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# **Union is strength The integration of ISO 9001 and ISO 14001 contributes to improve the firms' financial performance**

## **Abstract**

**Purpose** – The purpose of this paper is to fill a gap in the management systems (MSs) field by addressing whether the implementation of an integrated management system (IMS) and the integration level of its elements bring benefits and/or challenges to companies and whether these are related to corporate financial performance (CFP).

**Design/methodology/approach** – Drawing on a Spanish sample of 76 organizations with at least an environmental and a quality MS, the authors perform a partial least squares (PLS) analysis.

**Findings** – The results showed evidence of a positive relationship of the integration benefits with respect to the integration level of MS documentation and the integration level of MS procedures that overweights the negative significant effect of difficulties of integration in relation to the integration level of MS documentation and the integration level of MS procedures. The authors also found new evidence on this topic, related to a positive significant relationship between the integration level of MS procedures and CFP that overweights the negative significant effect of integration level of MS documentation on CFP.

**Research limitations/implications** – This study used cross-sectional data from interviewees who are Catalan managers. Furthermore, the mail survey was answered in 2010 at the beginning of the economic crisis from which results should be taken with caution given that the situation might have changed due to the continuation of the Spanish economic crisis.

**Practical implications** – The findings could allow companies' managers to understand the extent to which the integration of quality management practices and environmental management practices influences some of the most relevant firms' financial performance dimensions.

**Originality/value** – As far as the authors know, there are not empirical studies that address the relationship of IMS with a measure of performance such as CFP.

**Keywords** ISO 14001, ISO 9001, Corporate financial performance, Integrated management systems

## **1. Introduction**

During the last three decades, environmental, quality and other management systems (MSs) and their corresponding standards have proliferated worldwide. For instance, the number of certificates delivered at the end of 2013 for the two most implemented standards of the International Organization for Standardization (ISO), that is, the ISO 9001 and ISO 14001 standards, reached 1,129,446 and 301,647, respectively (ISO, 2014). Other MSs can also be certified with the standards 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) or energy management (ISO 50001). As various authors highlight (e.g. Delmas, 2001; Tarí et al., 2012), the ISO 9001 and 14001 standards are voluntary and fulfil the organizational objectives of systematizing and formalizing business processes, translating these to procedures and documenting the systems. Thus, they do not measure the quality of a firm's products or services or a firm's environmental results, hence they are not performance standards. Given this "non-performance" orientation of the standards, the majority of studies have analysed the benefits that may be reaped from ISO 9001 and ISO 14001 certification and implementation as well as the challenges firms may face (Simon et al., 2012a). These studies have also analysed the benefits and difficulties of implementing an integrated management system (IMS) that joins together all the systems in the organization. The benefits of IMS have been found to be higher to the benefits of implementing the MSs individually due to the existing synergies among the different systems, which in turn makes the management of the IMS more efficient. However, as far as we know, there are no empirical studies that address the relationship of IMS with a measure of performance such as corporate financial performance (CFP). Therefore, the objectives of this paper are twofold. First, we aim to analyse whether the benefits and difficulties of implementing an IMS have an effect on the integration level of the different IMS elements, namely the procedures and the documentation. Second, we want to analyse whether the integration level of the companies' MSs has a significant impact on their CFP. The paper is structured as follows. In the first section we review the literature on the benefits and difficulties of the implementation of ISO 9001 and ISO 14001 based MSs, their relationship with financial performance and the studies (or the lack of studies) on IMS and financial performance. Then we delve into the methodology followed to test our hypothesis and we present the results of a model linking IMS and CFP. Finally, we discuss the results and offer some concluding remarks.

## **2. Literature review**

### **2.1 Benefits and difficulties of MSs**

The benefits of implementing QMS and EMS and their related standards, ISO 9001 and ISO 14001, have been widely studied (Boiral and Gendron, 2011; Heras-Saizarbitoria and Boiral, 2013). From a theoretical point of view, QMS are likely to increase firms' competitiveness by being more efficient and lowering the cost of quality, thus increasing productivity, on-time delivery and customer satisfaction (Casadesus and Karapetrovic, 2005a, b; Santos et al., 2012).

Following a similar reasoning, the implementation of an EMS can bring competitive advantage to companies as it may help them to become aware of and reduce inefficiencies in their use of resources (Holt, 2011; Curcovic and Sroufe, 2011; Tarí et al., 2012; Grolleau et al., 2013). For example, ISO 9001 adoption has been related to the improvement of the internal efficiency of the company (Douglas and Glen, 2000; Terziovski et al., 2003; Jang and Lin, 2008; Sharma, 2005; Heras-Saizarbitoria et al., 2011),

quality improvement (Escanciano et al., 2001; Casadesus and Karapetrovic, 2005a, b), customer satisfaction (González-Torre et al., 2001), improved image for competitors and stakeholders (Casadesus and Karapetrovic, 2005a, b) and employee motivation (Santos and Escanciano, 2002; Kunnanatt, 2007). The same kind of study has been undertaken regarding ISO 14001 benefits (Heras-Saizarbitoria and Boiral, 2013). The main benefits of this standard are linked to a reduction in the usage of resources and enhanced image for stakeholders (Delmas, 2001; Bansal and Bogner, 2002; Melnyk et al., 2002; Bansal and Hunter, 2003; González-Benito and González-Benito, 2005; Yin and Schmeidler, 2009; Rodriguez-Melo and Mansouri, 2011).

On the other hand, other studies consider that the implementation of MSs and their related standards do not necessarily drive to more competitiveness (Grolleau et al., 2013). In fact, according to some studies, they can lead to decrease firms' competitiveness (Konar and Cohen, 2001; Corbett et al., 2005). Moreover, firms can face many difficulties when implementing MSs, such as the lack of top management commitment, the limited resources, the challenging integration of these new management practices in the organizational culture, the requirements of the system, the organizational structure and commitment of the human resources (managers and workers) (Leung et al., 1999; Casadesus and Karapetrovic, 2005a, b; Psomas et al., 2011; Sampaio et al., 2009; Heras-Saizarbitoria and Boiral, 2013).

Despite the benefits associated to the implementation of MSs and their corresponding standards, unless certification is not positively associated with financial performance, it may lack credibility and be considered as another transitory management trend (Sharma, 2005). Nonetheless, whether Management Systems Standards (MSSs) certification is associated with more objective measures of performance, such as financial performance, remains an issue (Sharma, 2005), which we attempt to tackle in the following section.

## **2.2 MS standards and financial performance**

Although many studies to analyse the relationship between the implementation and certification of ISO 9001 or ISO 14001 and financial performance have been undertaken, the majority of them lead to inconclusive results (Feng et al., 2008; Sampaio et al., 2012; Tarí et al., 2012). There are some empirical investigations that conclude that there is a positive relationship between ISO 9001 or ISO 14001 certification and corporate financial improvement (Lee et al., 2001; Beirao and Sarsfield Cabral, 2002; Janas and Luczak, 2002; Nicolau and Sellers, 2002; Wayhan et al., 2002; Chow-Chua et al., 2003; Kaynak, 2003; Dimara et al., 2004; Naser et al., 2004; Parast et al., 2011; Shahin and Dabestani, 2011; Castka and Corbett, 2015), whilst others do not empirically support this association (Häversjö, 2000; Lima et al., 2000; Aarts and Vos, 2001; Heras et al., 2001, 2002a, b; King and Lenox, 2002; Tsekouras et al., 2002; Martínez-Costa and Martínez-Lorente, 2003; Al-Tuwaijri et al., 2004; Corbett et al., 2005; Moneva and Ortas, 2010; Amato and Amato, 2012; Al-Najjar and Anfimiadou, 2012).

### **2.2.1 ISO 9001 and financial performance.**

The theoretical underpinnings that lay under the proposal that the implementation of ISO 9001 can increase financial performance are Garvin's (1984) and Deming's (1986) quality models, which put forward that, as the quality of a company is improved, waste is eliminated, costs are reduced, and financial performance improves. Empirical studies confirm this proposition. For instance Sharma (2005) found in a panel data sample of six years in Singapore that the financial performance of firms that had achieved ISO 9001 certification was significantly superior to the non-certified firms.

Applying event-study methods from 7,238 US manufacturing firms, Corbett et al. (2005) put forward that ISO 9001 certification leads to a significant increase in a series of financial measures (the return

on assets (ROA), return on sales (ROS) and Tobin's q sales, cost of goods divided by sales, and sales divided by assets). Terlaak and King (2006) used a 232 firm sample and concluded that ISO 9001 increased the sales of the companies. For their part, Benner and Veloso (2008) also used panel data from 650 firms in the car supplier industry and found that early implementation of ISO 9001 had significant positive impact on financial performance measured with increases in the firm's ROA, ROS and Tobin's q. In the same vein, Kafetzopoulos and Gotzamani (2014) found a positive relationship of ISO 9001 and food standards with financial performance in 347 Greek firms. On the opposite, several authors have proposed a negative effect of ISO 9001 certification on firm's performance. For example, Terziovski et al. (1997) examined 962 Australian and 379 New Zealand companies to find that among several financial variables only cash flow significantly increased with certification.

However, other variables studied such as market share or sales growth did not increase. Similarly, Lima et al. (2000) analysed 129 firms from Brazil on five indicators (operating income on total assets, net income on total assets, sales to total assets, operating income to sales and net income to sales) and stated that no discrepancy in the performance levels can be found between certified and non-certified firms. For their part, Martínez-Costa et al. (2008) study a sample of 700 Spanish firms to find that ISO 9001 certification had little or no effect on the firms' productivity and ROA. Also, with a survey of 204 firms, McGuire and Dilts (2008) found no significant effect of ISO 9001 on the stock market valuation.

### **2.2.2 ISO 14001 and financial performance.**

Due to the similarities of the two standards, the reasoning for ISO 14001 to bring financial enhancements can consequently be proposed. The implementation of an environmental MS standard can increase a firm's added value, e.g., through an improvement of productivity (Nishitani, 2011). Thus, it is expected that EMS implementation brings about sales increase through an increase in the demand of environmentally conscious customers and cost reductions through an improvement in productivity, as well as the achievement of environmental objectives (Nishitani, 2011). Empirically, several authors have studied the effect of EMS on financial performance.

For instance, Kinbara and Kaneko (2005) found a positive effect of environmental efficiency on ROA in Japanese firms. Darnall et al. (2007) modelled data from an OECD survey of 4,200 manufacturing facilities in France, Germany, Hungary, Canada, Japan, Norway and the USA in 2003, and found a positive relationship between several environmental performance measures (e.g. water waste efficiency improvements and reduction in air pollution) and financial profits. Also, Darnall et al. (2008) examined survey data from more than 1,000 manufacturers from different countries and present empirical evidence supporting EMS improve profitability and growth. Nishitani (2011) used panel data on Japanese export-oriented companies from 1996 to 2007 and found that implementation of an EMS enhances firm's value. Tognere et al. (2012) present empirical evidence on the effect environmental management certification (ISO 14001) on 552 Brazilian companies' profitability using panel data between 1996 and 2008. The results show that certified firms were more profitable than firms without certification. Conversely, it has also been argued that EMSs do not increase financial performance.

EMS involve significant investment and important modifications of manufacturing processes in order to reduce pollution and energy consumption and/or to use renewable sources of energy. As these environmental investments increase production costs that cannot be reported in the product selling prices, they can negatively affect the financial performance of companies (Klassen and Whybark, 1999; Albertini, 2013). Empirically, this reasoning has been tackled by Konar and Cohen (2001) who used data on 321 US publicly traded firms to find that environmental performance had a significant negative effect on the market value of the firms. For their part, Watson et al. (2004) examined the effect of EMS certification on the variation of the ratios of ROA, business margins and other similar financial ratios

and found that there were no significant differences between certified and non-certified companies. Similarly, a lack of proof of performance change was found by Cañón and Garcés (2006), who analysed the impact of ISO 14001 certification on improved market values in 80 large Spanish companies. In the same line, no significant effect between EMS implementation and financial performance measures such as ROS and ROA was reported by Toyozumi (2007), who used pooled data from Japanese firms. Cañón-de-Francia and Garcés-Ayerbe (2009) found that ISO 14001 certification had a negative effect on the market value of less polluting and less internationalized firms.

### **2.3 IMSs and financial performance**

Although the majority of studies examine the effect of the implementation of a single MSs on firm performance, the reality is that more and more firms are implementing more than one MS (Bernardo et al., 2012; Simon et al., 2012b). In fact, Grolleau et al. (2013) or Von-Ahsen (2014) propose that because of their similarities and complementarities, quality and environmental MSs and their corresponding standards are more likely to be associated to higher business performance when implemented together than when only one of these standards is implemented.

Moreover, firms can decide to integrate several MSs into a single, jointly managed system (Karapetrovic and Willborn, 1998; Douglas and Glen, 2000; Karapetrovic et al., 2006; Zeng et al., 2007; Bernardo et al., 2009). Empirical studies regarding the scope and the level of integration confirm this idea (Zutshi and Sohal, 2005; Jorgensen et al., 2006; Karapetrovic et al., 2006; Pojasek, 2006; Zeng et al., 2007; Salomone, 2008; Karapetrovic and Casadesus, 2009; Bernardo et al., 2009, 2010; Asif et al., 2010; Khanna et al., 2010; Leopoulos et al., 2010; López-Fresno, 2010; Simon et al., 2011, 2012a, b; 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 MSs (Khanna et al., 2010). 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, such as the human resources, the documentation, the audits or the procedures (Jørgensen, 2008). 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 (1998). Karapetrovic et al. (2006) conducted an empirical study in order to examine 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, 2012; Simon et al., 2011, 2012a).

Standardized MSs usually 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). 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 MS point of view, it would be more appropriate to merge the different MSs into one system, because it reduces duplicate work and bureaucracy (Jørgensen, 2008). Thus, today many organizations are implementing MSs not just to fulfil 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).

Therefore, 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; Casadesus and Karapetrovic, 2005a, b; Zutshi and Sohal, 2005; Zeng et al., 2007; Curcovic et al., 2008; Salomone, 2008; Asif et al., 2009; Yin and Schmeidler, 2009; Khanna et al., 2010; Asif et al., 2010; Von-Ahsen, 2014). 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.

Accordingly, our first and second hypotheses are:

H1. The benefits of IMS directly and positively affect the integration level of the documentation resources of the organizations.

H2. The benefits of IMS directly and positively affect the integration level of the procedures of the organizations.

Despite the numerous contributions defending the implementation of an IMS, firms also face some difficulties during the integration process (Karapetrovic and Willborn, 1998; Karapetrovic, 2003). The main difficulties cited in the literature 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 (Karapetrovic and Willborn, 1998; Wassenaar and Grocott, 1999; Matias and Coelho, 2002; Zutshi and Sohal, 2005; Karapetrovic et al., 2006; Zeng et al., 2007; Asif et al., 2009). Hence, our third and fourth hypotheses are:

H3. The difficulties of IMS directly and negatively affect the integration level of the documentation resources of the organizations.

H4. The difficulties of IMS directly and negatively affect the integration level of the procedures of the organizations.

However, although some authors (e.g. Asif et al., 2010; Santos et al., 2011; Oliveira, 2013) theoretically propose that due to their numerous benefits mentioned above, the implementations of an IMS should lead to improved financial performance, as far as we know, there are not quantitative empirical studies testing this relationship. Thus, our fifth hypothesis is:

H5. The integration level of the documentation resources directly and positively affects CFP.

The effect of the difficulties of integration on CFP has not empirically been addressed either. Therefore, we propose that our last hypothesis is:

H6. The integration level of the procedures directly and positively affects CFP.

### **3. Methodology**

#### **3.1 Questionnaire and measures used**

To test our hypotheses we take as a reference framework the measurement model developed and tested by Simon et al. (2014) for examining the difficulties in the integration of MSs. They find that difficulties of integration negatively affect both the integration level of MS documentation and the integration level of MS procedures.

However, they do not analyse how the implementation of IMSs can affect CFP. For this reason, we introduce their three constructs – difficulties of integration, documentation and procedures – in our model and add two additional construct – benefits of integration (Simon and Petnji Yaya, 2012) and CFP, which allows us to study the relationship between CFP and two constructs: the integration level of MS documentation and the integration level of MS procedures. T

hus, we adopted the measurement items from the conceptual and empirical research of Juran (1986), Karapetrovic et al. (2006), Karapetrovic and Casadesus (2009) Simon and Petnji Yaya (2012) and Simon et al. (2014) for generating the constructs “difficulties of integration”, “benefits of integration”, “documentation” and “procedures”. For the measurement of all items of “difficulties of integration” and “benefits of integration”, we use a Likert scale ranging from 1 (not at all important) to 5 (very important) while for the items to assess “documentation” and “procedures” we use a Likert scale ranging from 1 (not integrated) to 3 (fully integrated). To construct the “CFP” dimension, we utilize the following items: ROA, return on equity (ROE), ROS, operating profits and cash flow (Claver et al., 2007; Iraldo et al., 2009; Marti et al., 2015; Molina-Azorin et al., 2009; Moneva and Ortas, 2010).

ROA represents the amount of income a company gains for each euro of assets it controls, that is, it measures the efficiency of assets in producing income. ROE indicates the amount of net income generated by the firm with the shareholder investment. ROS represents the net income gained by the firm for each euro of sales. Operating profits indicates the profits that a firm gains after removing operating expenses (e.g. depreciation). Cash flow measures the firm’s liquidity, indicating whether a firm has financial capacity to invest in implementing an IMS. These items are measured using the widely known SABI database provided by Bureau van Dijk ([www.bvdep.com/](http://www.bvdep.com/)). We match the verified financial data provided by Bureau van Dijk with those obtained through questionnaire using the name of the company.

### **3.2 Sampling and data collection**

This research uses the data of the respondents of a mail survey conducted by Simon and Petnji Yaya (2012) and Simon et al. (2012a). This mentioned mail survey with the questionnaire was sent to 176 Catalan companies which had ISO 9001 and ISO 14001 certificates, in February 2010. Managers responsible for the QMS and/or EMS in the firms answered it between February and June 2010. We retained 76 questionnaires with complete and valid answers being the response rate representative as shown by Simon and Petnji Yaya (2012) and Simon et al. (2012a) who examine this sample to analyse the effect of integration characteristics on the innovation and customer satisfaction and the relationship between the difficulties of integration and the integration level of MSs, respectively.

Finally, due to the lack of financial data our sample includes 50 companies. Although the sample size is small, it is sufficient to provide efficient results according to Vandenberg (1996) who indicated that the efficient sample size for a four-construct product with five attributes per construct is in the range of 50 responses. This is congruent with two popular rules of thumb indicating that the value resulting of multiplying the number of estimated parameters by five must be lower than the sample size (Bentler and Chou, 1987) and the minimum sample size of a partial least squares (PLS) path model is ten times the maximum number of paths for the most predicted construct (Hair et al., 2012). However, Huth



(2008) demonstrates that the failure to comply with the later rule of thumb does not substantially affect the quality of the model estimated.

#### **4. Data analysis and results**

##### **4.1 Assessment of the measures**

In order to model the effect of IMSs on CFP constructs we apply an exploratory principal components factor analysis using the normalized varimax rotation method to the items of each considered dimension: difficulties of integration, benefits of integration, documentation, procedures and CFP (Hair et al., 1998). Each item that possesses a factor loading greater than 0.6 (Chin, 1998a, b; Gallardo-Vázquez and Sanchez-Hernandez, 2014) is part of only one factor with eigenvalue  $W_1$  while we drop poorly loaded items. We measure the adequacy of the factor analysis adopting the Barlett's sphericity and Kaiser-Meyer-Olkin (KMO) tests. The results are shown in Table I. The KMO test for CFP, benefits and procedures is above 0.6 (significance level is around 0.6). However, the results of the KMO test reach the value of 0.573 for difficulties and 0.576 for documentation, not being fully satisfactory. Although the results of the KMO measures are not fully satisfactory for the difficulties and documentation, their corresponding Barlett's sphericity tests are 182.62 (df% 55) and 124.83 (df% 10), respectively, indicating that the correlation matrix of the variables introduced in the analysis differs significantly from the identity matrix and, therefore, the factor analysis has an optimal level of adequacy (Moneva and Ortas, 2010). The results of Barlett's sphericity tests reach the value of 141.48 (df% 10) for CFP, 146.99 (df% 45) for benefits and 648.95 (df% 45) for procedures, verifying that there are sufficient correlation among variables.

Taking into account the factor loadings of each item and the results obtained in the KMO test and Barlett's sphericity tests, the scales to measure the CFP are made up of two dimensions, namely "relative corporate financial performance (RCFP)" and "absolute corporate financial performance (ACFP)". The scales to evaluate benefits of integration are composed of four dimensions: "communication", "efficiency", "systems" and "tasks". Furthermore, the scales to measure difficulties of integration consist of four dimensions: "standards", "internal organization", "external support" and "inefficiencies". In the same way, the scales to evaluate documentation are composed of two dimensions: "top management" and "medium and low management", whereas the scales to measure the procedures of integration are made up of two dimensions: "quality planning" and "quality control and improvement".

##### **4.2 Validity and reliability of the proposed scales**

To analyse the reliability and validity of the scales we perform a confirmatory factor analysis using PLS which allows us to assess the psychometric properties of the factor structures.

Specifically, we employ an overall confirmatory measurement model where each measurement item loads onto its respective latent constructs (Wong, 2013). Table II summarizes the factor loadings and some descriptive diagnostic statistics, such as t-values, standard deviations, Cronbach's  $\alpha$  and average variances extracted (AVE). The results indicate that the scales built for the several constructs are valid, with almost all the items statistically significant[1] ( $p < 0.05$ ), exceeding their factor loadings the recommended 0.6 threshold (Chin, 1998b; Gallardo-Vázquez and Sanchez-Hernandez, 2014) in their respective construct, except Proc6 (eliminated due to its value of 0.028). Given that in our case the minimum value of factor loadings is 0.787, we can state that more than 50 per cent of the variance in the observed variables is explained by the construct (Carmines and Zeller, 1979; Loureiro et al., 2012).

Furthermore, each Cronbach's  $\alpha$  coefficient is over the threshold of 0.7 (Nunnally and Bernstein, 1994) in both constructs and in their factors, ensuring the internal consistency and validity of the construct. The content validity is confirmed since the AVE from each construct comfortably exceeds the threshold of 0.5 (Fornell and Larcker, 1981), indicating a strong convergent validity between the items measuring the same construct as shown by Tables II and III. To assess construct reliability we employ the composite reliability (CR) summarized in Table III. The CR of each construct is greater than the recommended 0.80 threshold (Koufteros, 1999; Nunnally, 1978), ranging from 0.86 to 0.98. This implies that the variance captured by the factor is significantly more than the variance indicated by error components (Lee et al., 2012), therefore, it is ensured the construct reliability of all constructs. Altogether, these results provide evidence of a high degree of convergent validity and reliability of the proposed scales. Additionally, to guarantee discriminant validity we compare the reliability coefficients of the concepts to the bivariate correlation between pair of constructs following Lopez-Gamero et al. (2011).

All reliability coefficients are higher than the correlation between the constructs of interest, as shown in Table IV, which authenticates that each factor complies with the statistical requisite of unidimensionality. After checking the validity and reliability of the scales, we evaluate the global model.

#### **4.3 Conceptual model and hypotheses testing**

As shown in Figure 1, we propose a structural model path representing relationships between different constructs, obtained from principal component analysis explained above, which are used as a second-order latent construct (Simon et al., 2014). To estimate the relationship between the mentioned latent constructs we employ PLS with the SmartPLS 2.0.M3 software package (Ringle et al., 2005). Structural equation modelling through PLS, considered a second-generation multivariate analysis (Chiappetta Jabbour et al., 2013), which is characterized by the estimation of the values for latent variables scores using an iterative procedure, where each latent variable is created as the weighted sum or linear combination of its manifested variables (Bravo et al., 2016) combining principal components analysis and regression (Loureiro et al., 2012). This technique is useful for several reasons: the execution algorithm does not require any specific statistical distribution of the data (Fornell and Cha, 1994; Moneva and Ortas, 2010); the sample size for path coefficient estimation can be small (Chin and Newsted, 1999; Lin and Hsu, 2015; Simon et al., 2014); it provides robust estimators in presence of collinear issues caused by high correlation among limited observation values, missing data and predicted variables (Lin and Hsu, 2015); the portions associated with the predicted variables (X) and explanatory variables (Y) can be integrated into the model (Lin and Hsu, 2015) reducing type II errors (Lohmoller, 1989; Chin et al., 2003) that might exist in conventional principal components analysis; it allows us to work with complex theory (relating concepts) and/or in initial stages of development as in our case (Chiappetta Jabbour et al., 2013) avoiding problems of inadmissible solutions and factor indeterminacy (Fornell and Bookstein, 1982). However, PLS technique does not provide a significance test of parameters. For this reason, we run the precision of the PLS estimates and test the hypothesis, in conjunction with a t-test, implementing non-parametric resampling techniques.

In particular, we adopt a bootstrap resampling method with a total of 200 random sub-samples generated from the original data set (Chin, 1998b; Fornell and Larcker, 1981; Loureiro et al., 2012). Table V shows the results for testing the research hypothesis, indicating that the path coefficients (regression coefficients) are above the recommended absolute value of 0.2 (Chin, 1998a) being significant at levels of 0.01, 0.05 or 0.10. We verify that benefits of integration positively and directly affect both the integration level of MS documentation and the integration level of MS procedures being communication the strongest predictor. On the contrary, we find that difficulties of integration

negatively and directly affect the integration level of MS documentation and the integration level of MS procedures being standards and internal organization the most important variables in the prediction of difficulties of integration, contributing to 31 per cent, respectively, of its  $R^2$ . We also verify that benefits of integration is a more important variable in the prediction of both the integration level of MS documentation and the integration level of MS procedures than the difficulties of integration taking into account the indices of variance for endogenous constructs ( $R^2$ ), compensating its negative effect on the mentioned endogenous constructs.

Finally, our results indicate that there is a significant and negative relationship between the integration level of MS documentation and CFP. This could be due to some documents of ISO certification are not necessary (Barry, 2011) and/or the implementation of IMS could be driven by documentation that does not take into account the organizational behaviour, increasing the bureaucracy in the firm (Abraham et al., 2000). To overcome this shortcoming, firms may develop a communication strategy that allows them to adopt a less hierarchical organizational structure, more integrated and efficient in providing information in all directions.

On the other hand, the link between integration level of MS procedures and CFP is significant and positive as stated by Castka and Corbett (2015), being the integration level of MS procedures the most important variable in the prediction of CFP taking into account the indices of variance for endogenous constructs ( $R^2$ ) (Tenenhaus et al., 2005; Wetzels et al., 2009) which allows us to demonstrate predictive power of our proposed model. This is congruent with the result obtained when we check the goodness of fit of the overall model using the measure proposed by Tenenhaus et al. (2005) whose value ( $Gof_{small} = 0.19$ ) reveals a good fit.

## **5. Discussion and conclusions**

While the adoption of ISO 9001 and ISO 14001 standards has been growing worldwide (HerasSaizarbitoria et al., 2011; Heras-Saizarbitoria and Boiral, 2013; Simon et al., 2014) many questions remain about the extent to which these MSs relate to CFP. Previous literature has examined the effect of each MS standard on the firms' financial performance reaching mixed results (Feng et al., 2008; Martínez-Costa et al., 2008; Potoski and Prakash, 2005; Sampaio et al., 2012; Tarietà al., 2012; Castka and Corbett, 2015). However, many companies are implementing both MSs standards (Bernardo et al., 2015; Ferrón-Vílchez and Darnall, 2016; Pereira-Moliner et al., 2012) having the possibility to manage them jointly to create an IMS as pointed out by Casadesus et al. (2009), Heras-Saizarbitoria and Boiral (2013), Simon et al. (2014) and Zeng et al. (2007). The integration level of these standards could affect firms' costs and firms' efficiency and, therefore, their CFP.

Given that the lack of systematic statistical evidence on the examination of CFP benefits associated with the joint use of both quality and environmental MSs, our study focused on analysing whether the benefits and difficulties of implementing an IMS have an effect on the integration level and whether the integration level of the companies' MSs has a significant impact on their CFP. To test and estimate these causal relationships we proposed a secondorder PLS model that was implemented in a sample of Catalan firms.

Our results showed evidence of a positive relationship of the integration benefits with respect to the integration level of MS documentation and the integration level of MS procedures that overweights the negative significant effect of difficulties of integration in relation to the integration level of MS documentation and the integration level of MS procedures, which is in agreement with Simon et al. (2012a) and Simon et al. (2014). This suggests that the integration of documentation into a single MS allows firms to simplify their MSs by avoiding the duplication of policies, procedures and records (both

standards use similar structure and language) which leads to less redundancy and makes easier its use and understanding (Bernardo et al., 2015; Simon et al., 2012a; Simon et al., 2014) and reduction of bureaucracy in the companies and the conflicts between individual systems (Pereira-Moliner et al., 2012; Rebelo et al., 2014).

In turn, the integration of procedures into a single MS could allow firms to improve internal efficiency by optimizing resources (Abad et al., 2014; Salomone, 2008); improving management control (Rebelo et al., 2014) and increasing the productivity (Abad et al., 2014). This could be due to both ISO 9001 and ISO 14001 standards having requirements classified according the PDCA cycle of continual improvement (Bernardo et al., 2015) and their integration allows firms to benefit from related synergies.

Furthermore, we also found new evidence on this topic, related to a positive significant relationship between the integration level of MS procedures and CFP that overweights the negative significant effect of integration level of MS documentation on CFP. Thus, the full integration of MS procedures may allow firms to achieve synergies that generate scope economies which improves the firms' financial performance. These scope economies created become sufficiently important to compensate the bureaucracy costs associated with the implementation of IMSs standards whose effect on CFP is significantly negative.

This is congruent with Schylander and Martinuzzi (2007) who point out that ISO 9001 and ISO 14001 are bureaucratic and hard to translate into practical work and although their integration allow firms to have only one source of documentation this still involves a high degree of bureaucracy, complexity and high resource demands that reduce the CFP. This finding could be relevant for the ISO, as it indicates that the documentation used to integrate ISO 9001 and ISO 14001 standards could be complex and difficult to use and understand by firms. Therefore, ISO may include additional explanations and interpretations in ISO 9001 and ISO 14001 standards to facilitate its use, and publish additional content to make the integration of documentation simpler, faster and better, which would make work much easier for companies' managers. Furthermore, this study has other managerial implications.

Thus, companies' managers can understand the extent to which the integration of quality management practices and environmental management practices influences some of the most relevant firms' financial performance dimensions. The integration of the abovementioned MSs could allow firms to benefit from the creation of synergies which lead not only to reduce the time and costs associated to their implementation but also to improved efficiency. Therefore, managers who want to implement both MSs should integrate their documentation and procedures which would allow them to improve their CFP. This finding is in accordance with the statements of Castka and Corbett (2015) pointing out that the implementation of ISO 9000 and ISO 14000 certifications improves firm's financial performance due to firms following the procedures enshrined in the documentation.

This paper also has important implications for academics, as it provides new empirical evidence on the relationship between IMSs and CFP. Previous researchers have examined how the adoption of ISO 9001 and ISO 14001 affects CFP (Ferrón-Vílchez and Darnall, 2016) and how the adoption of ISO 9001 or ISO 14001 influences firms' financial performance (Feng et al., 2008; Martínez-Costa et al., 2008; Potoski and Prakash, 2005; Sampaio et al., 2012; Tarí et al., 2012). However, no previous literature exists on examining the effect of integration level of quality and environmental MSs on CFP (Bernardo et al., 2015). Thus, our study contributes to this literature review showing that firms with all components of the MSs integrated into a single system outperform firms whose MSs are integrated partially or managed separately. As in other similar studies, some limitations and future research lines should be noted.

This study used cross-sectional data from interviewees who are Catalan managers. Furthermore, the mail survey was answered in 2010 at the beginning of the economic crisis from which results should be taken with caution given that the situation might have changed due to the continuation of the Spanish economic crisis.

In addition, our model did not take into account the effect that other factors (organizational structure, size, and so on) may exert on the relationship between IMSs and CFP. Other authors, Bowler et al. (2016), Castka and Corbett (2016) and Darnall et al. (2016), analyse the relationship between ISO standards and other standards such as ecolabels. The adoption of both of them could affect the CFP which should be taken into account in future research. By pointing out these limitations, future research efforts in this area could be enhanced.

Thus, it may be interesting to update the research replicating this study, which would allow us to use a time lapse and, therefore, to examine long-term relations. A future research agenda including control and mediating variables (organizational structure, size and so on) in our model could also be established. This would allow us to make specific hypotheses to show how they affect our model.

*Note 1.* As mentioned by Moneva and Ortas (2010) PLS method does not provide a significance test of parameters, so its execution algorithm does not require any specific statistical distribution of the data. However, it is possible to analyse their significance implementing non-parametric resampling techniques. Thus, we adopt a bootstrap resampling method model with a total of 200 random sub-samples.

## References

- Aarts, F.M. and Vos, E. (2001), "The impact of ISO registration on New Zealand firms' performance: a financial perspective", *TQM Magazine*, Vol. 133 No. 3, pp. 180-191.
- Abad, J., Dalmau, I. and Vilajosana, J. (2014), "Taxonomic proposal for integration levels of management systems based on empirical evidence and derived corporate benefits", *Journal of Cleaner Production*, Vol. 78, September, pp. 164-173.
- Abraham, M., Crawford, J., Carter, D. and Mazotta, F. (2000), "Management decisions for effective ISO 9000 accreditation", *Management Decision*, Vol. 38 No. 3, pp. 182-193.
- Albertini, E. (2013), "Does environmental management improve financial performance? A metaanalytical review", *Organization & Environment*, Vol. 26 No. 4, pp. 431-457.
- Al-Najjar, B. and Anfimiadou, A. (2012), "Environmental policies and firm value", *Business Strategy and the Environment*, Vol. 21 No. 1, pp. 49-59.
- Al-Tuwaijri, S., Christensen, T. and Hughes, K. (2004), "The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach", *Accounting, Organizations and Society*, Vol. 29 No. 5, pp. 447-471.
- Amato, L. and Amato, C. (2012), "Environmental policy, rankings and stock values", *Business Strategy and the Environment*, Vol. 21 No. 5, pp. 317-325.
- Asif, M., Fisscher, O.A.M., Joost de Bruijn, E. and Pagell, M. (2010), "An examination of strategies employed for the integration of management systems", *The TQM Journal*, Vol. 22 No. 6, pp. 648-669.
- Asif, M., Bruijn, E.J.D., Fisscher, O.A.M., Searcy, C. and Steenhuis, H.J. (2009), "Process embedded design of integrated management systems", *International Journal of Quality and Reliability Management*, Vol. 26 No. 3, pp. 261-282.
- Bansal, P. and Bogner, W.C. (2002), "Deciding on ISO 14001:

economics, institutions, and context", *Long Range Plan*, Vol. 35 No. 3, pp. 269-290. Bansal, P. and Hunter, T. (2003), "Strategic explanations for the early adoption of ISO 14001", *Journal of Business Ethics*, Vol. 46 No. 3, pp. 289-299. Barry, L.M.M. (2011), "ISO certification in the tour operator sector", *International Journal of Contemporary Hospitality Management*, Vol. 23 No. 1, pp. 115-130. Beirao, G. and Sarsfield Cabral, J. (2002), "The reaction of the Portuguese stock market to ISO 9000 certification", *Total Quality Management*, Vol. 13 No. 4, pp. 465-474. Benner, M.J. and Veloso, F.M. (2008), "ISO 9000 practices and financial performance: a technology coherence perspective", *Journal of Operations Management*, Vol. 26 No. 5, pp. 611-629. Bentler, P.M. and Chou, C.P. (1987), "Practical issues in structural modeling", *Sociological Methods & Research*, Vol. 16 No. 1, pp. 78-117. Bernardo, M., Casadesus, M., Karapetrovic, S. and Heras, I. (2009), "How integrated are environmental, quality and other standardized management systems?, An empirical study", *Journal of Cleaner Production*, Vol. 17 No. 8, pp. 742-750. Bernardo, M., Casadesus, M., Karapetrovic, S. and Heras, I. (2010), "An empirical study on the integration of management system audits", *Journal of Cleaner Production*, Vol. 18 No. 5, pp. 486-495. Bernardo, M., Casadesus, M., Karapetrovic, S. and Heras, I. (2012), "Do integration difficulties influence management system integration levels?", *Journal of Cleaner Production*, Vol. 21 No. 1, pp. 23-33. Bernardo, M., Simon, A., Tarí, J.J. and Molina-Azorín, J.F. (2015), "Benefits of management systems integration: a literature review", *Journal of Cleaner Production*, Vol. 94, May, pp. 260-267. Boiral, O. and Gendron, Y. (2011), "Sustainable development and certification practices: lessons learned and prospects", *Business Strategy and the Environment*, Vol. 20 No. 5, pp. 331-347. Bowler, K., Castka, P. and Balzarova, M. (2016), "Understanding firms' approaches to voluntary certification-evidence from multiple case studies in FSC certification", *Journal of Business Ethics*, pp. 1-16 (in press). Bravo, R., Lucia-Palacios, L. and Martin, M.J. (2016), "Processes and outcomes in student teamwork: an empirical study in a marketing subject", *Studies in Higher Education*, Vol. 41 No. 2, pp. 302-320. Cañón, J. and Garcés, C. (2006), "Repercusión económica de la certificación medioambiental ISO 14001", *Cuadernos de Gestión*, Vol. 6 No. 1, pp. 45-62. Canon-de-Francia, J. and Garces-Ayerbe, C. (2009), "ISO 14001 environmental certification: a sign valued by the market?", *Environmental and Resource Economics*, Vol. 44 No. 2, pp. 245-262. Carmines, E.G. and Zeller, R.A. (1979), *Reliability and Validity Assessment*, Sage, Newbury Park, CA. Casadesús, M., Heras-Saizarbitoria, I. and Karapetrovic, S. (2009), "Sistemas de gestión estandarizados: ¿ existen sinergias?", *Revista europea de dirección y economía de la empresa*, Vol. 18 No. 2, pp. 161-174. Casadesús, M. and Karapetrovic, S. (2005a), "Has ISO 9000 lost some of its lustre: a longitudinal impact study", *International Journal of Operations & Production Management*, Vol. 25 No. 6, pp. 580-596.

Casadesus, M. and Karapetrovic, S. (2005b), "The erosion of ISO 9000 benefits: a temporal study", *International Journal of Quality and Reliability Management*, Vol. 22 No. 2, pp. 120-136. Castka, P. and Corbett, C.J. (2015), "Management systems standards. diffusion, impact and governance of ISO 9000, ISO 14000 and other management systems standards", *Foundations and Trends in Technology, Information and Operations Management*, Vol. 7 Nos 3-4, pp. 161-379. Castka, P. and Corbett, C.J. (2016), "Governance of eco-labels: expert opinion and media coverage", *Journal of Business Ethics*, Vol. 135 No. 2, pp. 309-326. Chiappetta Jabbour, C.J., Lopes de Sousa Jabbour, A.B., Govindan, K., Alves Teixeira, A. and De Souza Freitas, W.R. (2013), "Environmental management and operational performance in automotive companies in Brazil: the role of human resource management and lean manufacturing", *Journal of Cleaner Production*, Vol. 47, May, pp. 139-140. Chin, W. (1998a), "Issues and opinion on structural equation modelling", *MIS Quarterly*, Vol. 22 No. 1, pp. vii-xv. Chin, W.W. (1998b), "The partial least squares approach to structural equation modeling", in Marcoulides, C.A. (Ed.), *Modern Methods for Business Research*, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 295-336. Chin, W.W., Marcolin, B.L. and Newsted, P.R. (2003), "A partial least squares latent variable modelling approach for measuring interaction effects: results from a Monte Carlo simulation study and

an electronic mail emotion/adoption study", *Information Systems Research*, Vol. 14 No. 2, pp. 189-217. Chin, W.W. and Newsted, P.R. (1999), "Structural equation modeling analysis with small samples using partial least squares", in Hoyle, R.H. (Ed.), *Statistical Strategies for Small Sample Research*, Sage Publications, Thousand Oaks, CA, pp. 307-341. Chow-Chua, C., Goh, M. and Wan, T.B. (2003), "Does ISO 9000 certification improve business performance?", *International Journal of Quality & Reliability Management*, Vol. 20 No. 8, pp. 936-953. Claver, E., López, M.D., Molina, J.F. and Tarín, J.J. (2007), "Environmental management and firm performance: a case study", *Journal of Environmental Management*, Vol. 84 No. 4, pp. 606-619. Corbett, C.J., Montes-Sancho, M.J. and Kirsch, D. (2005), "The financial impact of ISO 9000 certification in the United States: an empirical analysis", *Management Science*, Vol. 51 No. 7, pp. 1046-1059. Curcovic, S. and Sroufe, R. (2011), "Using ISO 14001 to promote a sustainable supply chain strategy", *Business Strategy and the Environment*, Vol. 20 No. 2, pp. 71-93. Curcovic, S., Sroufe, R. and Landeros, R. (2008), "Measuring TQEM returns from the application of quality frameworks", *Business Strategy and the Environment*, Vol. 17 No. 2, pp. 93-106. Darnall, N., Henriques, I. and Sadorsky, P. (2008), "Do environmental management systems improve business performance in an international setting?", *Journal of International Management*, Vol. 14 No. 4, pp. 364-376. Darnall, N., Ji, H. and Vazquez-Brust, D.A. (2016), "Third-party certification, sponsorship and consumers' ecolabel use", *Journal of Business Ethics*, pp. 1-17, doi: 10.1007/s10551-016-3138-2 (in press). Darnall, N., Jolley, G.J. and Ytterhus, B. (2007), "Understanding the relationship between a facility's environmental and financial performance", in Johnstone, N. (Ed.), *Environmental Policy and Corporate Behaviour*, Edward Elgar, Cheltenham, pp. 213-259. Delmas, M. (2001), "Stakeholders and competitive advantage: the case of ISO 14001", *Production and Operations Management*, Vol. 10 No. 3, pp. 343-358. Deming, E. (1986), *Out of the Crisis*, MIT Press, Cambridge, MA. Dimara, E., Sakuras, D., Tsekouras, K. and Goutsos, S. (2004), "Strategic orientation and financial performance of firms implementing ISO 9000", *International Journal of Quality & Reliability Management*, Vol. 21 No. 1, pp. 72-89. Douglas, A. and Glen, D. (2000), "Integrated management systems in small and medium enterprises", *Total Quality Management*, Vol. 11 No. 4, pp. 686-690.

Escanciano, C., Fernandez, E. and Vazquez, C. (2001), "ISO 9000 certification and quality management in Spain: results of a national survey", *TQM Magazine*, Vol. 13 No. 3, pp. 192-200. Feng, M., Terziovski, M. and Samson, D. (2008), "Relationship of ISO 9001:2000 quality system certification with operational and business performance", *Journal of Manufacturing Technology Management*, Vol. 19 No. 1, pp. 22-37. Ferron-Vílchez, V. and Darnall, N. (2016), "Two better than one: the link between management systems and business performance", *Business Strategy and the Environment*, Vol. 25 No. 4, pp. 221-240, doi: 10.1002/bse.1864. Fornell, C. and Bookstein, F.L. (1982), "A comparative analysis of two structural equation models: Lisrel and PLS applied to market data", in Fornell, C. (Ed.), *A Second Generation of Multivariate Analysis*, Vol. 1, Praeger, New York, NY, pp. 289-324. Fornell, C. and Cha, J. (1994), "Partial least squares", in Bagozzi, R.P. (Ed.), *Advanced Methods of Marketing Research*, Blackwell, Oxford, pp. 52-78. Fornell, C. and Larcker, D. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50. Fresner, J. and Engelhardt, G. (2004), "Experiences with integrated management systems for two small companies in Austria", *Journal of Cleaner Production*, Vol. 12 No. 6, pp. 623-631. Gallardo-Vázquez, D. and Sanchez-Hernandez, M.I. (2014), "Measuring corporate social responsibility for competitive success at a region level", *Journal of Cleaner Production*, Vol. 72, June, pp. 14-22. Garvin, D.A. (1984), "Product quality: an important strategic weapon", *Business Horizons*, Vol. 27 No. 3, pp. 40-43. González-Benito, J. and González-Benito, O. (2005), "An analysis of the relationship between environmental motivations and ISO 14001 certification", *British Journal of Management*, Vol. 16 No. 2, pp. 133-148. González-Torre, P., Adenso-Díaz, B. and González, B. (2001), "Empirical evidence about managerial issues of ISO certification", *TQM Magazine*, Vol. 13 No. 5, pp. 355-360. Grolleau, G.,

Mzoughi, N. and Pekovic, S. (2013), "Is business performance related to the adoption of quality and environmental-related standards?", *Environmental and Resource Economics*, Vol. 54 No. 4, pp. 525-548. Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1998), *Multivariate Data Analysis*, Prentice Hall, Upper Saddle River, NJ. Hair, J.F., Sarstedt, M., Ringle, C.M. and Mena, J.A. (2012), "An assessment of the use of partial least squares structural equation modeling in marketing research", *Journal of the Academy of Marketing Science*, Vol. 40 No. 3, pp. 414-433. Häversjö, T. (2000), "The financial effects of ISO 9000 registration for Danish companies", *Managerial Auditing Journal*, Vol. 15 Nos 1-2, pp. 47-52. Heras, I., Casadesus, M. and Dick, G.P.M. (2002a), "ISO 9000 certification and the bottom line: a comparative study of the profitability of Basque region companies", *Managerial Auditing Journal*, Vol. 17 Nos 1-2, pp. 72-78. Heras, I., Casadésus, M. and Ochoa, C. (2001), "Effects of ISO 9000 certification on companies' profitability: an empirical study", *Proceedings of the 6th International Conference on ISO 9000 and TQM*, Paisley, Ayr, 17-19 April. Heras, I., Dick, G.P.M. and Casadesus, M. (2002b), "ISO registration's impact on sales and profitability: a longitudinal analysis of performance before and after accreditation", *International Journal of Quality and Reliability Management*, Vol. 19 No. 6, pp. 774-791. Heras-Saizarbitoria, I. and Boiral, O. (2013), "ISO 9001 and ISO 14001: towards a research agenda on management, system standards", *International Journal of Management Reviews*, Vol. 15 No. 1, pp. 47-65.

Heras-Saizarbitoria, I., Molina-Azorín, F.J. and Dick, G.P. (2011), "ISO 14001 certification and financial performance: selection effect versus treatment effect", *Journal of Cleaner Production*, Vol. 19 No. 1, pp. 1-12. Holt, D. (2011), "Where are they now? Tracking the longitudinal evolution of environmental businesses from the 1990s", *Business Strategy and the Environment*, Vol. 20, pp. 238-250. Huth, T. (2008), *Organizing Cross-Functional New Product Development Projects*, Springer Gabler. Iraldo, F., Testa, F. and Frey, M. (2009), "Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European Union", *Journal of Cleaner Production*, Vol. 17 No. 16, pp. 1444-1452. ISO (2014), *The ISO Survey of Certifications – 2013*, International Organization for Standardization, Geneva. Janas, I. and Luczak, H. (2002), "Explorative study of the expected consequences for existing quality management systems due to the revision of ISO 9001 in certified companies in Germany", *The TQM Magazine*, Vol. 14 No. 2, pp. 127-132. Jang, W. and Lin, C. (2008), "An integrated framework for ISO 9000 motivation, depth of ISO implementation and firm performance: the case of Taiwan", *Journal of Manufacturing Technology Management*, Vol. 19 No. 2, pp. 194-216. Jørgensen, T.H. (2008), "Towards more sustainable management systems: through life cycle management and integration", *Journal of Cleaner Production*, Vol. 16 No. 10, pp. 1071-1080. Jørgensen, T., Remmen, A. and Mellado, M. (2006), "Integrated management systems – three different levels of integration", *Journal of Cleaner Production*, Vol. 14 No. 8, pp. 713-722. Juran, J.M. (1986), "The quality trilogy: a universal approach to managing for quality", *Quality Progress*, Vol. 19 No. 8, pp. 19-24. Kafetzopoulos, D. and Gotzamani, K. (2014), "Critical factors, food quality management and organizational performance", *Food Control*, Vol. 40, June, pp. 1-11. Karapetrovic, S. (2003), "Musings on integrated management systems", *Measuring Business Excellence*, Vol. 7 No. 1, pp. 4-13. Karapetrovic, S. and Casadesus, M. (2009), "Implementing environmental with other standardized management systems: scope, sequence, time and integration", *Journal of Cleaner Production*, Vol. 17 No. 5, pp. 533-540. Karapetrovic, S., Casadesus, M. and Heras, I. (2006), *Dynamics and Integration of Standardized Management Systems*, Documenta Universitaria, Girona. Karapetrovic, S. and Willborn, W. (1998), "Integration of quality and environmental management systems", *The TQM Magazine*, Vol. 10 No. 3, pp. 204-213. Kaynak, H. (2003), "The relationship between total quality management practices and their effects on firm performance", *Journal of Operations Management*, Vol. 21 No. 4, pp. 405-435. Khanna, K.H., Laroia, S.C. and Sharma, D.D. (2010), "Integrated management systems in Indian manufacturing organizations: some key



findings from an empirical study", *The TQM Journal*, Vol. 22 No. 6, pp. 670-686. Kinbara, T. and Kaneko, S. (2005), *Analyses of Environmental Management*, Hakuto Shobo, Tokyo (in Japanese). King, A. and Lenox, M. (2002), "Exploring the locus of profitable pollution reduction", *Management Science*, Vol. 48 No. 2, pp. 289-299. Klassen, R.D. and Whybark, D.C. (1999), "Environmental management in operations: the selection of environmental technologies", *Decision Sciences*, Vol. 30 No. 3, pp. 601-631. Konar, S. and Cohen, M.A. (2001), "Does the market value environmental performance?", *The Review of Economics and Statistics*, Vol. 83 No. 2, pp. 281-289. Koufteros, X.A. (1999), "Testing a model of pull production: a paradigm for manufacturing research using structural equation modeling", *Journal of Operations Management*, Vol. 17 No. 4, pp. 467-488.

Kunnanatt, J.T. (2007), "Impact of ISO 9000 on organizational climate: strategic change management experience of an Indian organization", *International Journal of Manpower*, Vol. 28 No. 2, pp. 175-192. Lee, C., Lee, T. and Chang, C. (2001), "Quality/productivity practices and company performance in China", *International Journal of Quality & Reliability Management*, Vol. 18 No. 6, pp. 604-625. Lee, M.L., Kim, S.T. and Choi, D. (2012), "Green supply chain management and organizational performance", *Industrial Management and Data Systems*, Vol. 112 No. 8, pp. 1148-1180. Leopoulos, V., Voulgaridou, D., Bellos, E. and Kirytopoulos, K. (2010), "Integrated management systems: moving from function to organisation/decision view", *The TQM Journal*, Vol. 22 No. 6, pp. 594-628. Leung, H.K.N., Chan, K.C.C. and Lee, T.Y. (1999), "Costs and benefits of ISO 9000 series: a practical study", *International Journal of Quality & Reliability Management*, Vol. 16 No. 7, pp. 675-691. Lima, M.A.M., Resende, M. and Hasenclever, L. (2000), "Quality certification and performance of Brazilian firms: an empirical study", *International Journal of Production Economics*, Vol. 66 No. 2, pp. 143-154. Lin, H.Y. and Hsu, M.H. (2015), "Using social cognitive theory to investigate green consumer behavior", *Business Strategy and the Environment*, Vol. 24 No. 5, pp. 326-343, doi: 10.1002/bse.1820. Lohmoller, J.B. (1989), *Latent Variable Path Modelling with Partial Least Squares*, Physica-Verlag, Heidelberg. López-Fresno, P. (2010), "Implementation of an integrated management system in an airline: a case study", *The TQM Journal*, Vol. 22 No. 6, pp. 629-647. Lopez-Gamero, M.D., Molina-Azorín, J.F. and Claver-Cortes, E. (2011), "The relationship between managers' environmental perceptions, environmental management and firm performance in Spanish hotels: a whole framework", *International Journal of Tourism Research*, Vol. 13 No. 2, pp. 141-163. Loureiro, S.M.C., Dias Sardinha, I.M. and Reijnders, L. (2012), "The effect of corporate social responsibility on consumer satisfaction and perceived value: the case of the automobile industry sector in Portugal", *Journal of Cleaner Production*, Vol. 37, December, pp. 172-178. McGuire, S.J. and Dilts, D.M. (2008), "The financial impact of standard stringency: an event study of successive generations of the ISO 9000 standard", *International Journal of Production Economics*, Vol. 113 No. 1, pp. 3-22. Marti, C.P., Rovira-Val, M.R. and Drescher, L.G. (2015), "Are firms that contribute to sustainable development better financially?", *Corporate Social Responsibility and Environmental Management*, Vol. 22 No. 5, pp. 305-319. Martínez-Costa, M. and Martínez-Lorente, A.R. (2003), "Effects of ISO 9000 certification on firms' performance: a vision from the market", *Total Quality Management & Business Excellence*, Vol. 14 No. 10, pp. 1179-1191. Martínez-Costa, M., Martínez-Lorente, A.R. and Choi, T.Y. (2008), "Simultaneous consideration of TQM and ISO 9000 on performance and motivation: an empirical study of Spanish companies", *International Journal of Production Economics*, Vol. 113 No. 1, pp. 23-39. Matias, J.C.O. and Coelho, D.A. (2002), "The integration of the standards systems of quality management, environmental management and occupational health and safety management", *International Journal of Production Research*, Vol. 40 No. 15, pp. 3857-3866. Melnyk, S.A., Sroufe, R.P. and Calatone, R. (2002), "Assessing the impact of environmental management systems on corporate and environmental performance", *Journal of Operations Management*, Vol. 21 No. 2, pp. 329-351. Molina-Azorin, J.F., Claver-Cortés, E., Lopez-Gamero, M.D. and Tarí, J.J. (2009), "Green management and financial performance", *Management*

Decision, Vol. 47 No. 7, pp. 1080-1100. Moneva, J. and Ortas, E. (2010), "Corporate environmental and financial performance: a multivariate approach", *Industrial Management & Data Systems*, Vol. 110 No. 2, pp. 193-210. Naser, K., Karbhari, Y. and Mokhtar, M. (2004), "Impact of ISO 9000 registration on company performance", *International Journal of Quality & Reliability Management*, Vol. 19 No. 4, pp. 509-516.

Nicolau, J. and Sellers, R. (2002), "The stock market's reaction to quality certification: empirical evidence from Spain", *European Journal of Operational Research*, Vol. 142 No. 3, pp. 632-641. Nishitani, K. (2011), "An empirical analysis of the effects on firms' economic performance of implementing environmental management systems", *Environmental and Resource Economics*, Vol. 48 No. 4, pp. 569-586. Nunnally, J.C. (1978), *Psychometric Theory*, 2nd ed., McGraw-Hill, New York, NY. Nunnally, J. and Bernstein, I. (1994), *Psychometric Theory*, McGraw-Hill, New York, NY. Oliveira, O. (2013), "Guidelines for the integration of certifiable management systems in industrial companies", *Journal of Cleaner Production*, Vol. 57, October, pp. 1-10. Parast, M.M., Adams, S.G. and Jones, E.C. (2011), "Improving operational and business performance in the petroleum industry through quality management", *International Journal of Quality and Reliability Management*, Vol. 28 No. 4, pp. 426-450. Pereira-Moliner, J., Claver-Cortés, E., Molina-Azorín, J.F. and Tarí, J.J. (2012), "Quality management, environmental management and firm performance: direct and mediating effects in the hotel industry", *Journal of Cleaner Production*, Vol. 37, December, pp. 82-92. Pojasek, R. (2006), "Is your integrated management system really integrated?", *Environmental Quality Management*, Vol. 16 No. 2, pp. 89-97. Potoski, M. and Prakash, A. (2005), "Covenants with weak swords: ISO 14001 and facilities' environmental performance", *Journal of Policy Analysis and Management*, Vol. 24 No. 4, pp. 745-769. Psomas, E., Fotopoulos, C. and Kafetzopoulos, D. (2011), "Motives, difficulties and benefits in implementing the ISO 14001 environmental management system", *Management of Environmental Quality: An International Journal*, Vol. 22 No. 4, pp. 502-521. Rebelo, M.F., Santos, G. and Silva, R. (2014), "A generic model for integration of quality, environment and safety management systems", *TQM Journal*, Vol. 26 No. 2, pp. 143-159. Renzi, M. and Cappelli, L. (2000), "Integration between ISO 9000 and ISO 14000: opportunities and limits", *Total Quality Management*, Vol. 11 Nos 4-6, pp. 849-856. Ringle, C.M., Wende, S. and Will, A. (2005), *SmartPLS 2.0.M3*, SmartPLS, Hamburg, available at: [www.smartpls.de](http://www.smartpls.de) Rodriguez-Melo, A. and Mansouri, S.A. (2011), "Stakeholder engagement: defining strategic advantage for sustainable construction", *Business Strategy and the Environment*, Vol. 20 No. 8, pp. 539-552. Salomone, R. (2008), "Integrated management systems: experiences in Italian organizations", *Journal of Cleaner Production*, Vol. 16 No. 16, pp. 1786-1806. Sampaio, P., Saraiva, P. and Domingues, P. (2012), "Management systems: integration or addition?", *International Journal of Quality & Reliability Management*, Vol. 29 No. 4, pp. 402-424. Sampaio, P., Saraiva, P. and Guimarães Rodrigues, A. (2009), "ISO 9001 certification research: questions, answers and approaches", *International Journal of Quality and Reliability Management*, Vol. 26 No. 1, pp. 38-58. Santos, G., Costa, B. and Leal, A. (2012), "The estimation of the return on firms' investments – as to ISO 9001", *International Journal of Engineering, Science and Technology*, Vol. 4 No. 2, pp. 46-57. Santos, G., Mendes, F. and Barbosa, J. (2011), "Certification and integration of management systems: the experience of Portuguese small and medium enterprises", *Journal of Cleaner Production*, Vol. 19 No. 17, pp. 1965-1974. Santos, L. and Escanciano, C. (2002), "Benefits of the ISO 9000: 1994 system: some considerations to reinforce competitive advantage", *International Journal of Quality & Reliability Management*, Vol. 19 No. 3, pp. 321-344. Schylander, E. and Martinuzzi, A. (2007), "ISO 14001-experiences, effects and future challenges: a national study in Austria", *Business Strategy and the Environment*, Vol. 16 No. 2, pp. 133-147. Shahin, A. and Dabestani, R. (2011), "A feasibility study of the implementation of total quality management based on soft factors", *Journal of Industrial Engineering and Management*, Vol. 4 No. 2, pp. 258-280.

Sharma, D. (2005), "The association between ISO 9000 certification and financial performance", *The International Journal of Accounting*, Vol. 40 No. 2, pp. 151-172. Simon, A. and Petnji Yaya, L.H. (2012), "Improving innovation and customer satisfaction through systems integration", *Industrial Management & Data Systems*, Vol. 112 No. 7, pp. 1026-1043. Simon, A., Karapetrovic, S. and Casadesus, M. (2012a), "Difficulties and benefits of integrated management systems", *Industrial Management and Data Systems*, Vol. 112 No. 5, pp. 828-846. Simon, A., Karapetrovic, S. and Casadesus, M. (2012b), "Evolution of integrated management systems in Spanish firms", *Journal of Cleaner Production*, Vol. 23 No. 1, pp. 1-19. Simon, A., Bernardo, M., Karapetrovic, S. and Casadesus, M. (2011), "Integration of standardized environmental and quality management systems audits", *Journal of Cleaner Production*, Vol. 19 No. 17, pp. 2057-2065. Simon, A., Kafel, P., Nowicki, P. and Casadesús, M. (2015), "The development of complaints handling standards in spa companies: a case study analysis in Spain", *International Journal for Quality Research*, Vol. 9, pp. 675-688. Simon, A., Petnji Yaya, L.H., Karapetrovic, S. and Casadesus, M. (2014), "Can integration difficulties affect innovation and satisfaction?", *Industrial Management and Data Systems*, Vol. 114 No. 2, pp. 183-202. Tarí, J.J., Molina-Azorín, J.F. and Heras, I. (2012), "Benefits of the ISO 9001 and ISO 14001 standards: a literature review", *Journal of Industrial Engineering and Management*, Vol. 5 No. 2, pp. 297-322. Tenenhaus, M., Esposito, V.E., Chatelin, Y.M. and Lauro, C. (2005), "PLS path modeling", *Computational Statistics & Data Analysis*, Vol. 48 No. 1, pp. 159-205. Terlaak, A. and King, A.A. (2006), "The effect of certification with the ISO 9000 quality management standard: a signalling approach", *Journal of Economics Behavior & Organization*, Vol. 60 No. 4, pp. 579-602. Terziovski, M., Power, D. and Sohal, A. (2003), "The longitudinal effects of the ISO 9000 certification process on business performance", *European Journal of Operational Research*, Vol. 146 No. 3, pp. 580-595. Terziovski, M., Samson, D. and Dow, D. (1997), "The business value of quality management systems certification", *Journal of Operations Management*, Vol. 15 No. 1, pp. 1-18. Tognere, R., Funchal, B. and Nossa, V. (2012), "Is ISO 14001 certification effective? An experimental analysis of firm profitability", *Brazilian Administration Review*, Vol. 9, May, pp. 78-94. Toyozumi, T. (2007), *Strategic Environmental Management* (in Japanese), Chuo Keizaisha, Tokyo. Tsekouras, K., Dimara, E. and Skuras, D. (2002), "Adoption of a quality assurance scheme and its effect on firm performance: a study of Greek firms implementing ISO 9000", *Total Quality Management*, Vol. 13 No. 6, pp. 827-841. Vandenbosch, M.B. (1996), "Confirmatory compositional approaches to the development of product spaces", *European Journal of Marketing*, Vol. 30 No. 3, pp. 23-46. Von-Ahsen, A. (2014), "The integration of quality, environmental and health and safety management by car manufacturers – a long-term empirical study", *Business Strategy and the Environment*, Vol. 23 No. 6, pp. 395-416. Wassenaar, P. and Grocott, S. (1999), "Fully integrated management systems", paper presented at the 3rd International and 6th National Research Conference on Quality Management, RMIT University, Melbourne, February 8-10. Watson, K., Klingenberg, B., Polito, T. and Geurts, T. (2004), "Impact of environmental management system implementation on financial performance: a comparison of two corporate strategies", *Management of Environmental Quality: An International Journal*, Vol. 15 No. 6, pp. 622-628. Wayhan, V.B., Kirche, E.T. and Khumawala, B.M. (2002), "ISO 9000 certification: the financial performance implications", *Total Quality Management and Business Excellence*, Vol. 13 No. 2, pp. 217-231.

Wetzels, M., Odekerken-Schröder, G. and Van Oppen, C. (2009), "Using PLS path modeling for assessing hierarchical construct models guidelines and empirical illustration", *MIS Quarterly*, Vol. 33 No. 1, pp. 177-195. Wong, C.W.Y. (2013), "Leveraging environmental information integration to enable environmental management capability and performance", *Journal of Supply Chain Management*, Vol. 49 No. 2, pp. 114-136. Wright, T. (2000), "IMS- three into one will go!: the advantages of a single integrated quality, health and safety, and environmental management system", *The Quality Assurance Journal*, Vol. 4 No. 3, pp. 137-142. Yin, H. and Schmeidler, P.J. (2009), "Why do standardized ISO 14001

environmental management systems lead to heterogeneous environmental outcomes?”, *Business Strategy and the Environment*, Vol. 18 No. 7, pp. 469-486. Zeng, S., Shi, J. and Lou, G. (2007), “A synergetic model for implementing an integrated management system: an empirical study in China”, *Journal of Cleaner Production*, Vol. 15 No. 18, pp. 1760-1767. Zutshi, A. and Sohal, A.S. (2005), “Integrated management system. The experience of three Australian organisations”, *International Journal of Quality and Reliability Management*, Vol. 16 No. 2, pp. 211-232. Further reading Brown, A. and Van der Wiele, T. (1995), “Industry experience with ISO 9000”, *Asia Pacific Journal of Quality Management*, Vol. 4 No. 2, pp. 8-17. Koufteros, X. and Marcoulides, G. (2006), “Product development practices and performance: a structural equation modelling-based multi-group analysis”, *International Journal of Production Economics*, Vol. 103 No. 1, pp. 286-307. Wilkinson, G. and Dale, B.G. (1999), “Integrated management systems: an examination of the concept and theory”, *The TQM Magazine*, Vol. 11 No. 2, pp. 95-104.

Indicators	Kaiser-Meyer-Olkin criterion	Barlett's sphericity tests	
	KMO	$\chi^2$	p-value
CFP	0.658	141.48	0.00
Benefits	0.668	146.99	0.00
Difficulties	0.573	182.62	0.00
Documentation	0.576	124.83	0.00
Procedures	0.722	648.95	0.00

Table 1. Exploratory Factor Analysis tests

Factors	Loadings	t-value	SD
<i>Difficulties of integration</i>			
Norms ( $\alpha = 0.97$ , AVE = 0.94)			
Dif4	0.931	24.473	0.038
Dif5	0.988	206.052	0.005
Dif13	0.988	205.793	0.005
Internal organization ( $\alpha = 0.95$ , AVE = 0.90)			
Dif6	0.977	85.733	0.011
Dif12	0.894	15.234	0.059
Dif14	0.976	83.034	0.012
External support ( $\alpha = 0.83$ , AVE = 0.85)			
Dif8	0.916	32.682	0.028
Dif9	0.926	38.147	0.024
Inefficiencies ( $\alpha = 0.89$ , AVE = 0.90)			
Dif10	0.946	33.227	0.029
Dif11	0.954	44.550	0.021
<i>Advantages of integration</i>			
Communication ( $\alpha = 0.96$ , AVE = 0.87)			
Bf7	0.915	19.175	0.048
Bf9	0.957	35.487	0.027
Bf10	0.911	21.071	0.043
Bf11	0.978	114.276	0.009
Bf12	0.913	20.605	0.044
Efficiency ( $\alpha = 1.00$ , AVE = 1.00)			
Bf4	1.000	20937.055	0.000
Bf5	1.000	20939.028	0.000
Systems ( $\alpha = 0.94$ , AVE = 0.94)			
Bf1	0.971	51.441	0.019
Bf2	0.969	47.406	0.021
Tasks ( $\alpha = 1.00$ , AVE = 1.00)			
Bf3	1.000	0.000	0.000
<i>Documentation</i>			
Top management ( $\alpha = 0.79$ , AVE = 0.70)			
Doc1	0.791	16.604	0.048
Doc2	0.893	21.082	0.043
Doc3	0.787	10.242	0.079
Medium- and low-level management ( $\alpha = 0.90$ , AVE = 0.91)			
Doc4	0.958	77.525	0.012
Doc5	0.953	76.800	0.012
<i>Procedures</i>			
Quality planning ( $\alpha = 0.84$ , AVE = 0.75)			
Proc1	0.867	25.585	0.034
Proc7	0.849	16.321	0.053
Proc8	0.873	23.915	0.037
Quality control and improvement ( $\alpha = 0.96$ , AVE = 0.82)			
Proc2	0.864	12.102	0.073
Proc3	0.890	5.666	0.165
Proc5	0.878	7.635	0.120
Proc9	0.890	16.457	0.055

(continued)

Factors	Loadings	t-value	SD
Proc10	0.877	9.300	0.097
Proc11	0.865	8.754	0.102
Proc12	0.893	20.214	0.045
<i>CFP</i>			
RCFP ( $\alpha = 0.89$ , AVE = 0.81)			
ROA	0.948	71.049	0.013
ROE	0.875	23.570	0.037
ROS	0.874	30.080	0.029
ACFP ( $\alpha = 0.87$ , AVE = 0.89)			
Operating profits	0.942	66.734	0.014
Cashflow	0.947	103.545	0.009

Table 2. CFA results of the factor loadings

	AVE	Composite reliability	$R^2$	Cronbach's $\alpha$	Communality	Redundancy
Benefits	0.8439	0.9818	0.0000	0.9792	0.8439	0.0000
CFP	0.5877	0.8768	0.0803	0.8260	0.5877	-0.0236
Difficulties	0.8389	0.9811	0.0000	0.9784	0.8389	0.0000
Documentation	0.5517	0.8599	0.0656	0.7968	0.5517	-0.1194
Procedures	0.6921	0.9568	0.1238	0.9485	0.6921	-0.1358

Table 3. Output of the second order constructs SEM fitness

Factors	ACFP	1	2	3	4	5	6	7	8	9	10	11	12
1. Communication	0.0417												
2. Efficiency	0.0140	0.8531											
3. External support	0.0488	0.9407	0.8225										
4. Inefficiencies	0.0382	0.9815	0.8099	0.9006									
5. Internal organisation	0.0303	0.9613	0.9903	0.8857	0.9906								
6. Medium and low level management	0.0910	0.1356	0.1913	0.1076	0.1470	0.1315							
7. Norms	0.0672	0.9437	0.7210	0.8669	0.9473	0.8334	0.1659						
8. Quality planning	-0.3549	0.0706	0.1382	0.0642	0.0578	0.0943	0.3920	0.0425					
9. Quality control and improvement	0.0475	0.3097	0.3924	0.2817	0.3039	0.3409	0.5180	0.2539	0.6536				
10. RCFP	0.3806	-0.2296	-0.2532	-0.1733	-0.2489	-0.2700	-0.0100	-0.1695	-0.1118	-0.0267			
11. Systems	0.0168	0.9091	0.9707	0.9014	0.8643	0.9367	0.1624	0.7829	0.1323	0.3727	-0.2394		
12. Tasks	0.0150	0.7416	0.8851	0.7165	0.7317	0.8133	0.1301	0.6194	0.1382	0.3304	-0.2527	0.8589	
13. Top management	-0.4557	0.1566	0.2406	0.1193	0.1501	0.1938	0.4077	0.1043	0.8048	0.7488	-0.1349	0.2200	0.1831

Table 4. Correlation between latent constructs

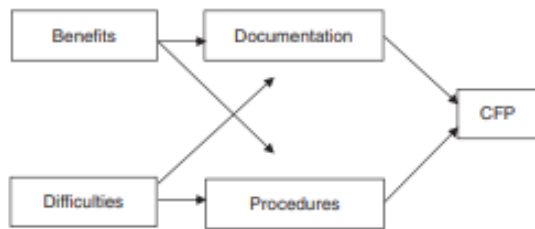


Figure 1. Proposed model

Hypothesis	Path coefficient	SE	t-value	p-value
<i>H1: Benefits → Documentation</i>	0.666	0.357	1.785	0.081
<i>H2: Benefits → Procedures</i>	0.810	0.317	2.556	0.014
<i>H3: Difficulties → Documentation</i>	-0.455	0.243	1.769	0.083
<i>H4: Difficulties → Procedures</i>	-0.515	0.137	3.728	0.001
<i>H5: Documentation → CFP</i>	-0.477	0.199	2.451	0.018
<i>H6: Procedures → CFP</i>	0.301	0.192	1.681	0.099

Table 5. Second-order SEM hypotheses results