

An Empirical Study of the Impact of Management Standards on the Innovation Processes

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Abstract

Purpose- The aim of this research is to respond, from an empirical point of view, to the next question: “Does management systems based on standards hinder innovation processes?”.

Methodology- In order to achieve this objective, an empirical work with the participation of 249 companies, in the framework of a research project called “Integrated Management Systems (IMS) in the Spanish companies” (SEJ2006-00682/ECON financed by the Ministry of Science and Technology within the aid program for R+D project) carried out from January to April 2006, is presented in this paper.

Findings- Principal findings of the survey of 249 Spanish organizations registered to both the ISO 9001 and ISO 14001 standards which was illustrated here are: Managers and people involved in standardized management systems gave less importance to the statement that standards hinder innovation processes, although not with a statistically-significant difference compared to the other types of managers who responded to the survey. The importance given to the sentence “MSSs hinder innovation” decreased as more MSSs were considered for implementation in the future.

Originality/value- The majority of the work on innovation and quality management systems available in the current literature is based on the framework of Total Quality Management. In difference, the empirical analysis illustrated in this paper is focused on the various characteristics of standardized management systems, for example their current and future application and integration.

Keywords Standardization, ISO 9001, Innovation, Management systems
Paper Type Research Paper

1 Introduction

The academic literature of empirical studies that have analysed the effects of QM (Quality Management) in companies' performance is very extensive (see for literature reviews Sila and Ebrahimpour, 2002; Heras, 2006). Empirical studies seem to have evidenced that the implementation of methodologies and tools that are linked to QM (e.g. implementation of TQM programs based on EFQM, ISO 9001 or other similar models) have improved companies' performance, although there is a big discussion on this issue.

Although the relationship between the implementation of Quality Management Systems (QMSs) and the innovation capacity of the organizations has been broadly studied from a theoretical point of view (see Prajogo and Sohal, 2003; Singh and Smith, 2004; Prajogo and Sohal, 2004a; Feng et al., 2006; Hoang et al., 2006; Martínez-Costa and Martínez-Lorente, 2008), there are not many empirical studies in the literature that are related to the impact of Management System Standards (MSSs) on the innovation capacity of organizations.

When considering the correlation between MSSs and innovation, the literature generally presents different views. From the point of view of Kondo (2000): "It is pointed out that 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, Naveh and Marcus (2004), regarding the usefulness of the ISO 9001 standard to achieve innovation performance, consider that innovation is dependent upon the level of the standard adoption in an organization. According to Bossink (2002), the standard has to be really assimilated in an organization first, and subsequently, by going beyond its established requirements, ISO 9001 can become an important basis for innovation processes in the organization. Since innovation it is not one of the "Eight Quality Management Principles" (see ISO 9000: 2005), ISO 9001 can be considered as a platform to innovate only by going beyond its compulsory requirements (Bossink, 2002).

Considering the previous theoretical work, the aim of this research is to respond, from an empirical point of view, to the following question: "Do Management Systems (MSs) based on standards hinder the innovation processes in an organization?" In order to address this question, empirical research illustrated in the next section was performed.

2 Data collection

In 2006, within the framework of a research project called "Integrated Management Systems (IMS) in Spanish organizations", a questionnaire based on the existing theoretical and empirical literature was sent out to managers of ISO 9001: 2000 and ISO 14001: 2004 –registered organizations in the Spanish Autonomous Communities of the Basque Country and Madrid. These two communities, in addition to Catalonia, have the highest number of MSS certificates in the Spain. This specific research follows a previous research in Catalonia, the details of which can be found in Karapetrovic et al. (2006).

The questionnaire was mailed, with a prepaid postage envelope, to 525 organizations with both the ISO 9001 and the ISO 14001 certificates in the Basque Country, and 525 of the 990 such organizations in Madrid. After the telephone calls to follow-up on the reception of the survey, the questionnaires were sent back by 122 companies in the Basque Country and by 132 organizations in Madrid. This represents a 24.19% response rate (Heras et al., 2007). The aim of the questionnaire was to obtain empirical-based answers to analyze both the current status and the future evolution of the application and integration of international MSSs within organizational management systems. One of the survey questions addressed the perceived importance of the following affirmative sentence: "Management system standards hinder innovation processes", which became the Key Statement (KS) analyzed in this paper. In accordance with this KS, the following two main hypotheses and seven sub-hypotheses were tested.

Hypothesis 1.

Importance attributed to the Key Statement varies among organizations depending on the implemented MSSs and their integration.

Sub-hypothesis 1. Importance attributed to the KS varies among organizations with a different number of implemented MSSs.

Sub-hypothesis 2. The variation within the importance attributed to the KS is correlated with the different number of MSSs implemented in organizations.

Sub-hypothesis 3. Importance attributed to the KS varies among organizations with different integration levels of the implemented MSSs.

Hypothesis 2.

Importance attributed to the Key Statement varies among organizations depending on the implementation of new MSSs:

Sub-hypothesis 4. Importance attributed to the KS varies among organizations which considered a different number of MSSs important to implement in the future.

Sub-hypothesis 5. The variation within the importance attributed to the KS is correlated with the number of MSSs considered important for the future implementation in the organization.

Sub-hypothesis 6. Importance attributed to the KS varies if the implementation of an innovation management standard is considered important for the organization or not (In Spain, as in a number of other countries, for example the United Kingdom, there already exists an innovation management standard, namely the UNE 166 000 series).

Sub-hypothesis 7. Importance attributed to the KS varies among organizations with different views on the most preferable option for the future MSS implementation.

A summary of the results of the testing of these hypotheses is presented in the following section. Full results can be found in Castillo (2007).

3 Results

There were 249 valid responses to the key statement. Considering a total population of 1.515 certified organizations in the Basque Country and Madrid, and a confidence level of 95%, the admissible margin of error is 6.1%. In general, it can be said that the majority of the respondents (64.3%) gave a low level of importance to the statement:

“Management system standards hinder innovation processes” (Figure 1. Responses to the Key Statement). Namely, 47%, or almost a half of the respondents considered this sentence as “Not Very Important”, while 17.3% considered it as “Somewhat Important”. 28.5% of the respondents adopted a “Neutral” or a more conservative position considering the sentence as “Important”. And just the 7.2% of respondents attributed the “Extremely important” alternative to the statement. Therefore, it seems clear that for the majority of the organizations, MSSs do not hinder innovation processes.

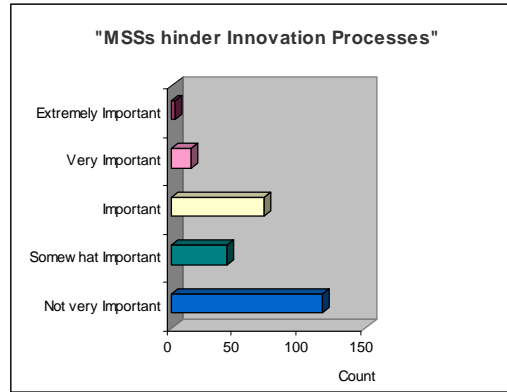


Figure 1. Responses to the Key Statement

Before analyzing the proposed hypotheses, the first analysis carried out was related to the respondents and the various company characteristics. However, none of the analyzed variables demonstrated any difference between respondents. In other words, we did not find any statistically-significant differences, with a 95% confidence level, in the responses to the key statement depending on the size, the type of the business activity (Production / Services), the industry sector, or the customer of the organization (Final Customer/ Intermediate Customer / Both). The same was true for the regions where the organizations were based (Basque Country / Madrid). On the other hand, the position of the respondent in the organization (General Manager / Management System Director / Other Area Manager) indicated some differences, however these differences were not statistically significant. This result seemed to show that general managers and management system directors gave less importance to this sentence than other area managers. Overall, these results, presented in Castillo (2007), allow us to work on the hypotheses without any kind of stratification.

Non-parametric tests can be used to test the hypotheses. Depending on the variable measurement levels, there are two specific non-parametric tests used in this work: Mann-Whitney and Kruskal-Wallis tests to analyze if independent samples come from the same population, and the Spearman correlation coefficient to analyze the correlation between variables. The following paragraphs represent the results of this analysis.

Sub-hypothesis 1 is rejected with a p-value=0.442 for the confidence level of 95% (Table I. Kruskal-Wallis Test Results for Sub-Hypothesis 1). The “Number of MSSs implemented” refers to the number of MSSs implemented in the organization. The minimum is two, since organizations with at least ISO 9001 and 14001 were included in the survey. Checking the mean rank and the percentages obtained seems to indicate that the importance attributed to the key statement decreases as the number of implemented standards increases. However, these differences are not significant.

Sub-hypothesis 2 is also rejected. Considering that the Spearman correlation coefficient is not significantly different from zero, there is no correlation between the importance attributed to the key statement and the number of different MSSs implemented in the organization.

Sub-hypothesis 3 is rejected with $p\text{-value}=0.706$ for the 95% confidence level. Although the differences are not statistically significant, organizations that did not integrate their standardized MSs gave more importance to the key statement. The mode in this case is the

% within Number of MSSs Implemented		Importance of "MSSs hinder innovation processes"					Total
		Not very Important	Somewhat Important	Important	Very Important	Extremely Important	
Number of MSSs Implemented	2	48,6%	18,1%	26,1%	5,8%	1,4%	100,0%
	3	42,6%	13,1%	36,1%	6,6%	1,6%	100,0%
	4	36,7%	23,3%	33,3%	6,7%		100,0%
	5	61,5%	7,7%	23,1%	7,7%		100,0%
	6	66,7%	33,3%				100,0%
	7	100,0%					100,0%
	9	50,0%	50,0%				100,0%

Test Statistics ^{a,b}	
	Importance of "MSSs hinder Innovation processes"
Chi-Square	5,833
df	6
Asymp. Sig.	,442

a. Kruskal Wallis Test
b. Grouping Variable: Number of MSSs Implemented

Table I. Kruskal-Wallis Test Results for Sub-Hypothesis 1 (Number of MSSs Implemented)

same for organizations that have made or not integration efforts. The mean rank is higher for organizations without the integration, and these organizations had a higher percentage of answers considering the key statement as either "very important" or "extremely important".

Considering the test results on the first three sub-hypothesis, we have to reject the main Hypothesis 1 and conclude that "The number of implemented MSSs and their integration does not affect the perception of the organizations regarding MSSs being a possible barrier to the innovation processes".

In order to analyze Hypothesis 2, four sub-hypotheses have been tested, with the following results.

Sub-hypothesis 4 is rejected for the confidence level of 95% (Table II. Kruskal-Wallis Test Results for Sub-Hypothesis 4). However, considering that the $p\text{-value}$ is 0.149, it could be accepted for a lower confidence level of 85.1% ($1 - p\text{-value}$). Namely, the importance attributed to the key statement may vary depending on the number of MSSs considered important for future implementation in the company. Checking the mean rank and the percentage within the MS future implementation level seems to indicate that the importance given to the key statement decreases with the propensity to implement a higher number of management system standards.

% within Number of MSSs for future application

		Importance of "MSSs hinder innovation processes"					Total
		Not very Important	Somewhat Important	Important	Very Important	Extremely Important	
Number of MSSs for future application	2	34,4	18,8	35,9	10,9		100,0
	3	46,6	15,5	29,3	5,2	3,4	100,0
	4	40,0	13,3	43,3	3,3		100,0
	5	50,0	22,7	13,6	13,6		100,0
	6	50,0	18,8	31,3			100,0
	7	71,4	7,1	21,4			100,0
	8	71,4	28,6				100,0
	9	75,0	25,0				100,0
	10	50,0	20,0	20,0		10,0	100,0
	11	60,0		20,0	20,0		100,0
	12	50,0	16,7	33,3			100,0
	13		100,0				100,0
	14	80,0		20,0			100,0
	15	33,3	33,3	33,3			100,0
	Total	47,0	17,3	28,5	6,0	1,2	100,0

Test Statistics^{a,b}

	Importance of "MSSs hinder Innovation Processes"
Chi-Square	17,021
df	12
Asymp. Sig.	,149

a. Kruskal Wallis Test

b. Grouping Variable: Number of MSSs for future application

Table II. Kruskal-Wallis Test Results for Sub-Hypothesis 4
(Number of MSSs for future application)

Sub-hypothesis 5 is also accepted (Table III. Results from the Spearman correlation coefficient in Sub-Hypothesis 5). The correlation coefficient is -0.2 and the p-value=0.001. Hence, there is a significant negative weak correlation between the importance given to the key statement and the propensity to implement a higher number of MSSs in the future.

Correlations					
				Importance of "MSSs hinder Innovation Processes"	Number of MSSs for future application
Spearman's rho	Importance As a Barrier to Innovation	Standards	Correlation Coefficient	1,00	-,20 **
			Sig. (2-tailed)	.	,00
			N	249	249
	Number of MSSs for future application	Standards	Correlation Coefficient	-,20 **	1,000
			Sig. (2-tailed)	,00	.
			N	249	256

** Correlation is significant at the 0.01 level (2-tailed).

Table III. Results from the Spearman correlation coefficient in Sub-Hypothesis 5

Sub-hypothesis 6 is rejected for the confidence level of 95% and the p-value=0.22 (Table IV. Mann-Whitney Test Results for Sub-Hypothesis 6). The importance attributed to the key statement is smaller if the future implementation of an Innovation MSS is considered important for the company. In fact, there is a higher percentage of organizations which consider the key statement as "Important" and "Very important" in the group which considers that the Innovation MSSs should not be implemented. However, taking into account the hypothesis testing results, these differences are not statistically significant.

% within Importance of an Innovation MSS

		Importance of "MSSs hinder innovation processes"					Total
		Not very Important	Somewhat Important	Important	Very Important	Extremely Important	
Importance of an Innovation MSS	Implementation should be done in the future	53,7%	18,5%	22,2%	3,7%	1,9%	100,0%
	Implementation should not be done	46,0%	15,0%	30,1%	8,8%		100,0%
Total		48,5%	16,2%	27,5%	7,2%	,6%	100,0%

Test Statistics^a

	Importance of "MSSs hinder Innovation Processes"
Mann-Whitney U	2720,000
Wilcoxon W	4205,000
Z	-1,221
Asymp. Sig. (2-tailed)	,222

a. Grouping Variable: Importance of an Innovation MSS

Table IV. Mann-Whitney Test Results for Sub-Hypothesis 6
(Importance of an Innovation MSS)

The last *sub-hypothesis* (Table V. Kruskal-Wallis Test Results for Sub-Hypothesis 7), is also rejected with a p-value of 0.368 for the confidence level of 95%. Organizations that consider the implementation of MSSs and excellence models as suitable options for the future give less importance to the key statement than the organizations which do not intend to implement any MSSs or excellence models. This result can be confirmed by checking the mean rank and the percentage within the general view of future implementations. However, these differences are not statistically significant.

% within Options suitable for future		Importance of "MSSs hinder innovation processes"					Total
		Not very Important	Somewhat Important	Important	Very Important	Extremely Important	
Options Suitable for future	Management Standards	51,9%	19,4%	25,0%	2,8%	,9%	100,0%
	Excellence Models - TQM	50,6%	14,3%	26,0%	7,8%	1,3%	100,0%
	No One	40,0%	16,7%	36,7%	6,7%		100,0%
Total		49,8%	17,2%	27,0%	5,1%	,9%	100,0%

Test Statistics ^{a,b}	
	Importance of "MSSs hinder Innovation Processes"
Chi-Square	1,998
df	2
Asymp. Sig.	,368

a. Kruskal Wallis Test
b. Grouping Variable: Options Suitable for future

Table V. Kruskal-Wallis Test Results for Sub-Hypothesis 7
(Options Suitable for Future Use)

Considering the previous sub-hypothesis we can conclude the following: Organizations that intend to implement more MSSs perceive standardization as a possible barrier to the innovation processes to a lesser degree. However, there is no such difference between the organizations that intend to implement new innovation management system standards and the rest. Also, no differences were detected between organizations intending to implement a management system standard or a business excellence model and the ones that did not intend to do so.

4 Conclusions

The majority of the work on innovation and quality management systems available in the current literature is based on the framework of Total Quality Management. In difference, the empirical analysis illustrated in this paper is focused on the various characteristics of standardized management systems, for example their current and future application and integration. The principal findings of the survey of 249 Spanish organizations registered to both the ISO 9001 and ISO 14001 standards which was illustrated here are:

The assumptions related to the possible differences depending on the organizations' characteristics such as size or industry sector were rejected. This finding could be understood with the idea that management system standards (MSSs) are generic, therefore making organizational characteristics not affect the perceptions regarding their innovation performance.

Managers and people involved in standardized management systems gave less importance to the statement that standards hinder innovation processes, although not with a statistically-significant difference compared to the other types of managers who responded to the survey. This finding is most likely due to their position and involvement with MSSs allowing them to develop a balanced view of the company's characteristics at operational and strategic level (Prajogo and Sohal, 2004b).

There were no differences in the perception of MSSs as a barrier to the innovation processes depending on the number of MSSs implemented in an organization and whether or not the corresponding standardized management systems were integrated.

The importance given to the sentence "MSSs hinder innovation" decreased as more MSSs were considered for implementation in the future.

There were also some differences when contrasting other MSS-related variables with the importance given to the statement that MSSs hinder innovation processes. However, those differences were not statistically significant.

Following the work of McAdam et al, 1998, future research will focus on comparing and analyzing quality MSSs and innovation management standards in order to see how complementary they are.

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