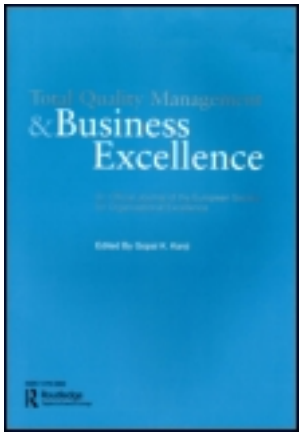

Total Quality Management & Business Excellence

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/ctqm20

Is implementing multiple management system standards a hindrance to innovation?

Sandra M. Castillo-Rojas [a], Martí Casadesús [a], Stanislav Karapetrovic [b], Lluís Coromina [c], Iñaki Heras [d] & Irene Martín [e]

[a] Department of Business Management and Product Design, University of Girona, Girona, Spain

[b] Department of Mechanical Engineering, University of Alberta, Edmonton, Canada

[c] Department of Economics, University of Girona, Girona, Spain

[d] Department of Business Management, University of the Basque Country, San Sebastian, Spain

[e] Department of Business Management, Polytechnic University of Madrid, Madrid, Spain

Version of record first published: 07 Nov 2012.

To cite this article: Sandra M. Castillo-Rojas, Martí Casadesús, Stanislav Karapetrovic, Lluís Coromina, Iñaki Heras & Irene Martín (2012): Is implementing multiple management system standards a hindrance to innovation?, Total Quality Management & Business Excellence, 23:9-10, 1075-1088

To link to this article: http://dx.doi.org/10.1080/14783363.2012.678587

Total Quality Management
Vol. 23, No. 9, September 2012, 1075–1088

Is implementing multiple management system standards a hindrance to innovation?

Sandra M. Castillo-Rojas[a*], Martí Casadesús[a], Stanislav Karapetrovic[b], Lluís Coromina[c], Iñaki Heras[d] and Irene Martín[e]

[a]*Department of Business Management and Product Design, University of Girona, Girona, Spain;* [b]*Department of Mechanical Engineering, University of Alberta, Edmonton, Canada;* [c]*Department of Economics, University of Girona, Girona, Spain;* [d]*Department of Business Management, University of the Basque Country, San Sebastian, Spain;* [e]*Department of Business Management, Polytechnic University of Madrid, Madrid, Spain*

This paper addresses the question of whether multiple management system standards (MSSs) such as ISO 9001 and ISO 14001 hinder innovation processes. Following a review of the relevant literature, an empirical study of 249 Spanish organisations registered to both ISO 9001 and ISO 14001 is presented. The principal finding of a previous study [Castillo, S.M., Casadesus, M., Karapetrovic, S., Heras, I., & Martin, I. (2008). Do standardized management systems hinder innovation processes, in *Proceedings of the 2nd International Quality Conference – Quality Festival 2008*, Kragujevac, Serbia (also appeared in the *International Journal of Quality Research*, 2(2), 121–127] is a decrease in the importance attached to the statement that MSSs hinder innovation as more of these standards are considered for implementation in the future. The model presented in this paper includes data from organisations that have not just implemented, but have also integrated their standardised management systems (MSs). This model investigates the effects of specific motivators and difficulties of implementing multiple MSSs on the responses of organisations to the statement that MSSs are seen as a barrier to innovation. The model also examines the effect of MSSs as a barrier to innovation on the intention of these organisations to implement MSSs in the future. Results show significant influence for the variables studied.

Keywords: management system standards; innovation processes; standardised management systems; hindering innovation; quality management

Introduction

As quality management has become an established aspect of virtually all organisational activities, it is now common for organisations to implement the various related standards. The best known of these are the International Organization for Standardization (ISO) standards from the ISO 9000 family, for example, ISO 9001, ISO 9004, and the many ISO 10000 guidelines, as well as excellence models, such as the ones coming from the European Foundation for Quality Management (EFQM) and the American National Institute for Standards and Technology, namely the EFQM and Malcolm Baldrige frameworks, respectively. There is also a growing range of management system standards (MSSs) in other fields, for example, ISO 50001: 2011 for energy management systems (MSs) and

*Corresponding author. Emails: sandra.castillo@udg.edu, sm.castillor@gmail.com

ISSN 1478-3363 print/ISSN 1478-3371 online

http://dx.doi.org/10.1080/14783363.2012.678587
http://www.tandfonline.com

ISO 27001: 2005 for information security. In addition, MSSs exist even for innovation, for example, the Spanish UNE 166002: 2006 (AENOR, 2006) and the European CWA 15899: 2008 (CEN, 2008). In manufacturing companies, integrating these innovation MS within the group of already integrated MSs is generating competitive advantages (Matias & Coelho, 2011).

There is conflicting evidence in the academic literature about the relationship between the utilisation of such MSSs and organisational performance in general. There is also doubt about the more specific question of whether the implementation of MSSs promotes or hinders a firm's development of innovative products and processes. Some studies in this area have taken a positive view of the relationship in arguing that a common feature of all MSSs is that they tend to promote innovative organisational reform (Kanji, 1996; Tang, 1998; Prajogo & Sohal, 2001), whereas others have adopted a more negative position in arguing that any form of prescriptive standardisation must inevitably inhibit creativity (Tidd, Bessant, & Pavitt, 1997; Slater & Narver, 1998; Dick, 2000).

Consequently, the study illustrated in this paper addresses the question of whether MSSs hinder or promote innovation processes. Following a review of the relevant literature, an empirical study of Spanish organisations registered to multiple MSSs, specifically to both ISO 9001 and ISO 14001 at the minimum, is presented. In the study, representatives of these organisations were invited to respond to the key assertion that: 'Management system standards hinder innovation processes'. The responses of the participants were then analysed in terms of several variables related to the present and future implementation of MSSs in their organisations. The paper concludes with a summary of the main findings and suggestions for future research.

Literature review and conceptual framework

Quality management and quality standards

The effects of QM on company performance have been empirically analysed in an extensive body of academic literature (Sila & Ebrahimpour, 2002; Heras, 2006; Hung, Lien, Fang, & McLean, 2010). In general, most of these empirical studies have suggested that the implementation of methodologies, tools, and standards associated with QM, for example, ISO 9000 standards and total quality management (TQM) programmes based on the EFQM or other similar models, has had a positive effect on company performance. However, a significant debate on this issue still continues.

Innovation management and quality management

In parallel to QM, innovation management has also become a major subject of interest for management academics (Hoang, Igel, & Laosirihongthong, 2006; Dervitsiotis, 2010, 2011; Edvardsson & Enquist, 2011), practitioners (Gupta & Singh, 2006), and international economic organisations (OECD, 2007; WEF, 2008). However, the academic literature about the general relationship between QM and innovation, and the more specific question of whether the implementation of TQM practices promotes or hinders a firm's development of innovations contain two opposing positions (Rossetto & Franceschini, 1995; Kanji, 1996; Prajogo & Sohal, 2001).

Specifically, some studies have adopted a positive (or 'optimistic') perspective in contending that QM is strongly linked with the promotion of both product innovation and process innovation (Kanji, 1996; Tang, 1998). According to this view, QM is an innovation in itself and the implementation of QM in a firm is usually associated with

significant organisational innovations. Prajogo and Sohal (2001, p. 541) epitomised this position by arguing that 'TQM embodies principles that are congruent with innovation'. In accordance with this view, the *Oslo Manual*, which provides guidelines for collecting and interpreting innovation data (OECD, 2005), has included MSs, such as QMSs, among its guidelines for promoting organisational innovations. In this sense, academic studies refer to the ISO 9001 implementation as an administrative innovation (see, for instance, Kale & Arditi, 2010).

In contrast, the more negative (or 'pessimistic') view claims that QM methodologies and tools, especially QMS standards such as ISO 9001, which are based on systematisation and formalisation (Heras, 2006), actually hinder innovation because of their tendency to increase bureaucracy (Tidd et al., 1997; Slater & Narver, 1998; Dick, 2000).

Analysing previous research about TQM and its impact on organisational performance, and about innovation as a crucial factor in achieving a sustainable competitive advantage, Prajogo and Sohal (2003, p. 902) found the need to reassess the role of TQM in determining innovation performance. In their own contribution, Prajogo and Sohal (2004, 2006) tested the relationship between TQM and innovation performance because they believed that TQM, as a consequence of its roots in the concept of quality 'control', might be contrary to the 'spirit' of innovation. After examining the influence of TQM on organisational performance in terms of quality and innovation, the authors found that TQM had a significant positive effect on quality performance, but no significant effect on innovation performance. Prajogo and Sohal (2006) nevertheless suggested that TQM might still be an effective resource for pursuing other types of competitive performance than quality, including innovation.

Other studies have concluded that QM has a positive influence on innovation management. These include the work of Terziovski and Samson (1999), who confirmed a positive relationship between TQM and innovative capacity in terms of the number of new products offered to the market, and that of Hoang et al. (2006), who found that TQM, interpreted as a set of practices, including ISO 9000, had a positive impact on a firm's innovativeness. Lopez-Mielgo, Montes-Peon, and Vazquez-Ordas (2009) strongly confirm the positive link between quality management (including standardisation and quality control) and the organisation innovation capabilities.

In contrast to the empirical studies cited above, other studies concluded that TQM might hinder innovation (Tidd et al., 1997; Slater & Narver, 1998; Kim & Marbougne, 1999). In this regard, Atuahene-Gima (1996) argued that the 'customer focus' of QM is concerned with product 'conformance' (i.e. product quality), rather than product 'newness', that is, product innovation. Similarly, Singh and Smith (2004) did not find sufficient evidence to confirm a direct statistical relationship between TQM and improved innovation performance, although they suggested that the relationship between these concepts might be more complex than a simple direct influence. Indeed, these authors did not completely reject the proposition that TQM might facilitate innovation, albeit on a very limited basis.

Innovation and MSSs

Apart from the general relationship between innovation management and quality management, there has also been some interest in the more specific issue of the relationship between innovation capacity and the adoption of the ISO 9001 MSS.

By analysing data from two French microeconomics surveys, Pekovic and Galia (2009, p. 835) found that ISO 9000 adoption improves innovative performance:

> . . .more precisely, correlation between ISO 9000 and innovation is positive and significant concerning products (new or improved products for the firm, turnover due to new or improved products, new or improved products on the market and share of new or improved products to the market), processes (technologically new process) and innovation activities (total innovation expenditure and Number of innovation projects). Moreover, it is in its precise form that ISO 9000 certification seems to be positively associated with innovation performance.

Naveh and Marcus (2004, p. 354) endorsed the general usefulness of the ISO 9001 standard for improving innovation performance:

> ISO 9000 can become a springboard for rethinking the way a company does business and a point of departure for additional innovation. Going beyond means using ISO 9000 as a launching pad for new understandings about how the company does business.

However, innovation is not one of the 'Eight Quality Management Principles' (see ISO 9000: 2005). Therefore, according to Bossink (2002), the ISO 9001 standard must first be properly assimilated in an organisation before it can become an important basis for innovation processes. In other words, Bossink (2002) argued that ISO 9001 can become a platform for innovation, but only by going beyond its compulsory requirements.

An alternative point of view was put forward by Kondo (2000, p. 7), who argued that *all* forms of standardisation (including ISO 9001) are inherently contrary to innovation:

> . . . work standardization conflicts with motivation, since it restricts the creativity and ingenuity of the people engaged in the work and reduces their opportunities to exercise those faculties.

However, considering innovation as the process of bringing any new idea into practical use and including different stages such as creation, realisation, marketing, and sales of a new product (Boer & During, 2001; Wagner, 2005; Bhaskaran, 2006), it could be expected that mechanisms for quality management would help the management of innovation. This is particularly the case for the last three stages, and even more so for the stage of new product realisation, in order to ensure its reliability and performance.

Despite the interest in the relationship between specific MSSs and innovation capacity, the amount of empirical research work undertaken on this subject is rather limited and has been published only recently. In one of the few such studies, Martínez-Costa and Martínez-Lorente (2008) examined ISO 9001-certified companies in Spain and found clear evidence that the adoption of TQM had a significant positive effect on organisational innovation. In contrast to this positive finding regarding MSSs and innovation capacity, Könnölä and Unruh (2006) studied the implementation of ISO 14001 and found that it may constrain organisational focus on the existing production systems, thus hindering innovations that were discontinuous or radical. Other authors, like Feng, Prajogo, Tan, and Sohal (2006), argued that, simply, nowadays there is a process of shifting the focus from quality, including in ISO 9001, to other sources of competitive advantage, principally innovation.

While a number of new MSSs for innovation are emerging, such as UNE 166002: 2006 and CWA 15899: 2008, the question of whether MSSs promote or hinder innovation processes in an organisation remains unresolved. Therefore, a more in-depth empirical study is needed that would consider the adoption of multiple MSSs, that is, not only ISO 9001, but also ISO 14001, OHSAS 18001 for occupational health and safety, SA 8000 for social responsibility, and others.

This paper is a follow up on a previous descriptive empirical work (Castillo, Casadesús, Karapetrovic, Heras, & Martín, 2008). The research was undertaken with a view to shed further light on this interesting question about the influence of MSSs on innovation.

The following section illustrates the principal objective of the research. Subsequently, the data collection procedure used and previous results obtained in the analysis of this question are presented in Section 4. Sections 5 and 6 include the proposed model and the results obtained in this article, respectively. Finally some conclusions and further research are presented.

Objective

The main goal of this research is to analyse the effects of:

- the motivators to implement MSSs and
- the difficulties in implementing MSSs and integrating the related MSs

on the perception of the users of multiple MSSs regarding the hindrance of those standards to innovation, and in turn, on their intent to implement new standards in their company. This analysis has led to a proposed model, which is tested using structural equation modelling (*SEM*).

The correlation between the perceptions about MSSs as a barrier to innovation and the intent to implement new standards was analysed in a previous work (Castillo et al., 2008), which is summarised in the next section.

Data collection and previous results

General information

The aim of the empirical study was to analyse both the current status and the future evolution of the application and integration of international MSSs in a sample of Spanish companies. In pursuit of this aim, a self-administered, questionnaire-based, survey was conducted in 2006 and 2007 among 254 ISO 9001 and ISO 14001 – registered organisations in the autonomous regions of the Basque Country and Madrid. These two communities, together with Catalonia, have the largest proportions of MSS certificates in Spain.

Data collection

A questionnaire based on the theoretical and empirical literature was sent to managers of organisations holding both the ISO 9001: 2000 and ISO 14001: 2004 certificates. The questionnaire was mailed, with a prepaid postage envelope, to 525 organisations in the Basque Country and 525 organisations in Madrid. After follow-up telephone calls, completed questionnaires were returned by 122 companies in the Basque Country and by 132 organisations in Madrid, representing an overall response rate of 24.19%.

One of the survey questions sought to establish the perceived importance of the following affirmative statement, hereinafter referred to as the 'Key Statement':

> Management system standards hinder innovation processes.

The main results of the analysis of this statement, illustrated in Castillo et al. (2008), show that the majority of the respondents (64.3%) attached a low level of importance to the Key Statement. Indeed, almost half of the respondents (47%) considered the statement to be 'not very important', and a further 17.3% considered it to be only 'somewhat important'. More than a quarter of the respondents (28.5%) adopted an essentially 'neutral' position on the scale, considering the sentence to be 'important'. Only 7.2% of respondents

attached 'extreme importance' to the statement. It is thus apparent that the majority of the respondents did not believe that MSSs hinder innovation processes.

No statistically significant differences, with a 95% confidence level, were detected in the responses to the Key Statement in terms of the size of the organisations, the type of the business activity (63% production and 37% services), the industry sector, or the type of the organisation's customer (11% delivered their product to its final customer, 46% to an intermediate customer, and 43% to both). Moreover, there were no statistically significant differences between the two regions in which the organisations were based (Basque Country and Madrid).

Finally, the position of the respondent in the organisation (general manager/MS director/other area manager) did show some differences. Namely, general managers and MS directors attached slightly less importance to the Key Statement than did other area managers. However, these differences were not statistically significant. Taken together, these results meant that the hypotheses could be tested without a need for stratification.

Previous results

In Castillo et al. (2008), two groups of hypotheses with respect to the Key Statement were tested with the Mann–Whitney and Kruskal–Wallis tests to establish whether independent samples came from the same population; and the Spearman correlation coefficient to assess the correlation between variables.

The first group referred to the *present situation* with MSSs in the respondents' organisations, whereas the second group referred to the respondent's perceptions of the related *future scenarios*.

In the former group of hypotheses, it was postulated that the importance attached to the Key Statement by the respondents varies in accordance with the number of MSSs implemented in a given organisation (with the minimum being two because only organisations registered to both ISO 9001 and ISO 14001 were included in the survey) and the degree of integration of the corresponding MSs.

Although there were some observable differences, all these hypotheses were rejected. In other words, it would seem that the number of implemented MSSs and the degree of integration with the corresponding MSs did not affect the perception of the respondents regarding MSSs being a possible barrier to innovation processes.

In the latter group of hypotheses, it was proposed that the importance attached to the Key Statement by the respondents varies in accordance with the number of MSSs intended to be implemented by the organisation. In addition, the responding organisations' preferred options for future implementation of these standards, specifically the application of MSSs, excellence models, or no further application, as well as the responses regarding whether or not the implementation of a specific MSS for innovation is considered important for the organisation, were studied.

The results of the related tests indicate that respondents who intended to implement more MSSs were less likely to perceive standardisation as a hindrance to innovation processes. However, there was no statistical evidence to suggest that similar perceptions were held by respondents who intended to implement an innovation MSS or that the responses varied depending on the preferred option for future MSS implementation.

Hypothesis *H2a* was accepted at a lower confidence level of 85.1%, given that the *p*-value was 0.149. Mean rankings seem to indicate that the importance attached to the Key Statement decreased with a tendency to implement a greater number of MSSs. Hypothesis *H2b* was also accepted. The correlation coefficient was -0.2 (*p*-value equals to 0.001 with $n = 249$), which

indicates a significant negative weak correlation between the importance attached to the Key Statement and the tendency to implement a greater number of MSSs in the future.

The finding for Hypotheses *H2a* and *H2b* from Castillo et al. (2008) is used in this article as a part of the proposed model, which is presented in the next section.

The proposed model

Some of the survey questions attempted to establish the perceived importance of the motivators to implement multiple MSSs and the related difficulties. These difficulties specifically refer to the obstacles to integrating the corresponding standardised MSs in the organisation in order to take advantage of the synergies among them. The proposed model is based on the assumption that those motivators and the difficulties form the perception of respondents about the Key Statement and their intention of implement more MSSs in future.

The first step in the methodology was to create theoretical significant dimensions related with the motivators and difficulties items from the questionnaire. A principal component analysis (*PCA*) with *varimax rotation* was carried out in order to find the most adequate components for each dimension. Table 1 shows, for each dimension related to motivators and difficulties, a list of the items chosen, the *standardised loadings* and the reliability measured by *Cronbach's alpha*.

Regarding the results from Table 1, four dimensions for items related to the motivators, and four dimensions for the difficulties in implementing and integrating standardised MSs, were found. These dimensions are now explained in more detail from the theoretical point of view.

The first motivator dimension is composed of two specific reasons to implement MSSs that were included in the survey, namely 'customer pressures' and 'government pressures'. This dimension is called 'External Requirements' since it reflects the fact that the company was somehow forced to implement additional MSSs as a requirement of external stakeholders.

A second motivator dimension is called 'Market Opportunities', which indicates that the decision to implement the second and further MSSs was a strategic decision from the market point of view. This dimension consists of the following three reasons for implementation that were included in the survey: 'improvement of image and social impact', 'improvement of market share', and 'provision of competitive advantage'.

The third motivator dimension, 'Performance Improvement', includes 'improvement of efficiency and control' and 'decreasing problems and accidents'. This dimension indicates that the company chose to implement additional MSSs for internal restructuring and improvement reasons.

The last motivator dimension is named 'Synergies among the Management Systems'. It denotes the situation where the organisation, having already implemented the first MSS, chooses to capitalise on the obtained benefits and implement more MSSs. Items that form this dimension are: 'synergies among management systems' and 'natural continuation of the previous standards'.

With respect to the difficulties, the first dimension is called 'Human Resource Management'. It indicates that the main obstacles to implement and integrate standardised MSs are problems related to the employees, in this case the 'lack of employees' motivation' and the 'lack of collaboration among departments.

Difficulty dimension number two is about the lack of 'Specialised Support' necessary for the proper deployment of the standards within the organisation. This dimension is

Table 1. Factor analysis and reliability.

Variable group	Items	*Loadings*[a]	Reliability *Cronbach's alpha*
Motivators Reasons to implement multiple MSSs	*External requirements*		0.501
	Consumer pressures	0.817	
	Government pressures	0.817	
	Market opportunities		0.589
	Improvement of image and social impact	0.560	
	Improvement of market share	0.784	
	Provision of competitive advantage	0.853	
	Performance improvement		0.694
	Improvement of efficiency and control	0.877	
	Decreasing problems and accidents	0.877	
	Synergies among the MSs		0.766
	Natural continuation of the previous standard	0.900	
	Synergies among MSs	0.900	
Difficulties Difficulties to integrate MSs	*Human resource management*		0.677
	Lack of employees' motivation	0.869	
	Lack of collaboration among departments	0.869	
	Specialised support		0.689
	Lack of specialised auditors	0.781	
	Lack of technical support	0.798	
	Lack of specialised consultants	0.779	
	Institutional support		0.674
	Lack of government support	0.869	
	Lack of guidelines	0.869	
	Differences between the standards		0.666
	Differences in the models of standards	0.866	
	Difference in the common elements of standards	0.866	

Note: [a]Extraction method: PCA. Varimax rotation.

composed of three specific difficulties mentioned in the survey, namely the 'lack of specialised auditors', the 'lack of technical support' (for example, integration with ERP, etc.), and the 'lack of specialised consultants'.

The third difficulty dimension refers to the lack of 'Institutional Support', consisting of the 'lack of government support' and the 'lack of guidelines (for integration books, articles, documents, etc.)'.

The last difficulty dimension is called 'Differences between the Standards'. It refers to the fact that the way each MSS was conceived and defined could have generated conceptual incompatibilities among the different MSSs being implemented. This difficulty dimension is composed of the 'differences in models of standards (PDCA, process management, etc.)' and the 'difference in common elements of standards (audits, policy, etc.)'.

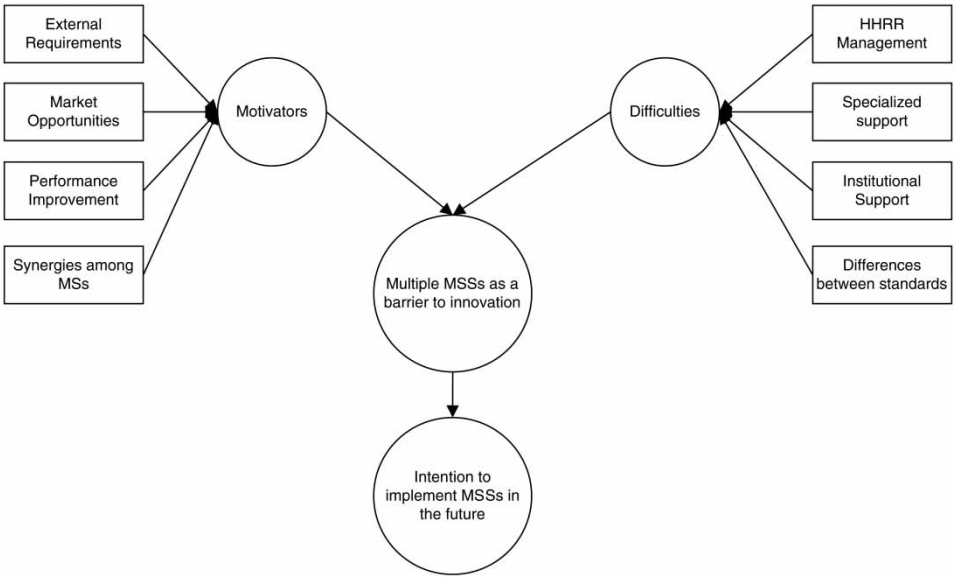

Figure 1. The proposed theoretical model.

Each dimension found has a score for internal consistency or reliability measured using *Cronbach's alpha* (Cronbach, 1951). In almost all cases, the *Cronbach's alpha* exceeded the value of 0.6. This is the value suggested by Malhotra (2004) as the minimum value that would be satisfactory to demonstrate internal consistency. Only in the cases of two dimensions, specifically 'External Requirements' and 'Market Opportunities', was the *Cronbach's alpha* slightly below this value.

As discussed previously, motivators and difficulties shape the perception of the respondents about the Key Statement and their intention to implement more MSSs in future. Once exogenous motivator and difficulty dimension were found and defined, their were used as observed variables in our specified model. Thus, the proposed model attempts to explain the relationship between the motivators to implement MSSs and difficulties in integrating the related MSs, the Key Statement, and the intention to implement new MSSs in the future. The theoretical model is shown in Figure 1.

Results

The results of the theoretical model show non-significant effects from most of the motivator and difficulty dimensions. Significant effects for two motivator dimensions were found, which were the 'External Requirements' and 'Performance Improvement', and one difficulty dimension, namely the 'Specialised Support'. The final model is a part of Figure 1 and it is shown in Figure 2.

The model is tested using SEM in order to study the effects from the dimensions on the Key Statement and future implementation, with the correction for measurement error.

The squares in Figure 2 indicate the observed variables, in this case dimensions found in Table 1. The answers certainly contained errors, which are indicated as δ_i. Therefore, each observed dimension is connected to the variable (with score equals to one) representing the construct for which the measurement is obvious (Saris & Gallhofer, 2007). The

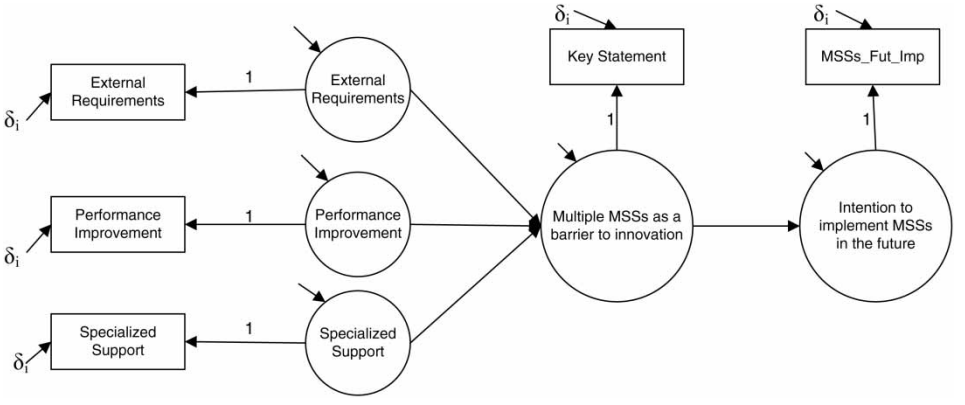

Figure 2. The final model.

names of these constructs are presented in a circle. The unobserved (latent) variables with variances are denoted as single arrows.

Evidently, the latent variable 'Multiple MSSs as a Barrier to Innovation' is of particular interest for our study, in order to know if the use of MSSs, including ISO 9001, is incompatible with innovation, considered as a new source of competitive advantage. The model from Figure 2 shows that this variable has an effect on the 'Intention to Implement MSSs in the Future', which is also measured by an observed variable corrected for the measurement error.

The evaluation of the goodness of fit of the model is a complex task for which many statistical tools are available. First of all, the estimates must be checked for admissibility (for example, variances may not be negative and correlations may not be larger than one).

In our case, the final results for the model show statistically significant effects from the variables in the model. A first goodness of fit measure for the global model is the χ^2 statistic to test the null hypothesis of no parameter omission, with its associated n degrees of freedom and the p-value. We obtained the χ^2 of 8.193, with six degrees of freedom and the p-value equal to 0.224. Therefore, the null hypothesis is not rejected. In other words, there is no parameter omission in the model. Other useful measures that quantify the fit of the model were also obtained. These measures are the compared fit index equalling 0.92 (acceptable above 0.90), the root mean square error of approximation of 0.043 (acceptable below 0.05), and the standardised root mean square residual equal to 0.042 (acceptable below 0.05). Thus, all three measures show a good fit of the model.

The relationships or effects between constructs (latent variables) are provided in the structural part of the model (Figure 3). The related standard errors are given in brackets.

All effects in the model are significant. Furthermore, we did not find additional necessary effects between constructs. Correlations between the motivator and difficulty constructs are found to be non-significant. Results show a positive effect from 'External Requirements' and 'Specialised Support' on the construct of interest, that is, 'Multiple MSSs as a Barrier to Innovation'. Therefore, the more the importance given to the demands from the public administration and customers to implement MSSs, the more MSSs are seen as a barrier to innovation. The positive effect from the 'Specialised Support' would mean that the more this support lacks, the more MSSs are seen as a barrier to innovation. A negative effect is found from the 'Performance Improvement' on the perception that MSSs are a barrier to innovation. Thus, the more the importance

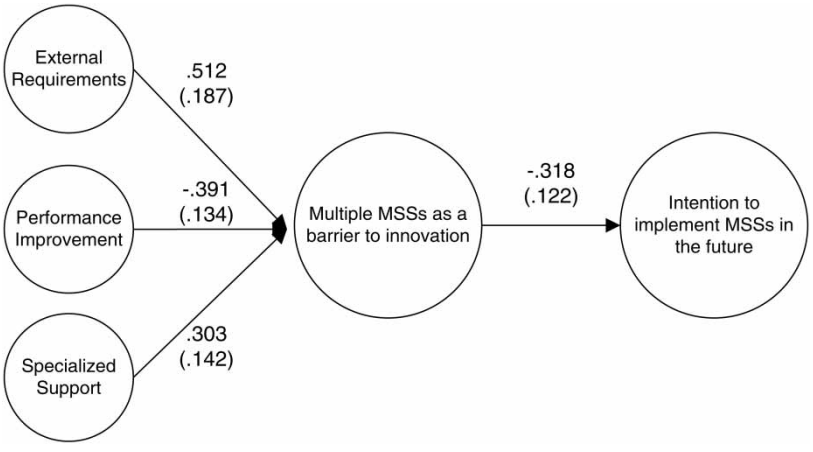

Figure 3. Results from the final model.

given to 'Performance Improvement' as a motivator to implement additional MSSs, the less is MSSs seen as a barrier to innovation.

The model is also linked to the study presented in Castillo et al. (2008), specifically in the use of the 'Intention to Implement MSSs in the Future' within the model. Results from the final model in Figure 3 show a significant negative effect of 'Multiple MSSs as a Barrier to Innovation' on the 'Intention to Implement MSSs in the Future'. Therefore, it could be said that organisations considering MSSs as a barrier to innovation have a lower intention to implement MSSs in the future.

Conclusions

As a starting point of this study, it was found that the importance attached to the Key Statement that MSSs hinder innovation decreased as more MSSs were considered for implementation in the future. In order to explore the effects of the motivators to implement MSSs and the difficulties of integrating the corresponding MSs on this finding, a model was presented and tested by means of *SEM*.

Eight motivator and difficulty dimensions were proposed. We found significant effects for two motivator dimensions, specifically 'External Requirements' and 'Performance Improvement', and one difficulty dimension, namely the lack of 'Specialised Support'. All analysed measures show a good fit of the model. In general, we can say that the above-mentioned three dimensions shape the perception of MSS users about these standards being a hindrance to innovation and their intent to implement new MSSs in the future.

From the perspective of decision-making, this perception is shaped by the reasons to implement MSSs in the organisation. In other words, organisations that chose to implement multiple standards as a measure towards 'Performance Improvement' had learnt how to extract the potential of MSSs, thus attaching less importance to the Key Statement. In this case, the perception attached to the Key Statement seems to be related to a conscious process of decision-making (i.e. analysing advantages and disadvantages, and potential benefits of the decision) before implementing MSSs. On the contrary, the more the organisations had been pushed by their external stakeholders to implement these standards, the more prevalent is the perception that MSSs are a barrier to innovation.

Thus, when the decision of MSSs implementation was made under external pressures, namely 'External Requirements', the perception of them as innovation inhibitors arises.

From the perspective of the MSSs integration process, when the difficulty related to the lack of specialised support decreases within the company, the perception of MSSs as a hindrance decreases. Indeed, when the lack of specialised auditors, technical support, and/or specialised consultants, is a fact of MSSs integration processes, companies have to explore and create their own particular mechanism to handle the integration process. Then, the MSSs integration process could become a really complex task, considering the broad amount of knowledge and skills that specialised people may require and manage. Even when people like consultants or auditors were experts on the set of MSSs in which the company is interested, each company had its peculiarities and creating the appropriate specialised support platform could be costly and hard. In spite of this, those companies who found the appropriate support in the integration process gave little importance to the Key Statement analysed.

Future research can focus on comparing quality-related MSSs, on one side, and innovation MSS, on the other, with a view to ascertaining whether or not they are complementary and how they might be integrated within an MS of an organisation. Other future empirical work could examine the application of MSSs in innovative companies to ascertain whether the use of standards facilitates innovation processes. Such an analysis could also consider distinctions between the different categories of innovation. As well, an in-depth analysis could be done by considering the application of standardised QM approaches in different stages of the innovation process.

Acknowledgements

This study is part of a larger research project entitled 'The integrated management system (IMS) in Spanish companies' (SEJ2006-00682/ECON) financed by the Ministry of Science and Technology within the aid programme for R+D projects.

References

AENOR. (2006). *UNE 166002: Gestión de la I+D+I. Requisitos de un sistema de gestión de I+D+i*. Madrid: Author.

Atuahene-Gima, K. (1996). Market orientation and innovation. *Journal of Business Research*, *35,* 93–103.

Bhaskaran, S. (2006). Incremental innovation and business performance: Small and medium-size food enterprises in a concentrated industry environment. *Journal of Small Business Management*, *44*(1), 64–80.

Boer, H., & During, W.E. (2001). Innovation, what innovation? A comparison between product, process and organisational innovation. *International Journal of Technology Management*, *22*(1–3), 83–107.

Bossink, B.A.G. (2002). The strategic function of quality in the management of innovation. *Total Quality Management & Business Excellence*, *13*(2), 195–205.

Castillo, S.M., Casadesús, M., Karapetrovic, S., Heras, I., & Martín, I. (2008). Do standardized management systems hinder innovation processes? In *Proceedings of the 2nd International Quality Conference – Quality Festival 2008*. Kragujevac, Serbia: Association for Quality and Standardization of Serbia-AQS (also appeared in the *International Journal of Quality Research, 2*(2), 121–127).

CEN (2008). *CWA 15899:2008 (Ed. 1): Standardization of an innovation capability rating for SMEs*. Brussels: Author.

Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16,* 297–334.

Dervitsiotis, K.N. (2010). A framework for the assessment of an organisation's innovation excellence. *Total Quality Management & Business Excellence*, *21*(9), 903–918.
Dervitsiotis, K.N. (2011). The challenge of adaptation through innovation based on the quality of the innovation process. *Total Quality Management & Business Excellence*, *22*(5), 553–566.
Dick, G.P.M. (2000). ISO 9000 certification benefits, reality or myth? *The TQM Magazine*, *12*(6), 365–371.
Edvardsson, B., & Enquist, B. (2011). The service excellence and innovation model: Lessons from IKEA and other service frontiers. *Total Quality Management & Business Excellence*, *22*(5), 891–910.
Feng, J., Prajogo, D.I., Tan, K.C., & Sohal, A.S. (2006). The impact of TQM practices on performance: A comparative study between Australian and Singaporean organizations. *European Journal of Innovation Management*, *9*(3), 269–278.
Gupta, M., & Singh, R. (2006). Experience management framework for managing innovation in post-harvest resource management. In *Proceedings 2006 IEEE International Conference on Management of Innovation and Technology* (Vol. 1/2, pp. 375–379). Singapore: IEEE.
Heras, I. (2006). *ISO 9000, ISO 14001 y otros estándares de gestión: pasado, presente y futuro*. Madrid: Editorial Civitas.
Hoang, D.T., Igel, B., & Laosirihongthong, T. (2006). The impact of total quality management on innovation: Findings from a developing country. *International Journal of Quality & Reliability Management*, *23*(9), 1092–1117.
Hung, R.Y.Y., Lien, B.Y.H., Fang, S.C., & McLean, G. (2010). Knowledge as a facilitator for enhancing innovation performance through total quality management. *Total Quality Management & Business Excellence*, *21*(4), 425–438.
Kale, S., & Arditi, D. (2010). Innovation diffusion modeling in the construction industry. *Journal of Construction Engineering and Management*, *136*(3), 329–340.
Kanji, G. (1996). Can total quality management help innovation? *Total Quality Management*, *7*(1), 3–9.
Kim, W.C., & Marbougne, R. (1999). Strategy, value innovation, and the knowledge economy. *Sloan Management Review*, *2*(Spring), 41–54.
Kondo, Y. (2000). Innovation versus standardization. *The TQM Magazine*, *12*(1), 6–10.
Könnölä, T., & Unruh, G.C. (2006). Really changing the course: The limitations of environmental management systems for innovation. *The Journal of Business Strategy and the Environment*, *16*(8), 525–537.
Lopez-Mielgo, N., Montes-Peon, J.M., & Vazquez-Ordas, C.J. (2009). Are quality and innovation management conflicting activities? *Technovation*, *29*(8), 537–545.
Malhotra, N.K. (2004). *Marketing research and applied orientation* (4th ed.). Englewood Cliffs, NJ: Prentice Hall.
Martínez-Costa, M., & Martínez-Lorente, A.R. (2008). Does quality management foster or hinder innovation? An empirical study of Spanish companies. *Total Quality Management & Business Excellence*, *19*(3), 209–221.
Matias, J.C de O., & Coelho, D.A. (2011). Integrated total quality management: Beyond zero defects theory and towards innovation. *Total Quality Management & Business Excellence*, *22*(6), 891–910.
Naveh, E., & Marcus, A.A. (2004). When does the ISO 9000 quality assurance standard lead to performance improvement? Assimilation and going beyond. *Engineering Management*, *51*(3), 352–363.
OECD. (2005). *Oslo manual: Guidelines for collecting and interpreting innovation data* (3rd ed.). Geneva: Author.
OECD. (2007). *Innovation and growth: Rationale for an innovation strategy*. Geneva: Author.
Pekovic, S., & Galia, F. (2009). From quality to innovation: Evidence from two French employer surveys. *Technovation*, *29*(12), 829–842.
Prajogo, D.I., & Sohal, A.S. (2001). TQM and innovation: A literature review and research framework. *Technovation*, *21*(9), 539–558.
Prajogo, D.I., & Sohal, A.S. (2003). The relationship between TQM practices, quality performance, and innovation performance: An empirical examination. *International Journal of Quality & Reliability Management*, *20*(8), 901–918.

Prajogo, D.I., & Sohal, A.S. (2004). The multidimensionality of TQM practices in determining quality and innovation performance – an empirical examination. *Technovation*, *24*(6), 443–453.

Prajogo, D.I., & Sohal, A.S. (2006). The integration of TQM and technology/R&D management in determining quality and innovation performance. *Omega*, *34*(3), 296–312.

Rossetto, S., & Franceschini, F. (1995). Quality and innovation: A conceptual model of their interaction. *Total Quality Management*, *6*(3), 221–229.

Saris, W.E., & Gallhofer, I. (2007). *Design, evaluation, and analysis of questionnaires for survey research*. New York, NY: Wiley.

Sila, I., & Ebrahimpour, M. (2002). An investigation of the total quality management survey based research published between 1989 and 2000. *International Journal of Quality & Reliability Management*, *19*(7), 902–970.

Singh, P.J., & Smith, A.J.R. (2004). Relationship between TQM and innovation: An empirical study. *Journal of Manufacturing Technology Management*, *15*(5), 394–401.

Slater, S.F., & Narver, J.C. (1998). Customer-led and market-oriented: Lets not confuse the two. *Strategic Management Journal*, *19,* 1001–1006.

Tang, H.K. (1998). An integrative model of innovation in organizations. *Technovation*, *18*(5), 297–309.

Terziovski, M., & Samson, D. (1999). The link between total quality management practice and organizational performance. *International Journal of Quality & Reliability Management*, *16*(3), 226–237.

Tidd, J., Bessant, J., & Pavitt, K. (1997). *Managing innovation: Integrating technological, market and organizational change*. London: John Wiley and Sons.

Wagner, E.R. (2005). Innovation in large versus small companies: Insights from the US wood products industry. *Management Decision*, *43*(6), 837–850.

WEF. (2008). *The global competitiveness report*. Geneva: World Economic Forum.