

Integrating Management Systems: A dynamic study of Spanish firms

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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, 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 with 167856 ISO 9001 certificates and 94938 ISO 14001 certificates.

During the last four years, both this proliferation and the increasing importance of MSSs have been demonstrated (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 and 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 et al. 2010).

With the aim to survey companies on the impact of MS 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. The purpose of this paper is to understand how the integration of MSs changes within a period of time. Moreover, it aims to analyse the integration of different MSs in Spanish firms in a four year period. The overall aim is to analyse the impact of integration on companies.

First, a review of the literature on the IMS is presented. 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.

2. Literature review

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). 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. 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 at a lesser extent.

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 and Jonker, 2003; Griffith and Bhutto, 2009; 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 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 and Willborn, 1998; Douglas and Glen, 2000; Renzi and Cappelli, 2000; Zutshi and Sohal, 2005; Salomone, 2008; Asif et al., 2009; Griffith and Bhutto, 2009; Khanna, 2010 and Asif et al., 2010). Today, many organisations 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, organisations can look to achieve significant internal benefits as well as meeting any external demands (Asif 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 and Willborn, 1998a; Karapetrovic, 2003; Zutshi and Sohal, 2005; Karapetrovic et al., 2006; Asif et al., 2009; Matias and Coelho, 2002; Zutshi and Sohal, 2005; Zeng et al., 2007 and Asif et al., 2009).

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. 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 Catalan 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 and Casadesús, 2010). 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 Karepetrovic 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 and Casadesús, 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 in 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 integration level of the different elements of the IMS.

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. 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.

From the 176 companies that answered in 2006, with a subsequent follow-up by telephone, 76 valid answers were obtained. Table 1 compares the features of two surveys.

Table 1. Profile of the 2006 and 2010 surveys (Source: own elaboration)

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%

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 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 Casadesús, 2006).

An empirical analysis on the evolution of the implementation and integration of MSs is provided in the next section. 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 analyse the significant differences of the integration variables over time.

4. Findings

4.1. 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 1 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), that 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.

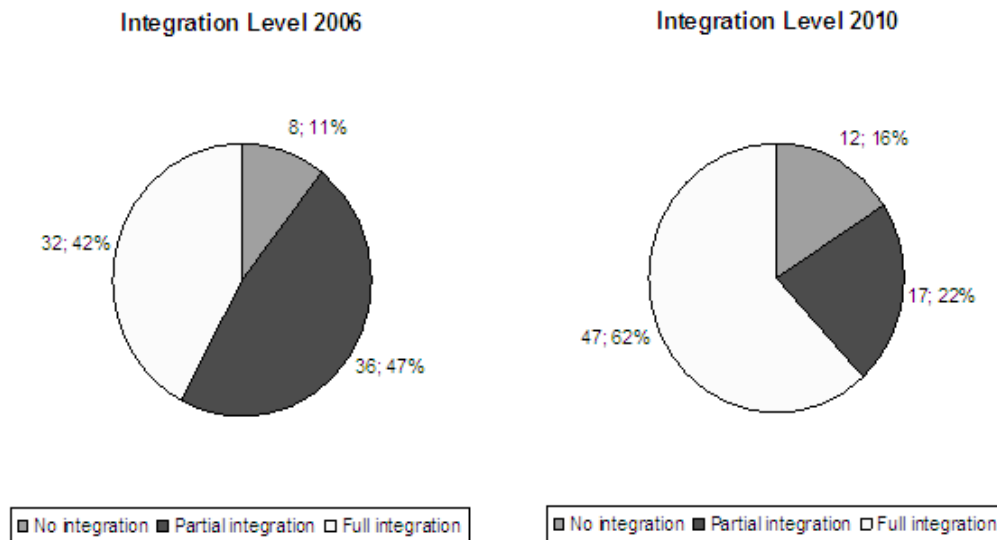


Figure 1. Integration level 2006-2010 (Source: own elaboration)

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 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 0.005, 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).

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.

In terms of the human resources involved in the different MSs, Figure 2 illustrates that both in 2006 and 2010, the level of integration is much higher at the top level management than at the shop floor level. 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.

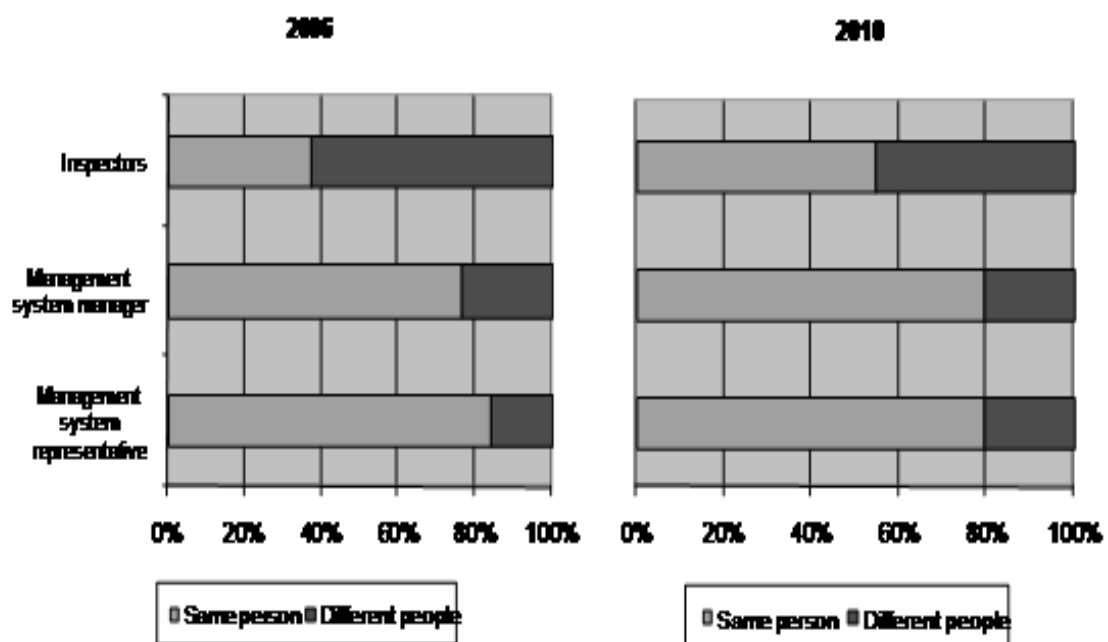


Figure 2. Integration of human resources involved in the different MSs

Source: own elaboration

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. 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.

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 3).

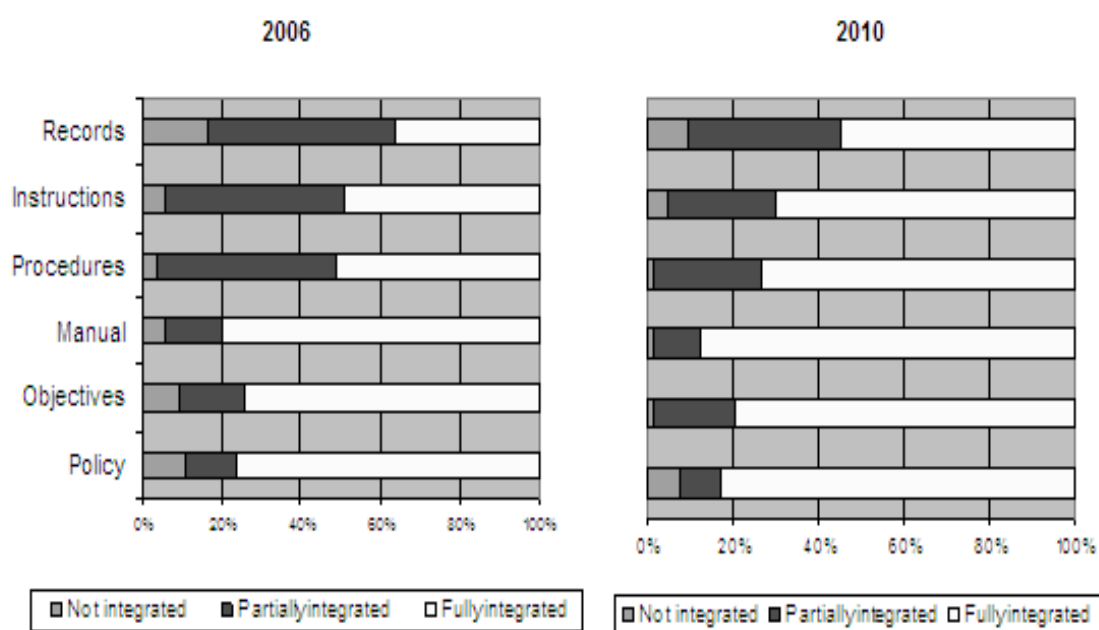


Figure 3. Integration of documentation and goals 2006-2010

Source: own elaboration

Comparing the 2006 and 2010 samples, 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.

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 4).

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, because many benefits and efficiencies are related to the integration of audits. For instance, the optimised use of resources is mentioned by Karapetrovic & Willborn, 1998b; Douglas & Glen, 2000; Karapetrovic, 2002; Zeng et al., 2005; Zeng et al., 2007; Zutshi & Sohal, 2005a; Pojasek, 2006 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).

Significant differences for procedures are detected using the Wilcoxon test 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.

5. Conclusions

The main objective of this research is to contribute to the understanding on how IMSs evolve over was undertaken. We conducted an empirical analysis which investigates data on the implementation and integration OF MSs 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 & Casadesús, 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 & Casadesús (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.

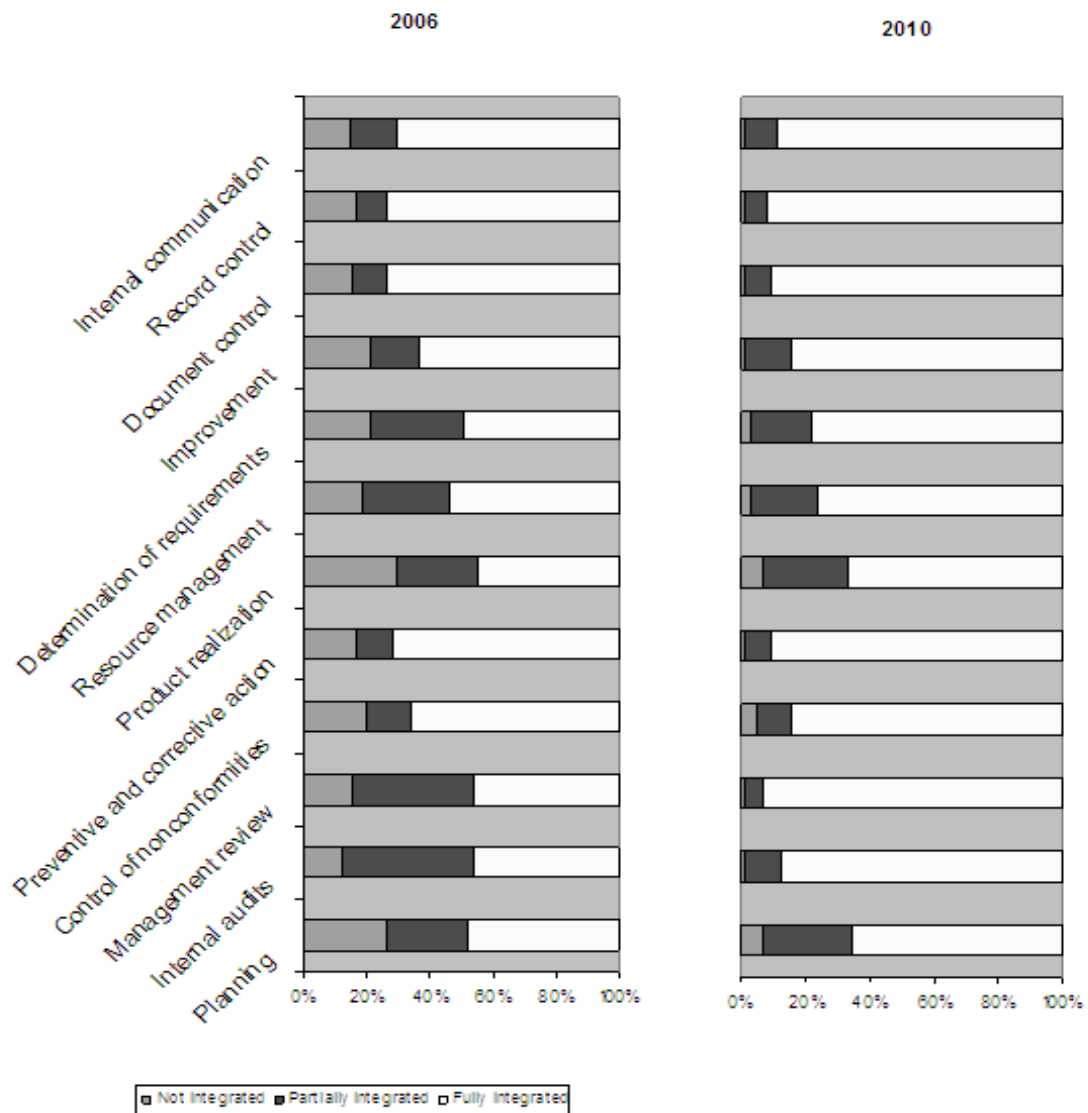


Figure 3. Integration of documentation and goals 2006-2010

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.

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 evolution 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, although obtaining static results, lead to very similar conclusions.

For future research, it would be interesting to study which is the perception of firms regarding the integration benefits and difficulties and how they evolve 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 integrationtime. In order to accomplish these objectives, the first study on the evolution of integration of MSs.

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