

Research Article

## Organizational innovation and its relation with the cooperation in innovation

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**ABSTRACT: Purpose** – The paper aims to analyze the influence of cooperation in innovation in the introduction of new organizational methods. As the company shares different kind of knowledge with each partner, this research pretends to get a broader picture of the interaction between its collaboration with distinct partners and the adoption of organizational innovations.

**Design/methodology/approach** – The paper studies the influence of four different agents: clients, suppliers, competitors and universities, that are going to be analyzed, using a probit regression with data about 9172 companies of the Spanish PITEC (Panel of Technological Innovation), for the year 2013.

**Findings** – The papers results show that the four types of cooperation have a positive and significant effect in the introduction of organizational innovations. From highest to lowest influence; competitors, clients, suppliers and universities.

**Research limitations/implication** – The study only uses data from the Spanish business scene, limited by its social and political conditions, so it isn't possible to generalize the results for the rest of countries. Therefore, future lines of investigation are proposed at the end.

**Practical implications** – The results show that in order to adopt new organizational methods in the company, managers could collaborate in innovation with the four agents selected, but specially, they should cooperate with competitors and clients.

**Originality/value** –The paper extends the literature of cooperation in innovation with the organizational innovation, a theme that has been barely taken into account, as researches have been mainly focused on technological innovations, rather than on the non-technological ones.

**Keywords:** Organizational innovation, cooperation, non- technological innovation.

### 1. Introduction

In our rapidly evolving world where, due to international lization and great technological development, the competitors of an organization can no longer be identified so clearly. Furthermore, product life cycles are becoming shorter and the concept of "creative destruction", popularized by Schumpeter, is very present in the environment. Thanks to this circumstances, companies seem to have finally understood the importance of innovation as the engine of sustained growth and competitiveness.

The very competitive and changing market is showing that the ability of companies to adapt quickly to changes in their environment is no longer an option but a requirement and that the "dynamism" of organizations has come to be an essential characteristic for its survival. The fact of maintaining a large market share is no longer a valid indicator to observe the future prospects of the organization. It is no longer enough because the globalization of markets has increased the number of competitors, and companies must remain at the forefront of their respective businesses to survive. At any moment, there may appear a more specialized rival that threatens a part of the business of the company and, in the event of it not being prepared, it may end up by disappearing.

To maintain the competitiveness of the company in the evolution that we are living towards a knowledge-based economy, we must renew and bet on intangible assets. A correct exploitation of knowledge is a key aspect to maintain the competitive advantages of the organization, but not only that, it also requires the development and acquisition of new knowledge. This requires R&D expenditure and cooperation with other agents so that the company has access to new inputs, and as a consequence, it can manage to materialize

them as innovations. In addition, companies must also be prepared to absorb and interpret the knowledge to which they have access through collaboration.

The importance of cooperation in innovation stems from the increasing complexity of science and technology and from the costs and uncertainties associated with R&D projects, which makes it difficult for a single company to develop new products and processes by itself (Navarro Arancegui, 2002). Therefore, this paper will try to shed some light on the effects of cooperation in innovation, specifically, with regard to the introduction of new organizational methods. This provides the organization with the aforementioned "dynamism", since it is understood as a dynamic organization, the ones that seek to be infinitely innovative and adaptable to the market through the adoption of new forms of organization (Dyer & Shafer, 2003). The introduction of new organizational methods can be done in three different manners (OECD, 2005). By introducing new practices in the way of doing business, by changing the organization of the workplace or by reshaping the management of the external relations. The company will get more dynamic as far as it internalized new organizational methods.

Hence, in this paper some principles are proposed to allow us to know how organizations achieve these agile structures through organizational innovations, in this case, through cooperation in innovation with various external agents. Therefore, this research study will try to answer the question; Can a dynamic company support in external innovation partnerships to encourage the introduction of organizational innovations?

This paper aims to contribute with new data to the field of

organizational innovation, a type of non-technological innovation that, as explained in section two, has been scarcely analyzed in comparison to technological innovations. Although there are already some studies that have investigated this type of innovation, most of them have focused on discovering the effects of organizational innovation (Hollen et al., 2013, Sapprasert & Clausen, 2012) and in analyzing what characteristics of the companies can make them more or less likely to introduce new organizational methods (Ganter & Hecker, 2013, Mol & Birkinshaw, 2009).

Because of this, the study will focus on analyzing the relationship between this type of innovation and the cooperation with other agents in innovation. In other words, if the external collaboration in R&D facilitates the adoption of organizational innovations in the company. To that end, four types of agents that make cooperation agreements have been selected: customers, suppliers, universities and competitors, which have also been used by other similar studies (Belderbos et al., 2004; & Santamaría, 2007). Each of them can contribute with a different type of knowledge to the organization, so we will analyze what the effects are, if any, of the cooperation with each one. This will allow us to discover the type of cooperation that is most influential in this aspect.

From here, the present work is structured as follows. The second section contains a review of the literature on organizational innovation and cooperation in innovation. In the third, the two main hypotheses presented for the study will be presented and will be broken down into 6 more concrete statements. The fourth section describes the data source used, the variables to be used in the econometric analysis and the methodology to be used in order to do the regressions. The fifth section will show the values obtained in the models and a discussion about the results obtained. Finally, the last section presents the conclusions obtained in the research study, its contribution, its limitations and some possible ideas for future research.

## 2. Previous Research

To date, innovation studies have focused mainly on technological innovations such as, product and process innovation (Damanpour & Aravind, 2012; Gallego et al., 2013). However, for some years, non-technological innovation has acquired a great importance, since according to several studies (Battisti & Stoneman, 2010; Camisón & Villar-López, 2014; Damanpour et al. 2009) companies benefit from complementarities between different types of innovation (for example, organizational innovation encourages the development of technological capabilities).

The fact that organizational innovation has been underestimated in comparison with technological innovation is due to three main factors, (Sapprasert & Clausen, 2012): first, there is no single coherent theoretical framework for understanding the phenomenon of organizational innovation (Armbruster et al., 2008), partly because there is no consensus on the definition of the term. Second, because the literature has lacked clarification on how to use this type of innovation as a variable and different units of analysis have been used in the previous researches (Armbruster et al., 2008; Mol & Birkinshaw, 2009).

And third, we have the lack of data and statistics to study this event (Hervás Oliver & Sempere Ripoll, 2013), since, unlike process and product innovations, which have been evaluated using data on patents or expenditure in I + D, organizational innovations are much less tangible and there is no consistent way of measuring it in different companies.

For this reason, and since its publication, it seems to be used

by a growing number of authors (Ganter & Hecker, 2013; Hervás Oliver & Sempere Ripoll, 2013; Meroño-Cerdan & López-Nicolas, 2013; Sapprasert & Clausen, 2012, Simao & Franco, 2015), this article will use the definition of organizational innovation established by the third edition of the Oslo Manual (OECD, 2005), which says:

*"An organizational innovation is the introduction of a new organizational method into practices, organization of the workplace or external relations of the company."*

This definition refers to the fact that innovation differs from any other organizational change in the company in the way that this organizational method should not have been used before in the company and that it has not to be the result of strategic decisions made by management (OECD, 2005). Using the idea of "new to the company" that some authors had previously used (Damanpour, 1992), or that others would later complement with the objectives that are being followed with the adoption of this innovation (Mol & Birkinshaw, 2009).

Based on the objective of the activity, some authors divide this type of innovation into four different parts; activities associated with setting goals, motivating employees, coordinating activities and making decisions (Birkinshaw & Goddard, 2009; Van Den Bosch, F.A., 2012). In this study it has been decided to use the division of organizational innovation that comes out of the definition of the Oslo Manual as this work is not going to focus so much on the objectives that are pursued with the introduction of organizational innovation but, rather on what is the relationship between it and the external cooperation in innovation.

This definition contains three types of organizational innovations. First, new business practices in the organization of work, in the procedures or in the routines of the company (practices to improve learning...). Second, new methods of organization of the workplaces of the company with the aim of achieving a better distribution of responsibilities and decision making among the employees of the organization. Third, new methods of managing external relations with other companies or public institutions, establishing new forms of collaboration with clients and research organizations, as well as integrating suppliers and outsourcing / subcontracting activities (OECD, 2005).

It should be noted that mergers and acquisitions are not considered organizational innovations even if these operations are carried out for the first time. They would count as innovations if, following the merger/acquisition, the company adopts new methods such as those mentioned above. Organizational innovation is a type of non-technological innovation, which, unlike technological innovation, has been scarcely studied. For this reason, the study will try to provide some information of added value to this growing field of study (Volberda et al., 2013), focusing on the analysis of the impact of the external cooperation of companies on the adoption of organizational innovations, allowing them to benefit from a more flexible and dynamic structure. Specifically, the work will seek to deepen these inter-organizational relationships, analyzing the type of partners (customers, competitors, suppliers and universities) with which it cooperates and taking into account a series of characteristics that can mediate between them, such as the size, the age, or the location of their markets.

The firms that enjoy from the benefits of this type of innovation have been previously analyzed, like a sample of Norwegian firms that were persistent in the adoption of organizational innovations for the period of time between the years 1999 and 2004 (Sapprasert & Clausen, 2012). This research discovered that the adoption of new organizational

methods improved the effects of organizational innovation on their business. Furthermore, a research made over a sample of German companies (Ganter & Hecker, 2013) proved that with the introduction of organizational innovations, the firms are more prone to achieve and maintain a competitive advantage. And finally, (Mol & Birkinshaw, 2009) found in a sample of English enterprises that new organizational methods do not only have to depend on internal structural factors to look for them, but also that they can seek on the interaction between internal and external knowledge sources.

This research will expand previous studies on the relationship between external cooperation and organizational innovation (Hollen et al., 2013) in analyzing how different types of innovations are effected and how each type of partner effects its introduction in the company. That is why the following two objectives are defined:

- To analyze the relationship between the cooperation in innovation and the adoption of organizational innovations.

A company that seeks to develop innovations in the organization needs to acquire new knowledge that allows it to make improvements and / or changes in practices, workplace organization and external relations of organizations. Traditionally, there were only two ways of acquiring the necessary knowledge: to produce it in the company itself, through R & D activities, or to buy it in the market. But a third way was discovered, the one that combines the previous two, to cooperate with other agents in the field of innovation (Navarro Arancegui, 2002). Specifically, (Inauen & Schenker-Wicki, 2012) states that innovative companies rely heavily on regular interaction with customers, suppliers, universities and competitors, which are analyzed in several previous papers (Tether, 2002; Simao & Franco, 2015; Nieto & Santamaría, 2007; Belderbos et al., 2004; Navarro Arancegui, 2002; Zeng et al., 2010). In addition, it has been studied that these types of cooperation agreements favor the introduction of innovations in the organization (Tether, 2002), although in a deeper investigation (Simao & Franco, 2015) the effect of cooperation could not be confirmed. In R & D with competitors, universities and state laboratories in the introduction of organizational innovations. In spite of this, a positive impact is expected to be obtained in the analysis of the relationship between cooperation and the adoption of organizational innovations made in this work.

- To evaluate the relationship between the cooperation with different external partners and the different types of organizational innovations described.

The beneficial effects of R & D cooperation with other companies have already been studied for some years; (Nieto & Santamaría, 2007) show that collaborations with suppliers, clients and research organizations have a positive impact on product innovation, (Powell & Grodal, 2005) that mutual learning and several collaborations are related to an increase in the patent number, (Gumusluoglu & Ilsev, 2009) verify that external support in innovation fosters organizational innovation through transformational leadership and (Tether, 2002) shows that partnerships are associated with innovations of higher level. Moreover, (Inauen & Schenker-Wicki, 2012) discovered that companies that carry a more opened innovation process get a higher amount of radical innovations. But what happens exactly with the cooperation with each agent. The cooperation with suppliers helps to develop new products and improve the existing ones (Nieto & Santamaría, 2007) and increasing the quality perceived by the customer. Moreover, collaborating with clients in innovation could help to lower the barriers to adopting new innovations, taking profit

of their creativity and encouraging the development of new products (Antikainen, et al., 2010). Otherwise, competitors are useful for handling problems that are outside the competitors areas of influence or for establishing basic research standards (Tether, 2002). Finally, cooperation with universities is believed to decrease transaction costs, correct market failures and decrease the risks of the interacting partners leading to increased productivity (Zeng et al., 2010).

In addition to the specific impact of each agent and from the perspective of organizational learning, companies that collaborate with other external agents have access to information and knowledge that would be difficult to achieve on their own and improve their performance (Borgatti & Foster, 2003), also benefiting from the presence of spill-overs of knowledge, which in fact, stimulate more cooperation in R & D (Belderbos et al., 2004). Due to this, it would be expected that given the characteristics of the different types of collaborators, their cooperation would influence organizational innovation differently, depending on the type of knowledge that could be obtained from the other external agent.

Moreover, in the possible exchange of knowledge between innovation cooperation participants and the importance of external sources of information in the adoption of innovations (Leiponen & Helfat, 2010; Mol & Birkinshaw, 2009), it would be expected that the cooperation with the main four collaborators in innovation (Belderbos et al., 2004; Nieto & Santamaría, 2007; Zeng et al., 2010; Inauen & Schenker-Wicki, 2012); competitors, customers, suppliers and universities, fosters the introduction of organizational innovations in the company.

To sum up, we have talked about two separated lines of research, the study of the effects of organizational innovation and the analysis of the impact of the external collaboration in the innovation of the company, mostly in the technological ones. They have been researched independently until recent years (Simao & Franco, 2015), so this paper will try to combine them by focusing on the study of the relationship between organizational innovation and the cooperation with other agents in innovation.

### 3. Hypotheses

The organization's cooperation operations increase its flow of knowledge, giving it access to new information, greater resource endowment and the know-how of the other members. This allows you to better understand the environment in which you move and be able to prepare in a more appropriate way for changes that can occur in it. This perspective has already been studied in the field of technological innovations (Simao & Franco, 2015; Tether, 2002), but there is still a long way to go in the case of organizational innovation (Damanpour & Aravind, 2012).

In addition, the creation of cooperation agreements can introduce changes in the structure of the company with the aim of obtaining a better management of external relations or a more optimal organization of company practices. Furthermore, some authors found that technological and non-technological innovations were usually related to each other and had similar determinants (Boer & Duing, 2001; Schmidt & Rammer, 2007), so we can assume that the majority of relevant arguments for technological innovations can be applied to the organizational ones (Simao & Franco, 2015). In this case, that the access to external knowledge is also an important matter for organizational innovation.

For this reason, and given that collaboration is a source of new knowledge and organizational changes in the company, the

following hypothesis has been developed:

H1. *The external cooperation of an organization encourages it to introduce organizational innovations by providing it with new knowledge and resources.*

From this hypothesis, and in order to dig deeply in the nature of organizational innovation and in the consequences of the cooperation in innovation, we have used the previously described definition of the Oslo Manual to deduced two more specific hypotheses from H1. Three are not deduced because as will be explained in the section of variables, the first two classes have a high correlation and will be combined. That is why you obtain:

H1a. *The external cooperation of an organization encourages it to introduce new organizational methods into the business practices and / or organization of the workplace.*

H1b. *The external cooperation of an organization encourages it to introduce new organizational methods in the external relations of the company.*

Given that external cooperation itself involves quite implicitly the introduction of new organizational methods in the external relations of the company, it is hoped that cooperation in innovation has a greater impact on the introduction of organizational innovations in external relations than in the two types of the hypothesis H1a.

In order to dig deeper into the relationship between innovation cooperation and introduction of organizational innovations in the company, an analysis of the concrete interactions that take place in collaboration with the four types of cooperation agents will be carried out. The cooperation agreements with each of them have different characteristics that will modify the relationship between collaboration and the adoption of organizational innovations according to the knowledge that they receive from them (Miotti & Sachwald, 2003).

Similar studies carried out with technological innovation show this variety; (Nieto & Santamaría, 2007) show how suppliers are the agents that have the greatest impact on product innovation alone, followed by clients and research organizations, leaving competitors to the last position. On the other hand, (Belderbos et al., 2004) argue that it also depends on the type of innovation being addressed, since cooperation with competitors and suppliers is more related to incremental innovations while collaboration with clients and universities is more associated with radical innovations. (Miotti & Sachwald, 2003) have also analyzed that while cooperation with customers and suppliers has some impact on the introduction of new products to the market, rivals are mainly used to share high R & D costs in high technology sectors and not in the research conducted at the frontiers of knowledge, which is achieved mainly through cooperation with universities.

Due to what has been said about the strong relation between external cooperation and the adoption of new forms of external relations management, the next hypothesis will analyze the concrete effect of the four selected collaborators in the same combination of the Hypothesis H1a, that is, in the introduction of new organizational methods related to the tasks performed by the company and the organization of its workplace. The second hypothesis is divided into four more specific statements, one for each type of partner, which will be explained below. But first, in general, the second hypothesis can be stated as follows:

H2. *The external cooperation in innovation with the four chosen agents encourages the introduction of new organizational methods in the business practices and / or the organization of the workplace.*

Firms cooperate with clients to gain knowledge about markets, they are more prone to adopt a market-driven strategy (Ritala

et al., 2013), and thus, to achieve organizational changes, as their needs can be of great help in preparing a more adequate response to demand (Miotti & Sachwald, 2003). In addition, listening to customers, especially in the early stages, can lead to innovations more quickly. However, these needs are tacit knowledge that the company must know how to take advantage of (Tether, 2002).

Hence, it is important to know whether cooperation in innovation with clients has an impact on the adoption of organizational innovations. From that we obtain hypothesis 2a:

H2a. *Cooperation with clients of an organization encourages it to introduce new organizational methods into business practices and / or organization of the workplace.*

As with customers, the knowledge that can be obtained from collaboration with rival companies can be very useful in comparing how good or bad are some organizational methods in the same market (Božic & Ozretic-Došen, 2015). In addition, this kind of cooperation can serve to share the costs and risks of some key technology for the development of your business (Tether, 2002). Even so, this type of cooperation is also very marked by the possible imitation of business practices and, consequently, by the ability of organizations to protect their own knowledge. This may result in avoiding cooperation with rivals as the risks of collaborating with clients or suppliers are much lower (Miotti & Sachwald, 2003).

This could lead to a decrease in the propensity to introduce organizational innovations in this type of cooperation, so it is important to study this phenomenon and to verify the following hypothesis:

H2b. *Cooperation with an organization's competitors encourages it to introduce new organizational methods in the business practices and / or the organization of the workplace.*

Cooperation with universities has something special because it can provide the organization with very up-to-date knowledge that can lead to the development of radical innovations (Belderbos et al., 2004). In addition, this type of industry collaboration with universities is increasing (Perkmann & Walsh, 2007).

Despite this, research carried out in universities may not be entirely oriented to the companies' businesses, a tendency that diminishes due to the pressure exerted by the government to foment the competitiveness of the industry and also due to the pressure that generates the lack of resources (Nieto & Santamaría, 2007). Therefore, it is important to determine the effect that innovation cooperation with this type of agents has on the introduction of organizational innovations, which leads to the following hypothesis:

H2c. *Cooperation between universities and organizations encourages them to introduce new organizational methods into business practices and / or organization of the workplace.*

And finally, there is the cooperation with suppliers, which is also very important when the employees know each other and the efficiency of the supply is greater. This collaboration is closely related to the tendency to outsource services and work together to ensure the quality of the final product (Belderbos et al., 2004), a fact that allows us to reduce risks and times of development of the product, increasing the flexibility and the adaptability of the company in the market (Nieto & Santamaría, 2007).

The more optimal the interaction between the two agents, the greater the competitiveness of the company, so analyzing the effect of this collaboration on the organizational methods of the company would be very interesting, and from this, the last hypothesis is obtained:

H2d. *The cooperation with suppliers of an organization encourages it to introduce new organizational methods into business practices and / or organization of the workplace.*

**4. Research Method**

In the three sections of this section we will describe: first, the source from which the data to be used will be extracted; second, the variables chosen for the study; and third, the methodology to be followed in the econometric analysis of research work.

**4.1. Source of Data**

The empirical analysis was based on the data of the Technological Innovation of Companies' Surveys for the year 2013 available in the Panel of Technological Innovation (PITEC), which would be the Spanish Community Innovation Survey. The PITEC is part of the General Plan for Science and Technology Statistics, promoted by the European Union Statistics Office (Eurostat), to analyze the development of business R & D & I activities at national level.

With regard to Spain, PITEC is a statistical instrument on the monitoring of technological innovation activities in Spain, the result of the joint effort of three institutions: the National Statistics Institute (INE), the Spanish Foundation for Science and Technology (FECYT) and the Cotec Foundation. The objective of this project is to contribute to the improvement of the statistical information available on the technological activity of companies and the conditions for carrying out scientific research in this area.

Unlike the innovation surveys carried out in other countries, which are carried out every two years and on a voluntary basis, the questionnaire to which Spanish companies are submitted has an annual frequency and is included in the National Statistical Plan as compulsory, so a very high response rate is obtained. Thanks to this, PITEC has managed to offer more than 460 variables of around 12,000 companies since 2005 on an annual basis.

In this study, the focus is on companies that have carried out innovation activities in the period 2011-2013 and that the panel refers to as "No incidence", in relation to that there haven't been problems to follow up. In this case, the total number of companies amounts to 9172, which accounts for 71.44% of the total of the companies that make up the 2013 panel.

The questions asked by the survey to be able to classify the type of organizational innovation that was introduced in the company between the years 2011 and 2013 are included in the Annexes section of the present work.

**4.2 Variables used**

What we intend to analyze in this work are the effects of external cooperation in innovation in the adoption of new organizational methods, therefore, the dependent variables will indicate if the company in question introduced some organizational innovation during the period 2011-2013, classified in the three types of innovations described in the third edition of the Oslo Manual. These variables are collected from a yes or no answer, so they will be dummy variables.

The independent variables of the different econometric models will indicate whether the study companies cooperated or not and the type of partner with which this cooperation took place.

**Table 1 - Description of the variables of the study**

Variables	Explanation	Previous works
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In the same way as the dependent variables, the independent variables are dummy. Finally, the analysis includes a series of control variables that measure different characteristics of the companies, used in previous works, and that can influence the relationship between the dynamism of the organization and the cooperation in innovation with external agents of its surroundings.

Next, we will explain the effect of the control variables on the relationship between cooperation with external agents and the introduction of organizational innovations.

- **TAMANO:** Larger companies have access to greater resources, both economic and human, than smaller firms, so adoption of organizational innovations will be affected (Leiponen & Helfat, 2010). In addition, larger organizations will be more willing to introduce this type of innovation when facing larger numbers of competitors of all sizes (Mol & Birkinshaw, 2009). This indicates that the size of the company will positively influence the implementation of innovations (Damanpour, 1992).

- **ANIOCREA:** Older companies are more likely to try to introduce organizational innovations (Sapprasert & Clausen, 2012), but SMEs also enjoy positive influence with the adoption of these innovations (Laforet, 2013). However in this variable there are two contradictory consequences: since the experience of age increases the efficiency of the routines performed. It also distances the capacities of the organization and the demand of the environment (Sapprasert & Clausen, 2012; Sørensen & Stuart, 2000). In spite of this, the company's seniority is expected to encourage the introduction of new methods of work organization.

- **INNPROD, INNPROC:** The complementarities analyzed by different authors between technological and non-technological innovations (Battisti & Stoneman, 2010; Camisón & Villar-López, 2014; Damanpour et al., 2009; Gallego et al., 2013; Sapprasert & Clausen, 2012) indicate that the fact that the organization has introduced product and process innovations can positively affect the introduction of organizational innovations due to the complementarities between them.

- **REMUSUP:** The level of education of the employees of the company will also influence the adoption of new organizational methods, since the more educated workers are supposed to be more flexible and more able to absorb and exploit better the external knowledge (Simao & Franco, 2015).

- **OTROPAIS:** The scope of performance of the company will affect the company's organizational innovation to the extent that companies are exposed to more innovations of this type as the market in which they act increases. This internationalization also increases the size and number of competitors, so the organization will have to further encourage the adoption of new organizational methods with which to maintain its competitiveness (Ganter & Hecker, 2013).

- **INDUSTRY FIXED EFFECTS:** Used to control the heterogeneity of the industry in the adoption of organizational innovations.

The following table shows a list with the names of the variables to be used in the econometric analysis, accompanied by a brief description and the values they can take, as well as some of the previous works that have used them:

Dependent variables	INORGN1	Dummy variable that counts as a 1 when the company has introduced new business practices in the work organization or in the enterprise's procedures between the years 2011 and 2013, and 0 when it hasn't.	(Hervás Oliver & Sempere Ripoll, 2013; Meroño-Cerdan & López-Nicolas, 2013)
	INORGN2	Dummy variable that counts as a 1 when the company has introduced new organizational methods in the workplace with the objective of improving the responsibility distribution and the decision-making between the years 2011 and 2013, and 0 when it hasn't.	(Hervás Oliver & Sempere Ripoll, 2013; Meroño-Cerdan & López-Nicolas, 2013)
	INORGN3	Dummy variable that counts as a 1 when the company has introduced new managing methods of the external relations with other enterprises or public institutions between the years 2011 and 2013, and 0 when it hasn't.	(Hervás Oliver & Sempere Ripoll, 2013; Meroño-Cerdan & López-Nicolas, 2013)
Independent variables	COOPNEWik <sup>1</sup>	Dummy variable that counts as a 1 when the company cooperated with the different type of partners and 0 when it didn't. This variable has 2 indexes, the i, that goes from 1 to 8 (indicating the partner), and the k, that differentiates the location of the partner (from 1 to 5).	(Belderbos, Carree, & Lokshin, 2004; Mol & Birkinshaw, 2009)
	TAMANO	Variable that represents the number of employees of the organization.	(Ganter & Hecker, 2013; Mol & Birkinshaw, 2009; Sapprasert & Clausen, 2012; Serrano, López, & García, 2013; Sørensen & Stuart, 2000)
Control variables	ANIOCREA	Variable that indicates when the organizations were created.	(Sapprasert & Clausen, 2012; Sørensen & Stuart, 2000)
	INNPROD	Dummy variable that counts as a 1 when the company has introduced a product innovation between the years 2011 and 2013, and 0 when it hasn't.	(Ganter & Hecker, 2013; Serrano et al., 2013)
	INNPROC	Dummy variable that counts as a 1 when the company has introduced a process innovation between the years 2011 and 2013, and 0 when it hasn't.	(Ganter & Hecker, 2013; Serrano et al., 2013)
	REMUSUP	The percentage of employees with higher education in the organization.	(Ganter & Hecker, 2013; Mol & Birkinshaw, 2009; Serrano et al., 2013; Simao & Franco, 2015)
	MDOLOCAL	Dummy variable that counts as a 1 when the company's market is local, and 0 when it isn't.	(Ganter & Hecker, 2013; Mol & Birkinshaw, 2009)
	MDONAC	Dummy variable that counts as a 1 when the company's market is the national one, and 0 when it isn't.	(Ganter & Hecker, 2013; Mol & Birkinshaw, 2009)
	MDOUE	Dummy variable that counts as a 1 when the company's markets are other countries of the EU, the EFTA or other candidates for the EU, and 0 when it isn't.	(Ganter & Hecker, 2013; Mol & Birkinshaw, 2009)
	OTROPAIS	Dummy variable that counts as a 1 when the company's market is not included in the last 3 variables, and 0 when it is.	(Ganter & Hecker, 2013; Mol & Birkinshaw, 2009)
	Industry fixed effects	The study includes some dummy variable in order to control the specific effects of each industry. For that, we are going to use the data base classification, that puts the industry in 44 different sectors, following the CNAE-2009 code.	(Ganter & Hecker, 2013; Mol & Birkinshaw, 2009; Sapprasert & Clausen, 2012)

Following the choice of dependent variables, a correlation analysis was performed to see how correlated they were between them. The results obtained are presented in the following table:

**Table 2- Correlation coefficients between the 3 dependent variables**

<sup>1</sup> The variable COOPNEWik has been described as it is used in the PITEC database, but for the purpose of the paper we have selected 5 of the 8 agents: competitors, suppliers, universities and clients. For the last one, we have merged the public and the private sector. This means that we have used the (i) indexes 2, 3, 4, 5 and 7 of the table in the Annex 2.

	INORGN1	INORGN2	INORGN3
INORGN1	1		
INORGN2	0,6964	1	
INORGN3	0,4770	0,4975	1

Given the high correlation between the variables of organizational innovation 1 and 2, we will choose to combine them into a dummy variable that takes the value 1 when there is type 1 innovation, innovation type 2 or both, and takes the value 0 when there is a 0 in INORGN1 and INORGN2. This new variable has been called INORGN12<sup>2</sup>.

Regarding the variables on the market of the organization, it was decided to join the first 3 in a single one in order to compare better between the companies that have the market geographically close and those that do not. Thus we obtain the variable COMBMDO, that would allow a better adjustment of the scope of performance of the company. But it could not be included in the following analysis because it coincided with the dependent variable INORGN12 and the software eliminated it from the regression.

**4.3. Methodology**

In order to find the relationship between the external cooperation of companies and their adoption of organizational innovations, the study is going to use a Probit analysis. In this case, the analysis is adjusted because it is a regression model in which the dependent variable has only two possible outcomes, such as the adoption of organizational innovation in this study.

Because of this, we will perform a series of Probit analyzes, one for each dependent variable in the case of the first hypothesis; first, for the variable that combines INORGN1 and INORGN2 and second, for the variable of adoption of new methods of management of external relations, INORGN3. Then the specific cases of cooperation with each agent for the variable INORGN12 will be analyzed, as already explained in the development of the second hypothesis that the variable inorgn3 has been omitted from this analysis due to the strong correlation with the external cooperation. In each of them the variables of cooperation in innovation will be used as an independent variable along with the group of control variables.

In addition, the use of this model has increased among business strategy researchers, which, although it has generated problems with its use due to the lack of experience of the researchers, it already has a series of good practices when it is used in research studies (Hoetker, 2007).

**5. The Results of Hypotheses Testing**

First of all, we are going to show a brief summary of the variables characteristics. In order to do that, we can observe, in tables 4 and 5, the averages, the standard deviations and the correlation coefficients of each of them.

**Table 3 -Averages and standard deviations of the variables**

Variable	Average	Standard deviation
INORGN12	0,34	0,47
INORGN3	0,12	0,33
COOPSINO	0,26	0,44
COOPCLI	0,10	0,30
COOPCOMP	0,07	0,25
COOPUNIV	0,11	0,32
COOPPROV	0,11	0,32
INNPROD	0,35	0,48
INNPROC	0,35	0,48
REMUSUP	28,82	2,94
OTROPAIS	0,48	0,50
L_TAMANO	3,96	1,81
L_ANIOCREA	7,59	0,01

<sup>2</sup> A comparison between the resultant model of both variables has been made and their coefficients have appeared to be very similar. Due to this factors, we find it appropriate to merge them.

Due to the dichotomous nature of most variables, the averages are relatively low, but they also allow us to observe the percentage of Spanish firms in the sample that perform each of the activities that hide behind the variables. In the case of the dependent variables, the 34% of the companies introduced the first two types of organizational innovation and the 12% have

introduced new managing methods of the external relations. Other aspects of the spanish enterprises are that the 35% that have introduced process innovations between 2011-2013, or that 11% cooperate with universities on innovation. In addition, it is indicated that the average percentage of paid workers with higher education is 28.8% for the year 2013.

**Table 4 - Correlation coefficients of the variables**

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1 INORGN12	1												
2 INORGN3	0,47	1											
3 COOPSINO	0,27	0,24	1										
4 COOPCLI	0,21	0,22	0,56	1									
5 COOPCOMP	0,18	0,21	0,46	0,41	1								
6 COOPUNIV	0,20	0,22	0,61	0,52	0,46	1							
7 COOPPROV	0,23	0,22	0,61	0,48	0,36	0,45	1						
8 INNPROD	0,29	0,20	0,41	0,29	0,22	0,27	0,29	1					
9 INNPROC	0,39	0,23	0,37	0,23	0,18	0,22	0,31	0,40	1				
10 REMUSUP	0,09	0,12	0,15	0,16	0,14	0,18	0,08	0,13	0,03	1			
11 OTROPAIS	0,14	0,08	0,18	0,13	0,06	0,10	0,11	0,27	0,18	0,03	1		
12 L_TAMANO	0,23	0,14	0,20	0,10	0,10	0,14	0,21	0,16	0,25	-0,23	0,12	1	
13 L_ANIOCREA	-0,08	-0,04	-0,05	0,00	-0,01	-0,02	-0,08	-0,05	-0,10	0,14	-0,12	-0,27	1

On the other hand, in the correlation coefficients it is observed that the highest values obtained are 0.61 between the COOPSINO variable and the cooperation with universities and suppliers. But this is not expected to cause problems since they are used in different models, COOPSINO in the models of the hypothesis 1 and the others in the 2.

Next, we will show the tables with the results obtained in the

probit regressions for the hypotheses presented in section 3 of the paper. To do this, we begin with the presentation of Table 5, which contains the regressions made for the hypothesis 1. The model 1 for the H1a and the second one for the hypothesis 1b, where we can see whether the cooperation of companies encourages the introduction of different kinds of organizational innovations.

**Table 5 – Econometric analysis for Hypothesis 1**

		Model 1		Model 2	
Dependent variable		INORGN12		INORGN 3	
		Coefficient		Coefficient	
Independent Variable	COOPSINO	0,2399	***	0,3643	***
Control Variables	INNPROD	0,3033	***	0,2683	***
	INNPROC	0,7437	***	0,4368	***
	REMUSUP	0,0036	***	0,0043	***
	OTROPAIS	0,1067	***	0,1719	***
	L_TAMANO	0,1284	***	0,1012	***
	L_ANIOCREA	-2,3153		-0,2795	
Constant		16,2333		0,3668	
Industry fixed effects		YES		YES	
R^2 McFadden		0,171528		0,144433	
Observations		9172		9172	
Prediction ability		74,00%		87,80%	
P-value of the residuals normality test		0,451274		0,483586	



As can be seen in the table, process innovation is the variable that most influences the introduction of organizational innovations. Furthermore, the age of the companies has a positive effect, since the older the companies, the greater the introduction of the first two types of organizational methods. The rest of the variables have less influence on the variable INORGN12, the level of education of the employees being the control variable that has least effect in the introduction of innovations.

From the perspective of how the external cooperation affects the introduction of organizational innovation, we can observe that the collaboration has a greater effect on the adoption of new managing methods of the external relations, as we stated earlier. There is a significant difference between both model dependent variable coefficients, as model 1 has a coefficient of two thirds in comparison with model 2.

As for the confidence of the variables used, it was obtained that all variables, except the year of creation of the company, can be accepted at 99%, with a p-value of L\_ANIOCREA of 0.11 in the model 1 and 0.87 for the model 2. In the case of this variable, it should be emphasized that, although it has a

negative coefficient, the data that is being indicated is the year of creation, not the age of the organization.

Despite this, the models have a McFadden R2 value of 0.171 and 0.144 respectively, which could seem to be really low, but having a 0.2 in this type of regression already indicates a model with very good prediction. Therefore, it can be seen that a significant model has been obtained that shows the existence of some influence of the cooperation with external agents in the introduction of organizational innovations', whose errors are normally distributed. Due to this, it can be affirmed that the hypothesis H1 has been verified.

The next table shows the 4 models related to the analyses of the collaboration that the companies carry out with the agents previously described in section 3: the clients, the competitors, the universities and the suppliers.

It can be observed that the cooperation with the competitors of the organization, despite having the largest coefficient of cooperation variables and correctly predicting a very similar number of observations, is a less reliable model because it has a much lower p-value in the normality test of the residuals.

**Table 6 – Econometric analysis for Hypothesis 2**

Dependent variable		Model 3 Clients		Model 4 Competitors		Model 5 Universities		Model 6 Suppliers	
INORGN12		Coefficient		Coefficient		Coefficient		Coefficient	
Independent Variable	Cooperation	0,3270	***	0,3782	***	0,2388	***	0,2702	***
Control Variables	INNPROD	0,3225	***	0,3326	***	0,3327	***	0,3300	***
	INNPROC	0,7645	***	0,7716	***	0,7716	***	0,7535	***
	REMUSUP	0,0037	***	0,0037	***	0,0036	***	0,0038	***
	OTROPAIS	0,1074	***	0,1157	***	0,1114	***	0,1145	***
	L_TAMANO	0,1319	***	0,1324	***	0,1312	***	0,1296	***
	L_ANIOCREA	-2,4499	*	-2,3214		-2,3221		-2,1368	
Constant		17,2195		16,2567		16,2767		14,8629	
Industry fixed effects		YES		YES					
R^2 McFadden		0,171465		0,171357		0,169998		0,170672	
Observations		9172		9172		9172		9172	
Prediction ability		74,50%		74,40%		74,30%		74,40%	
P-value of the residuals normality test		0,769529		0,206745		0,704889		0,909671	

As in previous models, the year of creation of the company is the least significant variable, while the introduction of process innovations remains the variable that most influences the introduction of new organizational methods. In addition, the R2 of McFadden and the percentage of well estimated values are very similar to those obtained in Model 1, varying in the probability of the residuals following the distribution of a normal function.

Based on the regressions, it is also possible to analyze the

influence of each type of cooperation on the introduction of new organizational methods in business practices and / or organization of the workplace, a fact that can be seen in the coefficients of the cooperation variables of Models 3, 4, 5 and 6. Ordered from lowest to highest influence, we obtain that cooperating with universities, 0.2388, has the lowest impact, followed by cooperation with suppliers, 0.2702, and with customers, 0.3270. Finally, the cooperation with competitors, with a coefficient of 0.3782, has the greatest effect on a

company when introducing this type of innovations. Finally, after observing that the four models that refer to the second hypothesis are significant and that they have normally distributed errors, it can be concluded that the four hypotheses have been verified as expected thanks to the review of the literature.

In addition, it is important to highlight the importance of process innovation in this relationship, which is the variable with the highest coefficient of the regression, being much more influential than the level of studies of the employees, the variable that has the least impact when introducing organizational innovations. Although the year of creation of the company should be considered as the most influential variable, it has been decided not to treat it as such due to the small significance that it has in the regressions.

As for the rest of the control variables, it has been observed that the introduction of product innovations is the second major influence when making changes in organizational methods, while the size of the organization and the fact that they have businesses in a distant market usually influence in a similar way.

The study shows that companies that cooperate with third parties in the field of innovation enjoy a greater introduction of organizational innovations than companies that do not. In addition, this allows us to add that these companies are more dynamic (Dyer & Shafer, 2003) and are better prepared to survive the changes that may occur in their environment.

This has a reasonable explanation, since when cooperating with third parties on innovation, organizations would have access to greater sources of knowledge and greater resources (Navarro Arancegui, 2002), which would facilitate the introduction of new organizational methods in the company.

## 6. Summary and Concluding Remarks

Despite the fact that organizational innovation is considered of great importance to the organization, its study has been very underestimated compared to technological innovations (Damanpour & Aravind, 2012). Therefore, this work aims to expand the available knowledge about this type of innovation and more particularly in the effect that external cooperation has on it. Although some previous studies have analyzed the importance of external information sources (Ganter & Hecker, 2013; Mol & Birkinshaw, 2009), the objectives pursued with this type of innovation (Meroño-Cerdan & López-Nicolas, 2013) or the effects of these new organization methods (Sapprasert & Clausen, 2012), very few had analyzed the effects of external cooperation on the introduction of organizational innovations (Simao & Franco, 2015). In addition, this work contains a greater range of control variables than the few previous studies that were carried out in this line of the literature, which allows a better understanding of the interaction between cooperation with third parties in innovation and the adoption of new methods of organization by the company.

After observing the results obtained in the analysis, it was possible to verify the veracity of the hypotheses developed in section 3 of the work, allowing to conclude that the external

cooperation could be beneficial for the dynamism of the organizations and their capacity to adapt to the environment, since, as will be discussed in the limitations of the study, it is necessary to take the absolute affirmation with caution. Regarding the cooperation with customers, universities, suppliers and competitors, significant positive influences have been obtained in the introduction of new organizational methods in business practices and / or organization of the workplace, although in the case of competitors, the normality of the residuals has a much worse adjustment than in the other three cases. This fact could be due to what was commented in section 3 that the cooperation with this type of agents could be influenced by the fear of imitation and unwanted spillovers during the collaboration, making necessary the introduction of some variable of control to explain their interaction with the introduction of organizational innovations such as the appropriation regime or the sector.

Cooperation with customers and suppliers are two types of vertical collaboration that have a positive impact on the introduction of organizational innovations along the supply chain (Simao & Franco, 2015), bringing the company closer to both ends of the chain of value. However, the objectives of the two types of cooperation are different, while collaboration with suppliers focuses on incremental innovations or quality improvement, customer cooperation seeks to increase the volume of sales (Belderbos et al. Al., 2004).

Finally, cooperation with universities, which is less influential than other types of cooperation in introducing organizational innovations, is consistent with the fact that such partnerships are more closely linked to obtaining complementary resources at the technological frontier (Miotti & Sachwald, 2003) than to non-technological innovation.

The research work presents a series of theoretical and practical implications. First, the theoretical contribution made to the literature of non-technological innovations, certainly neglected until a few years ago, on the effect of external cooperation on innovation as a source of new knowledge. It also confirms the expected effects of the control variables in the adoption of new organizational methods, and finally, it manages to start a possible new line of research of this topic, the one that combines the introduction of organizational innovations with the external collaboration of different agents in order to benefit from different aspects.

In practice, work can help in the promotion of a range of external actors with which business managers could cooperate in innovation if they wanted to adopt new organizational methods. This may be even more beneficial for companies if they carry out both technological and non-technological innovations, since their combined effect is considered to be positive and significant in the company's performance (Sapprasert & Clausen, 2012). The innovation in products and processes in the company as a competitive advantage to adopt organizational innovation has even more importance in dynamic markets. Managers in innovation-intensive markets should be really up to date with the organizational methods of their industry in order to introduce new ones in the company. But it isn't enough to introduce new-to-the firm methods, they

will have to adopt the new-to-the-industry ones so they can get competitive advantages from the organizational innovation.

In spite of this, the study is not exempt from certain limitations that restrict the complete generalization of the conclusions. First, this study has used a cross-sectional data analysis drawn from an innovation survey and, due to the fact that the adoption of innovations is a dynamic process, there may be certain effects that are caused by a casual association at that time. For this reason it is believed that this analysis can't draw conclusions of causality and that a possible way to continue with this research would be a longitudinal data analysis, which would allow a more complete evolution of the dynamic process of innovation to be observed.

Another limitation is that it has not been possible to analyze separately the characteristics of the different industries and, although the sector fixed effects have been taken into account, it would be interesting to analyze specifically what happens in some specific sectors in future studies on this aspect. For example, there is the high-tech sector, which has already talked about how important it could be in it cooperation with competitors (Miotti & Sachwald, 2003).

Another possibility for future research could be the analysis of these effects in other countries that have a similar innovation survey. This is due to the fact that the characteristics of the environment and the national innovation system of each country have a great influence on the innovation strategies followed by the organizations of the different nations. Because of that, it would be interesting to analyze the impact of cooperation in other countries such as the United Kingdom, France or Germany, since they have a similar CIS and would shed more light on the relationship between cooperation in innovation and the adoption of organizational innovations.

**ANNEXES**

**Annex 1 – Questions made for obtaining the variables of the study**

An organizational innovation is a new organizational method in your enterprise's business practices (including knowledge management), workplace organization or external relations that has not been previously used by your enterprise.

- It must be the result of strategic decisions taken by management.
- Exclude mergers or acquisitions, even if for the first time.

**During the three years 2010 to 2012, did your enterprise introduce:**

New **business practices** for organizing procedures (i.e. supply chain management, business reengineering, knowledge management, lean production, quality management, etc.)

New methods of **organizing work responsibilities and decision making** (i.e. first use of a new system of employee responsibilities, team work, decentralization, integration or de-integration of departments, education/training systems, etc.)

New methods of **organizing external relations** with other firms or public institutions (i.e. first use of alliances, partnerships, outsourcing or sub-contracting, etc.)

**Annex 2 – Table of codes of the variable COOPNEWik**

The next table shows the data associated with each index, (i)

and (k), of the variable:

Index (i)	Partner Type
1	Other enterprises of the same group
2	Suppliers
3	Clients of the private sector
4	Clients of the public sector
5	Competitors
6	Consultants
7	Universities
8	Research centers
Index (k)	Partner localization
1	Same country
2	Other country in europe
3	United States
4	China and India
5	The rest of the countries

Source: PITEC database

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