

Full Length Research Paper

Cooperation with suppliers as a source of innovation

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Accepted 6 October, 2010

This paper tries to analyze the association between cooperation with suppliers and the level of innovation achieved by the customer. Therefore, a supplier may serve as an external source for innovation and this paper studies the different models set up by a company with its suppliers. Special attention is drawn to the competitive and cooperative models. Next, the Spanish companies responding to the Spanish Business Strategies Survey (SBSS) are categorized according to the level of cooperation with their suppliers. The results suggest that the higher the level of cooperation, the better results the company achieves regarding innovation. A closer look shows that among companies that cooperate with their suppliers, those with a higher level of innovation get better financial performance.

Key words: Suppliers, cooperation, performance, purchasing supply chain.

INTRODUCTION

The firm's ability to continuously generate innovations is one of its most critical capabilities in today's business management (Ellonen et al., 2009). At the beginning of the 1990s, only some 5% of firms turned to external sources of innovation. However, in the new millennium this proportion has increased to 85% (Roberts, 2001). As uncertainty increases, companies are finding themselves facing what some authors call a high ratio of uncertainty to knowledge (McGarth and MacMillan, 2009). So, firms do not innovate on their own, but rather it is becoming increasingly necessary for them to interact with other organisations in order to attain, develop and exchange different types of knowledge, information and other resources. Therefore, it does not make sense to consider innovation as an individual and isolated decision (Edquist, 1997; Ebrahim et al., 2009; Cannella et al., 2010).

Along these same lines, we may say that a firm's ability to manage external knowledge sources can be considered as a key component in achieving the role of innovator. Innovation is no longer something that happens solely within the firm, but rather it involves the supply chain, notable within this being the crucial role

played by the supplier (Schiele, 2006). The relationship which firms establish with their suppliers may take the form of different models, from a competitive model to a partnership model. Today, a cooperative relationship is becoming widespread whose features favour greater supplier involvement in the development of new products (Cantista and Tylecote, 2008; Valle and Vazquez-Bustelo, 2009). This involvement of suppliers in innovation is becoming ever more important in dealing with changes in customer preferences, shortening product lifestyles, etc.

Therefore, we can see that a firm's relationship with its suppliers plays an important role in its ability to innovate (Roberts, 2001). Taking this idea as a starting point, we are going to investigate whether Spanish firms enter into cooperative relationships with their suppliers and, if so, we will analyze the existence of a link between cooperation with suppliers and firms' degree of innovation. Finally, we will add to the study financial performance as a variable related to the degree of innovation and degree of cooperation with suppliers.

THEORETICAL FRAMEWORK

Here, we present the theoretical basis for our study, beginning with innovation sources, within which we find suppliers as an external source of innovation. Also, we

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review the extreme models which the relationship between firms and their suppliers may adopt. Finally, from a theoretical point of view, we present the different models about customer-supplier relationship and the degree of innovation achieved by firms.

Innovation sources

Ideas are developed in a setting of mutual exchange based on a network established with a set of partners, so that the innovative power of each party becomes decisive for the rest of the members inside the network (Håkansson and Eriksson, 1993). This network implies the coordination of firms' interrelated activities, that is to say, coordination of a set of exchanges of varying nature between the parties, increasing interdependence and driving value creation. In this way, relational rents occur, defined as the profits obtained from an exchange relationship and which could not be obtained by the firm in isolation, since they originate from the collective action of the parties (Dyer and Singh, 1998). Those firms which are involved with other firms overcome, in general, the disadvantages which arise from undertaking innovation projects alone (Rothwell, 1991). Notable among those disadvantages are the small number of technical specialists employed by the firm and the management opportunity costs linked to the search for external sources of innovation. This type of innovation is known as 'innovation network' and takes place when different actors from different organisations combine their skills, improving an existing product or process or even creating a new one. This type of innovation is different from 'inventor innovation' (an invention, usually patented, which leads to a completely different product) or 'innovation lab' (a group of people who make up a unit or department dedicated to systematically improving processes or products of that same firm) (Freeman and Soete, 1997).

The innovation network is a type of external innovation, a notable feature of which, according to Schiele (2006), is working together with suppliers, either in a process of development of new products, or in one of continual improvement (Figure 1). In this way, the type of relationship established with suppliers can be a key factor in a firm's innovation. All this leads us to the existence of a link between purchasing and innovation based on networks of firms (Håkansson and Eriksson, 1993). The role of the supplier lies in supporting the customer firm's innovation process. The most common situation is that the customer firm proposes an idea but does not know how to materialise it or finds that the requirements are beyond its key competences and, for this reason, decides to involve the supplier, although, new ideas which the supplier is able to contribute to the buyer may also be developed (Håkansson, 1989). This vision comes from an approach based on resources and capabilities, within

which the firm's network of suppliers can maintain, or even increase, its competitiveness due to the development of product/process innovations as a valuable resource which is difficult to imitate (Dyer and Singh, 1998). However, firms may adopt different models in the relationship with their suppliers according to a wide range of aspects such as duration, supplier selection, information exchange, level of participation, etc. In the customer-supplier relationship, the extreme models which this relationship may adopt will be studied.

Customer-supplier relationship

We find different models of a firm's relationship with its suppliers according to the level of communication, selection criteria, functions involved, degree of dependence, length of the relationship, etc. Although, there is a wide range of customer-supplier relationship models, two different situations emerge. On one hand, a model characterised by the short term, a minimum information exchange, supplier selection based on price and a low level of involvement of both parties. We find various terms to refer to this model, such as open market bargaining (Landeros and Monczka, 1989), exit model (Helper, 1991), traditional approach (Burdett, 1992), competitive model (Hendrick and Ellram, 1993), spot market (Toni and Nassimbeni, 1999) or combative relationship (Billington et al., 2006). From here on, we will refer to this type of relationship as 'competitive model'.

This competitive model involves a relationship between a customer firm and a large number of suppliers, based on short term contracts in which the conditions of the transaction are specified (price, quality, delivery and sharing of profits). The suppliers are chosen according to the price they offer through a competitive bidding. In addition, both firms try to be as independent as possible, meaning that the information exchange is minimal and limited to the specifications of the product that is the object of the transaction, involving the least number of levels and functions of the firms.

On the other hand, we find a model based on the long term, a continuous exchange of information, careful selection of the supplier - taking into consideration both operational and strategic aspects - and a high level of involvement of both parties. Despite the fact that in the literature we find various terms to refer to this model, such as customer-supplier partnership (Shapiro, 1985), cooperative relationship (Landeros and Monczka, 1989), strategic partnership with suppliers (Ellram, 1991), voice model (Helper, 1991), relational contract (Toni and Nassimbeni, 1999), super collaboration (Billington et al., 2006), there is a general consensus regarding its definition. From here on, we will refer to this type of customer-supplier relationship using the term 'cooperative model'. This cooperative model consists of a close, long term relationship between a firm and a small

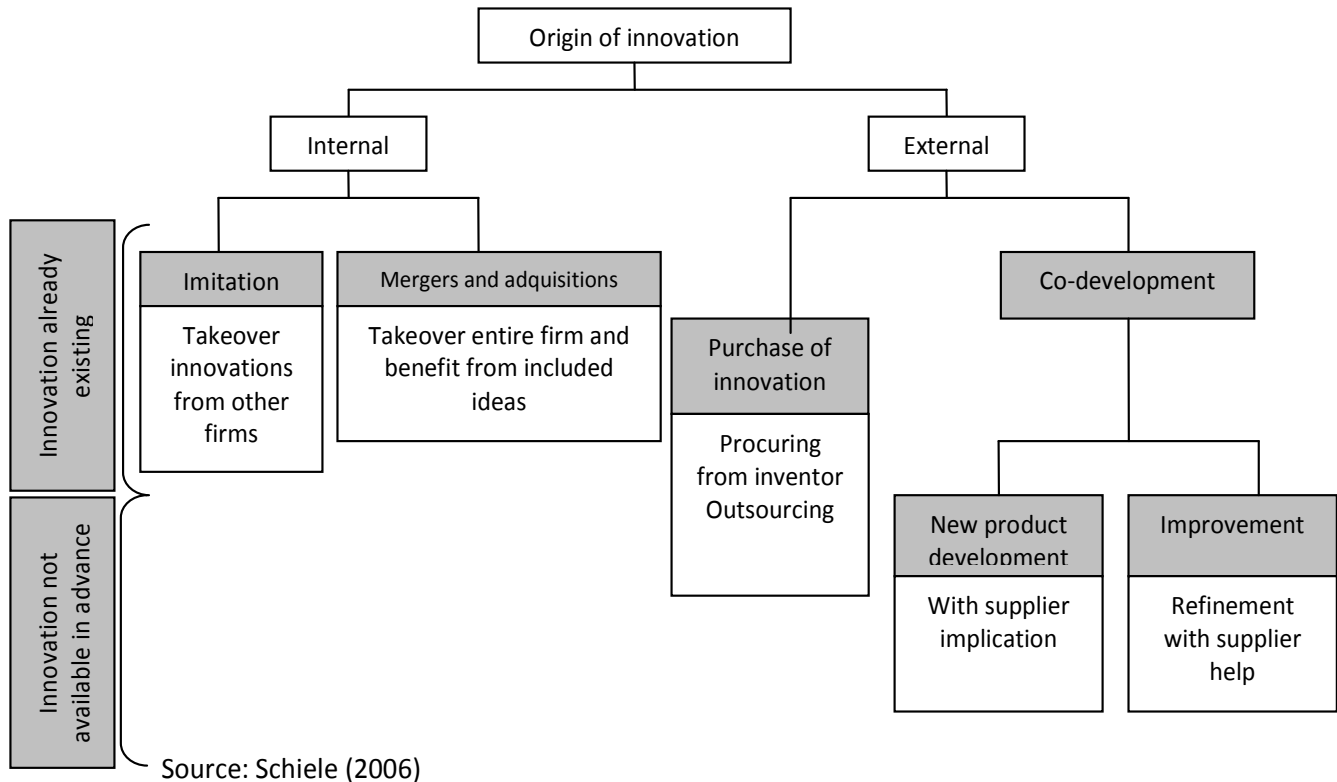


Figure 1. Origin of innovation.

number of suppliers, based on trust, mutual respect and a continuous exchange of information. In this way, both parties work together, even in the preliminary stages of component and product design, and they share resources, personnel, facilities, etc. Therefore, this relationship is not limited to the mere purchasing of the needed components from suppliers, but rather it assumes a high degree of involvement of both parties. Thus, we can observe that the relationship between a firm and their suppliers may adopt different forms. Taking into account the role of the supplier as an external source of innovation, we wonder whether the customer-supplier model could be related to the degree of innovation achieved by the firm.

Innovation in the customer-supplier relationship

Given that the supplier can contribute to the customer's innovation process, it is important to bear in mind that this effect does not occur automatically, but that it will depend on different factors. Notable among these is the relationship established between the customer firm and its supplier. Taking this idea as a starting point, our objective is to analyze the supplier relationship model which favours innovation. In the literature we find different contributions which highlight the cooperative relationship

as an important element in achieving better innovation performance. However, we can classify the literature in two different categories. Firstly, that research which focuses on the relationship between some of the characteristics of the cooperative relationship and innovation, such as information exchange, trust, investment in specific assets or technological collaboration (Ragatz et al., 1997; Carr and Kaynak, 2007; Groznik and Maslaric, 2010; Nieto and Santamaría, 2010). Some studies focus on the relevance of frequent communication between the supplier firm and its customer, considering that those suppliers with whom information can fluidly be exchanged are more likely to contribute to the customer firm's innovation.

Other studies refer to the trust in the ability of the supplier to respond to the needs put forward (Dogson, 1993; Sivadas and Dwyer, 2000). This type of trust, called 'competence trust' by Sako (1992), is an important element in achieving good results in innovation (Roy et al., 2004). Competence trust refers to the expectation of a job well done by the other party, so that it is expected that the partner is willing to improve their situation to the advantage of both parties. Finally, we also find studies linking investment in specific assets with innovation in business (Bartlett and Ghoshal, 1989; Gupta and Govindrajana, 2000). Di Guardo and Valentini (2007) consider that investment in specific assets improves the

Table 1. Cooperation level with suppliers.

Cooperation level	Frequency	Percent (%)
Below average	1028	61.7
Above average	637	38.3

creation and appropriation of technological externalities. These authors consider that cooperation with suppliers has a positive influence on innovation, owing to the fact that the technological capabilities developed under the umbrella of the partnership give rise to greater likelihood of innovation. The second group includes those studies linking cooperation with suppliers in itself and innovation. McCutcheon et al. (1997) consider that cooperation with suppliers is more important than technological competence in order to ensure the success of product development projects. Liu et al. (2000) adds the field of activity and establish that the cooperative relationship of a local supplier firm with a multinational firm can improve both operating and innovation performance.

Finally, Cantista and Tylecote (2008) analyze the customer-supplier relationship in Great Britain and they find a clear connection between cooperation with suppliers and innovation. These authors argue that the relationship between firms has a considerable influence on the degree of innovation achieved. For this reason, they consider that innovation is more likely to achieve greater success if interaction between firms is involved. Why does cooperation with suppliers play an important role in achieving innovation? One explanation lies in the fact that value is created during the innovation process, the extent of which is very difficult to determine in advance, meaning that it is not possible for all the details to be covered in the contract forming the basis of the relationship. So, the parties have to trust in one another, in that they will share the achievements attained, in that they will try to respond to the needs of the other firm. If this type of trust exists, ideas may be shared which can give rise to innovation. The underlying idea is that the relationship with the supplier will be more innovative if the customer is able to trust that losing control will not make them more vulnerable. This trust may be reinforced through various mechanisms based on values, also known as norms of behaviour. Notable among them are solidarity (commitment), harmonisation of relational conflict, integrity, reciprocity, open communication and availability of resources. In practice, these characteristics are what differentiate a competitive relationship with suppliers from a cooperative relationship (Sako, 1992; Dyer and Singh, 1998). From everything stated so far, it emerges that cooperation with suppliers may be an important factor in attaining greater achievements in innovation. This leads us to propose the following hypothesis.

Hypothesis: "Those firms which cooperate with their suppliers achieve better level of innovation."

METHODOLOGY

In order to confirm our hypothesis, we chose the Spanish Business Strategies Survey (SBSS) developed by SEPI Foundation from Spain Government. This survey comprises statistical research carried out annually since 1990 of a representative panel of firms in the Spanish manufacturing industries. Its design is quite flexible and it is intended to provide microeconomic panel information adapted to the specification and contrast of econometric models derived from economic theory. The reference population of the SBSS is those firms with 10 or more employees in the manufacturing industry. The geographical scope is the national territory as a whole, that is to say, those firms having at least one production plant in Spain. The variables have a yearly timeframe. After receiving the data, we followed the instructions of those responsible for the survey and we eliminated those firms which show an incomplete financial year or which perform repair/maintenance activities. This gave us a sample comprising 1,665 Spanish manufacturing firms. As such, we present the variables of the SBSS which allowed us to carry out our empirical study as follows. From the variables related to information exchange with suppliers, technological collaboration with suppliers and mutual dependence (calculated as the relation between the volume of specific purchases and the total volume of purchases), we created a cooperation indicator which allows us to classify the sample from the SBSS according to the degree of cooperation with their suppliers. The use of these three variables to define the customer-supplier model is endorsed by the studies of Heide and John (1990), Hendrick and Ellram (1993), Groves and Valsamakis (1998), Rinehart et al. (2004), Fossas et al. (2009), Pai and Yeh (2010). This indicator is a standardised factor which allows us to classify the firms into those which cooperate with their suppliers above or below the average (Table 1). Innovation can be measured in the SBSS by means of different variables, whose distribution is shown in Table 2. Firstly, it includes a direct question relating to whether "The firm has obtained product innovations (completely new products, or with such significant modifications that these make them different from those previously produced)." Next, if firms answer the preceding question in the affirmative, they are asked to state the number of innovations carried out. Finally, more detailed information is requested regarding the type of innovation.

Finally, we attempted to relate our hypothesis to the firm performance. Specifically, from the SBSS we chose the gross operating margin as an indicator of the customer firm's financial performance (Table 3). This variable is considered by many authors to be a firm performance which is linked to the customer-supplier model (Richeson et al., 1995; Kaynak, 1997; Carr and Pearson, 2002; and Gonzalez-Benito, 2007). Next, we examined the average gross operating margin in each group of firms according to the degree of cooperation with their suppliers and we found that those which cooperate above the average show an average gross operating margin of 10.08% as opposed to 7.94% for those firms which cooperate below the average. The contrast of the difference between the averages using variance analysis, taking the degree of cooperation as an independent variable and the gross operating margin as a dependent variable, allows us to state that those firms which cooperate with their suppliers above the average achieve better financial performance (Table 4). At this point, we were ready to contrast our hypothesis based on the variables which allow us to analyze cooperation with suppliers and the degree of innovation.

INVESTIGATION RESULTS

Taking into account the classification of Spanish firms according to their degree of cooperation with suppliers, we analyze the results obtained as regards product

Table 2. Product innovation.

Item	Answer	Frequency	Percent (%)
Product innovation	No	1273	75.7
	Yes	409	24.3
Number of innovations	0	1273	75.7
	1-10	316	19.2
	10-50	42	2.5
	50-100	8	0.5
	More than 100	9	0.5
New materials	No	1459	86.7
	Yes	223	13.3
New components	No	1462	86.9
	Yes	220	13.1
New design	No	1386	82.4
	Yes	296	17.6
New functions	No	1477	87.8
	Yes	205	12.2

Table 3. Ebitda.

Ebitda (%)	Frequency	Percent (%)
Lower than (-50)	7	0.42
(-50) - 0	218	13.10
0 - 25	1326	79.73
25 - 50	112	6.75

Table 4. Cooperation – Ebitda.

Cooperation level	Frequency	Ebitda	F	p-value
Below average	1027	7.94	10.43	0.001**
Above average	624	10.08		

Levene's test: 0.388 (sig: 0.533) ** < 0.01.

innovation. To do this, we keep in mind that product innovation is analyzed by the SBSS using a set of variables relating to the existence of innovation, the number of innovations and the type of innovation incorporated into the product. Firstly, we refer to the variable relating to the existence, or otherwise, of innovation in each of the two groups of firms created from the degree of cooperation with suppliers (Table 5). We observe that there is a greater tendency to innovate in those firms which cooperate with their suppliers above the average. Next, we determine whether the difference

in averages for innovation is significant. By means of the independent sample T-test, we verify that the difference in averages for innovation is significantly greater for those firms which show a degree of cooperation with suppliers above the average (Table 6). That is to say, those firms which cooperate above the average achieve a greater number of innovations than those which cooperate below the average. Next, we analyze the variable relating to the number of innovations achieved by the firms in the SBSS. This variable shows an average of 4.22 for those firms which cooperate above the average, as opposed to 1.51

Table 5. Cooperation – Innovation.

		Cooperation level	
		Below average (%)	Above average (%)
Product innovation	Yes	128 (12.5)	277 (43.5)
	No	900 (87.5)	360 (56.5)

Table 6. Cooperation – Innovation (t test).

Cooperation level	Innovation	t	p-value
Below average	0.12	-13.98	0.00**
Above average	0.43		

** < 0.01.

for those which cooperate below the average. The contrast of averages allows us to state that those firms which cooperate with their suppliers above the average show a greater average number of product innovations (Table 7).

In addition, we are able to study the type of innovation incorporated into the product. In Table 8, we see that those firms which cooperate with their suppliers above the average show a greater degree of innovation due to new materials, new components, new design or new functions. Comparing the difference between averages in type of innovation (Table 9) allows us to state that those firms which cooperate above the average with their suppliers show a greater degree of innovation irrespective of whether this is due to the incorporation of new materials, new components, new design or new functions to the product. After studying about the relation among cooperation with suppliers and product innovation, its impact on the firm performance should be investigated. This is particularly true as a firm performance is a key criterion for managerial success (Akgün et al., 2007). We analyze whether there are differences in the firm performance according to its degree of innovation. We had previously drawn the conclusion that those firms which cooperate with their suppliers above the average achieve better financial performance, that is to say, a higher gross operating margin. However, we are able to take a step further by studying whether we find differences in the performance according to product innovation. In order to do this, we focus on those firms which cooperate above the average with their suppliers and we find that those firms which innovate achieve an average gross operating margin of 11.34% as opposed to 9.18% for those firms which do not innovate. The contrast of the difference in averages of the gross operating margin (Table 10) allows us to state that within those firms which cooperate with their suppliers above the average, those which innovate achieve an average gross operating margin significantly higher than those which do not innovate.

DISCUSSION

The current environment, characterised by dynamism and changes in customer preferences and needs, etc., forces firms into a continuous process of adaptation and transformation of their products and processes. All this means that greater importance is being placed on the study of innovation within firms. Nowadays, it is difficult for firms to own all the resources and capabilities required to meeting this need to innovate, and, for this reason, they are turning to external sources of innovation: suppliers, customers, organisations, etc. The importance which the relationship between purchasing and innovation is acquiring led us to focus on the analysis of suppliers as an external source of innovation. Firms may establish different relationships with their suppliers, as a result of which they may achieve different results as regards innovation. The relationship of firms with their suppliers has given rise to a large number of studies focusing on the definition of customer-supplier models, highlighting the existence of two extreme models: the competitive model and the cooperative model. The analysis of each one leads us to draw the conclusion that the cooperative model involves a relationship of trust, commitment, information exchange, technological collaboration and investment in specific assets which brings together all the conditions necessary for creating an atmosphere in which better performance can be obtained as regards innovation. Therefore, we propose the following hypothesis: "Those firms which cooperate with their suppliers achieve better level of innovation." We contrast our hypothesis on the sample of Spanish firms responding to the SBSS. In order to do this, we create a supplier cooperation indicator from the variables related to information exchange, technological collaboration and mutual dependence, which allows us to classify the firms into two groups according to their level of cooperation with suppliers. From this classification, we contrast our hypothesis by analyzing the degree of innovation in the two groups of firms.

This analysis shows us that those firms with an above average level of cooperation with suppliers have a greater tendency to innovate products. In addition, these same firms achieve a greater number of innovations. We study the type of innovation in depth and we detect that those firms which cooperate above the average with their suppliers show a greater degree of innovation irrespective of whether this is due to the incorporation of new materials, new components, new design or new functions

Table 7. Cooperation - Number of innovations (t test).

Cooperation level	Number of innovations	t	p-value
Below average	1.51	-2.92	0.003**
Above average	4.22		

** < 0.01.

Table 8. Cooperation - type of innovation.

		Cooperation level	
		Below average (%)	Above average (%)
New materials	Yes	64 (6.2)	156 (24.5)
	No	964 (93.8)	481 (75.5)
New components	Yes	57 (5.5)	160 (25.1)
	No	971 (94.5)	477 (74.9)
New design	Yes	94 (9.1)	198 (31.0)
	No	934 (90.9)	439 (69.0)
New functions	Yes	55 (5.3)	148 (23.2)
	No	973 (94.7)	489(76.8)

Table 9. Cooperation - Type of innovation (t-test).

Cooperation level	New materials	t	p-value
Below average	0.06	-9.79	0.003**
Above average	0.24		
Cooperation level	New components	t	p-value
Below average	0.06	-10.51	0.00**
Above average	0.25		
Cooperation level	New design	t	p-value
Below average	0.09	-10.73	0.00**
Above average	0.31		
Cooperation level	New functions	t	p-value
Below average	0.05	-9.84	0.00**
Above average	0.23		

** < 0.01.

Table 10. Innovation-Ebitda.

Product innovation	Ebitda	t	p-value
No	9.18	1.085	0.009**
Yes	11.34		

** < 0.01.

functions to the product. Finally, we analyze the gross operating margin as an indicator of financial performance. Those firms which cooperate above the average achieve a higher gross operating margin compared with those which cooperate below the average. What is more, within the firms which cooperate above the average, we have found that those which innovate achieve better financial performance than those which do not. In this way, we see that a long term relationship with suppliers based on trust, exchange of resources and mutual commitment, that is to say, a cooperative relationship with suppliers, creates an atmosphere of working together towards obtaining innovative products which adapt to customer preferences and needs. This combined effort involves sharing the costs of innovation and taking advantage of the resources and capabilities of the other party, all of which can lead to greater customer satisfaction and, in short, obtaining better financial performance for the firm.

The results obtained from this research can have implications for company management, since they contribute empirical evidence regarding cooperation with suppliers as an element which can favour a firm's degree of innovation. Firms are increasingly turning to external sources of innovation, being unable to respond to current changes and demands by themselves. Notable among these sources is the supplier as an agent of the supply chain who is able to contribute their experience, knowledge and resources related to the input of the firm. This contribution is not done independently. Working together with suppliers and sharing future plans is likely to originate a greater number of different kinds of innovations. All of this will benefit the firm's competitive position and the performance it is able to achieve. When assessing the results obtained by this study, we should bear in mind that it possesses a series of limitations, mainly due to the information source used: SBSS. On the one hand, limitations arising from the survey itself, the investigation being limited to manufacturing firms in Spain. On the other, limitations caused by the use of the SBSS to analyze the customer-supplier relationship, innovation and the performance achieved something which has not allowed us to consider other features of the relationship with suppliers, other types of innovation and other measures of performance. However, despite the limitations it presents, we must acknowledge that the SBSS has allowed us to make a great number of observations and to avoid the many disadvantages resulting from the collection of information at an individual level. Finally, we wish to indicate the next steps we will take in our research. Firstly, we try to carry out an analysis comparing different sectors, bearing in mind that the degree of innovation varies from one to another. In addition, we try to create an analysis model which will allow us to study in detail the explanatory power of certain variables (including cooperation with suppliers) regarding firms' degree of innovation through the application of statistical techniques such as regression.

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