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# **Improving Innovation and Customer Satisfaction through Systems Integration**

## **Abstract**

### **Purpose**

In recent years, organizations have been forced to compete in a new environment and to become more innovative, provide more quality and respond more effectively to consumers' needs and preferences. Within this context, the main objectives of this research are to propose scales and study the existing relationships among innovation, Management System Standards (MSSs) Integration and customer satisfaction in order to help organizations to manage these elements and increase their performance.

### **Methodology**

Data for this study derives from a survey carried out in 76 Spanish organizations registered to at least both ISO 9001:2008 and ISO 14001:2004. An Exploratory Factor Analysis (EFA) and Structural Equation Modelling (SEM) are utilised to assess and confirm the proposed scales validity and the relationships of the research model.

### **Findings**

The conceptual model finds significant support based on the empirical study. Three of the four dimensions of innovation and the four dimensions of MSs Integration are confirmed. Besides, the findings show that the integration characteristics are positively related to innovation and satisfaction, whereas, innovation is only partially linked to satisfaction.

### **Originality**

This study, which aims to shed light on the integration characteristics, is the first to propose a model that links the three concepts of integration, customer satisfaction and innovation together. These are relevant issues for the competitiveness of companies, willing to increase their performance, especially for companies which have implemented several ISO based systems, which have become a key part of the organisation's lifeline and a prerequisite for survival in the twenty-first century.

**Key Words:** Integration Characteristics, Innovation, Customer Satisfaction, ISO 9001, ISO 14001.

## **1. Introduction**

In a remarkably short time, economic globalisation has changed the world's economic order, bringing with it new challenges and opportunities. Innovation merits a special attention nowadays, given its importance for firms in order to adapt to the global market and to provide customized solutions to consumers. Customers are becoming more sophisticated, segmented and demanding, and expect more in terms of customization, newness, quality and price (Stark, 2000). To adapt to these customer's needs, organizations need to provide quality standardised products that are innovative and environmentally friendly (Stark, 2000). In this context, the management of innovation, customer satisfaction and the implementation of quality and environmental standards in organizations are considered essential for organizations to compete in the markets.

This research is an important step forward in finding out the impact of systems integration on innovation and customer satisfaction. This research wants to explore how the integration of management systems relates to the process of innovation and how the innovative products or services will satisfy the customer demand, needs and requirements. Systems integration can be considered as a type of organizational innovation (Llach *et al.*, 2011), thus, there exists a strong relationship between these two constructs. Moreover, innovation increases customer satisfaction as it maximizes the value of their purchases. In order to satisfy their customers, companies need to be innovative and to this, they have to manage the different systems in the organization effectively. Therefore, firms should be committed to managing integrated management systems, innovation, customer satisfaction and the existing interrelationships among them.

In this context, the aim of this study is to propose scales to measure MSs integration characteristics, customer satisfaction and organization innovation as well as to critically analyse if there is any relationship among these constructs in order to help organizations to better understand and manage these elements. This yields inside into the attributes of the integration characteristics that an organization should focus on to achieve the goal of customer's satisfaction and organization innovation and hence increase organisation performance.

## **2. Literature review**

### **2.1. Innovation, customer satisfaction and Management System Standards**

In reviewing the literature on innovation, various definitions have emerged from different perspectives. An innovation is defined by the Oslo Manual (OECD, 2005) as “*a product, process, marketing method or organizational method that is new (or significantly improved) to the firm, including products, processes and methods that firms are the first to develop and those that have been adopted from other firms or organizations*”.

On the other hand, customer satisfaction is a business terminology to evaluate how much a product or service supplied by company has been able to satisfy or please the customer (Nemati *et al.*, 2010).

In order to achieve customer satisfaction, firms need to create an environment and culture to find ways to serve customer needs and expectations. For these reason, Management System Standards (MSSs) that aim at satisfying customer needs, are becoming more and more popular. In the last few years, many organizations have chosen to implement standardized MSs, such as the ones based on ISO 14001 and ISO 9001. The proliferation of new MSSs, such as the one for occupational health and safety OHSAS 18001 (BSI, 2007) among others, gives the option that firms integrate the corresponding MSs into a single system in order to benefit from the existing synergies among them (Zeng *et al.*, 2007).

### **2.2. MSSs and innovation**

The interrelationships among innovation, MSs standards and customer satisfaction represent important topics for organizations willing to increase their competitiveness and they have been examined by numerous authors (i.e. Nemati *et al.*, 2010).

For example, the relationship between standardization and innovation has been a controversial topic which has been dealt in numerous studies. While standardisation and innovation are often perceived as conflicting processes, there are growing public policies and academic literature that perceive standardization as an enabler for innovation by facilitating access to markets and enabling interoperability between new and existing technologies, products, services, and processes (Galvin and Rice, 2008).

### **2.2.2. Integrated Management Systems**

During the last few years, both the proliferation and the increasing importance of MSSs have been demonstrated (ISO, 2010). Traditionally, organizations have focused on establishing MSs that comply with each MSSs requirements individually, often in isolation from each other and sometimes even in conflict (Zeng *et al.*, 2007). However, Integrated Management Systems (IMSs) that address organizations' objectives jointly are becoming more and more popular as they aim to satisfy the needs of several MSs while running a business (e.g. Salomone *et al.*, 2008). Achieving this can be beneficial to the organization's efficiency and effectiveness. Therefore, the beneficial characteristics of the integration of the systems and the similarities in terms of purposes and implementation factors justify the importance of evaluating Quality Management Systems and Environmental Management Systems together (Tarí and Molina-Azorín, 2010). These authors suggest that quality and environmental management systems and standards have become a key pillar for the improvement and survival for many organisations. Then, the common elements of both management systems can be implemented in a shared manner in whole or in part by organisations without unnecessary duplication (Tarí and Molina-Azorín, 2010). According to Tarí and Molina-Azorín (2010), managing a Quality Management System together with and Environmental Management System can have an impact on organizational performance, namely on customer satisfaction or product development and improvement (innovation).

Considering the previous theoretical work, we present the following research hypothesis:

*H1: The beneficial characteristics from Integrated Management Systems directly and positively affect innovation in organizations (where the characteristics from Integrated Management Systems consist of (a) Better use of the Systems, (b) System Performance, (c) Organizational Strategic and (d) Internal Cohesion).*

### **2.3. MSSs and customer satisfaction**

The previous section introduced the existing relationships found in the literature between MSSs and innovation. Standardization of MSs, helps to create an environment and culture that supports innovation. One of the core components of management standards is customer satisfaction. Companies that implement MSs have to explore and find ways to serve customer needs and expectations at the best. This creates the impetus for companies to be innovative in developing and launching new products or services to match the customers' needs.

The relationship between MSSs and customer satisfaction is supported by the fact that the most implemented standards worldwide, ISO 9001 and ISO 14001 are focused on customer satisfaction. ISO 9001:2008 (clause 8.2.1) requires that customer satisfaction is monitored. Companies that are ISO 9001 certified demonstrate to their customers that they comply with the ISO's Quality Management System requirements therefore, organizations have to measure customer satisfaction, determining the needs and

expectations of their customers and showing that their product or service meets customer needs and expectations (ISO 9001:2008). Implementation of ISO 14001 by setting up of internal processes gives confidence to customers about the managing of environmental issues.

Therefore, one of the key elements of MSSs is the need for a customer focus. Moreover, in a competitive environment, product and service innovation is necessary to surpass competitors in the degree to which the needs of customers are satisfied. Therefore, it is logical to believe that companies that implement MSSs together and that benefit from the advantages of having an IMS will make an appropriate and considerable effort in the innovation of their products and services. Therefore, our second hypothesis is:

*H2: The beneficial characteristics from Integrated Management Systems directly and positively affect customer satisfaction (where the characteristics from Integrated Management Systems consist of (a) Better use of the Systems, (b) System Performance, (c) Organizational Strategic and (d) Internal Cohesion).*

## **2.4. Innovation and customer satisfaction**

Companies bring about many changes and innovations to attract customers and give them more satisfaction (Nemati *et al.*, 2010). Furthermore, managers are willing to invest in innovation once they consider that customers' needs are not fully satisfied by the current products.

However, research that investigates a firm's customer-focused strategic orientation tends to investigate retention, loyalty, and share of wallet from existing customers without addressing the potential role played by innovation (Pan and Zinkhan, 2006). While such a focus upon customer retention through building deeper relationships may enhance the short-term performance of a firm, it is quite possible that there are unintended consequences associated with a heightened concentration upon current customers, such as a firm's decreased willingness to invest in innovation (Chandy and Tellis, 1998).

Innovative means that organizations are creating something new to increase their customer share and to satisfy their needs. Because innovation means coming up with something unique and different from competitors, it should result in a positive customer experience. This is the essence of innovation: attract customers and satisfy them. Therefore, our third hypothesis is:

*H3: Innovation in organizations directly and positively affects customer satisfaction. (Where innovation in organizations consists of: (e) process innovation, (f) organization innovation and (g) marketing innovation).*

On the basis of the above discussions and proposed hypotheses, figure 1 summarizes all the hypotheses in a conceptual model as follows:

**-Insert Figure 1 about here-**

## **3. Methodology**

### **3.1. Questionnaire and measures**

To examine the associations between the constructs and to test the hypotheses mentioned above in Figure 1, a structured questionnaire was designed. In general, the survey

included questions related to the implementation of MSs, the integration characteristics of the organizations, innovation and satisfaction. The questionnaire was topically organized and the constructs were measured as follows.

Measurement of the “beneficial characteristics from IMS” was based on the conceptual and empirical research of Karapetrovic *et al.* (2006), Karapetrovic and Casadesus (2009) and Simon *et al.* (2011), who used a questionnaire to measure the integration levels and the associated beneficial characteristics of IMS of Spanish organizations. The theoretical support for the development of this “integration benefits scale” is based on the work of many studies investigating firms’ benefits and efficiencies related to the integration of management systems. For instance, Salomone (2008), Simon *et al.* (2011) and Zeng *et al.* (2011) present improvements related to having an integrated system such as costs savings, operational benefits, better external image, improved customer satisfaction, better audit results and enhanced employee motivation. Therefore, the variables “better use of the systems”, “system performance”, “organizational strategic” and “internal cohesion” were selected following the scale of integration benefits used in Simon *et al.* (2011) and Simon *et al.* (2012), which was developed following the above mentioned theoretical developments.

The construct “innovation” was measured with items adopted from the Oslo manual (OECD, 2005) which include four types of innovation in organizations, namely product, process, organization and marketing innovation. The innovation scales in the Oslo Manual have been written for and by experts from thirty countries that collect and analyse innovation data. The manual is based on a consensus of views on the demand for innovation indicators and the underlying policy needs, on the definitions of innovation and on the lessons to be learned from previous surveys (OECD, 2005).

Finally the construct “satisfaction” was assessed using a 5 items scale developed to measure the general level of customer satisfaction based on the organizations standpoint. The scales were adapted from the European Consumer Satisfaction Index (ECSI), an economic indicator that measures customer satisfaction (O’Loughlin and Coenders, 2002).

All items were measured on five-point Likert-type scales ranging from 1- “not at all important” to 5- “very important” for the items of “beneficial characteristics from integration” and “innovation” and 1-“is much worse” to 5-“is much improved” for the items measuring “satisfaction”.

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

Our research is a follow-up study of the respondents to a mail survey carried out by Karapetrovic *et al.* in 2006 in 176 companies with ISO 9001 and ISO 14001 certificates, the results of which were partially illustrated in Bernardo *et al.* (2009) and Karapetrovic and Casadesus (2009). The 176 companies were selected from a database of Spanish standards registrars. The survey was mailed to 535 ISO 9001 and ISO 14001 registered companies in 2006 and 176 valid answers were obtained. In order to continue the study of Karapetrovic and Casadesus (2009) on the integration of MSs in Catalonia, a new field study was carried out during the months of February to July 2010, using a questionnaire addressed to the 176 firms from the Karapetrovic *et al.* (2006) study. We used duplicated sampling in order to be able to replicate the study carried out in 2006 by sending the questionnaire to the same firms that had already responded in the first investigation. The

questionnaire is a replication of the one developed by Karapetrovic *et al.* (2006). However, regarding the integration of MSs, additional questions on innovation and on customer satisfaction were included following the literature on the topic.

The study was carried out in Spanish organizations. In 2009, Spain ranks fourth worldwide in the number of organizations holding ISO 9001 certificates, and third in terms of ISO 14001 registrations (see ISO, 2010).

Data collection was completed from February to July 2010. After rejecting some incomplete or invalid questionnaires, a total of 76 usable responses were retained. This figure represented a response rate of 43% and 93% reliability, with 95% confidence. The survey was served by mail and addressed to the manager in charge of the Quality Management System (QMS) and/or Environmental Management System (EMS). Respondents were primarily male (75 per cent) and their day-to-day responsibilities included managing the organization's quality, environmental and integrated systems. Regarding the organizations, out of the 76 participating firms, 22% were large companies, 42% were medium and 36 were small-sized. The property of the shares was distributed as follows: 23% of the firms are family businesses, 5% are controlled majorly by business angels or private investors, 2% by employees and the rest by other firms. Regarding the management systems implemented, 100% of the firms had ISO 9001 and ISO 14001 as it was a prerequisite for selecting the companies. Additionally, eight companies had implemented OHSAS 18001 and two the Eco-Management and Audit Scheme (EMAS).

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

Given that outliers often have a dramatic effect on the fitted model, the univariate skewness and kurtosis were computed to test the normality of each variable used in the model. The results (see Table 1 for the items to which here are referenced with only the code) ranging from -1.037 (B3) to 0.493 (I10) for skewness and from -1.107 (I9) to 2.286 (B3) for kurtosis, were within the maximum limits of an absolute value of two for skewness and seven for kurtosis, as recommended by Curran *et al.* (1996). Besides it was clear that most variables were slightly off-centre.

##### **4.1. Assessment of the scales to measure the beneficial characteristics from integration and innovation**

An Exploratory Factor Analysis (EFA) was conducted using SPSS 19 software on the items collected for the characteristics from integration and innovation scales using normalised varimax as the rotation method (Hair *et al.*, 1998). EFA is often recommended when researchers have no hypotheses about the nature of the underlying factor structure of their measure. In this study, we seek to group the variables related to the characteristics from integration and innovation in order to create a small number of unobservable latent variables (Novales, 1997). Close inspection of the loadings of the items of the characteristics from integration scales on their respective constructs revealed B3 "task simplification" loaded poorly, thus was discarded. Furthermore, examination of the loadings of the items from innovation scales on their respective constructs disclosed I1 "new or significantly improved goods" and I7 "new methods of organizing external relations" loadings were greater than 0.3 and loaded equally in more than two factors, therefore, these items were deleted. Consequently, a new principal components analysis was carried out using the remaining items and the results of the EFA are shown in tables 1 and 2.

The Kaiser-Meyer-Olkin (KMO) measures were 0.780 and 0.815. Bartlett's sphericity tests were 359.780 (df=55) and 308.832 (df=28) with a significance of 0.000. In addition 75.85 % and 79.19% of variance accounted for the characteristics of integration and innovation respectively. Besides, all factors loadings were higher than 0.5 and according to the loadings of the factors on the dimensions, they were named: "better use of the systems", "system performance", "organizational strategic" and "internal cohesion" for the Integration characteristics (see table 1); and "process innovation", "organizational innovation" and "marketing innovation" for the Innovation construct.

#### 4.2. Reliability and validity of the proposed scales

The initial dimensionality proposal was confirmed after arrays of Confirmatory Factor Analysis (CFA) were conducted to assess the factor structure. First, we computed the internal consistency of the dimensions considering two indicators: the composed reliability Cronbach's alpha coefficient, whose minimum threshold is 0.7 (Nunnally and Bernstein, 1994) and the variance extracted (AVE) for each scales, which value must be over 0.5 (Fornell and Larker, 1981). These indicators, shown in table 1 and 2, were all acceptable factors except for "system performance" ( $\alpha=0.69$ ) and "process" ( $\alpha=0.69$ ). However, they exceeded the minimum satisfactory value of 0.6 to demonstrate an internal consistency (Malhotra, 2004). Therefore, the measurement scales were considered to possess high-internal consistency and reliability among the items.

The validity of the individual items on their corresponding factors was confirmed by load values greater than 0.7 (Carmines and Zeller, 1979), with the exception of the item "B10" (loading 0.66), which was faintly lower. However, because it was so close to the threshold, it was decided to retain this item, in accordance with the relaxed criterion suggested by Barclay *et al.* (1995). Besides, factor loadings of the confirmatory model were found to be statistically significant ( $P < 0.001$ ) and greater than 0.5 (Sanzo *et al.*, 2003). The evidence of the EFA and CFA, taken together, supported the convergent validity of the component dimensions of the proposed scales.

**Table 1: Measurement items for the main integration characteristics.**

Factors	CFA (Confirmatory Factor Analysis) Loadings		EFA (Exploratory Factor Analysis) ( <sup>a</sup> ) Loadings			
	Loadings	t-value ( <sup>b</sup> )	1	2	3	4
<b><i>Better use of the Systems (<math>\alpha = 0.74</math>, AVE= 0.79)</i></b>						
B1: Improvement of the systems understanding and use	.89	27.90	.81			
B2: Better options to include new systems	.89	101.08	.87			
<b><i>System Performance (<math>\alpha =0.69</math>, AVE= 0.75 )</i></b>						
B4: Increase of organizational efficiency	.87	16.71		.86		
B5: Better use of the internal and external audit results	.87	66.86		.72		
<b><i>Organizational Strategic (<math>\alpha = 0.80</math>, AVE=0.84 )</i></b>						
B6: Firm image improvements	.91	64.94			.86	
B7: Organizational global strategy improvements	.91	76.00			.70	
<b><i>Internal Cohesion (<math>\alpha = 0.82</math> AVE= 0.58)</i></b>						
B8: Employee motivation improvements	.70	16.47				.63
B9: Department barriers elimination and higher collaboration	.81	34.17				.73
B10: Higher stakeholders implication	.66	12.04				.54

B11: Organizational culture improvement	.78	29.43	.72
B12: Better communication	.84	31.16	.86

Note: CFA=Confirmatory Factor Analysis; EFA= Exploratory Factor Analysis;

a: Total variance extracted by the four factors equal 75.85%; Rotation: Varimax normalized; The Kaiser-Meyer-Olkin (KMO) measure = 0.780; Bartlett's sphericity test =359.780; df = 55 with a significance of  $p < 0.001$

b : all t-value are significant at  $P < 0.001$

**Table 2: Measurement items for the innovation constructs**

Factors	CFA (Confirmatory Factor Analysis) Loadings		EFA (Exploratory Factor Analysis) (a) Loadings		
	Loadings	t-value (b)	1	2	3
<b>Process (<math>\alpha = 0.69</math>, <math>AVE=0.66</math> )</b>					
I2: New or significantly improved methods of manufacturing	.87	3.60	.81		
I3: New or significantly improved logistics	.87	5.33	.86		
<b>Organization (<math>\alpha = 0.74</math>, <math>AVE=0.79</math>)</b>					
I5: New business practices for organising procedures	.89	56.28		.90	
I6: New methods of organising human resources	.89	47.43		.76	
<b>Marketing (<math>\alpha =0.91</math>, <math>AVE=0.79</math>)</b>					
I8: Employee motivation improvements	.89	62.35			.88
I9: Department barriers elimination and higher collaboration	.86	48.04			.84
I10: Higher stakeholders implication	.91	89.82			.84
I11: Organizational culture improvement	.87	91.42			.84

Note: CFA=Confirmatory Factor Analysis; EFA= Exploratory Factor Analysis; a: Total variance extracted by the three factors equal 79.19%; Rotation: Varimax normalized; The Kaiser-Meyer-Olkin (KMO) measure = 0.815; Bartlett's sphericity test =308.832; df = 28 with a significance of  $p < 0.001$

b: all t-value are significant at  $P < 0.001$

### 4.3. Structural model

Although the items used to measure the constructs in this study were based on items from the extant literature, before checking the causal model, it was necessary to check their validity in the current context by performing tests of internal consistency, convergent validity, and discriminant validity. The scale for the constructs of “satisfaction” was found to be uni-dimensional. EFA of the scales extracted only one factor. From the CFA, Cronbach's alpha (0.79) exceeded the recommended value of 0.7 (Nunnally and Bernstein, 1994), thus demonstrating high internal consistency. The validity of individual items within the constructs of “satisfaction” (0.66-0.81) was also confirmed and the factor loadings of the confirmatory model were found to be statistically significant ( $P < 0.001$ ) and greater than 0.5 (see Table 3). These findings, together with the results presented in the previous section, provided evidence of acceptable internal consistency and convergent validity for all three constructs (integration characteristics, innovation and satisfaction).

**Table 3: Organization perception of customers' general satisfaction after the integration of MSSs (items loadings)**

Factor	CFA (Confirmatory Factor Analysis) Loadings	
	Loadings	t-value <sup>(b)</sup>
<b><i>Satisfaction (<math>\alpha = 0.79</math> , AVE: 0.55 )</i></b>		
Sat1: Product quality	.81	36.69
Sat2: Customer service quality	.85	43.67
Sat3: Perceived value	.68	22.89
Sat4: Firm image	.67	23.69
Sat5: Customer complaints handling	.66	15.10

Additionally, discriminant validity, which authenticates that each factor represents a separate dimension, was investigated through linear correlations or standardised covariances between latent factors by examining whether inter factor correlations are less than the square root of the average variance extracted (Fornell and Larker, 1981). Table 4 shows that the square root of the AVE, highlighted in bold italic, was greater than the correlations presented by each construct with other constructs. Besides, the correlation coefficients were less than 1 by an amount greater than twice their respective standard errors (Ribbink *et al.*, 2004). Taken as a whole, these evidences supported the discriminant validity of the items as measures of their respective underlying constructs.

**Table 4: Descriptive and bivariate correlations between main constructs, and square root of Average Variance Extracted**

	Mean	SD	1	2	3	4	5	6	7	8
1. Better use of the Systems	3.61	.72	<b>.88</b>							
2. System Performance	3.78	.61	.35	<b>.86</b>						
3. Organizational Strategic	3.65	.68	.25	.45	<b>.91</b>					
4. Internal Cohesion	3.06	.57	.31	.32	.58	<b>.76</b>				
5. Process	2.95	.89	.20	.17	.10	.06	<b>.81</b>			
6. Organization	2.73	.94	.40	.10	.26	.25	.39	<b>.88</b>		
7. Marketing	2.45	1.04	.31	.20	.23	.25	.54	.48	<b>.88</b>	
8. Satisfaction	3.62	.52	.34	.43	.18	.38	.24	.28	.31	<b>.74</b>

**Notes:** Square Root of AVE are in **bold italic font style** on the main diagonal and correlations between latent variables follow below; all correlations were significant at the  $P < 0.01$  level (two-tailed)

#### 4.4. Causal relationship estimate

Two different approaches are available for the estimation of a structural equation model (SEM): a covariance structure-based approach, maximum likelihood estimation of structural equation models (SEM-ML), also known as linear structural relations (LISREL), and a component-based (or variance-based) approach, PLS approach to structural equation modelling, also known as partial least squares path modelling (PLS-

PM). The two approaches are more complementary than competing, and the choice of one rather than the other should depend on the purpose of the analysis, the nature of the model and the research context (Tenenhaus *et al.*, 2004).

However, in this study the proposed structural model was estimated by means of Partial Least Squares (PLS version 2.0). Indeed, the use of PLS was motivated by the following considerations: (i) after screening the distribution of the data for normality as mentioned above, it was evidenced that most variables were slightly off-centre, and (ii) the limited sample size (n=76). PLS makes no assumptions regarding the distribution of the variables and ensure optimal prediction accuracy (Fornell and Cha., 1994). It has special abilities that make it more appropriate than other techniques when analyzing small sample sizes, it is shown to be very robust against multicollinearity (Cassel *et al.*, 2000) and it is often more adapted to empirical data.

The goodness-of-fit index proposed by Tenenhaus *et al.* (2004), which takes into account both the explained variances for the latent dependent variables and their commonalities, was 0.26. The model explained between 11 and 32% of the variance of each independent variable (see Table 5). Plinth on the model performance statistics, it can be concluded that the proposed model exhibited an acceptable fit to the data and the hypothesized relationships were tested.

**Table 5: Model fitness**

	AVE	Composite Reliability	R Square	Cronbach's Alpha	Communality	Redundancy
Better use of the Systems	0.79	0.88		0.74	0.79	
System Performance	0.75	0.86		0.69	0.75	
Organizational Strategic	0.84	0.91		0.80	0.84	
Internal Cohesion	0.58	0.87		0.82	0.58	
Process	0.66	0.78	0.04	0.69	0.66	0.01
Organization	0.79	0.88	0.11	0.74	0.79	0.05
Marketing	0.79	0.94	0.12	0.91	0.79	0.06
Satisfaction	0.55	0.86	0.32	0.79	0.55	0.05

The significance of the paths of the inner model was calculated by using bootstrapping based on 1,000 re-samples to ascertain the stability and the statistical significance of the parameter estimates. Table 6 summarizes the results of the hypothesis testing. Overall results show that all the hypotheses were either totally or partially supported. Obviously, this study overlooked the “process innovation” dimension while testing H1, since the variance explained was only 4%. As expected, hypothesis H1 predicts a positive impact from “integration characteristics” to “innovation” and it is therefore supported. In our model, all the dimensions of “integration characteristics” loaded significantly in the dimensions “organization” and “marketing innovation”. Moreover, “better use of the systems” is the strongest predictor for both “organization innovation” and “marketing innovation”, followed by “internal cohesion”, “organizational strategic” and “system performance”

Furthermore Hypothesis H2, which predicted a positive influence of the “integration characteristics” on “satisfaction”, was significantly supported. In fact, all three

dimensions of “integration characteristics” (system performance, internal cohesion and better use of the systems) are significantly related to “satisfaction”. Conversely, H3 was partially supported as the relationship between “process innovation” and “organization innovation” on “satisfaction” produced surprising results of an insignificant positive effect. Instead, we found that only “marketing innovation” directly influenced “satisfaction” independently as the focal predictor.

**Table 6: Hypotheses results for the Structural Model**

	Hypothesis	Path coefficient	SE <sup>a</sup>	t-value	P-value	Conclusion
<b>H1ae</b>	Better use of the Systems → Process	0.23	0.10	2.27	0.027	Accepted*
<b>H1af</b>	Better use of the Systems → Organization	0.18	0.04	3.73	0.000	Accepted***
<b>H1ag</b>	Better use of the Systems → Marketing	0.23	0.03	6.42	0.000	Accepted***
<b>H1be</b>	System Performance → Process	-0.06	0.06	1.04	0.302	Rejected
<b>H1bf</b>	System Performance → Organization	-0.08	0.04	1.96	0.055	Accepted*
<b>H1bg</b>	System Performance → Marketing	0.04	0.04	0.97	0.336	Rejected
<b>H1ce</b>	Organizational Strategic → Process	-0.00	0.08	0.02	0.984	Rejected
<b>H1cf</b>	Organizational Strategic → Organization	0.15	0.06	2.35	0.022	Accepted*
<b>H1cg</b>	Organizational Strategic → Marketing	0.03	0.06	0.65	0.518	Rejected
<b>H1de</b>	Internal Cohesion → Process	-0.06	0.06	0.87	0.388	Rejected
<b>H1df</b>	Internal Cohesion → Organization	0.13	0.06	2.02	0.048	Accepted*
<b>H1dg</b>	Internal Cohesion → Marketing	0.14	0.04	2.47	0.016	Accepted*
<b>H2a</b>	Better use of the Systems → Satisfaction	0.14	0.05	2.72	0.008	Accepted**
<b>H2b</b>	System Performance → Satisfaction	0.30	0.03	8.03	0.000	Accepted***
<b>H2c</b>	Organizational Strategic → Satisfaction	0.00	0.05	1.73	0.089	Rejected
<b>H2d</b>	Internal Cohesion → Satisfaction	0.24	0.04	5.04	0.000	Accepted***
<b>H3e</b>	Process → Satisfaction	-0.05	0.05	1.07	0.293	Rejected
<b>H3f</b>	Organization → Satisfaction	-0.09	0.04	0.12	0.905	Rejected
<b>H3g</b>	Marketing → Satisfaction	0.19	0.04	4.78	0.000	Accepted***

<sup>a</sup> Standard Error; Significant at two tail: (\*) P-value < 0.05; (\*\*) P-value < 0.01 and (\*\*\*) P-value < 0.001

**-Insert Figure 2 about here-**

## 5. Discussion

Before answering to the key contribution of the study, we first assess the credentials of the key dimensions to evaluate MSs standards integration characteristics and organization innovation and satisfaction. We used an exploratory factor analysis and a confirmatory factor analysis to ascertain whether the scales have a factor structure that reflects the

theoretical dimensionality of their setting. Thus, this study emphasises four sets of determining dimension factors for the integration characteristics namely: “better use of the systems”, “system performance”, “organizational strategic” and “internal cohesion”. Moreover, our analyses have shown fairly conclusively that the four dimensions configuration initially proposed for innovation in the organization do not fit the data set. The dimension of “product innovation” was discarded since all the items were loading very poorly. Hence, only three dimensions: “process innovation”, “organization innovation”, and “marketing innovation” were retained. It was not a surprise that managers attached more weight on process innovation rather than on product innovation, given that the extant literature supports the notion that some process innovations can completely revolutionize the way a product is produced and it is a type of innovation that significantly reduces costs (Dess *et al.*, 2006). Moreover, product innovation may remain a source of competitive advantage but only for a short period of time, since competitors often tend to imitate the new and successful product innovations (Zhang *et al.*, 2004). Organization and marketing innovation were also given more importance than product innovation by managers, as they are becoming the new sources of innovation and competitive advantage for companies (Qingyu *et al.*, 2004).

The results of the theoretical model show several significant effects from the integration characteristic “better use of the systems” on innovation and satisfaction. This would mean that the introduction of these systems, such as ISO 9001 and ISO 14001, could be considered itself as an innovation, therefore contributing to a positive impact between these variables as suggested by Camisón *et al.* (2007) and Llach *et al.* (2011).

Results also show a positive effect from “system performance” and “organizational strategic” groups on “organizational innovation”. In this case, more efficiency and a clear strategy when managing the systems would result into greater innovation regarding the organizational methods used in the companies. In this sense, strategic factors in the organizations, such as systems integration, have been found to condition organizational innovation (Helfat and Raubitschek, 2000).

The positive effects from “internal cohesion” on “organizational” and “marketing innovation”, show the effects of softer aspects of the organization (relationships among employees, communication between departments) on softer kinds of innovation (organizational and marketing), whereas the “internal cohesion characteristics” do not show a significant effect on “process innovation”. The influence of aspects such as internal communication or internal cohesion among employees and departments in an organization has been studied and related to softer types of innovation such as organizational and marketing, because they foster new innovative ideas in the organization and can become a driver for integration (Welch and Jackson, 2007).

The following integration aspects, namely “better use of the systems”, “system performance” and “internal cohesion”, were found to have a significant impact on “satisfaction”. These effects would mean that organizations having higher efficiency and ability to use the systems as well as more motivated employees and more communication between departments, would have more customer satisfaction. These results are consistent with the findings of Simon *et al.* (2012) and Bernardo *et al.* (2012), who found that the most important aspects of IMS were related to employee’s motivation and relationships.

Finally, we find a positive effect between “marketing innovation” and “satisfaction”, meaning that customers would be more satisfied if they perceived the new ways of presenting and selling products. This finding is coherent with the literature on the innovation’s impact on customers because firms are more likely to prioritize customer demands during marketing innovation than during product innovation. During product innovation, firms fear the cannibalization of existing products (Tushman and Anderson, 1986) and that customers will not receive the direct benefits of this innovation whereas they believe that marketing innovation is directly perceived by customers (Gordon, 2006).

## **6. Conclusions**

This study, which aims to shed light on the relationships between integration characteristics, customer satisfaction and innovation, contributes to narrowing the gap in the field of MSs integration by providing insights into how the management of certain aspects of IMS can enhance innovation and customers satisfaction, thus increasing firm’s performance.

The objectives of this study were threefold. First we aimed at studying the existing relationships between integration and customer satisfaction. The second objective was to analyse the possible relationship between integration and the level of innovation of organizations. Finally, our third hypothesis tested the relationship between innovation and customer satisfaction. In order to explore these effects, a proposed model was presented and tested by means of SEM.

The first conclusion to be drawn from the study is that the beneficial characteristics of integration can be grouped in four large clusters, which are "better use of the systems", "system performance", "organizational strategic" and "internal cohesion". This last group of characteristics is the one to receive the most comments in the literature. For example, the attitude and motivation of people is mentioned in Zeng *et al.* (2007). Therefore, we can conclude that the attitude and motivation of people when working with the MSs plays a vital role during the process of integration of these systems within the organizations studied.

We have found three innovation constructs, namely, "process innovation", "organization innovation", and "marketing innovation". This classification is similar to the one proposed by the OECD (2005) in the Oslo Manual, which include these three types of innovation but adds product innovation, which we do not find in our study.

Finally, the clustering pertaining to customer satisfaction has one construct: "satisfaction" and it is composed by four variables which are based on the ECSI model (O’Loughlin and Coenders, 2002).

As we have been able to find very few studies showing the relationships between the integration beneficial characteristics, the innovation level and customer satisfaction (i.e. Nemati *et al.*, 2010), we used cluster results to explore these effects by means of SEM. Four integration characteristics, three innovation and one customer satisfaction dimensions, as well as the relationships among them, were proposed.

Overall results show all the hypotheses were either totally or partially supported. We found positive impact from integration characteristics to innovation. In our model, all the

dimensions of integration characteristics had an impact on “organization and marketing innovation”. Specifically, “better use of the systems” is the strongest predictor for both “organization innovation” and “marketing innovation”, followed by “internal cohesion”, “organizational strategic” and “system performance”. This shows that a better understanding and use of the systems conducts the organizations to increase their innovation levels. Therefore, both internal and strategic factors that condition organizational innovation (such as the management of systems) need to be taken into account by managers, who should strengthen different strategic factors and internal capabilities to achieve an adequate level of organizational innovation and thus improve performance and encourage innovation (Helfat and Raubitschek, 2000).

A significant positive effect from of integration characteristics on satisfaction was found. Specifically, all three dimensions of integration characteristics (system performance, internal cohesion and better use of the systems) were significantly related to satisfaction, demonstrating a strong relationship between the integration of MSs and their associated characteristics with the satisfaction of the firms’ customers. As one of the main components of MSs is customer satisfaction, companies that implement them have the need to be innovative in developing and launching new products or services to match the customers’ needs and requirements. It is clear from our study that MSs implementation and integration produce positive results for customers, increasing levels of customer satisfaction (Heim and Sinha, 2001; Nagar and Rajan, 2005). As MSs particularly stress the importance of customer focus it is important that companies manage these systems properly in order to benefit from their customer perspective and become more customer oriented. Stressing the need for using MSs to enhance customer focus can help businesses shift their focus toward customer satisfaction (Mehra *et al.*, 2001).

The influence of innovation on customer satisfaction was partially supported as the double interaction between “process innovation” and “organization innovation” on “satisfaction” was not found to have a positive effect. Instead, only “marketing innovation” had a significant effect on “customer satisfaction”. These are not surprising effects taking into account some results found by Pan and Zinkhan, (2006) who found that the willingness to innovate of a company did not necessarily turn into positive customer satisfaction results. The existence of a link between marketing innovation and customer satisfaction rather than between other types of innovation and satisfaction is supported by several authors who believe that marketing innovation is easily perceived by customers, therefore, making firms more willing to invest in it (Gordon, 2006). While such a focus upon customer satisfaction through building more direct relationships may enhance the marketing innovation efforts of a company, it is quite possible that there are unintended consequences associated with a heightened concentration upon this type of innovation, such as a firm’s decreased willingness to invest in product, process or organizational innovation (Chandy and Tellis, 1998).

The findings of the study have several practical implications for managers of firms with more than one implemented MS. As more and more systems are introduced in the organizations and their management becomes more complex, many organizations are simplifying their MSs. Therefore, the integration of MSs helps organizations manage their MSs as well as incorporating innovation and customer satisfaction as part of their systems. Shaping strong positive relations of an organizations’ MSs with the innovation process and customer satisfaction, can be a source of essential knowledge in the aspect of

improving management processes, customer processes and improving products and services.

It is apparent from our results that integration is of the greatest importance in generating customer satisfaction and innovation. This shows that managers must ensure that they manage their quality and environmental MSs by providing high quality products which are environmentally sustainable at all times if they wish to enhance customer satisfaction and innovation in the firm. In particular, the study has revealed that “better use of the systems” is the most critical predictor of process, organization and marketing innovation. Managers should therefore place greater emphasis on managing the IMS efficiently by improving the systems understanding and use and by providing better options to include new systems, as suggested by Simon *et al.* (2012).

Second, although previous research has suggested that organizational strategic and system performance issues are the most important dimensions for predicting innovation (Helfat and Raubitschek, 2000), the present study found that “internal cohesion” was the most important factor in fostering innovation. This suggests that managers of IMS should ensure that the climate and communication among employees are dealt properly in order to ensure that the organization’s objectives are aligned with those of the employees. Managing these internal aspects in the organization can make employees aware of their role in the process of continual improvement of formalized product quality, innovation and customer service, leading the organization to total quality management and business excellence.

Finally, customer satisfaction has become a vital concern for companies and organizations in their efforts to improve product and service quality, and maintain customer loyalty within a highly competitive market place. Because we find that only marketing innovation relates to customer satisfaction, managers should adopt innovative marketing strategies to enhance customer satisfaction, especially with regard to optimizing perceived product and service quality to meet and exceed customers’ expectations.

Although the findings provide meaningful implications for organizations implementing MSSs or MSSs integration, there are several limitations which should be addressed in the future. The main limitation of our study is the sample size, 76 organizations, which could be the cause that some of the hypothesized relationships are not significant. Furthermore, the sample in which this study is based was drawn from a single country, Spain, which may limit the generalization of the results. Finally, the responses analyzed only reflect the points of view of the company managers and not of other involved actors such as the auditors, the employees or the customers. If this had been the case, the richness of the data gathered would have been higher and therefore, the conclusions drawn for the study would have been more representative of the reality of these organizations.

Given the answers regarding the beneficial integration aspects experienced by organizations, their innovation level and the customer satisfaction, future research could focus on identifying the relationship between these variables and financial performance measures. It would also be interesting to study how the perception of firms regarding these interactions evolves over time.

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