Chapter 16
A Study on External and Internal Motivations and Its Influence on the Results of Implementing EN 9100 Standard

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Abstract EN 9100 is a quality management system standard for the aerospace industry derived from the ISO 9000 standard. The aerospace industry is economically prominent, both worldwide and in Spain. The goals of this paper are (a) to analyze the motivations of Spanish aerospace firms in adhering to EN 9100 standard and (b) to examine whether the type of motivation affects the results of implementing this standard. To accomplish this, both ANOVA and a simple linear regression model were applied to data from the 122 aerospace industry valid survey responses. The results demonstrate that most firms adhere to EN 9100 in the Spanish aerospace industry due to "external" motivations, such as to increase their institutional legitimacy and reputation. Nevertheless, firms, where "internal" motivations such as to improve their operational execution or organizational processes are predominant, showed superior benefits as a result of implementing the standards. The conclusions of this article may be of interest both for academic and professional spheres of activity.

Keywords Quality management · Quality assurance standards · EN 9100 · ISO 9000 · Spanish aerospace industry · Legitimacy

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16.1 Introduction

Currently, the high level of competition in most markets in developed economies is forcing companies to strong development of quality as a way to implement the new competitive strategy based on the "differentiation" (Fernandes, Lourenço & Silva, 2014). In this context, the management systems of quality allow companies to acquire management tools to set policies and responsibilities, allocate resources, and identify key activities (Criado & Calvo, 2009), so that these practices of quality management, being focused on continuous improvement, can lead to improvements in key business performance (García, Del Río, & Alonso, 2014).

The aerospace industry is one of the principal economic sectors worldwide. In 2012, the top 100 firms worldwide had revenues of 665,970 million dollars, which is the equivalent to 5% of the global GDP (PwC, 2013). In Spain, the aerospace industry is also significant. In 2012, it was ranked as the fifth in size in Europe (DBK, 2013) both in number of employees (40,200 workers) and revenue (6715 million euros). Exports are one of the industry's main markets and represent 75% of revenues.

Indeed, due to the increasing complexity of the sector, there are no manufacturers that can develop a final product (airplane, helicopter, satellite, etc.) in its entirety from beginning to end. In fact, final goods in this industry are the product of a collaborative process between many system and subsystem manufacturers and other specialist firms. This originates a dense network of contractors and has led to the progressive internationalization of the manufacturing and development functions (TEDAE, 2010).

As in other global industries, externalization and delocalization are common strategic elements. In addition, security has always been the main prerequisite for any product in this industry. Therefore, it became indispensable to establish normalization and quality control protocols for the management systems of these global supply chains (Del Río & Martínez, 2008). Standardization is a mechanism that facilitates exchanges and international commerce in a global economy by eliminating the barriers derived from each country's individual practices (Heras & Boiral, 2013). In consequence, quality standards in the aerospace industry have always been superior to those in other industrial sectors with the exception perhaps of the automotive industry (Grijalbo & Prida, 2005a; Gutierrez, 2008).

Among these quality assurance standards, the ISO 9000 is a series of norms that strive to standardize processes, functions, and roles but do not necessarily prescribe goals or results (Braun, 2005; Guler, Guillen, & MacPherson, 2002). Implementing quality assurance standards requires time, financial, and organizational investments, both at the beginning of implementation and for maintenance (Pires, Cociorva, Saraiva, Novas, & Rosa, 2013), that are expected to maximize their return, with the different perceived benefits which directly or indirectly lead to better business performance (Alic, 2014; Magd, 2008; Rusjan & Alic, 2010). Nevertheless, these investments do not always have positive returns (Psomas, Fotopoulos, & Kafetzopoulos, 2010), and negative effects—such as increased bureaucracy, extra work, etc.—appear and sometimes prevail over the positive ones (Delic, Radlovacki,

Kamberovic, Maksimovic, & Pecujlija, 2014), which may partially account for the stagnation or even reduction of the number of certificates that has been occurring since 2010 (Alic, 2014; Dahlgaard-Park, Chen, Jang, & Dahlgaard, 2013). This would seem to indicate that it is not enough to meet criteria for certification in these standards but that there are other factors that determine a positive result (Zelnika, Maletic, Maletic, & Gomiscek, 2012).

One of these factors could be the motivations that impelled the organization to implement these standards (Boiral, 2011; Criado & Calvo, 2009; Heras, Casadesús, & Marimón, 2011; Lee, To, & Yu, 2009; Psomas et al., 2010; Sampaio, Saraiva, & Rodrigues, 2010). These motivations can be classified in two groups: (a) external, due to the pressure of the different stakeholders, related to the institutional theory from a theoretical perspective, and (b) internal, with the objective of improving the organizational processes (Nair & Prajogo, 2009).

The EN 9100 standard family (AS 9100 in America and SIAC 9100 in Asia) was originated by IAQG (International Aeroespacial Quality Group) as an adaptation of the ISO 9000 standards to the aerospace industry, with 83 additional requirements specifically adapted to the aerospace industry in areas that directly impact reliability and security of aerospace products such as design, purchasing, process control, inspection and testing, and nonconformity control. In December 2012, the OASIS database of IAQG—a registry of firms that adhere to these standards—counted 14,300 business headquarters worldwide. Logically, implementation of these standards has superior costs in comparison to the more generic ISO 9000 since it has additional requirements for the aerospace sector. In theory, the cost of adhering to the more stringent set of standards should be compensated by their increased benefits.

This paper aims to start filling the research void on the implementation of quality assurance standards in the aerospace industry. The goals of the current investigation are (a) to analyze the motivations of Spanish aerospace firms in adhering to EN 9100 standard as well as their relative importance and (b) to find out whether the type of motivation affects the "internal" or "external" benefits resulting from implementing this standard. To this end, a survey was sent to the 306 firms in the sector in 2011 since this was the latest complete fiscal year when research was initiated (October 2012). With the data collected from 122 valid responses, the authors applied ANOVA testing and a simple linear regression model.

16.2 Literature Review

Studies on the EN 9100 standard are scarce. Some focus on its general characteristics and the differences with ISO 9000 standards (Beltrán, 2002; Grijalbo & Prida, 2005b; Gutierrez, 2008; Juny, 2005). Others study how commonplace its implementation is among first-tier manufacturers and suppliers (it is widespread) versus second and third tiers where implementation is uneven (Grijalbo & Prida, 2005a, 2005c). Another cohort of studies examines models and recommended procedures

to adhere to these standards (IAT, 2003). A final group describes how EN 9100 has been implemented in specific aerospace firms (Mugarra, 2003; Murga, 2002; Vilar, 2003). Nevertheless, none of these papers analyze the areas targeted by this study. For this reason, the authors extended their literature review to works that examine the ISO 9000 standard. The ISO 9000 is the predecessor of EN 9100 and has been widely studied in industries outside the aerospace sector.

Research on motivation to adhere ISO 9000 standards shows that unless required by specific regulation (Rodriguez-Escobar, Gonzalez-Benito, & Martínez-Lorente, 2006), implementation is usually originated by the firm itself based on positive result expectations attributed to the standards (Alic, 2014; Magd, 2008; Rusjan & Alic, 2010).

Given that in the Spanish aerospace industry it is not compulsory to adhere to EN 9100, motivation to implement must have a proactive component. Examining studies on motivation in ISO 9000 firms, there are two main types of benefit expectations: those of "external" nature (institutional legitimacy, image and market positioning, financial or marketing issues, customer relations) along with "internal" motivators such as organizational and operational process improvements or human resource management (Boiral & Amara, 2009; Corbett, Montes & Kirsch, 2005; Gotzamani & Tsiotras, 2002; Sampaio et al., 2010). From a theoretical standpoint, these two types of motivations—internal and external—correspond with two views of organizational decision-making: institutional theory and resource- and capability-based theories (Martínez-Costa, Martínez-Lorente, & Choi, 2008; Prajogo, 2011).

Most previous research identifies external motivators as primary (Bhuiyan & Alam, 2005; Heras & Arana, 2006; Kammoun & Aouni, 2013; Martínez-Costa et al., 2008; Melao & Guia, 2013; Poksinska, Dahlgaard, & Antoni, 2002; Rodriguez-Escobar et al., 2006; Terziovski, Power, & Sohal, 2003), although there are those that defend the opposing view or that, at the very least, both internal and external motivators are equally important (Chang & Lo, 2005; Del Río, Alvárez, & Fraiz, 2012; Fotopoulos & Psomas, 2010; Gotzamani & Tsiotras, 2002; Heras et al., 2011; Yeung, Lee, & Chan, 2003).

Regarding the benefits of implementing ISO 9000, some authors do not find any or find that they are limited in scope (Boiral & Amara, 2009; Delic et al., 2014; Martinez-Costa, Choi, Martínez, & Martinez-Lorente, 2009; Martínez-Costa & Martínez-Lorente, 2003; Quazi, Hong, & Meng, 2002; Wilson, Walsh, & Needy, 2003), but most researchers agree that implementing ISO 9000 standards has positive effects on firms. There are mainly two types of benefits to be derived from implementation: those that pertain to "internal aspects" (organizational, operational, or human resource management) and those related to "external aspects" (financial, marketing, and stakeholders relations) (Casadesus, Karapetrovic, & Heras, 2004; Gotzamani & Tsiotras, 2002; Gutierrez, Torres, & Molina, 2010; Sampaio et al., 2010; Tari, Molina-Azorín, & Heras, 2012).

Comparing the relative importance of each type of benefit, some authors prioritize the positive effects of internal benefits (Bhuiyan & Alam, 2005; Heras et al., 2011; Lo, Yeung, & Cheng, 2009; Martínez-Costa et al., 2008; Melao & Guia, 2013; Terziovski & Power, 2007; Wahid & Corner, 2009), while others emphasize exter-

nal ones (Benner & Veloso, 2008; Corbett, Montes, & Kirsch, 2005; Dick, Heras, & Casadesús, 2008; Karapetrovic, Casadesus, & Heras, 2010; Martínez-Costa & Martínez-Lorente, 2007; Wayhan, Kirche, & Khumawala, 2002). Nevertheless, most studies identify both internal and external positive effects (Calisir, 2007; Feng, Terziovski, & Samson, 2008; Gotzamani & Tsiotras, 2002; Lo & Chang, 2007; Rodriguez-Escobar et al., 2006). Furthermore, Karapetrovic et al. (2010) confirm that the ISO 9000 benefits and costs decrease over time, but benefits remain important, at least the ones referred to the first objective of the ISO 9001:2000 standard: customer satisfaction.

Finally, previous research on the relation between the different types of motivation to implement ISO 9000 standards (internal or external) and resulting benefits points to a consensus regarding the greater results of implementing the standards because of internal motivators rather than external pressures of different stakeholders or to improve external aspects (legitimacy/reputation and image improvement/following a trend) (Boiral & Roy, 2007; Casadesus, Heras, & Marimon, 2011; Feng et al., 2008; Gotzamani & Tsiotras, 2002; Heras et al., 2011; Lee et al., 2009; Martínez-Costa et al., 2008; Prajogo, 2011; Rodriguez-Escobar et al., 2006; Sampaio et al., 2010). Assertions to the contrary are an exception to the norm (Bhuiyan & Alam, 2005).

16.3 Methodology

Sample

The present study targeted firms in the Spanish aerospace industry: all those involved in developing, manufacturing, or maintaining aerospace products. This industry is made up of a wide variety of concerns. For this reason, the authors compiled multiple industry-specific databases, as shown in Table 16.1.

Table 16.1 Survey population breakdown according to census

Census	Firms in aerospace industry		Ancillary businesses	Total
	Aviation subsector	Aerospace subsector		
TEDAE	34	6	12	52
OASIS	96	7	57	160
Other	78	5	11	94
Total	208	18	80	306

Table 16.2 Question areas under study

Internal aspects	
Related to organizational processes	Production management control, definition of responsibilities and rules, process documentation, etc.
Related to operational execution	Efficient use of resources, inspection and logistic cost decrease, decline in nonconformity, etc.
Related to HR	Job satisfaction, work team dynamics, employee suggestion systems, etc.
External aspects	
Related to finance and marketing	Sales volume, market quota, sales-per-employee ratio, etc.
Related to stakeholders relations	Legitimacy and public image and reputation, client retention, number of complaints, etc.

Table 16.3 Technical specifications of the survey

Universe	Spanish firms in the aerospace industry
Sampling technique	Random: the survey was sent to all entities in the universe
Methodology	Mail and online survey
Individuals receiving the survey	Director of quality assurance or equivalent
Population	306
Sample size	122
Confidence level	95% ($z = 1.96$; $p = q = 0.5$)
Sampling error	6.9%
Time period	From October 1, 2012 to January 31, 2013

Methodology

Data for the study was obtained from a survey sent to all firms in the census. The questions in the survey were derived from previous studies on ISO 9000 standards (Casadesus et al., 2004; Gotzamani & Tsiotras, 2002; Mercado, Castillo, & Mateo, 2005). Based on the literature review, questions were included to ascertain both the motivations to implement EN 9100 standard and the results of the process. The main areas and their typology are shown in Table 16.2:

One hundred twenty-two valid survey responses were received or 39.9% of the population (306 firms). The EN 9100 standard has been widely adopted among survey participants (74.6% or 91 firms). Ninety percent of those implemented the standard at least 3 years ago, and 76% of them has adhered all its processes to the standard. Both the longevity and the level of implementation reinforce the validity of the data obtained from the survey. Based on this information, Table 16.3 offers the technical specifications of the survey:

Proposed Model

To deepen our understanding on the influence of each type of predominant motivation (internal/external) on each of the internal (organizational, operational, human resources) or external (financial and marketing, human resource management) positive effects, the authors developed a simple linear regression model with the following variables:

Dependent Y variables: Positive effects as a result of implementing EN 9100 standard, as defined in Table 16.1. These variables can adopt five possible values: (1) very low, (2) low, (3) average, (4) high, and (5) very high:

y_1 variable: positive effects related to organizational processes (OrgEN)
y_2 variable: positive effects related to operational execution (EjecEN)
y_3 variable: positive effects related to human resources (RrhhEN)
y_4 variable: positive effects related to finance and marketing (FinComEN)
y_5 variable: positive effects related to stakeholders relations (StakeEN)

Independent X variable:

x_1 variable: Main motivation type (internal/external) for implementation (*TipoMot*). Using data collected in the survey distributed among participating firms, this value can be either 1, if external motivations are the main type, or 2, if internal motivations are predominant.

Utilizing these variables a simple linear regression model was built:

$$y_i = \beta_0 + \beta_1^* x_{1,i} + u_i$$

$$\text{Effect}_I = \beta_0 + \beta_1^* \text{MotType}_{1,i} + u_i$$

Table 16.4 Importance of "internal" motivators to adhere to EN 9100

	Importance level of internal motives (% of firms that chooses each option)				
Types of internal motives	Very low	Low	Average	High	Very high
Related to organizational processes	2%	7%	16%	48%	27%
Related to operational execution	8%	19%	26%	26%	21%
Related to HR	17%	21%	26%	28%	8%

Table 16.5 Importance of "external" motivators to adhere to EN 9100

	Importance level of external motives (% of firms that chooses each option)				
Types of external motives	Very low	Low	Average	High	Very high
Related to finance and marketing	0%	4%	14%	43%	39%
Related to stakeholders relations	0%	2%	10%	41%	47%

Table 16.6 Influence level of EN 9100 in obtaining positive internal effects

	Influence level of EN 9100 in obtaining positive internal effects (% of firms that choose each option)				
Types of positive internal effects	Very low	Low	Average	High	Very high
Related to organizational processes	0%	6%	20%	46%	28%
Related to operational execution	2%	15%	22%	40%	21%
Related to HR	10%	18%	30%	30%	12%

Table 16.7 Influence level of EN 9100 in obtaining positive external effects

	Influence level of EN 9100 in obtaining positive external effects (% of firms that choose each option)				
Types of positive external effects	Very low	Low	Average	High	Very high
Related to finance and marketing	2%	4%	17%	42%	35%
Related to stakeholders relations	0%	1%	12%	44%	43%

16.4 Results

With regard to the paper's first goal, *to analyze the motivations of Spanish aerospace firms in adhering to EN 9100 standard and the relative importance of each motivation type*, Tables 16.4 and 16.5 present the importance levels assigned to each "internal" or "external" motivating factor.

The above tables show that firms assign high importance to external motivators. A high percentage of firms state that marketing, finance (82%), and stakeholders relations (88%) motives were of high or very high importance in their decision to implement EN 9100.

On the other hand, firms assign less importance to internal motivators. Organizational improvement is the primary motivator (75% responded that it was of high or very high importance), while operational execution and HR lag behind (47% and 36%, respectively).

Regarding the paper's second objective, *to analyze the possible relation between types of motivation to implement EN 9100 in the Spanish aerospace industry and the resulting positive internal or external effects*, the information collected is shown in Tables 16.6 and 16.7. These tables show how much of an influence participating firms consider exists between adhering to EN 9100 and the existence of positive internal or external effects as described in Table 16.2.

Tables 16.6 and 16.7 demonstrate that adhering to EN 9100 has both internal and external positive effects. Among internal results, organizational improvements are the most frequently reported. Seventy-four percent of the surveyed firms responded that the EN 9100 had a high or very high influence on improving these areas, followed by improvements in operational execution (61%) and human resources to a lesser extent (42%). Among the types of positive external results, firms report high or very high benefits in improving stakeholders relations (87%), followed by benefits in the marketing and financial functions (77%). Overall, positive external effects

Table 16.8 ANOVA for the positive effects derived from implementing EN 9100, according to the predominant internal or external motivation to the standard

Variables	Sig.
Internal organizational effect	0.015
Internal operational execution effect	0.000
Internal HR effect	0.000
External finance and marketing effect	0.080
External stakeholders relations effect	0.021

Factor: Internal or external motivation type
$p < 0.05$ is significant at 95% confidence level

Table 16.9 Independent variable coefficients for model

Dependent variable	Independent variable	Nonstandardized coefficients		Standardized coefficients		
		Beta	Standard error	Beta	*t*	Sig.
OrgEN	(Constant)	2.481	0.265		9.358	0.000
	Motivation type	0.444	0.188	0.258	2.370	0.020
ExecEN	(Constant)	1.815	0.284		6.391	0.000
	Motivation type	0.778	0.201	0.400	3.873	0.000
HrEN	(Constant)	1.519	0.258		5.881	0.000
	Motivation type	0.815	0.183	0.449	4.463	0.000
FinMkEN	(Constant)	3.148	0.221		14.223	0.000
	Motivation type	0.278	0.157	0.196	1.775	0.080
StaketEN	(Constant)	2.963	0.211		14.044	0.000
	Motivation type	0.352	0.149	0.256	2.358	0.021

derived from implementing the EN 9100 standard clearly outweigh any positive internal effects with a minimum high or very high external effect importance rating of 77% versus a maximum of 74% for internal effects.

To analyze how the different types of motivation to adhere to EN 9100 relate to the benefits derived from implementation, two groups were defined. In the first, external motivation to adhere to EN 9100 was stronger than internal. In the second, internal motives were at the very least balanced with external ones.

An analysis of variance (ANOVA) test was then applied to both groups. The analysis shows significant differences in positive internal and stakeholders relations effects among the two groups. The relationship with positive external financial and marketing effects did not surpass the significance threshold. ANOVA results are shown in Tables 16.7 and 16.8.

Furthermore, to deepen our understanding on the influence of each type of predominant motivation (internal/external) on each of the internal (organizational, operational, human resources management) or external (financial and marketing, stakeholders relations) positive effects, the authors developed a simple linear regression model. Table 16.9 shows the results obtained by this model. Specifically, it contains the coefficients for the independent variable (main type of motivation) in relation to the dependent variable (each of the effects).

Thus, the final model would be:

Table 16.10 Coefficient of determination

Dependent variable	R^2 (%)
OrgEN	16.60
ExecEN	16.00
HrEN	20.10
FinMkEN	3.80
StakeEN	16.60

$$\begin{aligned}
\text{OrgEN} &= 2.481 + 0.444\left(\text{TipoMot}\right) + u,\\
\text{EjecEN} &= 1.815 + 0.778\left(\text{TipoMot}\right) + u,\\
\text{RrhhEN} &= 1.519 + 0.815\left(\text{TipoMot}\right) + u,\\
\text{FinComEN} &= 3.148 + 0.278\left(\text{TipoMot}\right) + u,\\
\text{StakeEN} &= 2.963 + 0.352\left(\text{TipoMot}\right) + u,
\end{aligned}$$

Based on the data in Table 16.9, the "main motivation-type" variable is proven as significant—with $t > 2$—for each of the internal positive effects (organizational, operational, and human resources) as well as for the external positive effect on stakeholders relations. Since it is positive, an increase in the independent variable will cause an increase in the dependent variables, all other things being equal. Therefore, if the "main motivation type" increases by 1 unit, "OrgEN" will increase by 44.40%, "EjecEN" will increase by 77.80%, "RrhhEN" will increase by 81.50%, and "StakeEN" will increase by 35.20%. As the "main type of motivation" variable's value increases (which means that internal motivations are more important), so do the internal and external positive effects.

On the contrary, the "main motivation type" is a variable with $t < 2$ ($t = 1.775$) for positive financial and marketing effects from implementing the standards. Therefore, "FinComEN" is discarded as nonsignificant.

Table 16.10 includes the coefficient of determination (R^2) for each dependent variable. It shows an R^2 value between 16% and 20% (for significant values). This means that the independent variable ("main motivation type") explains between 16% and 20% of the changes in the dependent variables.

16.5 Discussion and Conclusions

This study contributes to filling a gap in the literature. Previous studies have focused predominantly on generic aspects of the EN 9100 standard and on formal processes to implement the standard. The literature therefore lacks studies on motivations and results derived from the implementation of EN 9100 in the aerospace sector. Thus, this study contributes in two key areas: (a) it provides analysis of the main motivations for aerospace firms to adhere to EN 9100 and (b) it investigates the relationship between type of motivation and type of improvement derived from adhering to the standard.

The first objective of this research was to identify motivations to implement the EN 9100 standard in the Spanish aerospace sector. Empirical data show that each external motivation received a greater number of "high" or "very high" importance ratings from firms than any internal motivation received. These findings are consistent with research by Poksinska et al. (2002), Terziovski et al. (2003), Bhuiyan and Alam (2005), Rodriguez-Escobar et al. (2006), Heras et al. (2006), Martínez-Costa et al. (2008), Melao and Guia (2013), Kammoun and Aouni (2013). These authors all found that external motivations were enough to ensure firms adhered to this standard.

The second objective of this research was to analyze relationships between aerospace firms' type of motivation (internal or external) to implement EN 9100 and internal and external positive effects of adhering to the standard. ANOVA of firms' survey responses showed that positive effects of adhering to EN 9100 differed significantly as a function of motivation type. These differences were observed for all types of positive internal and external effects, with the exception of financial and marketing effects (external).

Simple linear regression analysis confirmed that *type of predominant motivation (external or internal) to adhere to the EN 9100 standard* was a significant variable for all positive internal effects (i.e., improvements in organizational processes, operations, and human resources management). This variable was also significant for external effects on stakeholders relationship management, such us the level of institutional legitimacy. Effects were greater when predominant motivations for implementing EN 9100 were internal.

This finding is consistent with those reported by Gotzamani and Tsiotras (2002), Rodriguez-Escobar et al. (2006), Boiral and Roy (2007), Feng et al. (2008), Martínez-Costa et al. (2008), Lee et al. (2009), Sampaio et al. (2010), Prajogo (2011), Casadesus et al. (2011), and Heras et al. (2011). These authors concluded that if the only motivations for adhering to this standard were external (e.g., a petition from clients or improving the level of legitimacy and market image), then firms suffered a high risk of achieving the desired external result, but achieving this result, however, does not mean that the standard is really improving the firm's quality and internal operations: The firm is neither acquiring new capabilities nor gaining sustainable competitive advantage, except by not being excluded from the market.

Results provide guidance to managers of aerospace firms so that they may successfully achieve the goals (i.e., the external and internal benefits derived from EN 9100) associated with implementing this standard. Firms can thus maximize their return from initial and ongoing investment in implementing the standard.

This research found that aerospace firms adhered to the EN 9100 standard mainly because they were seeking external benefits. Such motivations are understandable in the aerospace sector. Work is often subcontracted, and customers enjoy great negotiating power because of their size and the complexity of the work. Hence, aerospace firms should focus on obtaining internal positive effects derived from the EN 9100 standard (i.e., improvements in organizational processes, operations, and human resources management). These internal motivations can cause more successful integration of the standard's principles in firms' daily practices. Likewise, estab-

lishing a set of requisites (general involvement of managers and employees, training, etc.) can initially yield operational and organizational improvements in processes, products, and services and can subsequently yield sustainable improvements in quality level and stakeholders satisfaction, which ultimately yield long-term financial improvements.

Like all research, this study has some limitations. First, the nature of the research and the sampling error (6.9%) mean that results must be interpreted with caution. Results should be considered approximations until they can be confirmed by new empirical research. Second, the questionnaire collected has been completed by quality managers in aerospace firms. Therefore, respondents' opinions could suffer from some bias derived from mangers' direct involvement in decisions to implement the EN 9100 standard.

Future research should address these limitations by performing studies that confirm or extend the conclusions of the current study. To do so, future research should use new methods or should increase the sample size. Likewise, researchers should collect data from other actors in the implementation process such as employees and even customers.

In addition, given the increasingly global nature of the aerospace sector, a second future line of research would be to extend the geographic scope of this study to other continents such as America or Asia. Scholars could thereby compare results with the present study to determine whether region is a determinant factor in the implementation of the EN 9100 standard and verify whether positive effects derived from this implementation appear. Finally, a third line of research would be to identify the reasons why type of predominant motivation (external or internal) is a nonsignificant variable for obtaining positive financial and marketing (external) effects.

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