third proposition to be tested in the following is therefore:

P3: Case study organizations use ISO 19011 in their internal audits.

In an empirical study of 435 companies, three distinct levels of audit integration were identified in Bernardo et al. (2010), namely ‘low level of integration’, ‘medium level of integration’ and ‘high level of integration’. The study of Bernardo et al. (2010) could not identify a group of any significance that did not integrate quality, environmental and other MS audits to a certain degree. 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, 2005; Karapetrovic and Casadesus, 2009), organizations prefer integration of MS audits to managing and conducting them separately.

Secondly, the results of Bernardo et al. (2010) show that there are significant parallels between internal and external audits (e.g., Cortemanche, 1989). The fourth proposition to be tested differs in some ways with the work of Karapetrovic et al. (2006) who found that some components of the external audits were more integrated than the internal ones. For example, they found that more firms conduct audits in a simultaneous manner during external audits than during internal ones. However, it is coherent with the results found by Bernardo et al. (2010) who state that some components of the audit system, for instance the internal audit teams, are integrated at a much higher level than the corresponding external audit components, and Salomone (2008) who found that 78% of the studied companies integrated their internal audits, while this fraction was 65% in the case of external audits. Therefore, internal audits usually have a lead in most of the aspects studied, which could be related to the

level of integration of the overall MSs, as pointed out previously. The fourth proposition to be examined in our study is therefore:

P4: Specific audit components are more integrated in internal than in external audits in case study organizations.

The studies reviewed in this section provide an overview on some aspects of the integration of audits. However, as can be seen from the above literature review, there are limited studies into the practice of the integration of audits of standardized MSs. This is perhaps because such audits, regardless of whether they are integrated or not, are not widely researched in general, or because many MSSs against which they are conducted are new (Bernardo et al. 2010).

Therefore, the investigation illustrated here is focused on studying the possible existence of distinctive practices with respect to the integration of internal and external MS audits in organizations registered to multiple MSSs. In the following section, the methodology applied in the study will be described.

### **8.3. Methodology**

This research involves in-depth case studies of four specific organizations in order to study how these companies conduct their audits and to which extent they integrate the audit elements of their MSs.

This qualitative approach is often used in the analysis of processes within organizations because the main goal is to know what the entrepreneurs and managers' point of view is (Eisenhardt, 1989).

A case study approach has been adopted *“to allow causes, processes and consequences of behaviour to be investigated”* (Yin, 2009). In this research, a case study is defined as an empirical inquiry that investigates a contemporary phenomenon within its real-life context in which multiple sources of evidence are used (Yin, 2009).

The approach is useful in such exploratory modes of research and can *“provide detailed understanding of particular situations which may then be utilized inductively to create better theory by pointing to gaps and beginning to fill them”* (Siggelkow, 2007). One such gap contours around qualitative research in the field of integration of MS audits. We aim to build



on existing theory, mainly focusing on auditing integration, and especially on the nature and reasons of differences for integrating audit systems in the firms.

### **8.3.1. Selection of cases and procedure**

We selected the four case studies focusing on organizations registered at least to ISO 9001: 2000 and ISO 14001: 2004 standards to ensure they were companies that could have integrated their management systems. The companies were selected from 179 Catalan organizations that had responded to a mail survey on the integration of management systems in a previous empirical study in 2006 (Karapetrovic et al., 2006; Bernardo et al., 2009; Bernardo et al. 2010). We chose the four companies of our study based on the results of Bernardo et al. (2009) who found three groups of companies with some level of integration and one with no integration. The companies for the case studies were chosen following the criteria of diversity, as we chose firms that in the 2006 survey had different levels of integration, taking one company from each of the four groups identified by Bernardo et al. (2009).

The methodological process included various steps such as initial contact, sending out the presentation letter and interview guidelines, visit and transcription of the interview, coupled with the information from company websites. According to Eisenhardt (1989) a few case studies are generally sufficient. We visited the four firms and interviewed the persons responsible for MSs for about one hour. Eisenhardt (1989) suggested that a researcher should have a well-developed interview protocol before making site visits. We used a structured interview protocol in all site visits. The protocol covered a number of topics such as important changes in the organization, introduction and maintenance of MSs, integration, internal and external audits and future plans. On the interviewing side, we assured two interviewers in all the cases. Each interview resulted in a case study that was sent to the organization in order to validate the content.

### **8.3.2. Data analysis**

In the first step, a within-case data analysis, which involves “detailed case study write-ups for each site”, was conducted by analyzing in detail the company answers (Eisenhardt, 1989). We analyzed and organized the cases according to a limited number of concepts such as the company characteristics, their management systems and integration, internal and external audits and future plans.

The second step was a cross-case search for patterns, looking for similarities and differences among the four cases (Eisenhardt, 1989). The main criterion to analyse our cases was the level of audit integration, as presented in the following section. We found two out of the four categories described in Bernardo et al. (2009): medium and high level of integration. Two other categories which we label “no integration” and “low integration”, although present in the sample of firms chosen in 2006, are not represented in our case studies as our four firms have decided at one point in time to integrate their MSs and their audits. This is consistent with the findings of Douglas and Glen (2000), Karapetrovic et al. (2006) or Bernardo et al. (2010) who state that the majority of companies integrate audits.

#### **8.4. Findings**

In order to analyze the aspects previously mentioned in the methodology, four different organizations, all with multiple registered MSs, have been selected.

The data analysis reveals responses regarding the conduct of internal and external audits, and it is particularly focused on the main elements of the audit system, i.e. audit processes, including the corresponding input (audit plan) and output (audit report), and audit resources (Karapetrovic and Willborn, 2000).

This study also reveals different combinations of audit elements such as the people, the processes involved or the audit plans and reports, which can lead to different levels of integration and can be classified into one of the three levels detected in Bernardo et al. (2010).

These four cases constitute an important contribution of this study, as we have been able to find only one paper using case analysis in the field of management system audit integration. Beckmerhagen et al. (2003) study how audits can help in the integration of quality and safety MSs based on the experiences of a nuclear waste disposal facility in Germany.

The case studies and their corresponding analysis are presented in the following subsections. First, an overview of the organization is presented. Then we proceed to describe the management systems and the integration status of each organization. Finally, we present how the firms perform their audits.

##### **8.4.1. Firm 1**

###### ***The organization***

Firm 1 is a small firm located in Terrassa (Barcelona) with 31 employees dedicated to the manufacture of chemicals for process improvement in the paper and pulp industry. Its

specialties and market segments include paper making, the production of cellulose, coated fine paper and recycling.

Currently, Firm 1 has two fully integrated standardized MSs, the quality MS certified to ISO 9001:2008 and the environmental MSs certified to ISO 14001:2004. In the future, the firm intends to continue renewing the certificates of the two MSs.

### ***Audits***

The internal audits are performed annually at Firm 1 by an external company which audits the complete integrated system. To integrate the audits of each system, the company followed two steps. Since the firm saw that many audit procedures were duplicated for Environment and Quality MSSs, and the first step was to combine them. Then, the firm made a common manual to audit the systems together. The third step is to coordinate the audit objectives of each management system in order to verify that the systems are working properly and that they meet the requirements of each of the standards.

Apart from improving efficiency in the control of documentation and the synergies created between the two systems, another benefit of having integrated the audits of the two systems is the opportunity in the future to integrate OHSAS 18001 into the whole system. However, some difficulties have arisen during the process of audit integration. The main challenge to integrate the MSs has been to simplify all the audit documentation of the non-integrated systems and to accomplish all the requirements of the standards.

Audit teams are the same and simultaneously audit against both standards. The audit is performed following the guidelines proposed by ISO 19011 using a single plan and a single report for audit results. The auditors use the audit manual to audit all the procedures and documents of the company. Because the firm is from the chemical sector, a very important part of the audit process is that the auditors review the issue of legal compliance. They also make a tour of the facilities to see the storage of waste, labeling and monitoring of the traceability of the production process.

A significant aspect of internal audits is the requirement by the firm that the audit team which performs the internal audit changes regularly (every three years). This is done to receive more and better feedback and recommendations in the final report to continuously improve the integrated system. For example, a remarkable improvement arising from the recommendations of the auditors during the last internal audit was the improvement in the

calibration of the laboratory equipment. Another opportunity for improvement suggested by the auditors several times is to certify against OHSAS 18001 and integrate the three systems.

About the findings of the audits, the company answered that the audit suggests opportunities for improving the implementation of each MS individually, as well as for improving the integration of the system as a whole.

Regarding external audits, the auditor organization first sends to the firm the audit plan and then performs the audit during two days through some parts of the system. The organization only receives information about the audit plan, but has no knowledge about the tools or processes that will be used during the external audit. The results of the external audit consist of a report containing opportunities for improvement, observations and nonconformities. Regarding the non-conformities, the firm resolves them with preventive and corrective actions, having meetings in which these actions are discussed. Like in the internal audit, the external audit report suggests opportunities for improving the implementation of each MS individually as well as for improving the integration of the system as a whole.

#### **8.4.2. Firm 2**

##### ***The organization***

Firm 2, located in Santa Perpetua de la Mogoda (Barcelona) has 33 employees. It is dedicated to the manufacture and marketing of plastic vinyl compounds. In the last two years the firm has added a new business line dedicated to the production of rigid PVC by extrusion for electrical cables and moulds, for instance.

Currently, the firm has two implemented MSs, ISO 9001:2008 and ISO 14001:2004 and the quality manager is responsible for both MSs. In the future, the company plans to renew the existing certificates.

##### ***Audits***

Internal audits are conducted annually using the company's own system, as they have their own procedures for the audits, which are not based on ISO 19011. The firm does not consider the fact this standard is currently under revision as a motivation to implement new systems. The firm thinks that, although it would be easier to audit multiple systems, it would not help the implementation of new MSs. During the last four years, the organization has moved from

having a partially-integrated system for internal audits to have a fully integrated system, which has increased the efficiency of the audits.

Having already integrated all the other elements of audits, such as the audit plan and the audit report, in 2010, the firm has increased the integration of the audit team, which is now the same for both standards. The audits are performed simultaneously.

The organization followed two steps to integrate the audits of the system. They first introduced ISO 9001 and then ISO 14001. In 2010, they already audited the two systems at once. Two auditors go to the firm and theoretically, one is the expert who audits the QMS and the other audits the EMS. However, in practice, they both audit both systems and share tasks according to their availability, in order to increase the efficiency of the audit.

To coordinate the objectives of the audit, the firm aims to integrate the three systems implemented: Quality, Environmental and Occupational Health and Safety. However, currently the auditors audit only the first two each year. Their Occupational Health and Safety system is audited by a team from their firm apart from the other two systems.

The main benefit of having integrated the audits is “*not suffer two different audits. Simplification, simplification and simplification*”. The company does not consider that there were any specific challenges for having the audits integrated.

The external audits are conducted following ISO 19011 guidelines. The company stresses that the audit team changes every two or three years so that new ideas are added continuously to the system. As in the internal audits, the audit plan and report are totally integrated and the audit also finds opportunities for improvement of the implementation of each standard and of the integrated system. The audit report includes the executive summary of the audit (previous changes/conclusions about the effectiveness of the system, improvement possibilities, strengths and observations), non-compliance table, next audit planning matrix, final provisions and annexes (centers, participants and data sheet). Regarding the non-conformities, if they are simple they are solved during the audit process, if not, the appropriate corrective actions are undertaken.

### **8.4.3. Firm 3**

#### ***The organization***

Firm 3, with 135 employees and located in Castellbisbal (Barcelona), manufactures lubricants. The firm has an extensive product range including hydraulic fluids, anticorrosive products, laminating oil and biodegradable lubricants.

The firm has implemented ISO 9001:2008 and ISO 14001:2004 MSs, which have been integrated fully. Regarding the future of the certifications, the company plans to renew them.

#### ***Audits***

Internal audits are performed using a standard plan, with annual audits of all requirements of the integrated system. Internal audits are performed using a standard plan, with annual audits of all requirements of the integrated system. The audit goals have been coordinated, basically checking first the process goals and then verifying the compliance with their procedures. Although the auditors are the same for both systems and a single audit plan and report are used, the firm considers the two systems as interrelated and not fully integrated because some specific processes of each system (quality and environmental) are audited separately.

The following steps are taken for conducting the internal audit. First, the audit plan is determined including the audit team, the points of the standards that need to be audited and those responsible for the processes involved. This plan is communicated to all the affected process staff. Second, the audit is performed. During the audit, the correct implementation of the corrective actions of the previous audit are checked while taking notes of the new non-conformities and observations that appear: *"It is always good to keep convincing the staff of the importance to continuously find improvement areas and to fix non conformities the very moment they are found"*. As the result of the internal audit, a report containing non-conformities and observations is produced. It includes the improvement actions, with the corresponding staff responsible to perform them and dates of execution. Generally, proposals of improvements aimed at increasing the interaction between processes are derived from the final report. The non-conformities are resolved with corrective actions, always checking the effectiveness of these actions. The report is then transmitted to the management of the company. Then, the staff responsible for each process documents the corrective actions and deadlines for implementation. Finally, the audit team verifies with the corresponding evidence, compliance with the corrective actions and deadlines for implementation.

The part of the process that the company stresses the most is the detection of weaknesses that become opportunities for improvement. The main benefit of having integrated audits is basically the avoidance of duplicated audits for the processes and the extensive knowledge of the requirements and the experience they have gained.

The main challenge during the integration of audits was to understand the benefits that this could bring to the company. It was very important to coordinate the team responsible for the audits and to receive support from the management of the company.

Internal audits are performed annually and cover all the requirements of ISO 9001 and ISO 14001, which is very beneficial for the firm, as it creates synergies to audit the standards at the same time.

The firm does not use ISO 19011, as the audit plan is very similar to the one used by their certification company. The firm believes that the fact this standard is currently under revision to increase the number of systems to audit is a clear motivation for new systems implementation.

External audits are conducted as follows. First, the company receives the audit plan and the audit begins with a preliminary meeting between the audit team and the process owners in order to determine the order of the actions to undertake during the audit. The auditors then review the system. The completion of the audit produces one report that contains the evaluated points of the standards, the non-conformities, observations and opportunities for improvement and the people involved. The audit system plan and audit reports are fully integrated and the audit finds opportunities for improvement of the implementation of each standard separately and for the integrated system.

#### **8.4.4. Firm 4**

##### ***The organization***

Firm 4 has nine employees. It is located in Banyoles (Girona). The company is dedicated to road transport and operates within the national territory and the European Union. In recent years, there has been no major organizational change in the company.

The firm is certified against two standardized MSs, a QMS certified to ISO 9001 and the environmental management system certified to ISO 14001. The two systems have the same scope as they cover all business processes. The company has implemented a system for

occupational health and safety that is not certified or integrated with the other two systems. Currently, they do not intend to certify or integrate it with the rest of the systems. In the future, the firm is not planning to implement new MSs, models or other certification standards.

### *Audits*

Initially, the quality and the environmental systems were audited separately, but the firm realized that they were working in a very similar way, so the company decided to integrate them. At the same time, the audit team changed and the new staff responsible for the internal audits started their job having an integrated system to audit. Internal audits are now performed by an external company and they are audited annually and simultaneously under the guidance of ISO 19011. The company does not consider that the fact this standard is currently under revision to increase the number of systems to audit is a motivation to implement new systems in the firm. The auditors, who are the same for the different standards, audit them as integrated systems covering all the processes that take place in the organization and provide a single report for all the systems.

The audit suggests opportunities to improve the implementation of each of the standards individually and to improve the integrated system. The audit team detects improvement opportunities by observing the functioning and the documentation of the MSs. Analysing them, they detect improvement opportunities, observations and non-conformities during the audit. Some improvement comments made to the firm during the last few audits have been the need to add new control indicators in the trucks, to promote training on ecological driving and to code all the documents related to the MSs. The non-conformities are resolved via immediate actions and corrective actions.

With regard to external audits, when the certification needs to be renewed, the audit team audits all the requirements of the standards that affect the firm. When it is a follow-up audit, only a part of the requirements are audited. The company receives information daily on how the audits are performed since the responsible people for the MSs accompany the auditors during the process. Additionally, the company is given the information on the audit results through the final report. The auditors, which change every two or three years, suggest many opportunities for improvement that the company subsequently applies.



The firm refers to the reduced time to do the audits as the main benefit of having them integrated. They also refer to the easiness to control the electronic documentation, as they are now the same for the two systems.

Regarding the system for occupational health and safety that is not certified or integrated with the other two systems, it is controlled, but not audited, by an external firm. This firm, annually inspects the firm facilities, does the medical tests of the staff, carries out training courses on health hazard issues and controls the documentation related to that system.

#### **8.4.5. Discussion**

Several relevant considerations can be drawn from the research carried out. The four case studies involve firms considered as SMEs according to their number of employees.

As it was a prerequisite for choosing the companies, the two standardized MSs implemented in all the companies are QMS and EMS. None of the companies has implemented any other MS. Regarding the integration of the systems, three of them have a fully integrated system, meaning that the personnel responsible for the MSs, the documentation and the processes are the same for the QMS and the EMS.

The scope of the internal audits involves all the processes of the organization in the four cases. Moreover, three of the respondents answered that their internal audits are conducted as an integrated system. However, the other firm considers the two MSs as distinct and separated so the audit is carried out considering these two systems only as interrelated systems and not as fully integrated systems. Thus, we could state that three of the four firms have fully integrated audits while the fourth organization has partially integrated the internal audit. This partially matches with the findings of Bernardo et al. (2010) who found three types of firms with different levels of audit integration. The group with the highest level of integration was the most numerous one with a high integration of human resources, inputs and outputs involved during the audit process. Proposition 1 is therefore accepted as our results confirm the idea that the four case study organizations have integrated their internal audits.

The internal audits are carried out in two cases by a team formed with auditors of the same firm. In the other two cases, the auditors are external to the firm. Regarding the audit team in both the internal and the external audits, they audit the QMS and the EMS as a single system. Therefore, in line with Karapetrovic et al. (2006) and Bernardo et al. (2010), we can say that the audit human resources are highly integrated in the four cases.

The audits are carried out simultaneously for the MSs implemented in all four firms and the audit plan and the audit report are the same as well. Therefore, like in Karapetrovic et al. (2006), we can consider that all the audit components are integrated both for the internal and the external audits. Similarly, the results of the audits suggest opportunities to improve the implementation of each of the standards individually and to improve the integrated system as a whole. Particularly, the firms resolve nonconformities for all the MSs together with corrective actions, detailing the responsible people and dates for their execution and checking the efficiency of each of the action afterwards. However, whereas three firms state that their audits are fully integrated, one of the firms considers that the two systems are interrelated and not fully integrated because some specific processes of each system are audited separately.

In two of the cases, the firms use ISO 19011 to carry the internal audit. The two remaining firms use their own procedures to carry out the process. In all cases except one, the external auditors use ISO 19011 to audit the system. We therefore partially accept proposition 3 as two of the companies analyzed use internal guidelines and two use ISO 19011 for the internal audit, although ISO 19011 is used for external audits in three of the cases similarly to the results found by Karapetrovic et al. (2006).

Specifically with respect to the external audits, the four firms state that their external audits cover all the process of the organization and are fully integrated. Therefore, we confirm proposition 2, as in all four firms the external audits are integrated. However, the interviewees of all four companies receive little information about how the process will be carried out, as the interviewees usually receive only the final report. However, they feel satisfied with the process and would not introduce changes to it. It is worth to mention that two of the three firms ask the certifying company to change the audit team every two or three years in order to receive new and better feedback and improvement comments from them.

Regarding the differences among internal and external audits, the main difference found among the four firms is the use of ISO 19011 to carry out the audits, which is more used in the external audits. We find no differences regarding the human resources, the inputs or the outputs of the audit process. This slightly differs from the results found by Karapetrovic et al. (2006), who find differences between the integration of the different components of the internal and the external audits. The results found by Bernardo et al. (2010) also state that some components of the audit system, such as the internal audit teams, are integrated at a much higher level than the corresponding external audit teams. We cannot thus accept

proposition 4 as case study firms do not show a higher level of integration of internal audits compared to the external audits.

**Table 1. Overview of propositions and findings**

<b>Propositions</b>		<b>Findings</b>
P1:	Case study organizations integrate internal audits against quality and environmental management system standards.	Supported
P2:	Case study organizations integrate external audits against quality and environmental management system standards.	Supported
P3:	Case study organizations use ISO 19011 in their internal audits.	Partially supported
P4:	Specific audit components are more integrated in internal than in external audits in case study organizations.	Rejected

### 8.5. Conclusions

This research has addressed the question of how firms with more than one standardized management system conduct the audits and to which extent they integrate the audit elements in order to profit from the advantages of having a sole, integrated audit system. In order to answer this question, one of the first empirical studies on the integration of management system audits was undertaken, with four detailed case studies.

In the first place, this research confirms the notion that firms with more than one MS integrate their audits. We could not identify any firm that did not integrate QMS and EMS audits to a certain degree. 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, 2005; Karapetrovic and Casadesus, 2009), our four organizations prefer integration of MS audits to managing and conducting them separately.

However, an interesting finding was that, despite all of the firms interviewed stating that their MSs and their audits are fully integrated, when asked more specifically on the different processes, the results vary. For example, while three of the respondents answered that their internal and external audits are conducted as integrated systems, one of the firms audits the two MSs implemented as interrelated systems because some of the processes of the company are audited separately for the quality and the environmental system. However, the four companies state that the auditors and audit teams, plans and reports are the same for the different MSs. A high level of integration therefore seems to have been achieved by the four organizations, similarly to the results found by Bernardo et al. (2010).

Secondly, the results show that there are significant parallels between internal and external audits (e.g., Cortemanche, 1989). For instance, in the four organizations studied, the levels of integration of the audit systems of both types are fairly similar. Therefore, in line with Bernardo et al. (2010), a high level of integration seems to have been achieved for the human resources that undertake both the internal and external audit processes as well as for the time for conducting the audits, the audit inputs, i.e. the audit plans, and its outputs, i.e. the audit reports. In all the case study organizations, the audit findings suggest opportunities to improve the implementation of each of the standards individually and to improve the integrated system as a whole.

One of the most interesting contributions of this article is related to the numerous benefits that firms perceive of having an integrated system for their audits (Karapetrovic and Willborn, 1998c; Karapetrovic, 2002 and 2003; Zeng et al, 2007; Bernardo et al, 2009). All of the firms interviewed highlight that integration of MSs promotes synergism and cost savings for the firm as well as a reduction of the time spent when managing the systems. Integration also allows the organizations interviewed to minimize duplication and redundancy of effort, to eliminate overlapping roles and responsibilities and to increase the efficiency of resource management. All these benefits of having integrated MSs, are the translated to a higher efficiency when carrying out their audits. Particular benefits mentioned by some of the organizations are simplification of audits and the opportunity in the future to integrate other MSSs into the whole system.

Some challenges regarding the process of audit integration were also outlined, such as the difficulties arose when simplifying all the audit documentation of the non-integrated systems and the efforts made to accomplish all the requirements related to internal audits.

One particular concern expressed by one of the companies is the lack of involvement of the rest of departments in the firm regarding quality and environmental matters. Promoting the involvement of the rest of the company increases objective and process alignment (Kraus and Grosskopf, 2008). This facilitates coordinated decision making and encourages the identification of coordinated solutions for deficiencies and promote multidisciplinary approaches to preventive and corrective actions for those deficiencies (Kraus and Grosskopf, 2008).

The study has implications for quality and environmental managers and auditors as it reveals different possibilities regarding the level of audit integration which organizations can reach, namely partial and full integration. It also uncovers some of the benefits of having integrated audit systems such as, the optimized use of resources or the synergies created among the audit systems.

The major limitation of this empirical study is that the case studies analyzed only reflect the points of view of the company managers and not of other involved actors such as the auditors of both internal and external audits. If this had been the case, the richness of the data gathered would have been higher and therefore, the conclusions drawn for the study would have been more representative of the reality of these organizations.

Another limitation of this paper is the focus on a single region in Spain, Catalonia. However, it should be noted that Spain is one of the leading countries in terms of management systems certifications in the world (see ISO, 2010) and Catalonia one of the leading Spanish regions regarding certification intensity (Heras and Casadesus, 2006). Therefore, we believe that our results can be highly significant for future studies in other places.

The study provides an original contribution to the understanding of whether and how the four case study organizations have integrated certain aspects of the audit systems (e.g., human and time resources and audit inputs and outputs). The case analysis detailed in this paper shows that MS audits have reached a very high level of integration. These findings urge scholars to further develop on these exploratory results in order to test the benefits of complete audit integration as a way to efficiently manage the auditing processes in organizations. Hence, a future line of research can be directed to the empirical analysis of the importance of the role of internal (as opposed to external) auditing, as well as to test whether augmenting the number of MSs in the integrated system increases or hinders the efficiency of the audits.

## **Chapter 9. Discussion**

The four essays of this dissertation explore the use of Integrated Management Systems in organizations. They approach the concept of IMS from several perspectives, regarding the integration strategies, levels, tools, benefits and difficulties that firms go through during the joint implementation of several MSs. Moreover, the process of auditing the IMS is also analyzed.

The first essay, "Evolution of Integrated Management Systems in Spanish firms", has two main objectives. The first is to analyze the evolution of IMSs experienced by ISO 9001 and ISO 14001 registered companies in Catalonia over time. Additionally, the paper aims to evaluate the impact of integration, namely the extent of integration and the difficulties experienced by firms, during the integration of MSs in companies with more than one MS. This is, as far as we know, the first study to analyse IMS in two different periods in time. The main findings reveal that, for the analyzed samples, little relationship exists between the integration difficulties, on one hand, and the level of MS integration, on the other. However, the main conclusion to be drawn from this study is that the majority of firms with more than one MS integrate them into a single system. Therefore, organizations seem to prefer integration over keeping their MSs separated and they evolve towards a state of complete integration

The second essay, "Difficulties and Benefits of Integrated Management Systems", has the objective to study whether the difficulties encountered by firms during the integration process are related to the level of integration of their MSs and whether their integration level affects the benefits of having an IMS perceived by organizations. From the results, we have proposed a model of the difficulties and benefits related to systems integration that have an effect on the level of integration of several specific items of the MSs involved. The model could not be confirmed, but it was useful in interpreting some aspects of the data. Four difficulty, four benefit and four integration dimensions, as well as the relationships among them, are proposed. The most significant relationships among the variables are mainly related to the human and documentation resources having an impact on the level of integration.

The third essay, "Implementing integrated management systems in chemical firms", explores how chemical companies integrate their MSs and whether they do it differently from other firms. The results for chemical and non-chemical firms were shown not to be significantly different, therefore, the first conclusion drawn from the study is that chemical firms integrate

in the same way and at the same level, that is, they highly integrate their MSs, compared to the non-chemical firms. One of the most interesting contributions of this article is related to the numerous benefits that firms perceive of having an IMS related to synergism promotion and cost savings for the firm as well as a reduction of the time spent when managing the systems. Integration also allows the organizations interviewed to minimize duplication and redundancy of effort, to eliminate overlapping roles and responsibilities and to increase the efficiency of resource management.

Finally, the fourth essay, "Integration of standardized environmental and quality management systems audits", involves in-depth case studies of four specific organizations in order to study how these companies conduct their audits and to which extent they integrate the audit elements of their MSs (e.g., human and time resources and audit inputs and outputs). The case analysis detailed in this paper shows that MS audits have reached a very high level of integration. In fact, we could not identify any firm that did not integrate QMS and EMS audits to a certain degree. Moreover, the results show that there are significant parallels between internal and external audits, namely that the levels of integration of the audit systems of both types are fairly similar. One of the contributions of this article is related to the benefits that firms perceive of having integrated audits, which outnumber the difficulties associated to them and are related to the efficiency of managing joint audits as well as taking advantages of the synergies that arise during the audit process.

## **Chapter 10. Conclusions and future research lines**

The topic of Integrated Management Systems is a relatively young topic (it started about 15 years ago) and there are not many empirical studies that contribute to enlarge theory about it. As it is a very narrow topic, with this study we aim to contribute to expand, in an exploratory way, the field of MSs integration.

Although the scope of the dissertation focuses on a very specific topic, integration of management systems, it tries to provide some insights into some of the neglected areas of management systems integration: evolution of IMS, relationship between IMS and the difficulties and benefits associated to them, their audit process and sector specific case studies. The findings can be of use to create some theory, as a recommendation to policy makers and to inform better quality and/or environmental managers as well as organization's top management on the strengths, weaknesses and processes of IMS.

The study has implications mainly for quality and environmental managers, consultants and auditors as it reveals different possibilities regarding the level of MSs and audit integration which organizations can reach, namely partial and full integration. It also uncovers some of the benefits of having integrated MSs and audits such as, the optimized use of resources or the synergies created among the systems.

From the results of our study, it is essential that managers and practitioners become aware of the challenges and obstacles of systems integration. Recommendations for managing IMS include: obtaining commitment from the top management; using implementation and integration guidelines; having training across the organization in aspects of integration, and last but not least having integrated audits. Moreover, having IMSs is especially important for organizations willing to move towards continuous improvement and business excellence as it can help organizations to efficiently tackle quality and environmental issues more efficiently and systematically.

One of the major limitations of this empirical study is the focus on a single region in Spain, Catalonia. However, it should be noted that Spain is one of the leading countries in terms of management systems certifications in the world (see ISO, 2011) and Catalonia one of the leading Spanish regions regarding certification intensity (Heras and Casadesus, 2006). Therefore, we believe that our results can be highly significant for future studies in other places.



Another limitation of this study is the sample size in 2010, 76 organizations, which could be the cause that some of our results are not significant. Further, the case studies analyzed only reflect the points of view of the company managers and not of other involved actors such as the auditors of both internal and external audits. If this had been the case, the richness of the data gathered would have been higher and therefore, the conclusions drawn for the study would have been more representative of the reality of these organizations. Moreover, in the field of IMS, there is a limitation in the number of specialised journals on the topic, which has represented a difficulty when reviewing the literature and when choosing the most appropriate journals in which to publish the articles presented in this dissertation.

For future research, given the large number of companies with IMSs, I confirm my interest to further study these exploratory results with a wider sample of organizations and to develop more case studies to document the progress in the area of integration of MSs. Specifically, research will be carried out in order to study how the perception of firms regarding the integration benefits evolves over time and to which extent new standards contribute to integration, how the standards structure impacts integration and whether they have been written in order to facilitate integration.

I am also interested into the benefits that specific aspects of system integration, such as the integration of audits, integration of documentation or joint management of human resources, bring to organizational performance, which is one of the future challenges of this research project. Moreover, specific difficulties of IMS, such as the integration of human resources, will be analysed in detail, as they have been uncovered as one of the main sources of conflict during the integration process.

Finally, regarding the auditing process, I would like to direct research to the empirical analysis on the roles of internal and external audits, as well as to test whether augmenting the number of MSs in the integrated system increases or hinders the efficiency of the audit process.

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## **Annexes**

**Annex 1. Survey questionnaire 2006**

# **Enquesta sobre la Integració de Sistemes de Gestió (ISG) a Catalunya**



L'objectiu d'aquesta enquesta és el d'avaluar la integració de sistemes de gestió, com la normativa *ISO 9000* i la *ISO 14000*, a Catalunya i en especial d'analitzar-ne la seva integració amb d'altres sistemes de gestió.

Aquesta enquesta és **confidencial i opcionalment anònima**, de manera que si es vol es pot omplir sense identificar-se. **No es publicaran ni facilitaran dades individualitzades**. Aquesta informació només servirà per elaborar quadres amb dades agrupades o globalitzades. El qüestionari s'ha dissenyat de forma que sigui **molt ràpid de contestar**.

Una vegada realitzat l'informe final, se us farà arribar una còpia on es situarà la vostra empresa respecte a la resta que hagin contestat l'enquesta.

Per qualsevol aclariment addicional us podeu adreçar a:

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*Universitat de Girona*

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telf: 972 41 82 86

**1. DADES DE L'EMPRESA**

1.1. El seu nom (opcional):.....

1.2. Nom de l'empresa: .....

1.3. Nombre de treballadors: .....

1.4. Sector:

- Administració pública
- Construcció
- Distribució
- Educació
- Energia
- Producció
  
- Salut / Assistència Social
- Sectors primaris
- Serveis financers / Assegurances
- Tècnics professionals / Científics
- Tecnologies de la informació
- Altres

## 2. NORMA D'ASSEGURAMENT DE LA QUALITAT ISO 9000

*Referent únicament a la norma ISO 9000 que la vostra empresa té certificada....*

2.1. Quina idea teniu dels beneficis que ha produït la implantació de la norma ISO 9000 en els següents indicadors de l'empresa? Marqueu si la influència ha estat favorable, desfavorable o si no n'hi ha hagut.

		Influència		
		Desfavorable	Indiferent	Favorable
Respecte als resultats operatius	Compliment terminis de lliurament	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Disminució errors i defectes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Rotació d'estocs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Estalvi de costos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Respecte als treballadors	Reducció terminis de lliurament	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Satisfacció en el treball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Absentisme laboral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Salut / Seguretat al treball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Respecte als clients	Sistema de suggeriments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Queixes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Satisfacció	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Respecte als resultats financers	Fidelització	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Vendes per empleat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Quota de mercat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Retorn de la inversió (Rendibilitat)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Creixement de les vendes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.2. Quin ha estat aproximadament el cost total de la implementació de l' ISO 9000, tenint en compte el cost dels consultors (si s'han utilitzat), el de la certificació, la formació, etc.,...? Quin és el cost addicional aproximat que cada any té la seva empresa per tal de mantenir el sistema?

	Cost total d'implementació	Cost anual de manteniment
Entre 6.000€ i 12.000€	<input type="checkbox"/>	<input type="checkbox"/>
Entre 12.000€ i 18.000€	<input type="checkbox"/>	<input type="checkbox"/>
Entre 18.000€ i 30.000€	<input type="checkbox"/>	<input type="checkbox"/>
Més de 30.000€	<input type="checkbox"/>	<input type="checkbox"/>

### 3. SISTEMES DE GESTIÓ IMPLEMENTATS A L'EMPRESA

***La vostra empresa està certificada segons la norma de gestió de la qualitat ISO 9000 i la de gestió mediambiental ISO 14000. Referent a aquestes i a d'altres sistemes de gestió que poguessin estar implementats...***

3.1. En quin ordre vàreu implementar les diferents normes de gestió (ISO 9001, ISO 14001, ISOTS16949, OHSAS 18001, EMAS, ...)? (Marqueu a la mateixa línia si es va fer simultàniament)

1:.....

2:.....

3:.....

4:.....

3.2. Quant de temps va passar des de que es va decidir implementar cada sistema de gestió fins que es va certificar l'empresa?

1er :.....

2on :.....

3er :.....

4rt :.....

**Una vegada ja estava implementat el primer sistema de gestió....**

3.3. Quines van ser les raons principals per a implementar-ne d'altres? Indiqueu la importància de cadascuna de les següents.

(1- gens important; 2- poc important ; 3- important ; 4-bastant important ; 5- molt important)

Raons principals per implementar altres normes	Importància				
Millora de la imatge i impacte social que ofereix l'empresa al mercat	1	2	3	4	5
Exigències dels clients	1	2	3	4	5
Exigències de l'administració pública	1	2	3	4	5
Millora de l'eficiència i el control de l'empresa	1	2	3	4	5
Consolidació i expansió de la quota de mercat	1	2	3	4	5
Minimitzar problemes de qualitat, socials, accidents laborals, ...	1	2	3	4	5
Recerca d'una avantatge competitivita respecte la competència	1	2	3	4	5
Per ser la continuació natural d'una normativa ja implementada	1	2	3	4	5
Provocar sinèrgies entre els diferents sistemes de gestió	1	2	3	4	5
Altres:	1	2	3	4	5

3.4. Quins recursos s'utilitzaren en el procés d'implementació del segon i/o posteriors estàndards?

- Llibres / Articles
- Normativa d'integració (UNE 66177)
- Material publicat per ISO
- Material publicat per l'Administració
- Consultors / Assessors
- Software
- Altres:.....

3.5. Quines de les normatives implantades a la seva empresa han estat integrades en un únic sistema de gestió?

- Cap. Els diferents sistemes de gestió (qualitat, medi ambient, ...) son totalment independents.
- Les següents: .....
- Totes

**Respondre *només* si no s'han integrats els diferents sistemes de gestió en un únic sistema...**

3.6. Quines han estat les raons per a no portar a terme la integració dels diferents sistemes de gestió? Indiqueu la importància de cadascuna de les següents.

(1- gens important; 2- poc important ; 3- important ; 4-bastant important ; 5- molt important)

Raons principals per no integrar les normes	Importància				
Dificultats en entendre l'estàndard (manca de coneixement)	1	2	3	4	5
Excessius requeriments dels nous estàndards	1	2	3	4	5
Estàndards massa diferents (incompatibilitats)	1	2	3	4	5
Manca de recursos	1	2	3	4	5
Manca d'interès per a fer-ho	1	2	3	4	5
Son àrees/departaments totalment independents	1	2	3	4	5
Per tal d'anar més ràpid	1	2	3	4	5
Desconeixement de que fos possible	1	2	3	4	5
Altres:	1	2	3	4	5



## 4. INTEGRACIÓ DELS SISTEMES DE GESTIÓ

***Respondre només si algunes de les diferents normatives implementades han estat integrades en un únic sistema de gestió.... (en cas contrari, passar a la secció 5 pàgina 9)***

4.1. Durant el procés d'integració de les anteriors normatives, s'utilitzà ...

	Si	No
... un mapa de processos	<input type="checkbox"/>	<input type="checkbox"/>
... un anàlisi detallat de elements comuns entre normatives	<input type="checkbox"/>	<input type="checkbox"/>
... un model propi d'implantació de la nostra empresa	<input type="checkbox"/>	<input type="checkbox"/>
... el "cicle PDCA" per a tots els processos implicats en el sistema integrat	<input type="checkbox"/>	<input type="checkbox"/>

4.2. En el procés d'integració dels diferents sistemes, quines foren les principals dificultats detectades?

*(1- gens important ; 2- poc important ; 3- important ; 4-bastant important ; 5- molt important)*

Dificultats detectades en la integració	Importància				
Manca de guies per a la integració (llibres, articles, documents, ...)	1	2	3	4	5
Manca de suport de l'Administració	1	2	3	4	5
Manca de recursos humans	1	2	3	4	5
Diferències en els models en que es basen les normes implementades (PDCA, gestió per processos,...)	1	2	3	4	5
Diferències entre varis elements comuns de les normes implementades (auditoria interna, comunicació externa, política, ...)	1	2	3	4	5
Manca de col·laboració entre departaments implicats	1	2	3	4	5
Manca d'auditors especialitzats	1	2	3	4	5
Manca d'un suport tecnològic (integració a l'ERP, ...)	1	2	3	4	5
Manca de consultors / assessors especialitzats	1	2	3	4	5
Implementació poc efectiva o poc rigorosa del primer sistema	1	2	3	4	5
Excessiu temps per a portar a terme la integració	1	2	3	4	5
Manca de motivació dels treballadors	1	2	3	4	5
Altres:	1	2	3	4	5

4.3. Respecte al nivell d'integració...

Assenyali la seva resposta amb una "X"

Els següents "actors" implicats ...	... són ...	
	Diferents persones	Les mateixes persones
Representant de l'organització al sistema de gestió		
Director / Responsable del sistema		
Inspectors		

Assenyali la seva resposta amb una "X"

La següent documentació...	...s'ha integrat...		
	No integrat	Parcialment (*)	Totalment (**)
Política de l'empresa			
Objectius de l'empresa			
Manual			
Procediments de treball			
Instruccions de treball			
Registres			

(\*) A partir de varis documents independents existents, s'han "ajuntat" i se n'ha redactat un de nou. (\*\*) S'ha redactat un únic document "integrat" totalment de nou

Assenyali la seva resposta amb una "X"

Els següents procediments de treball...	...s'han integrat...		
	No integrats	Parcialment (*)	Totalment (**)
Planificació			
Auditories internes			
Revisió del sistema			
Control de les no-conformitats			
Accions preventives i correctives			
Realització del producte i implementació			
Gestió dels recursos (persones, màquines,...)			
Determinació dels requeriments del sistema			
Millora del sistema			
Control de la documentació			
Control dels registres			
Comunicació interna			

(\*) A partir de varis procediments independents existents, s'han "ajuntat" i se n'ha creat un de nou. (\*\*) S'ha dissenyat un únic procediment "integrat" totalment de nou

## 5. AUDITORIES

**Referent a les auditories externes i internes dels diferents sistemes de gestió, independentment de si estan integrats o no...**

5.1. Respecte a les auditories externa i interna de les diferents normes de gestió implementades:

	INTERNES	EXTERNES	
Els equips d' auditors / auditors que les realitzen son....	<input type="checkbox"/>	<input type="checkbox"/>	... els mateixos per a totes les normes
	<input type="checkbox"/>	<input type="checkbox"/>	... els mateixos per a les següents normes:.....
	<input type="checkbox"/>	<input type="checkbox"/>	... diferents
Les auditories es porten a terme...	<input type="checkbox"/>	<input type="checkbox"/>	... simultàniament
	<input type="checkbox"/>	<input type="checkbox"/>	... al mateix temps per a les següents normes:.....
	<input type="checkbox"/>	<input type="checkbox"/>	... en períodes de temps diferents
Els equips d'auditors / auditors auditen les diferents normatives implementades	<input type="checkbox"/>	<input type="checkbox"/>	... com a sistemes absolutament independents
	<input type="checkbox"/>	<input type="checkbox"/>	... com a sistemes interrelacionats
	<input type="checkbox"/>	<input type="checkbox"/>	... com a un únic sistema integrat
Les auditories de les diferents normatives implementades utilitzen...	<input type="checkbox"/>	<input type="checkbox"/>	... un únic pla d'auditories i un únic informe dels resultats d'aquestes
	<input type="checkbox"/>	<input type="checkbox"/>	... un únic pla d'auditories i diferents informes de resultats per a cada normativa
	<input type="checkbox"/>	<input type="checkbox"/>	... diferents plans d'auditoria i informes de resultats per a cada normativa
Les auditories es realitzen ...	<input type="checkbox"/>	<input type="checkbox"/>	... procés a procés (procés de realització del producte, ...)
	<input type="checkbox"/>	<input type="checkbox"/>	... per a cada requeriment concret de la normativa (accions correctives, ...)
	<input type="checkbox"/>	<input type="checkbox"/>	No ho sé
L'auditoria es porta a terme seguint la guia proposada per la norma....	<input type="checkbox"/>	<input type="checkbox"/>	ISO 19011
	<input type="checkbox"/>	<input type="checkbox"/>	Altra:
	<input type="checkbox"/>	<input type="checkbox"/>	Cap
	<input type="checkbox"/>	<input type="checkbox"/>	No ho sé
Les auditories es realitzen amb una freqüència ...	<input type="checkbox"/>	<input type="checkbox"/>	... menor a 6 mesos
	<input type="checkbox"/>	<input type="checkbox"/>	... entre 6 mesos i menys d'1 any
	<input type="checkbox"/>	<input type="checkbox"/>	... entre 1 i 3 anys
L'auditoria	<input type="checkbox"/>	<input type="checkbox"/>	... detecta únicament detecta les no-conformitats
	<input type="checkbox"/>	<input type="checkbox"/>	... suggereix oportunitats per a millorar la implementació de cada normativa individualment
	<input type="checkbox"/>	<input type="checkbox"/>	... suggereix oportunitats per a millorar la integració dels sistemes
	<input type="checkbox"/>	<input type="checkbox"/>	... suggereix oportunitats per a millorar la implementació de cada normativa individualment i per a millorar la integració dels sistemes

5.2. Quina importància donaria als següents aspectes relacionats amb les auditories?

(1- gens important; 2- poc important ; 3- important ; 4-bastant important ; 5- molt important)

Respecte a les auditories	Importància				
	1	2	3	4	5
Que els auditors de les diferents normes siguin els mateixos	1	2	3	4	5
Que les auditories de diferents normes es portin a terme simultàniament	1	2	3	4	5
Que els auditors auditin les diferents normatives com a un únic sistema integrat	1	2	3	4	5
Que les auditories de diferents normatives utilitzin un mateix pla d'auditories	1	2	3	4	5
Que les auditories de diferents normatives generin un únic informe final	1	2	3	4	5
Que les auditories es realitzin "procés a procés" enlloc de departamentalment	1	2	3	4	5
Que l'auditoria es porti a terme seguint la norma ISO 19011	1	2	3	4	5
Que les auditories es realitzin amb una freqüència semestral com a mínim	1	2	3	4	5
Que les auditories suggereixin oportunitats de millora al impl. la norma individualment	1	2	3	4	5
Que les auditories suggereixin oportunitats de millora de la integració del sistema	1	2	3	4	5

## 6. EL FUTUR DE LES NORMATIVES DE GESTIÓ

**Referent a les possibilitats i expectatives que la vostra empresa té referents a les normes de gestió...**

6.1. Seria important que la meva empresa implementés els següents estàndards:

	No el conec	Ja el tenim implementat	Si	No	No ho sé
<b>Relatius a les àrees de l'empresa</b>					
OHSAS 18000 (Prevenió de riscos laborals)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UNE 166000 Ex (Gestió de la I+R+D)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UNE 66177 (Integració de sistemes de gestió)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 25000 (Serveis de tecnologia de la informació)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 26000 (Responsabilitat Social)	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 27001 (Seguretat de la informació)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 28000 (Seg. a la cadena de subministrament)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Relatius a la gestió de la qualitat / mediambient</b>					
ISO 10001 (Garantia de qualitat)	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 10002 (Gestió de queixes i reclamacions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 10003 (Resolució de conflictes)	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 10006 (Gestió de la qualitat en projectes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 10012 (Gestió del sistema de mesura)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 14031 (Avaluació d'impacte ambiental)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ISO 19011 (Auditories)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.2. Prioritza (del 1 al 4) quina d'aquestes opcions creus que és la opció més adequada per a la vostra empresa?

- Afegir nous estàndards relatius a la gestió de l'empresa (Responsabilitat social, Riscos laborals, ...)
- Afegir nous estàndards de suport a àrees concretes de l'empresa (Gestió de reclamacions, Gestió de sistemes de mesura, ...)
- Utilitzar models d'excel·lència en la gestió (EFQM, ...)
- No afegir cap nou estàndard ni utilitzar cap model de gestió

6.3. Atesa la proliferació de nous estàndards de gestió, s'està plantejant en l'actualitat diferents opcions per a la propera revisió d'aquestes normes. Prioritza (del 1 al 5) quina d'aquestes opcions creus que és la més adequada?

- Deixar-ho com està (Normes independents)
- Deixar-ho com està, però afegint una metodologia o una guia detallant com s'integren
- Redactar les normes independentment de forma que els requeriments comuns siguin idèntics (Per exemple auditories internes, comunicació, política, ...)
- Crear un nou estàndard "base" per als requeriments comuns, i reduir la resta d'estàndards (mediambientals, qualitat) als requeriments addicionals que siguin necessaris.
- Integrar varies normatives en una sola (Per exemple ISO 9001 i ISO 14001)

6.4. Quines àrees de l'empresa creus que serien importants que s'estandarditzessin mitjançant una nova normativa de gestió específica?

(1- gens important; 2- poc important ; 3- indiferent ; 4- important ; 5- molt important)

Àrea	Importància				
Àrea financera (comptabilitat, inversions, ...)	1	2	3	4	5
Gestió dels recursos humans	1	2	3	4	5
Serveis als clients	1	2	3	4	5
Gestió de la informació	1	2	3	4	5
Compres i vendes	1	2	3	4	5
Manteniment	1	2	3	4	5
Altres: .....	1	2	3	4	5

6.5. Quina importància donaries a les següents afirmacions?

(1- gens important; 2- poc important ; 3- indiferent ; 4- important ; 5- molt important)

Informació	Importància				
Els nous estàndards han de ser certificables	1	2	3	4	5
Una vegada assolida qualsevol certificació s'ha de renovar	1	2	3	4	5
Els nous estàndards s'han de poder certificar de forma integrada	1	2	3	4	5

**Arribats a aquest punt, volem agrair-vos molt especialment la col·laboració de la vostra empresa amb aquest estudi. Una vegada finalitzat, se us farà arribar directament un resum dels resultats d'aquest.**



Universitat  
de Girona

## Annex 2. Survey questionnaire 2010



# ***Management Systems Integration Survey***

The aim of this survey is to analyse the level of integration of Management Systems such as ISO 9001 and ISO 14001 in Catalonia.

This survey is **confidential and optionally anonymous**. We will not publish or provide **individualised data**. The information extracted from this survey will only produce grouped data. The questionnaire has been designed so that it is **easy to answer**.

For any clarification please contact:

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*Telf: 972 41 87 31*



**1. COMPANY DETAILS**

1.1. Your name (optional): .....

1.2. Company name: .....

1.3. Sector : .....

1.4. Number of employees: .....

1.5. What percentage of the shares with voting rights is currently owned by:

People who belong to a family or family group, who are blood relatives or related by marriage or similar links	%
Other families (not family members of the group above)	%
Venture capital companies, private investors, business angels, ...	%
Other companies (including parent company)	%
Non-family employees	%
Other (please specify .....	%
<b>Total</b>	<b>100%</b>

**2. MANAGEMENT SYSTEMS IMPLEMENTED IN THE COMPANY**

2.1. Which management system standards is your company certified to and what was the year of certification?

<i>Management Systems Standards</i>	<i>YES</i>	<i>NO</i>	<i>Year of certification</i>
<i>ISO 9001</i>			
<i>ISO 14001</i>			
<i>ISO 18001</i>			
<i>Others (please specify)</i> .....			

**3. MANAGEMENT SYSTEMS INTEGRATION**

***Answer only if some of the different standards have been integrated into a single Management System.... (Otherwise, go to page 6 section 4)***

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

- The following ones: .....
- All of them

3.2. To achieve the integration, did you follow any standards/guidelines?

- PAS 99:2006 (BSI)
- Other (please specify): .....

3.3. During the integration process of the standards mentioned in 3.1., did you use...

	Yes	No
... a process map	<input type="checkbox"/>	<input type="checkbox"/>
... an analysis of the common elements of the standards	<input type="checkbox"/>	<input type="checkbox"/>
... an organization's own model	<input type="checkbox"/>	<input type="checkbox"/>
... the "PDCA cycle" for all the processes of the integrated system	<input type="checkbox"/>	<input type="checkbox"/>

3.4. Regarding the standards of the integrated system...

*Indicate you answer with an "X"*

The following "actors" involved in the different standards of the system...	... are ...	
	Different people	The same person
Management system manager		
Management system representative		
Inspectors		

Indicate you answer with an "X"

The following documentation...	...has been integrated...		
	Not integrated	Partially (*)	Fully (**)
Company policy			
Company objectives			
Manual			
Work procedures			
Work instructions			
Records			

(\*) From several existing independent documents, they have been "merged" and a new one has been drafted (\*\*) A new, single, and integrated document has been drafted

Indicate you answer with an "X"

The following work procedures...	...have been integrated...		
	Not integrated	Partially (*)	Fully (**)
Planning			
Internal audits			
Management review			
Control of nonconformities			
Preventive and corrective action			
Product realization			
Resource management			
Determination of system requirements			
System improvement			
Document control			
Record control			
Internal communication			

(\*) From several existing independent documents, they have been "merged" and a new one has been drafted (\*\*) A new, single and integrated procedure has been drafted

3.5. During the process of integration of the different management system standards, which were the main difficulties identified?

(1- not at all important; 2- of little importance; 3- important; 4-moderately important; 5- very important)

Difficulties detected during the integration process	Importance				
	1	2	3	4	5
Lack of integration guidelines (books, articles, documents, ...)	1	2	3	4	5
Lack of government support	1	2	3	4	5
Lack of human resources	1	2	3	4	5
Differences in models for implemented standards (PDCA, process management, ...)	1	2	3	4	5
Differences in the elements of the standards (internal audit, external communication, policy, ...)	1	2	3	4	5
Lack of department collaboration	1	2	3	4	5
Lack of specialised auditors	1	2	3	4	5
Lack of technological support (integration to ERP, ...)	1	2	3	4	5
Lack of specialised consultants	1	2	3	4	5
Not efficient implementation of the first system	1	2	3	4	5
Excessive time to conduct the integration	1	2	3	4	5
Lack of employees motivation	1	2	3	4	5
Differences in the scope of standards	1	2	3	4	5
Lack of internal organizational culture	1	2	3	4	5
Lack of certifying organizations support	1	2	3	4	5
Other (please specify): .....	1	2	3	4	5

3.6. During the process of integration of the different management system standards, which were the main benefits identified?

(1- not at all important; 2- of little importance; 3- important; 4-moderately important; 5- very important)

Benefits obtained from integration	Importance				
	1	2	3	4	5
Improvement of the systems understanding and use	1	2	3	4	5
Better options to include new systems	1	2	3	4	5
Task simplification (documentation control, requirements)	1	2	3	4	5
Increase of organizational efficiency (cost reduction, ...)	1	2	3	4	5
Better use of the internal and external audit results	1	2	3	4	5
Firm image improvements	1	2	3	4	5
Organizational global strategy improvements	1	2	3	4	5
Employee motivation improvements	1	2	3	4	5
Department barriers elimination and higher collaboration	1	2	3	4	5
Higher stakeholders implication	1	2	3	4	5
Organizational culture improvement	1	2	3	4	5
Better communication	1	2	3	4	5
Other (please specify): .....	1	2	3	4	5

**4. AUDITS**

4.1. Regarding internal and external audits of the different implemented standards:

	INTERNAL	EXTERNAL	
The audit teams/auditors that carry out the audit are the...	<input type="checkbox"/>	<input type="checkbox"/>	Same audit team for all standards
	<input type="checkbox"/>	<input type="checkbox"/>	Same audit team for selected standards (please specify which standards:.....)
	<input type="checkbox"/>	<input type="checkbox"/>	Different audit teams
The audits are carried out at the...	<input type="checkbox"/>	<input type="checkbox"/>	Same time for all standards
	<input type="checkbox"/>	<input type="checkbox"/>	Same time for selected standards (please specify which standards:.....)
	<input type="checkbox"/>	<input type="checkbox"/>	Different times
The audit teams/auditors audit the different implemented standards...	<input type="checkbox"/>	<input type="checkbox"/>	As independent systems
	<input type="checkbox"/>	<input type="checkbox"/>	As interrelated systems
	<input type="checkbox"/>	<input type="checkbox"/>	As an integrated system
The audits of the different implemented standards use...	<input type="checkbox"/>	<input type="checkbox"/>	One audit plan for all standards
	<input type="checkbox"/>	<input type="checkbox"/>	Different audit plans for each standard
The audits of the different implemented standards use...	<input type="checkbox"/>	<input type="checkbox"/>	One audit report for all standards
	<input type="checkbox"/>	<input type="checkbox"/>	Different audit reports for each standard
The audits are carried out...	<input type="checkbox"/>	<input type="checkbox"/>	Process by process
	<input type="checkbox"/>	<input type="checkbox"/>	Requirement by requirement
	<input type="checkbox"/>	<input type="checkbox"/>	Do not know
The audits are carried out following the guidelines proposed by...	<input type="checkbox"/>	<input type="checkbox"/>	ISO 19011
	<input type="checkbox"/>	<input type="checkbox"/>	Another guideline
	<input type="checkbox"/>	<input type="checkbox"/>	No guideline
	<input type="checkbox"/>	<input type="checkbox"/>	Do not know
The audits are carried out with a frequency of ...	<input type="checkbox"/>	<input type="checkbox"/>	Less than 6 months
	<input type="checkbox"/>	<input type="checkbox"/>	Between 6 months and less than 1 year
	<input type="checkbox"/>	<input type="checkbox"/>	Between 1 and 3 years
The audit ...	<input type="checkbox"/>	<input type="checkbox"/>	Only detects nonconformities
	<input type="checkbox"/>	<input type="checkbox"/>	Shows improvement opportunities for the implementation of each standard
	<input type="checkbox"/>	<input type="checkbox"/>	Shows improvement opportunities for integration
	<input type="checkbox"/>	<input type="checkbox"/>	Shows improvement opportunities for the implementation of each standard and for integration

4.2. How important would the following aspects of the audits be for your organization?

(1- not at all important; 2- of little importance; 3- important; 4-moderately important; 5- very important)

Regarding the audits	Importance				
	1	2	3	4	5
That the auditors of different systems are the same	1	2	3	4	5
That the audits against different standards are simultaneous	1	2	3	4	5
That the audits are conducted as an integrated system	1	2	3	4	5
That the audits against different standards use the same auditing plan	1	2	3	4	5
That the audits against different standards generate only one report	1	2	3	4	5
That the audits are done "process by process" instead of "department by department"	1	2	3	4	5
That the audits follow the ISO 19011 standard	1	2	3	4	5
That the audits are conducted every 6 months at minimum	1	2	3	4	5
That the audits suggest opportunities to improve the implementation of each standard	1	2	3	4	5
That the audits suggest opportunities to improve the integration of systems	1	2	3	4	5

## 5. THE FUTURE OF MANAGEMENT SYSTEM STANDARDS

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

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

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

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

**6. CUSTOMER SATISFACTION**

6.1. In relation to the following dimensions, what impact would you say that the integration of management systems has brought on the satisfaction of your customers?

(1 - is much worse, 2 - has worsened, 3 – has remained the same; 4 - has improved, 5 – is much improved)

Satisfaction dimensions	Customer satisfaction				
	1	2	3	4	5
Product quality	1	2	3	4	5
Customer service quality	1	2	3	4	5
Perceived value	1	2	3	4	5
Firm image	1	2	3	4	5
Customer complaints handling	1	2	3	4	5

6.2. Do you have standardized procedures in relation to the following aspects?

- Customer satisfaction code of conduct
- Customer complaints handling system
- Customer dispute resolution
- Customer satisfaction measurement and analysis

6.3. Do you follow any standard for procedures mentioned in 6.2? Which ones?

- 1: .....
- 2: .....
- 3: .....
- 4: .....

## 7. INNOVATION

7.1. To what extent has your company introduced significant changes in the following items during the last 4 years (2007-2010)? Indicate the importance of each of the following:

*(1- no changes; 2- unimportant changes ; 3- important ; 4-fairly important; 5- very important)*

Changes in...	Importance of change				
<b>PRODUCT</b>					
New or significantly improved goods	1	2	3	4	5
<b>PROCESS</b>					
New or significantly improved methods of manufacturing	1	2	3	4	5
New or significantly improved logistics	1	2	3	4	5
New or significantly improved supporting activities for your processes	1	2	3	4	5
<b>ORGANIZATION</b>					
New business practices for organising procedures	1	2	3	4	5
New methods of organising human resources	1	2	3	4	5
New methods of organising external relations	1	2	3	4	5
<b>MARKETING</b>					
Significant changes to the aesthetic design or packaging	1	2	3	4	5
New media or techniques for product promotion	1	2	3	4	5
New methods for product placement or sales channels	1	2	3	4	5
New methods of pricing	1	2	3	4	5

**Thank you for your collaboration to this study.**



### Annex 3. Interview guidelines

#### ORGANIZATION

- How is the company organized now?
  - o Structure?
  - o Employees?
  - o Products?
- What changes occurred in the company in the last four years?
  - o Customers?
  - o Suppliers?
  - o Environment?
  - o Processes?
  - o Resources?
  - o Objectives?

#### MANAGEMENT SYSTEMS

- What management systems are currently operated by the company?
- Who is responsible for these management systems?
- Were any new management systems introduced in the last four years?
- If new systems were introduced, what were the reasons or motivation to implement them?
- If new systems were not introduced, what were the reasons not to implement them?
- What are the main benefits of each of the current management systems?
- What are the main challenges in operating the current management systems?
- What are the plans for the future regarding standardized management systems?

#### STANDARDS

- Were any new standards, guidelines or models used in the last four years?
  - o Standards (for management systems, e.g., ISO 27001, ISO 28000, ...)?
  - o Guidelines (for support, e.g., ISO 10001, ISO 10002, ISO 14031, ...)?
  - o Models (for business excellence, e.g., EFQM, ...)?
- If new guidelines or models were applied:
  - o How were they incorporated into the current system?
  - o How useful were they?
- Are there any plans for applying new guidelines or models?

#### INTEGRATION

- If new management systems were introduced in the last for years:
  - o Were they integrated in the existing integrated management system?
  - o In which order were they implemented?
  - o What model was used for integration (or implementation, if not integrated)?
  - o Which new processes, resources or objectives were introduced as a consequence?
  - o Which existing processes, resources or objectives were modified as a consequence?
  - o What benefits were obtained from integration (or implementation, if not integrated)?
  - o What challenges were seen during integration (or implementation, if not integrated)?
- If new management systems were not introduced in the last four years:
  - o How was the current integrated management system maintained?
  - o What changes, if any, were made in the current integrated management system?
  - o If changes were made, what were the reasons or motivation to do them?
  - o How was the current integrated management system improved?
  - o Were old benefits maintained and/or new benefits of integration obtained?
  - o What were any new challenges encountered in maintaining the integration?

## INTERNAL AUDITING

- How are internal audits currently conducted?
  - o How are audits against different standards coordinated?
    - Audit objectives (e.g., coordination of objectives across systems, ...)?
    - Audit processes (e.g., coordination of schedules, usage of auditing methods, ...)?
    - Audit resources (e.g., integration of audit teams, simultaneous audits, ...)?
    - Audit results (e.g., integration of reports, usage of findings across systems, ...)?
  - o How, and by whom, are internal audits planned?
    - A. Single audit plan for all standards
    - B. Single audit plan for some, but not all, standards
    - C. Different audit plans for different standards
  - o For different standards, are they conducted at the same time or at different times?
    - A. Same time for all standards
    - B. Same time for specific, but not all, standards
    - C. Different times for all standards
  - o Who conducts internal audits against different standards?
    - A. Same person for all standards
    - B. Specific person(s) for specific standard(s), but always in the same team
    - C. Different persons for different standards in different teams
  - o How are auditors auditing the integrated management system?
    - A. Following the business processes (all standards' requirements for one process)
    - B. Following the standards' requirements (all processes for each requirement)
  - o How, and to whom, are the results of internal audits reported?
    - A. Single audit report for all standards
    - D. Single audit report for some, but not all, standards
    - E. Different audit reports for different standards
- In auditing of the integrated management system:
  - o What challenges are encountered?
  - o How are these challenges managed?
  - o How do the auditors identify opportunities for improvement in the integrated system?
- What changes were introduced to the internal audits in the last four years?

## REGISTRATION

- What changes, if any, occurred in the registration in the last four years?
  - o Any new certificates added?
  - o Any existing certificates not maintained?
  - o Changes in the type of certification?
  - o Changes in the registrars?
- What are the plans for future in terms of registration?
  - o New certificates?
  - o Maintenance of existing certificates?