Journal of Business and Economics, ISSN 2155-7950, USA
August 2015, Volume 6, No. 8, pp. 1438-1458
DOI: 10.15341/jbe(2155-7950)/08.06.2015/005

http://www.academicstar.us

Analyzing the Characteristics of Firms with Better Innovative Performance

Ana Pérez-Luño, María Fuentes Blasco
(Pablo de Olavide University, Seville, Spain)

Abstract: Research on the innovative performance of organisations has generally obtained inconsistent results. Aiming to reduce such inconsistencies, this article analyses innovative performance by taking into account the characteristics of Spanish firms and their differences in terms of tendency towards innovation generation and/or adoption. Among the results obtained, it is possible to highlight that innovation radicalness, knowledge complexity, company's size and internal R&D expenditure favour innovative performance when the companies are analysed together. However, the introduction of a tendency towards innovation generation and/or adoption as a moderator variable reveals interesting differences between the features that appear to condition such performance.

Key words: innovation; knowledge complexity; size; R&D

JEL codes: M1 and M2

1. Introduction

The fundamental objective of strategy research is to identify the factors that explain the differences in competition between firms (Ceccagnoli, 2009). However, after more than one century of research, there is no agreement on those factors. Authors like Nonaka (2007) point out that in an economy where uncertainty is the only certainty, the only source of lasting competitive advantage is knowledge. In this sense, it is necessary to mention that managing knowledge does not guarantee higher incomes if the knowledge is not valuable or well managed (Barney, 1991).

It seems that the literature agrees on considering that a good knowledge management must lead to continuous innovation. However, this literature has frequently identified innovation generation with the launching of new products, when, in reality, these are different things. Product launching may be the consequence of either new knowledge generated within the organisation, or the adoption of knowledge already managed by other firms (Damanpour & Wischnevsky, 2006; Pérez-Luño, Valle & Wiklund, 2007, 2009 and 2011; Zhou, 2006). The first case represents innovation generation and the second reflects innovation adoption. This distinction has not been sufficiently considered in the literature, and has led to inconsistent results between research works (Wolfe, 1994) and a limited understanding of the precedents of innovative performance. In fact, Damanpour and Wischnevsky (2006, p. 269) suggest that "future research may resolve those inconsistencies by incorporating into the theory the differences between organisations that mostly generate innovations and those that mostly adopt them".

As mentioned before, firms that launch new products into the market have two options. They may adopt the

Ana Pérez-Luño, Associate Professor, Pablo de Olavide University; research areas/interests: innovation, strategy, knowledge, marketing. E-mail: anaperezluno@upo.es.
María Fuentes Blasco, Associate Professor, Pablo de Olavide University; research areas/interests: innovation, strategy, knowledge, marketing.

technology and knowledge developed by other firms, or they may internally generate new knowledge to obtain true innovations (Damanpour & Wischnevsky, 2006). According to the resources and capabilities theory (Barney, 1991), given that every organisation has a limited capacity to use resources, firms will have to make a strategic decision to balance the resources they want and/or can invest in innovation generation and/or innovation adoption. While the results of this strategy are similar in all cases, in the sense that the organisations actually develop a product that is launched into the market, innovation generation and innovation adoption require different organisational characteristics, resources and capabilities, which, depending on the industry, will make the firms more prone to one or the other strategy (to generating or adopting innovations). In addition, the different impact of innovation generation and innovation adoption on the market will condition the performance achieved by the companies through the launching of their products.

Given the importance of innovation, both on an academic and a business and political level, and the current gap in the literature, the research questions at the origin of this study are: What are the typical organisational characteristics of the firms that achieve better innovative performances? Are the characteristics of the firms that generate innovations different from those of the firms adopting innovations? The objective of the present study is to characterise the firms that achieve the best innovative performances. With this purpose, it takes into consideration the organisations' age and size, internal and external R&D expenditures, and knowledge, as well as the radicalness of their products. In addition, this work analyses whether those characteristics remain the same or are modified according to the firms' tendency to generate and/or adopt innovations.

The answers to these research questions represent a contribution to the literature on the topic in the sense that this is the first empirical research that offers a detailed characterisation of innovative firms (Damanpour & Wischnevsky, 2006). In addition, it has a significant business and political relevance, because it allows firms and public institutions to identify the organisational requirements to develop a successful innovative strategy (Nerkar & Shane, 2007) and to obtain a better performance from the introduced innovations. On the other hand, it is a contribution to the little empirical results of the resources and capabilities theory (Newbert, 2007), because it indicates which resources and capabilities allow the firms to obtain better performances from their innovations.

The structure of this article, in accordance with the objectives pursued, is as follows. After the introduction, the second section presents the theoretical aspects of the article leading to the formulation of the hypotheses. The third section describes the methodology used and the fourth section analyses the results obtained. Finally, the fifth section presents the final considerations, including the discussion, conclusions, contributions, limitations and possible future research lines.

2. Factors that Influence Innovative Performance

The introduction of new products is desirable when it helps to improve the activity of the firm. In this sense, the literature agrees that innovation may be a source of competitive advantages (Damanpour & Wischnevsky, 2006) and have an impact on profits (Subramaniam & Nilakanta, 1996). However, this statement is true only when the development of innovations leads to a better innovative performance. Consequently, understanding what innovative performance is becomes a relevant question.

A review of the literature allows defining innovative performance in relation to the competitive position of the organisation that innovates, i.e., as the degree in which the firm diverts from the existing practices regarding the creation of knowledge and new products or processes that are successfully introduced in the market (Capon,

Farley, Lehmann & Hulbert, 1992). It is interesting to underline that the ability to combine and apply knowledge is a necessary but insufficient condition to speak of innovative performance, because the inclusion of the "successful in the market" condition underlines the need for the new idea to provide a better competitive position for the organisation that develops it. Thus, the assumption that innovative performance entails an improvement of the firm's competitive position becomes one of the most important factors affecting business activity (Schumpeter, 1934; Hult, Harley & Knight, 2004).

As for the concept of "innovation", it is necessary to mention that it has been analysed in many disciplines and from very different perspectives (Damanpour & Wischnevsky, 2006). This article focuses on innovation from an organisational point of view. In this field, it is difficult to establish a full and closed definition of innovation due to the different value judgements made on the term. The only common feature of all the definitions provided is that innovation implies novelty (Schumpeter, 1934; Knight, 1967; Freeman & Soete, 1997; Damanpour, 1991; Grossman & Helpman, 1991; Afuah, 1998; Subramaniam & Youndt, 2005). The problem lies in the term "novelty", which is a relative one, because what is new for some, may be already known to others. In other words, an innovation may be considered new by an individual, an organisation, a specific environment or the world (Guellec, 1999). It is precisely the degree of novelty that this work takes as reference to distinguish innovation generation from innovation adoption. In this sense, the conceptualisations made by Grossman and Helpman (1991) and Mahmood and Rufin (2005) are used to define innovation generation as a form of technological development that expands not only the current knowledge of a firm but that of the world, and innovation adoption as the form of technological development that expands the current knowledge of a firm without altering the knowledge of the world. It is thus understood that only one firm can generate a specific innovation, whereas there may be (many, a few or none) other firms that will adopt it.

Applying this distinction between innovation generation and innovation adoption, Damanpour and Wischnevsky (2006) classify organizations according to their innovative activity (see Figure 1). These authors identify as "innovative organizations" (IOs) those that are capable of both generating and adopting innovations; as "innovation-adopting organizations" (IAOs), those whose strategy is based on the adoption of pre-existing innovations; as "innovation-generating organisations" (IGOs), those that can generate innovations and do not usually adopt them; and, finally, as "non-innovative organizations" (NIOs), those that can neither generate nor adopt innovations. Understanding the differences between these four types of organisations is essential for research on innovation (Damanpour & Wischnevsky, 2006; Wolfe, 1984).

		Innovation Generation	
		High	*Low*
Innovation adoption	*High*	Innovative Organisation IO	Innovation-adopting organisation IAO
	Low	Innovation-generating organisation IGO	Non-innovative organisation NIO

Figure 1 Organizations According to Their Innovative Activity

Source: Adaptaded from Damanpour and Wischnevsky, 2006

Montoya-Weiss and Calantone (1994) explain that innovation is interesting only when it allows the company that has developed it to obtain a profit. This is the reason why the factors established by the literature as most relevant in relation to the performance obtained by the organisations from their innovation capacity (Damanpour

& Wischnevsky, 2006; Montoya-Weiss & Calantone, 1994) are analysed here. Another analysis will subsequently be made to reveal whether the tendency to generate and/or adopt innovations affects that performance or not.

2.1 Size of the Organization

Authors like Sorensen and Stuart (2000) and Montoya-Wiess and Calantone (1994), among others, have underlined the importance of considering the size of the organisation as a variable that may influence its innovative performance. The literature has shown that the size of an organisation may be related to its greater or lesser tendency towards innovation (Bantel & Jackson, 1989; Cohen & Mowery, 1984; Rothwel & Zegveld, 1985). The arguments used in management literature to examine the relationship between the organisation's size and its innovations resemble the two Schumpeterian visions on innovative organisations. In other words, some researchers have pointed out that an increase in the size of the organisation leads to a greater number of resources and a greater innovative potential. On the other hand, from an enterprising perspective, smaller organisations have been pointed out as being more innovative due to their greater flexibility, adaptability and propensity to accept risks (Nord & Tucker, 1987; Damanpour, 1991).

With respect to innovative performance, authors like Dunphy, Herbig and Howes (1996) suggest that bigger firms achieve better performances than smaller ones. Their arguments are based, in addition to other factors, on the experience effect. This research suggests that the characteristics of small firms (flexibility, etc.) are useful for companies that generate a specific type of innovation, i.e., radical[1] (Burns & Stalker, 1961). However, if only the tendency to generate or adopt innovations is taken into account, big firms will have an advantage over smaller ones in obtaining a better performance from their innovations (Damanpour & Wischnevsky, 2006). The reason is that, in order to achieve a good innovative performance, the organisation requires the ability to accumulate knowledge and disseminate it among its members, to employ and motivate its creative staff and to solve technological and organisational problems; in other words, it needs to invest many resources in innovation (Arrow, 1983). These characteristics are typical of big companies with the available infrastructure required for the exploration and exploitation of knowledge leading to innovations (March, 1991) and capable of achieving a good performance. In addition, these characteristics are among those considered by authors like Teece (1986) as necessary for the firms to own their income. These statements lead to the following hypothesis:

H1.1 There is a positive relationship between the organisation's size and its innovative performance.

Considering the four groups of firms that are the object of this study, it is possible to state that the relationship between size and innovative performance will be influenced by the organisation's tendency to generate and/or adopt innovations. The reason is that the impact of the generation and/or adoption of innovations on innovative performance will be different: while innovation generation aims to reach first adopters and lacks in competition, adoptions must find a place of their own and compete with similar products launched by at least one other firm before. Thus, generating and/or adopting innovations will modify the effect of the organisation's size on its innovative performance through its tendency towards adoption or generation. In this sense, a second hypothesis is suggested:

H1.2 The relationship between an organisation's size and its innovative performance is moderated by its tendency to generate and/or adopt innovations.

2.2 Age of the Organisation

As with the size, there are authors who consider the age of the organisation as an element that favours innovative performance, and others that affirm that it is detrimental to it (Tushman & Anderson, 1986; Sørensen &

[1] Radicalness in innovation will be the object of further analysis.

Stuart, 2000). On the one hand, age can be related to a better innovative performance because new ideas are more efficiently assimilated when there is a solid basis of knowledge (Zahra & George, 2002); i.e., older firms, which have had time to accumulate knowledge, will have greater advantages than younger ones. On the other hand, it is possible to state that age is detrimental to innovative performance because older organisations have more difficulties in changing their routines (Tushman & Anderson, 1986; Sørensen & Stuart, 2000). However, in the same line as Sørensen and Stuart (2000) and Damanpour and Wischnevsky (2006), this research work assumes that an innovative activity can be developed independently from the rest of activities of the organisation (Burns & Stalker, 1961). From this perspective, older organisations can enjoy all the advantages of their experience and isolate the inconveniences derived from their routine. In other words, the knowledge accumulated by older organisations represents an advantage in achieving the best performance from their innovations. Consequently, another hypothesis is now suggested:

H2.1 There is a positive relationship between the organisation's age and its innovative performance.

As for the effect that the different types of business (according to their tendency to generate and/or adopt innovations) can have on innovative performance, its seems that, as with size, the organisation's greater or lesser tendency to generate innovations versus adopting them will influence the performance achieved. For instance, generating innovations can make a younger firm obtain a good innovative performance, while adopting innovations can make the innovative performance of a big company decline. This statement suggests to a new hypothesis:

H2.2 The relationship between an organisation's age and its innovative performance is moderated by the tendency to generate and/or adopt innovations.

2.3 Internal R&D Expenditure

Firms interested in developing ideas need people involved in creative activities, i.e., people who work for R&D or similar departments. These activities are considered as the major source of knowledge in the creative process (Dunphy, Herbig & Howes, 1996; Somaya, Williamson & Zhang, 2007). Consequently, there is evidence to affirm that the most R&D-intensive firms are the ones developing a greater number of innovations (Dunphy, Herbig & Howes, 1996; Somaya, Williamson & Zhang 2007). The internal R&D expenditure is a clear and evident sign that the company wishes to create knowledge that can be translated into innovation generation (Bierly & Chakrabarti, 1996; Cohen & Levinthal, 1990; Stock, Greis & Fischer, 2001; Díaz-Díaz, Aguilar-Díaz & De Saa-Pérez, 2006), and that its staff is ready to adopt innovations generated by other firms. These statements point to the idea that, due to their suitable infrastructure and knowledge, the most R&D-intensive firms are the ones obtaining better performances from their innovations. In other words:

H3.1 There is a positive relationship between the organisation's internal R&D expenditure and its innovative performance.

Evidently, the performance obtained by firms that generate their innovations will be different from that of firms that adopt them. As a consequence:

H3.2 The relationship between an organisation's internal R&D expenditure and its innovative performance is moderated by its tendency to generate and/or adopt innovations.

2.4 External R&D Expenditure

The literature assimilates external R&D expenditure with the acquisition of external knowledge, the purchase of licences, etc. (Bierly & Chakrabarti, 1996; Díaz-Díaz, Aguilar-Díaz & De Saa-Pérez, 2006). In this sense, it seems logical to think that an excessive emphasis on external R&D expenditure will lead to a worse innovative performance. The reason is that the firm will have to pay the company that develops the R&D a price that includes

the profit of that other company, and consequently the final performance of the resulting innovation will be negatively affected. The following hypothesis is therefore suggested:

H4.1 There is a negative relationship between the organisation's external R&D expenditure and its innovative performance.

It seems clear that the firms devoting great amounts of resources to the acquisition of externally-generated knowledge and externalising their strategic capability will adopt innovations and may obtain a specific performance from them. For this reason, IAOs are supposedly the most external R&D-intensive firms and the ones obtaining a better performance from the adopted innovations, developed from their externally-acquired R&D. On the other hand, generating innovations may entail acquiring external knowledge to combine it with the organisation's previous knowledge (Zahara & George, 2002). Thus, IGOs may achieve a good innovative performance by using the knowledge obtained through external R&D expenditure for the internal generation of innovations. According to these statements, it is understood that:

H4.2 The relationship between an organisation's external R&D expenditure and its innovative performance is moderated by its tendency to generate and/or adopt innovations.

2.5 Knowledge

A review of the literature on knowledge reveals that there is no general agreement on its concept and dimensions. In the broader sense, knowledge could be defined as "what isknown" (Grant, 1996). One of the first works that dealt with knowledge dimensions was published by Winter in 1987. This author considers that knowledge is composed of the following four dimensions: tacitness, observability, complexity and systemic character. However, more recent studies on knowledge and innovation have mainly focused on tacitness and complexity (Nonaka, 1994; Zander & Kogut, 1995; Grant, 1996; Subramaniam & Venkatraman, 2001).

2.5.1 Tacit Knowledge

Polanyi (1966) classified human knowledge into two categories. He distinguished, on the one hand, explicit (codified) knowledge, which can be transmitted through formal and systematic language, and, on the other, tacit knowledge, which has a personal quality that makes it difficult to formalise and communicate (Nonaka, 1994). Explicit knowledge is expressed, verbally or in written form, while tacit knowledge is non-verbalised — sometimes even not verbalisable — intuitive and non-articulated (Hedlung, 1994). Explicit knowledge is discreet or digital, while tacit knowledge is continuous, thus hindering its transference (Nonaka, 1994). Explicit knowledge is easy to process, whereas tacit knowledge is difficult to articulate and transmit in a systematic and logical way (Gopalakrishnan & Bierly, 2001). For tacit knowledge to be disseminated among the members of an organisation, it is necessary to transform it into words or numbers that everybody can understand. It is precisely during the time used to transform tacit knowledge into explicit knowledge and back into tacit knowledge how knowledge is created in organisations (Nonaka, 1994).

Tacit knowledge is deeply rooted in actions and individual experience, as well as in each person's ideals, values and emotions. It is also rooted in commitment and incorporated into a specific context (Nonaka, 1994). Given that it is not directly transferred, it can only be possessed through its application on a productive activity (Grant, 1996). The difficulty in codifying tacit knowledge, together with the fact that it can only be observed through application and acquired through practice, makes its transference slow, expensive and uncertain (Kogut & Zander, 1993).

The intrinsic characteristics of tacit knowledge lead to the idea that the firms that use it more intensively will be the ones capable of taking ownership of a greater part of the performance obtained from their innovations. In other words, those firms whose innovations are based on tacit knowledge will be more difficult to imitate and will

consequently obtain greater incomes from their innovations. These statements indicate that:

H5.1 There is a positive relationship between the organisation's tacit knowledge and its innovative performance.

Furthermore, this research work suggests that only the firms that generate innovations use tacit knowledge in their processes. On the contrary, adoptions are based on explicit knowledge. For this reason, it seems logical to think that the tendency to generate and/or adopt innovations will reinforce or weaken the effect that tacit knowledge has on innovative performance. In other words:

H5.2 The relationship between an organisation's tacit knowledge and its innovative performance is moderated by its tendency to generate and/or adopt innovations.

2.5.2 Complex Knowledge

Pringle (1951) established that the complexity of knowledge is related to the number of parameters required to define one system. Thus, the amount of information required to transfer complex knowledge is very large. The transference may be done, but its cost will usually be very high. The more complex the knowledge, the greater the number of interdependent abilities, routines, technologies and resources related to it (Zander & Kogut, 1995). Therefore, complexity increases the amount of information required for an effective transference of knowledge (Kogut & Zander, 1993; Zander & Kogut, 1995; Gopalakrishnan, Bierly & Kessler, 1999; Subramaniam & Venkatraman, 2001). On the other hand, authors like Gopalakrishnan and Damanpour (1994) assimilate the complexity of knowledge with sophistication and originality. The present study considers that a greater complexity of knowledge can influence innovative performance for various reasons. In the first place, because the originality associated to complex knowledge may help obtain a more attractive product with a better performance in the market. Second, because the fact that complex knowledge is difficult to transmit may help keep the secret and avoid imitation, possibly improving the performance of the innovation. For these reasons, it is suggested that:

H6.1 There is a positive relationship between the organisation's complex knowledge and its innovative performance.

Innovation generation is more intensely related with this type of knowledge. In addition, organisations will require a certain degree of complex knowledge whether they generate innovations or adopt them. Nevertheless, the greater or lesser tendency to generate innovations will affect the relationship between complex knowledge and innovative performance. For this reason, it is suggested that:

H6.2 The relationship between an organisation's complex knowledge and its innovative performance is moderated by its tendency to generate and/or adopt innovations.

2.6 Radicalness

The literature considers radicalness a fundamental attribute affecting the generation and adoption of innovations (Gopalakrishnan, Bierly & Kessler, 1999; Damanpour & Wischnevsky, 2006). A radical innovation is that which implies a novel contribution and is totally different from what existed before, i.e., it produces essential changes in the organisation's activities and represents a clear way out of the existing practices, entails a revolutionary change in technology and implies a high cost and a great risk assumption (Knight, 1967; Tushman & Anderson, 1986; Damanpour, 1991). In addition, radical innovations are associated to organisations used to experimenting in an enterprising atmosphere, having flexible structures and strong technical competencies (Tushman & Smith, 2002). In other words, radical innovations are facilitated by organic structures (Burs & Stalker, 1961). The launching of very radical products is expensive, but, when successful, it usually generates big profits (Damanpour, 1991).

When innovation consists of substantial improvements in the product, service or process, which, although presenting a certain degree of novelty, do not break clearly with the pre-existing technology, it is called an incremental innovation (Knight, 1967; Tushman & Anderson, 1986; Damanpour, 1991). Incremental innovations are associated with efficient and centralised organisations based on process improvement (Tushman & Smith, 2002). In other words, they are facilitated by mechanistic structures (Burs & Stalker, 1961).

With respect to innovative performance, it can be expected to be better in firms developing radical innovations (Gatignon & Xuereb, 1997). This leads to the following suggestion:

H7.1 The effect of a radical innovation on innovative performance is greater than the effect of an incremental innovation.

As for the impact produced by innovation generation versus innovation adoption on this relationship, it seems logical to think that there will be differences. In other words, it can be expected that the innovative performance of a firm more prone to generating innovations will be different from that of a firm that usually adopts innovations. For this reason, it is considered that:

H7.2 The relationship between an organisation's innovation radicalness/incrementality and innovative performance is moderated by its tendency to generate and/or adopt innovations.

In brief, Figure 2 shows the model proposed to explain the factors that affect the innovative performance of firms, where the organisation's size and age, internal and external R&D expenditures, knowledge and radicalness are the explanatory variables. According to the suggested hypotheses, the causal relationships between these variables and innovative performance are analysed, as well as the potential moderating effect of the tendency to generate and/or adopt innovations.

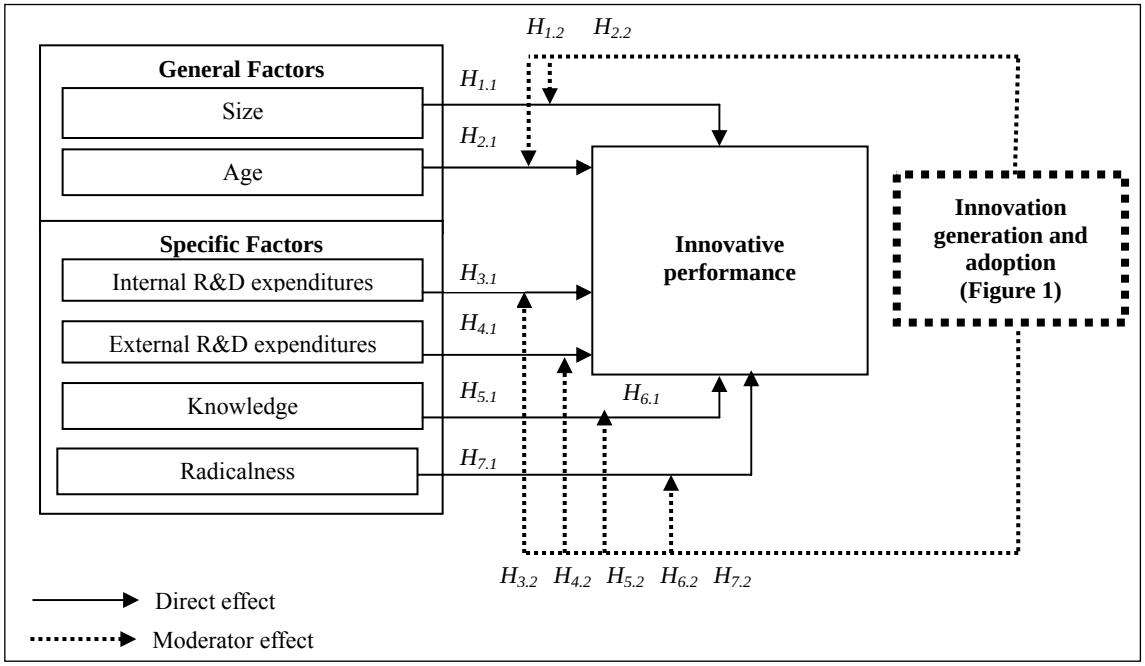

Figure 2 Model Proposed to Explain the Factors that Affect Innovative Performance

3. Methodology

3.1 Population and Research Sample

In order to perform the analysis, a population of Spanish firms is selected. These firms have at least 10 employees and belong to industrial sectors where innovation is a significant activity. The data collection process took place between March and November 2006.

After choosing the sectors under study, the selection of companies for the research sample was carried out with the help of a SABI database.[2] The initial population was composed of 2,942 firms. The first step was to contact them by telephone. Up to 177 firms could not be located. A thorough search on the Internet showed that most of these had gone bankrupt, had moved without leaving note of their new data, or, more simply, had not made public their contact details. Contact was therefore made with a total of 2,765 firms, of which 19 did not have more than 10 employees, 539 were service providers and did not manufacture any goods, 225 appeared twice on the list (their details were duplicated) and 228 imported their manufactures from foreign subsidiary companies and could not be analysed as Spanish firms. The remaining 1,764 companies were asked if they had launched any products in the last five years (produced for the world, a particular market or even a specific business interview). According to their answers, it was established that 700 firms had not launched any products within that period, nor had they generated or adopted any innovations; they were thus removed from the sample. A questionnaire was subsequently sent by e-mail, addressed to the R&D managers of the remaining 1,064 companies. Out of the 402 responses, 400 were valid, representing a response rate of 37.59 percent. Next, a non-response analysis was carried out by comparing the means of variables such as the firms' number of employees, total revenue and total assets. This analysis showed that there were no significant differences between those companies that had replied and the ones that had not.

A preliminary characterisation of the sample showed that the companies had a medium size (with an average of 291 employees and a standard deviation of 1.877) and an average age of 33 years (standard deviation of 23). In relation to their economic activity, 37.7 percent of the firms belonged to the chemical sector and 32.4 percent to the transport equipment manufacturing sector (excluding motor vehicles). Other companies manufacture medical and surgical equipment and instruments (11.3 percent), motor vehicles (10.6 percent), pharmaceutical products (6.8 percent) and electronic equipment (1.3 percent). They have an average internal R&D expenditure of 9.79 percent (standard deviation of 14.43) and an average external R&D expenditure of 2.52 percent (standard deviation of 6.86) in relation to their average sales volume.

3.2 Measures

The questionnaire included direct questions and a 7-points Likert scale. In order to assess the content validity, twenty-five managers of firms belonging to the sample were interviewed. Once their suggestions were incorporated, the questionnaire was sent to the R&D managers of the companies in the target population.

3.2.1 Dependent Variable

Innovative performance. The innovative performance of each organisation was measured by two items adapted from Capon, Farley, Lehmann and Hulbert's proposal (1992). These items are the following direct questions: (1) Considering the last five years, could you estimate the percentage of profits derived from the

[2] SABI (Iberian Balance Sheet Analysis System). This database contains financial information and data on the economic activity, partners, etc. of about 1,086,200 Spanish firms. It also contains information about Portuguese companies that has not been used given the specific objective of the research.

launching of new products? (2) What percentage of last year's sales was generated by products incorporating new technologies and commercialised for the first time in the last five years? An exploratory factor analysis was performed in order to study the dimensionality of the scale. The two items loaded on a single factor.

3.2.2 Independent Variables

Organisational size. Determined by the number of employees. Its value oscillated between 10 and 35,000 individuals; it was therefore measured as the Napierian logarithm of that number.

Organisational age. Measured as the difference between 2009 and the year of the firm's establishment.

Internal R&D expenditure. Measured as the percentage of sales that the company allocated for research and development activities.

External R&D expenditure. Measured as the percentage of sales that the company allocated for outsourced research and development activities.

Knowledge. The scale to measure the degree of tacit knowledge was adapted from Subramaniam and Venkatraman's proposal (2001). During the information collection process, the interviewee had to point out the correct answer in relation with the knowledge used by the firm to obtain innovations. The exploratory factor analysis showed that the items loaded on its corresponding dimension (there were three items for the tacit knowledge dimension and three for the complex knowledge dimension).

3.2.3 Radicalness

The scale designed to measure the radicalness of innovation was adapted from Subramaniam and Young's proposal (2005). These authors draw from the works by Tushmanand Anderson (1986) and Hendersonand Clark (1990) to define radical innovation capacity as the organisational ability to make the existing products obsolete, and incremental innovation capacity as the organisational ability to reinforce and expand its expertise in manufacturing its current products. Subramaniam and Young (2005) proposed three items to measure each of these capabilities. The results of the exploratory factor analysis showed that each item loaded on its corresponding dimension (there were three items for incremental dimension and three for radical dimension).

3.2.4 Moderator Variables

Innovation generation and innovation adoption. The questionnaire included a scale to analyse innovation generation and adoption, but due to the subjectivity of scales (Gopalakrishnan & Bierly, 2001), a direct measure was also introduced. This measure was obtained as follows. The total number of products launched in the last five years was requested, as well as the percentage of those products that were new for the world, for a specific market or for the adopting company. The number of generated innovations was calculated by multiplying the total number of launched products by the percentage of them identified as "new for the world". The number of adopted innovations was calculated by adding the percentages of products that were new for the market and for the firm, and the resulting amount was multiplied by the total number of products launched in the last five years.

In order to guarantee the adequacy of this direct measure (the number of generated and adopted innovations), two tests were carried out. First of all, 50 firms included in the sample were asked to describe each of their launched products in a questionnaire. Second, a group of experts analysed whether those products were new for the world, a limited environment or the organisation only. Considering that all products that are new for the world are generated innovations while the rest are just adopted innovations, the responses about the number of generated and adopted innovations on the questionnaire were checked to prove they were consistent with the experts' explanations. These tests ensured the validity of the measure.

Following the classification proposed by Damanpour and Wischnevsky (2006) and the methodology applied

by Atuahene-Gima and Ko (2001), the sample (400 companies) was segmented according to the variables *innovation generation* and *innovation adoption*. Given the sampling distribution of *innovation generation*, the cut-off point was the making of at least one innovation in the last five years. As for *innovation adoption*, the median[3] (7) of the index composed by the two variables was used as the cut-off point.

According to this double classification criterion, the sample was segmented into four groups (see Table 1). The first cluster, called Innovative Organisations (IOs), was thus formed by 80 companies characterised by high levels of innovation generation and innovation adoption, both over the two cut-off points. The second group, called Innovation-Generating Organisations (IGOs), was formed by 75 companies that had generated innovations in the last five years, but had not achieved the minimum of 7 innovation adoptions (high innovation generation and low innovation adoption). The third cluster, the Innovation-Adopting Organisations (IAOs), was composed of 121 firms that had made more than 7 innovation adoptions but no innovation generations. Finally, the last group (124 companies) was formed by firms that had not reached the minimum threshold of innovation adoptions and had not generated any innovations. They were called Non-Innovative Organisations (NIOs).

Table 1 Companies' Classification

		Innovation Generation	
		High (number of innovation generated ≥ 1)	*Low* (number of innovation generated = 0)
Innovation adoption	*High* (number of innovation adopted ≥ 7)	Innovative Organisation IO = 80	Innovation-adopting organisation IAO = 121
	Low (number of innovation adopted < 7)	Innovation-generating organisation IGO = 75	Non-innovative organisation NIO = 124

With regard to the groups' characterisation in terms of economic activity, it is worth noticing that 10.7 percent of the innovation-generating organisations (IGOs) belonged to the pharmaceutical sector, while 47.1 percent of the innovation-adopting organisations (IAOs) belonged to the chemical sector. On the other hand, 30 percent of the innovative organisations (IOs) developed economic activities related to either the medical and surgical equipment and instruments industry or the motor vehicles sector. IOs were larger than IAOs and NIOs. These companies had an average age of 35 years and spent, as an average, 15 percent of their sales on internal R&D activities and 3.19 percent on external R&D activities. IGOs were the largest companies within the sample and they were on average 33-years old. They spent, as an average, 10 percent of their sales on internal R&D activities and 3.37 percent on external R&D activities. IAOs were slightly smaller, with an average age of 31.76 years and average expenditures of 9 percent of their sales on internal R&D activities and 2.6 percent on external R&D activities. Finally, NIOs were the smallest, with an average age of 32.85 years, and an average8 percent and 1.53 percent of their sales spent, respectively, on internal and external R&D activities.

3.3 Dimensionality, Reliability and Validity Analysis of Measurement Scales

The proposal of dimensionality (two dimensions for radicalness, two dimensions for knowledge, and one factor for innovative performance) was confirmed through a first-order measurement model estimation performed with the help of the EQS 6.1 software. Due to the lack of multivariate normality, the estimation method applied was the robust maximum likelihood from the asymptotic variance-covariance matrix. The internal consistency of the dimensions was calculated by taking into account two indexes: the composite reliability coefficient, with a

[3] The median was chosen as the cut-off point due to the high level of dispersion in the sample. In this case, the sample mean was unrepresentative as an index of central tendency.

minimum threshold of 0.7 (Anderson & Gerbing, 1988), and the variance extracted for each factor, with a minimum threshold of 0.5 (Fornell & Larcker, 1981). These indicators were acceptable for all five dimensions (see Table 2). The global fit indexes showed that the variables converged towards the five factors. Taking the significance of the robust Chi-square statistic with caution, the global fit index was acceptable (RMSEA < 0.08; BBNFI and BBNFI > 0.9; CFI > 0.9).

Table 2 Measurement Model and Scales' Reliability

Radicalness		Items	Standardised λ	R^2
Radicalness (F1)	Composite Reliability = 0.8699 AVE = 0.691 *Cronbach's Alpha* = 0.868 *Explained variance* = 0.172	R1	0.896	0.803
		R2	0.801 (16.55**)	0.642
		R3	0.792 (12.11**)	0.628
Incrementallity (F2)	Composite Reliability = 0.7731 AVE = 0.535 *Cronbach's Alpha* = 0.766 *Explained variance* = 0.147	R4	0.833	0.694
		R5	0.701 (11.37**)	0.492
		R6	0.647 (9.52**)	0.418
Knowledge		Items	Standardised λ	R^2
Tacitness (F3)	Composite Reliability = 0.9152 AVE = 0.783 *Cronbach's Alpha* = 0.913 *Varianza explicada* = 0.184	KA1	0.851	0.725
		KA2	0.938 (24.65**)	0.879
		KA3	0.863 (20.45**)	0.744
Complexity (F4)	Composite Reliability = 0.7395 AVE = 0.503 *Cronbach's Alpha* = 0.735 *Explained variance* = 0.141	KA4	0.677	0.458
		KA5	0.769 (9.11**)	0.591
		KA6	0.643 (8.98**)	0.414
Innovative Performance (F5)		Items	Standardised λ	R^2
	Composite Reliability = 0.9276 AVE = 0.865 *Cronbach's Alpha* = 0.927 *Explained variance* = 0.136	CI1	0.911	0.829
		CI2	0.949 (10.13**)	0.901
Second order Measurement model's adjustment: Chi^2 Sat.(g.l. = 67) = 101.64 (p-valor = 0.0041); RMSEA = 0.036; CFI = 0.983; BB-NFI = 0.953; BB-NNFI = 0.977; GFI = 0.960; AGFI = 0.937 *Measurement model's adjustment for the explorative factorial analysis:* Barlett Test Chi^2 (g.l. = 91) = 2793.65 (p-value = 0.0000); KMO = 0.731				

Note: t values in brackets (*: Significant at p < 0.055%; **: Significant at p < 0.051%)

Table 3 Correlations and AVES

	F1	F2	F3	F4	F5
Radicalness (F1)	0.8313				
Incrementality (F2)	0.1420	0.7313			
Knowledge Tacitness (F3)	-0.1580	0.0220	0.8847		
Knowledge Complexity (F4)	0.0720	0.0380	0.5730	0.7096	
Innovative Performance (F5)	0.0357	0.0240	0.0006	0.0259	0.9300

Note: Significant at p < 0.05; AVE is represented in the principal diagonal.

The convergent and discriminant validity of the latent dimensions was also analysed. In both multidimensional scales (knowledge and radicalness), convergent validity was confirmed because the covariances between the two radicalness dimensions and the two knowledge dimensions were significant at 0.01, and their loadings were significant when a second-order model was estimated (see Table 2) (Anderson & Gerbing, 1988).

Discriminant validity was analysed through the linear correlations or standardised covariances between the latent factors. After squaring, they were lower than the average variance extracted (AVE), so the validity was guaranteed for both the knowledge scale and the radicalness scale. Discriminant validity was further analysed by verifying that the confidence interval for the correlation between each pair of latent factors did not contain value 1 (see Table 2), showing that both scales represented significantly different concepts (Anderson & Gerbing, 1988).

4. Results

4.1 Analysis of the Variables that Influence Innovative Performance

After verifying the validity of the knowledge and radicalness scales, an estimation of the two global models was carried out in order to contrast the hypotheses of causal relationships in the whole sample. The results are shown below: all the relationships proposed in the hypotheses are displayed in model 1, while model 2 presents only those that are significant at a minimum confidence level of 90 percent (Table 4).

Table 4 Causal Model Stimation (Full Sample)

		Model 1	Model 2
Relationships		(t-value)	(t-value)
Dependent Variable	Independent Variables		
Innovative Performance	Radicalness	*0.080 (1.703)*	0.118 (2.716)
	Incrementality	0.067 (1.252)	
	Knowledge tacitness	-0.109 (-1.497)	
	Knowledge complexity	*0.162 (2.106)*	0.075 (1.957)
	Internal R&D expenditures	*0.294 (4.966)*	0.333 (5.638)
	External R&D expenditures	0.092 (1.353)	
	Age	-0.009 (-0.143)	
	Size	*0.087 (1.860)*	0.093 (2.010)
Adjusted indexes		Model 1	Model 2
Chi^2 Sta. (g.l.); (p-value)		252.063 (125); (0.000)	163.983 (96); (0.000)
RMSEA		0.051	0.042
BB-NNFI		0.933	0.961
CFI		0.946	0.969
GFI		0.925	0.945

In both cases, fit indexes show that the estimations of the two models are acceptable for the research objectives defined in the theoretical framework. However, the re-estimation in model 2 of the significant relationships of model 1 shows how loadings improve at a confidence level of 95 percent. The results of model 2 indicate that radicalness and knowledge complexity influence innovative performance in a positive way at a confidence level of 99 percent and 95 percent, respectively. These findings support hypotheses $H_{7.1}$ and $H_{6.1}$. Among the direct variables, organisational size and internal R&D expenditure have a direct and significant effect on the innovative performance of the organisations; therefore, hypotheses $H_{1.1}$ and $H_{3.1}$ are also supported.

4.2 Analysis of the Strength of Causal Relationships Based on the Characterisation of the Companies as Innovation Generators and/or Adopters

A causal model was estimated for each of the four groups of firms, identified as innovation generators and/or

adopters. The different estimations were intended to test the potential heterogeneity of the strength of causal relationships. First of all, as an estimation of the whole sample, a model with all the proposed relationships was estimated for each group of companies. Subsequently, a second model was elaborated, including only those estimations that were significant at a minimum confidence level of 90 percent.

With regard to the innovative organisations (IO) group, the results of the second model indicate that their innovative performance is significantly influenced by the two dimensions of knowledge (tacit and complex) (see Table 5). However, it should be noted that, while complex knowledge influences innovative performance in a positive way, tacit knowledge has a negative effect on it. Moreover, neither of the two radicalness dimensions influences the dependent variable. As for the direct variables, only internal R&D expenditure has a positive and significant effect on the organisations' innovative performance.

Table 5 Causal Model Stimation (Group I: IO)

		Model 1	Model 2
Relationships		(t-value)	(t-value)
Dependent Variable	Independent Variables		
Innovative Performance	Radicalness	*0.068 (0.650)*	
	Incrementality	*0.092 (0.866)*	
	Knowledge tacitness	-0.194 (-1.758)	-0.179 (-1.674)
	Knowledge complexity	0.232 (2.053)	0.205 (1.879)
	Internal R&D expenditures	0.351 (3.672)	0.417 (4.583)
	External R&D expenditures	*0.132 (1.310)*	
	Age	*-0.022 (-0.265)*	
	Size	*0.015 (0.150)*	
Adjusted indexes		Model 1	Model 2
Chi^2 Sta. (g.l.); (p-value)		154.957 (132); (0.084)	83.354 (88); (0.620)
RMSEA		0.047	0.045
BB-NNFI		0.871	0.963
CFI		0.890	0.969
GFI		0.819	0.877

In the case of the innovation-generating organisations (IGOs) group, it is interesting to highlight the significant influence of the same variables as in the previous group, although some relationships have opposite signs (see Table 6). While tacit knowledge and internal R&D expenditure have a positive and significant influence on the sales and profit obtained from new products, the complex knowledge dimension has a negative effect at a confidence level of 90 percent. In other words, in this cluster, as complex knowledge increases, the sales and profits of new products become significantly lower.

Within the group of companies characterised by a high number of imitations and a low number of innovations — innovation-adopting organisations (IAOs) — the amount of significant relationships increases (see Table 7). The results show a positive and significant influence of radicalness and knowledge complexity on innovative performance, at least at a confidence level of 95 percent. In addition, the estimation of the direct variables indicates that internal R&D expenditure and organisational age have a significant effect on the dependent variable. All variables, except organisational age, have a positive influence. As the company grows older, its ability to innovate decreases.

Table 6 Causal Model Stimation (Group II: IGO)

		Model 1	Model 2
RELATIONSHIPS		(t-value)	(t-value)
Dependent Variable	Independent Variables		
Innovative Performance	Radicalness	*-0.113 (-0.906)*	
	Incrementality	*0.442 (0.230)*	
	Knowledge tacitness	0.377 (1.149)	0.461 (1.853)
	Knowledge complexity	-0.435 (-1.174)	-0.513 (-1.816)
	Internal R&D expenditures	0.372 (2.813)	0.382 (3.162)
	External R&D expenditures	*0.139 (0.886)*	
	Age	*0.021 (0.260)*	
	Size	*0.103 (1.024)*	
Adjusted indexes		Model 1	Model 2
Chi^2 Sta. (g.l.); (p-value)		190.446 (125); (0.000)	102.157 (82); (0.000)
RMSEA		0.084	0.058
BB-NNFI		0.838	0.941
CFI		0.868	0.954
GFI		0.805	0.857

Table 7 Causal Model Stimation (Group III: IAO)

		Model 1	Model 2
Relationships		(t-value)	(t-value)
Dependent Variable	Independent Variables		
Innovative Performance	Radicalness	0.201 (2.515)	0.216 (2.690)
	Incrementality	*0.014 (0.141)*	
	Knowledge tacitness	*-0.150 (-1.471)*	
	Knowledge complexity	0.245 (2.085)	0.174 (1.984)
	Internal R&D expenditures	0.296 (4.620)	0.309 (4.641)
	External R&D expenditures	*0.030 (0.359)*	
	Age	-0.145 (-1.942)	-0.160 (-2.053)
	Size	*0.038 (0.632)*	
Adjusted indexes			Modelo 2
Chi^2 Sta. (g.l.); (p-value)		121.949 (125); (0.560)	102.157 (82); (0.000)
RMSEA		0.060	0.058
BB-NNFI		0.921	0.941
CFI		0.935	0.954
GFI		0.863	0.857

Finally, the relationships between radicalness and complex knowledge and the sales and profits of new products are also significant in the group of non-innovative organisations (NIOs). The estimation of the causal model shows that these relationships are significant at least at a confidence level of 90 percent (see Table 8). With regard to the direct variables, internal R&D expenditure has a significant and positive effect on the dependent variable, and organisational size represents a positive influence at a confidence level of 95 percent.

Table 8 Causal Model Stimation (Group IV: NIO)

		Model 1	Model 2
Relationships		(t-value)	(t-value)
Dependent Variable	Independent Variables		
Innovative Performance	Radicalness	0.157 (1.668)	0.197 (2.535)
	Incrementality	*0.063 (-0.695)*	
	Knowledge tacitness	*-0.283 (-1.518)*	
	Knowledge complexity	0.352 (1.927)	0.134 (1.650)
	Internal R&D expenditures	*0.045 (0.571)*	
	External R&D expenditures	0.202 (2.275)	0.217 (2.919)
	Age	*0.016 (0.105)*	
	Size	0.147 (1.734)	0.174 (1.899)
Adjusted indexes			Modelo 2
Chi^2 Sta. (g.l.); (p-value)		195.01 (125); (0.000)	119.75 (96); (0.051)
RMSEA		0.068	0.045
BB-NNFI		0.906	0.967
CFI		0.923	0.973
GFI		0.835	0.889

Like all models showing only significant relationships, model 2 notably improves the fit indexes of model 1. The estimation of model 2 for the groups of innovative organisations (IO) and non-innovative organisations (NIO) should be especially noted. According to Baron and Kenny (1986, p. 1174), a moderator variable is "a qualitative or quantitative variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable". In this sense, the results show how the independent variables affect innovation performance in a different direction or with different strength depending on the firm's classification as innovation generator and/or adopter. For instance, despite the significant effect of the complex knowledge dimension on innovative performance in all four groups, its influence is clearly negative in the case of innovation-generating organisations (IGO) and positive for the rest of the clusters. This result partially supports hypothesis $H_{6.2}$. Furthermore, radicalness only influences innovative performance in organisations with a low level of innovation generation (IAOs and NIOs), showing no significant effect in groups characterised by a high level of innovation generation. This fact allows partially supporting hypothesis $H_{7.2}$.

Regarding the rest of direct measures, internal R&D expenditure only affects the innovative performance of the first three clusters of companies, not that of the non-innovative organisations (NIOs), a result that partially supports hypothesis $H_{4.2}$. Organisational size has a significant effect on innovative performance only within the group of non-innovative organisations (NIOs), and organisational age influences only the group of innovation-adopting organisations (IAOs). These results partially contradict $H_{1.2}$ and $H_{2.2}$, respectively.

After the estimation of the causal model, a multigroup analysis was performed in order to further assess the moderating effect of innovation generation and/or adoption on those relationships that had proved significant in, at least, two of the four groups. Taking into account the results shown in tables 5, 6, 7 and 8, those causal relationships that were relevant for the four groups were re-estimated. This step included a null hypothesis stating that the regression coefficients of the causal model are equal between groups when the relationship is significant (Iglesias & Vázquez, 2001). Also, the Lagrange multiplier test (LMTest) revealed the differences between the

parameters of the sub-samples in each group. These indexes showed that removing the restriction implied a significant change of the chi-square statistic; in other words, the rejection of the equality restriction improved the model fit (see Table 9).

Table 9 Hypotheses Test

Constrains	Between Grupos	gl	Chi^2 Differences	p-value
Knowledge complexity (F4) → Innovative performance (F5)	IO-IGO	1	1.175	0.278
	IO-IAO	1	0.241	0.623
	IO-NIO	1	0.335	0.563
Internal R&D expenditures → Innovative Performance (F5)	IO-IGO	1	0.241	0.624
	IO-IAO	1	1.045	0.307
Knowledge tacitness (F3) → Innovative performance (F5)	IO-IGO	1	5.379	0.020
Radicalness (F1) → Innovative performance (F5)	IAO-NIO	1	0.061	0.804

The statistics associated to the differences for each constraint showed that only the restriction on the relationship between tacit knowledge and innovative performance among innovative organisations (IOs) and innovation-generating organisations (IGOs) has a significant effect. Therefore, the degree of innovation adoption moderates the effect of tacit knowledge on the company's innovative performance. This effect is significant and negative for innovative organisations, but it is significant and positive for innovation-generating organisations. This result partially supports hypothesis $H_{5.2}$.

5. Discussion and Conclusions

With the exception of the most recent works (Damanpour & Wischnevsky, 2006), the researchers of studies on the characteristics of innovative organisations usually adopt a unitary vision on innovation generation and adoption. In general, innovative organisations are perceived as those that generate, adopt, or generate and adopt innovations without making any distinction (Pérez-Luño, Wiklund & Valle Cabrera, 2011). This vision has led to inconsistent results and to the lack, until the publication of the works by Damanpour and Wischnevsky (2006) and Pérez-Luño, Wiklund and Valle Cabrera (2011), of a reliable theory on the generation and adoption of innovations.

The first contribution of this research work is related with the possibility of describing four types of firms according to their relationship with innovation. In this sense, the IO category (firms that both generate and adopt innovations) includes companies that are larger than IAOs and NIOs and a bit smaller than IGOs, have an average age of 35 years and devote, on average, 15 percent of their sales to internal R&D and 3.19 percent to external R&D. It has been established that, on average, IGOs are the largest in size, have an average age of 33 years and invest 10 percent of their sales on internal R&D and 3.37 percent to external R&D. IAOs are a bit smaller, have an average age of 31.76 years and invest, on average, 9 percent of their sales on internal R&D and 2.6 percent to external R&D. Finally, NIOs are the smallest firms, with an average age of 32.85 years and an average 8 percent and 1.53 percent of their sales devoted, respectively, to internal and external R&D. These results indicate that all firms in the analysed sectors, which are all somehow related with innovation, have asimilar size and an average age ranging from 31 to 36 years. In other words, there is, on average, no relevant influence of young firms in the Spanish network of innovative companies. This is a significant result because it differs from the popular idea that points to new ventures as the most innovative organisations (Wiklund & Shepherd, 2003). In addition, these results indicate that both the internal and the external R&D expenditures are essential to generate and adopt

innovations (Galunic & Rodan, 1998). This finding is particularly relevant because it coincides with the results of the literature on organisational learning (March, 1991), which underline the importance of acquiring external knowledge in order to combine it with internal knowledge (exploration) and obtain new knowledge that may be exploited. In addition, it has notable practical implications because it emphasizes the importance of R&D investments as a way to develop the individual competitiveness of companies and the global competitiveness of the economy.

The second contribution of this article is related to the specification of the characteristics that can be useful to obtain a better performance from the innovations, according to the organisation's tendency to adopt or generate innovations. The generalisation of the concept of innovation (including generation and adoption in the same category) would have led to the conclusion that the factors determining innovative performance are: radicalness, knowledge complexity and high expenditure on internal R&D. However, the detailed study of each group of firms (combining the tendency to generate innovations with the tendency to adopt them) has allowed a much richer analysis of the characteristics that allow each group to obtain a better innovative performance. This is an important result because it specifies the form in which the different types of companies can achieve better innovative performances. In addition, those characteristics have a positive influence on some groups of firms while they negatively affect others, and this is why the tendency to generate or adopt innovations appears as an essential issue for managers, politicians and researchers that wish to know how to obtain the best innovative performance from the products launched into the market.

In this sense, it is interesting to point out that IOs and IGOs obtain a better innovative performance by using knowledge and investing on internal R&D. While internal R&D favours innovative performance in both cases, the effect of tacit and complex knowledge is opposite for each type of firm. This statement represents a fundamental double contribution. First of all, it indicates that, as suggested by authors like Cohen and Levinthal (1996), a greater percentage of internal R&D expenditure in relation to the total sales is transformed into a greater absorption capacity. This, in turn, is translated into the achievement of a greater number of innovations, which ultimately have an impact on innovative performance. As for knowledge, it may seem surprising to see that complex and explicit knowledge favours the innovative performance of IOs (firms that both generate and adopt innovations), while IGOs (firms that mostly generate innovations) require tacit and simple knowledge to achieve innovative performances. But, in fact, the analysis of the activity of each group of organisations confirms that this finding is plausible. In other words, firms that generate and adopt innovations (IO) need explicit and easily manageable knowledge in order to combine an exploitive strategy (adoption of innovations) with an exploratory strategy (generation of innovations) (March, 1991; Gopalakrishnan, Bierly & Kessler, 1999). However, this explicit knowledge can only be translated into profitable innovations when it has a minimum degree of complexity (Gopalakrishnan & Bierly, 2001). With regard to IGOs, the literature has established that the generation of innovations requires tacit knowledge (Nonaka, 1994). Nevertheless, and in order for the process to be viable, this tacit knowledge must be simple. In other words, IGOs obtain profits from the generation of innovations based on tacit and simple knowledge. This set of statements can be highly useful for those entrepreneurs who are generating and/or adopting innovations and who may need to know which resources and capabilities should be applied in order to obtain better performances.

The firms that obtain a better performance from the adoption of innovations (IAOs) are young and prone to invest on internal R&D. In addition, they must be capable of launching radical innovations based on complex knowledge. The relationship between complex knowledge and radicalness is consistent with previous researches

(see, for instance, Gopalakrishnan & Bierly, 2001). It is important to underline that adopting this kind of innovations is enough to achieve an innovative performance. In other words, this finding may be very useful for managers and supports the argument, found in the literature on newcomers and followers, which indicates that followers occasionally achieve higher profitability than newcomers. It is interesting to mention that firms that do not generate or adopt many innovations actually benefit from incremental innovations based on complex knowledge, obtained from the investment on external R&D through the acquisition of licenses, etc. According to previous literature (see, for example, the meta-analysis developed by Damanpour, 1991), the least innovative firms are the largest in size and the most bureaucratic.

As all researches, this one is subject to a series of limitations as, for instance, the scope of the field work, which is focused on five Spanish innovative sectors. It is important to make clear that, because of this reason, the results can only be generalised within this context; a future research work could include new sectors and/or countries. In addition, this research has analysed a limited number of variables. Future researches could consider new factors, like the firms' financial restrictions or degree of internationalisation, to improve characterisation. It would be interesting to incorporate financial performance or competitive advantage as a final variable, undoubtedly affected by the organisation's innovative performance. Given the relevance of these aspects, the present limitations certainly open new lines of research for future studies.

References:

Afuah A. (1998). *Innovation Management: Strategies, Implementation, and Profits*, Oxford University Press. New York.

Anderson J. C. and Gerbing D. W. (1988). "Structural equation modelling in practice: A review and recommended two-step approach", *Psychological Bulletin*, Vol. 103, No. 3, pp. 411-423.

Arrow K. J. (1983). "Innovation in large and small firms", in: J. Ronen (Ed.), *Entrepreneurship*, Lexington, MA: Lexington Books, pp. 15-28.

Atuahene-Gima K. and Ko A. (2001). "An empirical investigation of the effect of market orientation and entrepreneurship orientation alignment on product innovation", *Organization Science*, Vol. 12, No. 1, pp. 54-74.

Bantel K. and Jackson S. E. (1989). "Top management and innovations in banking: Does the composition of the top team make a difference?", *Strategic Management Journal*, Vol. 10, Special Issue, pp. 107-124.

Barney J. B. (1991). "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17, No. 1, pp. 99-120.

Baron R. M. and Kenny D. A. (1986). "The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations", *Journal of Personality and Social Psychology*, Vol. 51, No. 6, pp. 1173-1182.

Bierly P. and Chakrabarti A. (1996). "Generic Knowledge strategies in the U.S. pharmaceutical industry", *Strategic Management Journal*, Vol. 17, Winter Special Issue, pp. 123-135.

Burns T. and Stalker G. M. (1961). *The Management of Innovation*, London: Tavistock Publication.

Capon N., Farley J. U., Lehmann D. R. and Hulbert J. M. (1992). "Profiles of product innovators among large U.S. manufacturers", *Management Science*, Vol. 38, No. 2, pp. 157-169.

Ceccagnoli M. (2009). "Appropriability, pre-emption, and firm performance", *Strategic Management Journal*, Vol. 30, No. 1, pp. 81-98.

Cohen J. and Cohen P. (1983). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*, Lawrence Erlbaum Associates Publishers, New Jersey.

Cohen W. M. and Levinthal M. D. A. (1990). "Absorptive capacity: A new perspective on learning and innovation", *Administrative Science Quarterly*, Vol. 35, No. 1, pp. 128-152.

Cohen W. M. and Mowery D. C. (1984). "Firm heterogeneity and R&D: An agenda for research", in: M. C. Bozeman & A. Link (Eds.), *Strategic Management of Industrial R&D*, Lexington, Mass: Lexington Books.

Damanpour F. (1991). "Organizational innovation: A meta-analysis of effects of determinants and moderators", *Academy of Management Journal*, Vol. 34, No.3, pp. 555-590.

Damanpour F. and Wischnevsky J. D. (2006). "Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations", *Journal of Engineering and Technology Management*, Vol. 23, No. 4, pp. 269-291.

Díaz-Díaz N. L., Aguiar-Díaz I. And De Saa-Pérez P. (2006). "El conocimiento organizativo tecnológicoandla capacidad de innovación: Evidencia para la empresa industrial española", *Cuadernos de Economíaand Dirección de la Empresa*, Vol. 27, No. 2, pp. 33-60.

Dunphy S. M., Herbig P. R. and Howes M. E. (1996). "The innovation funnel", *Technological Forecasting and Social Change*, Vol. 53, No. 2, pp. 279-292.

Fornell C. and Larcker D. F. (1981). "Structural equation models with unobservable variables and measurement error: Algebra and statistics", *Journal of Marketing Research*, Vol. 18, No. 3, pp. 382-390.

Freeman C. and Soete L. (1997). "The economics of industrial innovation", Frances Pinter: London.

Galunic C. and Rodan S. (1998). "Resource recombinations in the firm: Knowledge structures and the potential for Schumpeterian innovation", *Strategic Management Journal*, Vol. 19, No. 12, pp. 1193-1201.

Gopalakrishnan S. and Bierly P. (2001). "Analyzing innovation adoption using a knowledge-based approach", *Engineering and Technology Management*, Vol. 18, No. 2, pp. 107-130.

Gopalakrishnan S., Bierly P. and Kessler E. H. (1999). "A re-examination of product and process innovations using a knowledge-based view", *The Journal of High Technology Management Research*, Vol. 10, No. 1, pp. 147-166.

Gopalakrishnan S. and Damanpour F. (1994). "Patterns of generation and adoption of innovation in organizations: Contingency models of innovation attributes", *Journal of Engineering and Technology Management*, Vol. 11, No. 2, pp. 95-116.

Grant R. M. (1996). "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, Vol. 17, Special Issue: Knowledge and the Firm, pp. 109-122.

Grossman G. M. and Helpman E. (1991). *Innovation and Growth in the Global Economy*, MIT Press: Cambridge, MA.

Guellec D. (1999). *Économie de l'innovation*, Paris: Éditions La Découverte.

Hedlund G. (1994). "A Model of knowledge management and the N-Form corporation", *Strategic Management Journal*, Vol. 15, *Special Issue: Strategy: Search for New Paradigms*, pp. 73-90.

Hult G. T. M., Hurley R. F. and Knight G. A. (2004). "Innovativeness: Its antecedents and impact on business performance", *Industrial Marketing Management*, Vol. 33, No. 5, pp. 429-442.

Iglesias V. And Vázquez R. (2001). "The moderating effects of exclusive dealing agreements on distributor satisfaction", *Journal of Strategic Marketing*, Vol. 9, No. 3, pp. 215-231.

Knight K. E. (1967). "A descriptive model of the intra-firm innovation process", *Journal of Business*, Vol. 40, No. 4, pp. 478-496.

Kogut B. and Zander U. (1993). "Knowledge of the firm and the evolutionary theory of the multinational corporation", *Journal of International Business Studies*, Vol. 24, No. 4, pp. 625-645.

Mahmood I. P. and Rufin C. (2005). "Government's dilemma: The role of government in imitation and innovation", *Academy of Management Review*, Vol. 30, No. 2, pp. 338-360.

March J. G. (1991). "Exploration and exploitation in organizational learning", *Organization Science*, Vol. 1, pp. 71-87.

Montoya-Weiss M. M. and Calantone R. (1994). "Determinants of new product performance: A review and meta-analysis", *The Journal of Product Innovation Management*, Vol. 11, No. 5, pp. 397-417.

Nerkar A. and Shane S. (2007). "Determinants of invention commercialization: An empirical examination of academically sourced inventions", *Strategic Management Journal*, Vol. 28, No. 11, pp. 1155-1166.

Newbert S. L. (2007). "Empirical research on the resource-based view of the firm: An assessment and suggestions for future research", *Strategic Management Journal*, Vol. 28, No. 2, pp. 121-35.

Nonaka I. (1994). "A dynamic theory of organizational knowledge creation", *Organization Science*, Vol. 5, No. 1, pp. 14-37.

Nonaka I. (2007). "The knowledge-creating company", *Harvard Business Review*, Vol. 85, No. 7-8, pp. 162-171.

Nord W. and Tucker S. (1987). *Implementing Routine and Radical Innovations*, Lexington, MA: Lexington Books.

Nunnally J. C. (1987). *Teoría Psicométrica*, Ed. Trillas. México.

OECD-EUROSTAT (1997). "The measurement of scientific and technological activities: Proposed guidelines for collecting and interpreting technological data", Oslo Manual. OECD, Paris.

Pérez-Luño A., Valle Cabrera R. and Wiklund J. (2007). "Innovation and imitation as sources of sustainable competitive advantage", *Management Research*, Vol. 5, No. 2, pp. 67-79.

Pérez-Luño A., Valle Cabrera R.AndWiklund J. (2009). "De la creatividad al lanzamiento de productos: el papel del conocimiento en los procesos de innovación e imitación", *Cuadernos de Economíaand Dirección de la Empresa*, Vol. 38, No. 1, pp. 95-118.

Pérez-Luño A., Wiklund J. and Valle Cabrera R. (2011). "The dual nature of innovative activity: How Entrepreneurial Orientation influences innovation generation and adoption", *Journal of Business Venturing*.

Polanyi M. (1966). *The Tacit Dimension*, New York: Anchor Day.

Pringle J. W. S. (1951). "On the parallel between learning and evolution", *Behavior*, Vol. 3, pp. 175-215.

Rothwell R. and Gardiner P. (1985). "Invention, innovation, re-innovation and the role of the user: A case study of British hovercraft development", *Technovation*, Vol. 3, No. 3, pp. 167-186.

Schumpeter J. A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, Transaction Publishers: New Brunswick.

Somaya D., Williamson I. O. and Zhang X. (2007). "Combining patent law expertise with R&D for patenting performance", *Organization Science*, Vol. 18, No. 6, pp. 922-937.

Sørensen J. B. and Stuart T. E. (2000). "Aging, obsolescence and organizational innovation", *Administrative Science Quarterly*, Vol. 45, No. 1, pp. 81-112.

Stock G. N., Greis N. P. and Fischer W. A. (2001). "Absorptive capacity and new product development", *The Journal of High Technology Management Research*, Vol. 12, No. 1, pp. 77-91.

Subramaniam A. and Nilakanta S. (1996). "Organizational innovativeness: Exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance", *Omega*, Vol. 24, No. 6, pp. 631-647.

Subramaniam M. and Venkatraman N. (2001). "Determinants of transnational new product development capability: Testing the influence of transferring and deploying tacit overseas knowledge", *Strategic Management Journal*, Vol. 22, No. 4, pp. 359-378.

Subramaniam M. and Youndt M. A. (2005). "The influence of intellectual capital on the types of innovative capabilities", *Academy of Management Journal*, Vol. 48, No. 3, pp. 450-463.

Teece D. J. (1986). "Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy", *Journal of Economic Behavior & Organization*, Vol. 15, No. 6, pp. 285-305.

Tushman M. L. and Anderson P. (1986). "Technological discontinuities and organizational environments", *Administrative Science Quarterly*, Vol. 31, No. 3, pp. 439-465.

Tushman M. and Smith W. (2002). "Technological change, ambidextrous organizations and organizational evolution", in: Baum J. (Ed.), *The Blackwell Companion to Organizations*, Blackwell Publishers, UK.

Wiklund J. and Shepherd D. (2003). "Knowledge-based resources, entrepreneurial orientation, and the performance of small and medium-sized businesses", *Strategic Management Journal*, Vol. 24, No. 13, pp. 1307-1314.

Winter S. G. (1987). *Knowledge and Competence as Strategic Assets*, Ballinger, Cambridge, M.A.

Wolfe R. A. (1994)."Organizational innovation: Review, critique and suggested research directions", *Journal of Management Studies*, Vol. 31, No. 3, pp. 405-431.

Zahra S. A. and George G. (2002). "Absorptive capacity: A review, reconceptualization, and extension", *Academy of Management Review*, Vol. 27, No. 2, pp. 185-203.

Zander U. and Kogut B. (1995). "Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test", *Organization Science*, Vol. 6, No. 1.

Zhou K. Z. (2006). "Innovation, imitation, and new product performance: The case of China", *Industrial Marketing Management*, Vol. 35, pp. 394-402.

Zollo M. and Winter S. G. (2002). "Deliberate learning and the evolution of dynamic capabilities", *Organization Science*, Vol. 13, No. 3, p. 14.