UCJC
Business and Society Review
(Formerly known as Universia Business Review)

How do external search strategies develop marketing and technological capabilities? Discussing its implications for innovation[1]

Como las estrategias de búsqueda externa desarrollan las capacidades tecnológicas y de marketing? Análisis de sus implicaciones para la innovación

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1. INTRODUCTION

According to the Resource Based View (RBV), the heterogeneity of resources and capabilities is key to understand the performance differences between firms and their capability to develop competitive advantage (Barney, 1991). Studies in this line suggest that organisational capabilities involve spanning processes such as technology development as well as customer and channel management, which are related to technology capabilities and marketing capabilities, respectively (Zang and Li, 2017). On the one hand, technological capability refers to the ability of a company to use a wide variety of technologies, to develop new ideas in order to create new products that are accepted by the market and also have followed a fast process development (Huang, 2011). On the other hand, market capability involves the attention paid to customers, pricing and advertising to repeatedly deliver desired benefits to customers (Song, 2008).

In the innovation literature, both capabilities have been considered

JEL CODES: O32

Received: July 2018. Accepted: February 2019

DOI: 10.3232/UBR.2019.V16.N2.01

EXECUTIVE SUMMARY

Innovation is essential for organizations, but also a complex and risky process. Marketing and technological capabilities have been argued to be necessary to achieve innovation; however, a better understanding is needed about how to develop these capabilities. In this paper we explore associations between firms' intense collaborations with different types of external partners and the development of market and technological capabilities. We conduct a comparative study on a sample of 467 Spanish firms belonging to industries with different technological intensities. This study provides an important contribution to the literature on open innovation and also includes practical implications for managers that encourage collaboration with different types of external agents for developing technological and marketing capabilities.

RESUMEN DEL ARTÍCULO

La innovación es esencial para las organizaciones, pero también es un proceso complejo y arriesgado. Se ha argumentado que las capacidades de marketing y tecnológicas son necesarias para lograr la innovación; sin embargo, todavía hace falta una mayor comprensión sobre cómo desarrollar estas capacidades. En este trabajo exploramos las asociaciones entre las colaboraciones intensas desarrolladas por la empresa con distintos tipos de socios externos y el desarrollo de capacidades de marketing y tecnológicas. Realizamos un estudio comparativo de una muestra de 467 empresas españolas pertenecientes a industrias con diferentes intensidades tecnológicas. Este estudio proporciona una importante contribución a la literatura sobre innovación y, además, incluye implicaciones prácticas para los directivos que fomenten la colaboración con distintos tipos de agentes externos para el desarrollo de las capacidades tecnológicas y de comercialización.

as an important source to develop a competitive advantage (Vorhies et al., 2009; Fernández-Mesa et al., 2014). Most innovation models acknowledge the role of technology and marketing for innovation (OECD, 2005). Technology capabilities provide plenty of new technical solutions for users' problems. Marketing capabilities allow the firm to update users' needs as well as to identify new users' segments. Therefore, an important attention has been paid to the mechanisms necessary to develop these two capabilities (Zang and Li, 2017).

The process of developing both capabilities has been strongly related to firm's knowledge management practices, which are connected to the stock of knowledge that the firm possess and can acquire through both formal and informal processes. However, in the current business context in which life cycle of products has been shortened and the customers' needs and preference take place in an accelerated rate, firms need to continually update their knowledge base by collaborating with partners located outside the boundary of the firm (Martín-de-Castro, 2015). External links allow firms to access different resources and technological capabilities that improve and complement firm's internal processes (Nieto and Santamaria, 2007; Rodríguez et al., 2018; Rodríguez-Ferradas and Alfaro-Tanco, 2016).

...the type of external partner is crucial in explaining the development of new capabilities and the innovation behaviour of firms from technology intensive and traditional industries

In order to better understand how firms are able to successfully develop new products and services in industrial markets, it is important to take into account (1) what processes take place inside the firm and (2) how external collaboration may improve those practices. In this vein, studies in the literature of open innovation suggest that firms sustaining deep collaborations with a reduced number of external partners or that collaborate with a broad variety of external partners are able to accelerate their innovation processes (Chesbrough, 2003). However, actors from which firms can receive knowledge and information are diverse. Therefore, depending of the knowledge needs, the firm will look for the type of external partner that can provide the lacking technological and market knowledge or the access to new practices that have been implemented in other contexts and organisations (Nieto and Santamaría, 2007; Terjesen and Patel, 2017).

In the present study, we suggest that firms may use external links in order to develop both capabilities. Following previous studies,

we propose two types of orientation that firms may display in their external knowledge search process: collaborating with industrial partners and collaborating with science-technology partners. For instance, interaction with industrial partners such as suppliers, clients and competitors enables firms to deepen their knowledge from their market and increase their capability to better commercialise their products. This is important in a context where marketing strategy is facing new challenges due to current significant technological advances (Melero et al., 2016). On the contrary, drawing knowledge from non-industrial partners, such as research agents, provides a firm with the opportunity to explore new technological areas and helps to broaden its technological knowledge base (Un et al. 2010). Therefore, depending on their needs, different firms may have different external knowledge links and different search strategies for improving marketing and technological capabilities and developing innovations.

Our research, therefore, aims at extending the literature of RBV and open innovation by proposing a framework that connects the use of different knowledge search strategies with the development of technological and marketing capabilities at the firm level. According to previous studies, learning from outside requires something more than just acquisition of external knowledge. Thus, firms need to develop capabilities to be able to integrate and apply the external knowledge into the organizational knowledge base and innovation processes (Teece, 2014; Ferreras-Méndez et al., 2015; Martín-de-Castro, 2015). In the present study, we explore whether the interaction with industrial and non-industrial partners provides firms with a diverse base of knowledge and practices that can be used to extend firms' capability to handle a wide variety of technologies to develop agilely new successful products (technological capability) or to pay satisfactory and effective attention to customers, pricing and advertising (market capability)

Many of the studies analysing inbound open innovation have focused in the depth and breadth of the external links. However, recent studies suggest that not only the intensity and the broad of the external knowledge search is important, but also the type of external partner is crucial in explaining the development of new capabilities and the innovation behaviour of firms from technology intensive and traditional industries (Van de Vrande et al., 2009; Chen et al., 2011).

Furthermore, we explore the benefits, in terms of capabilities, of the

KEY WORDS
Open innovation; Knowledge search strategy; Market capability; Technological capability; Industrial and non-industrial partners.

PALABRAS CLAVE
Innovación abierta; Estrategias de búsqueda de conocimiento; Capacidad de comercialización; Capacidad tecnológica; Socios industriales y no industriales.

use of different knowledge search strategies in different industrial context. Our analyses include firms with different technology intensities. Following previous studies, we suggest that distinctive search patterns can be identified at firms depending on their industry technology intensity (Chen et al., 2011). Our research, therefore, extends previous studies by showing how the orientation of external knowledge search strategy changes depending on the type of internal capability that firms aim to develop and the level of technology intensity of the industry. Furthermore, it offers important practical and managerial implications for those managers aiming at developing their firms' marketing and technological capabilities by fostering collaboration with external partners.

The structure of this paper is as follows. In section 2, we provide our theoretical framework and introduce our main propositions. In section 3, the methodology used in the empirical study and the characteristics of the sample data are described. Section 4 reports the results, and finally the conclusions and managerial implications are discussed in section 5.

2. THEORETICAL FRAMEWORK

2.1. Achieving innovation: the importance of marketing and technological capabilities

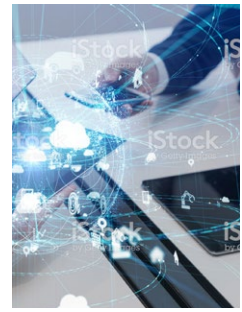
RBV emphasises that competitive advantage is not generated through the imperfections of the market, but from the differences in the level of resources between organisations, and more importantly, from how companies combine these resources over time generating capabilities that are valuable, rare, inimitable and exploitable by the organisation. In some cases, complexity and causal ambiguity may avoid companies to identify core capabilities, leaving little room for strategy (Peteraf, 1993). Teece (2014) reinforces this idea by assuring that core capabilities must be used in aid of a good strategy to be effective, facilitating the implementation of strategic actions quickly and effectively.

RBV supports the numerous studies that analyse technological and marketing capabilities as core for high performance and competitive advantage (Vorhies et al., 2009). In particular, marketing capability and technological capability have widely been understood as the traditional sources for innovation performance, necessary for high

performance and final competitive advantage (OECD, 2005).

Technological capability refers to the ability of a company to use a wide variety of technologies, to develop new ideas in order to create new products that are accepted by the market and also to have followed a fast process development (Afuah, 2002). In other words, technological capability includes not only mastering technologies, but also investing in R&D, autonomy of R&D decision making and a strong innovation orientation (Huang, 2011). As technological capability is embedded in organisational routines over time, it becomes more valuable, inimitable, and not substitutable, and therefore represents an important source of innovation.

In turn, marketing capabilities allow companies to repeatedly deliver desired benefits to customers. Companies that are not able to listen to the needs of consumers have difficulties in innovating (Song, 2008). In order to be successful in innovation it is necessary to master the technology (technological capabilities), but also to foster market capabilities that will also be necessary to know what consumers demand and offer them exactly this. Moreover, marketing capabilities of the company are also necessary to communicate the benefits to current and potential clients. In sum, marketing capabilities include environmental scanning, market planning, marketing skill development and coordination and communication (Day, 1994).



However, even though plenty of studies have shown the effect of marketing and technological capabilities on innovation (Vorhies et al., 2009; Fernández-Mesa et al. 2014), less is known of how firms develop these capabilities, which is essential in order to guide companies in the complex task of their development. Some studies highlight some important determinants of marketing capabilities. For example, Vorhies (1998) studies how business strategy, organisational structure and market information processing capabilities influence marketing capabilities development. More recently, Arunachalam et al. (2018) argues how entrepreneurial orientation might be linked to architectural marketing capabilities. However, there is not so much literature on how knowledge external search affects the development of marketing capability. We find a similar pattern in the case of technological capability. For example, Sears and Hoetker (2014) analysed how technology overlap affects technological capabilities. However, we still need to shed some light about the impact of knowledge external search strategies on the development of this capability.

2.2. Knowledge external search as an antecedent of technological and marketing capabilities

Evolutionary, innovation network theorists and recently, open innovation perspective analyse how firms innovate through searching for and interacting with external agents (Laursen and Salter, 2006). Some authors have even emphasised that sometimes external agents are even more important sources of innovation than the organisation itself (Spithoven et al., 2010).

The application of different knowledge search strategies to facilitate the access to knowledge from external partners has been defined in the open innovation perspective as inbound open innovation. According to this view, organisations increases the inflow of external knowledge by fostering two types of search strategies: knowledge search breadth and depth (Laursen and Salter, 2006). On the one hand, firms that search broadly explore across a wide number of external channels to incorporate new knowledge relevant for their innovation (breadth). On the other hand, firms that search deeply, draw heavily from a small number of external sources (depth). In contrast to breadth strategy, depth strategy, implies establishing long-term relationships with external agents, so they are time-consuming and also in need of many other resources. However, at the same time, this type of relationships can signify a large potential for learning (Terjesen and Patel, 2017). Thus, depth strategies seem to be especially relevant for the development of technological and marketing capabilities. For this reason, in this paper we focus on depth strategies (intensity in the collaboration) as determinants of technological and marketing capabilities.

External partners primarily include suppliers, customers, industry competitors, government organisations, universities, R&D organisations, consultant companies and all of them have been advanced as relevant in the search for innovative ideas (Nieto and Santamaría, 2007; Rodríguez et al., 2018). However, when analysing in detail each agent salient differences are reflected. In this sense, suppliers and clients are agents that possess knowledge targeted to the firm's needs and thus plays a pivot role in the incremental day-to-day innovation process. For example, working with customers not only provides benefits in identifying market opportunities, but also reduces the likelihood of poor design in the early stages of development. Similarly, suppliers are able to reduce components costs improving operational efficiency (Rodríguez-Ferradas and Alfaro-Tanco, 2016).

Furthermore, firms may also collaborate with firms that are on the same level laterally (competitors) to accelerate their innovation projects (Pun 2015). Suppliers, clients and competitors have often been classified as industrial partners (D'Este et al., 2016), and we argue that are essential for the development of market capabilities because firms sustaining collaboration with the aforementioned actors respond highly to market changes. Following this line of reasoning, we propose the following hypothesis:

H1a: Intense collaborations with industrial partners are positively associated to the development of marketing capabilities.

On the other hand, collaboration of companies with research centres or consultant institutions focus on the most generic or basic end of the R&D complex. Thus, while the interaction with industrial partners enables a firm to deepen existing technological capabilities and explore new marketing capabilities, drawing knowledge from research agents provides a firm with the opportunity to explore new technological areas and helps to broaden its technological knowledge base (Un et al. 2010). In other words, Non-industrial or science and technology partners help companies to obtain mainly new technological capabilities. Thus, we propose the next hypothesis:

H1b: Intense collaborations with non-industrial partners are positively associated to the development of technological capabilities.

2.3 Industrial differences for developing firms' capabilities

Prior research seems to agree of industrial differences in relation to the propensity of manufacturing firms of performing inbound open innovation (Laursen and Salter, 2006). Within manufacturing industries, there are different degrees of technological intensity that may affect open innovation patterns. For example, in higher technological manufacturing industries, processes demand higher investments in capital and technologies than for lower technology industries; thus, it seems more plausible to observe a trend towards higher open innovation. In general, knowledge external search provides manufacturing firms with the opportunity to expand and accelerate knowledge acquisition (Martín-de-Castro, 2015), in particular in higher technological industries.

Moreover, a recent study focusing in a Spanish biotechnology firm reinforces the previous idea by showing a positive effect of search depth on innovation (Ferreras-Méndez et al., 2015). These authors

explain that high technological firms, facing the danger of knowledge leakage, tend to constrain the number of external collaborations, but the collaborations that they engage with are deeper. This idea is in line with our main thesis, in which we argue that deep interactions are necessary in order to develop marketing and technological capabilities, especially in higher technological industries, where the fear of knowledge spillovers is higher. We argue that, to fully understand this problematic, we need to compare different industries with different technological intensities (high-medium technological intensity and low technological intensity). In sum, we propose:

H2a: Intense collaborations with industrial partners are positively associated to the development of marketing capabilities, especially in the case of higher technological industries.

H2b: Intense collaborations with non-industrial are positively associated to the development of technological capabilities, especially in the case of higher technological industries.

3. METHODOLOGY

3.1 Data collection

The data was collected from November 2011 to April 2012 from four different Spanish manufacturing industries: ceramic tiles, footwear making, toys and biotechnology. Two avoid problems of common method bias, we used two different informants from the firms: the CEO answered the questions related to knowledge search strategies whereas the R&D manager or similar answered the questions related to technology and market capabilities. To obtain a representative sample of firms we used industrial directories and identify a target population of 1217 firms. In order to encourage a higher participation, we offer a summary and a feedback report of the main finding of the study. A total of 474 firms agreed to participate in the study and personal interviews were conducted with those firms. We obtained a final sample of 467 completed questionnaires.

3.2 Measurements

Orientation of external knowledge search

In order to identify the orientation of external knowledge search, we ran a factor analysis based on the seven types of external partners in the four industries under study (**see Appendix**) (Chen et al.,

2011). The KMO and the chi-square for Bartlett's test of sphericity were highly significant for the four industries ($p < 0.0001$). Based on the above results, two factors were retained which reflect more than 60.47% of the variance in the original data for each of the industries according to the cumulative proportion of variance. The results are presented in **Table 1**.

Based on the factors obtained we distinguished two types of orientation: orientation to collaborate with industrial partners and orientation to collaborate with non-industrial partners. Three types of external partners form the former group (Industrial partners): suppliers, customers and competitors. Consultant companies, R&D organisations, universities and government organisations, form the latter group (non-industrial partners). The answers were based on an eight point Likert scale, where 1 represented low importance and 8 high importance. In the measurement introduced, we considered firms placing a value on a partner from zero to four does not have a depth orientation to collaborate with that external partner, whereas firm´s valuing the partner with a score from five to eight represents depth relationships with the specific partner. We assign a score of 0 to the former and 1 to the later. Therefore, for example, each firm gets an average of 0 when no orientation to sustain depth collaboration

Table 1. **Rotated factor loadings pattern for the depth orientation in the external knowledge search**

AGENTS	CERAMIC		FOOTWEAR		BIOTECHNOLOGY		TOY		NAME OF THE FACTORS
	Loadings		Loadings		Loadings		Loadings		
	1	2	1	2	1	2	1	2	
Suppliers of equipment, materials, components or software	0,198	**0,802**	0,46	**0,582**	0,3	**0,525**	0,094	**0,775**	Industrial partners
Clients or custumers	0,181	**0,822**	0,063	**0,869**	-0,136	**0,77**	-0,007	**0,851**	
Competitors and others enterprises from the same industry	0,235	**0,747**	0,011	**0,784**	0,237	**0,798**	0,343	**0,487**	
Consultants	**0,755**	0,153	**0,709**	0,249	**0,506**	0,397	**0,7**	0,296	Non-industrial partners
Laboratories or R&D companies	**0,795**	0,228	**0,772**	0,032	**0,664**	0,359	**0,742**	0,202	
Universities or other higher education institutes	**0,817**	0,188	**0,765**	0,052	**0,854**	0,045	**0,743**	-0,032	
Government or private non-profit research institutes	**0,697**	0,232	**0,747**	0,061	**0,828**	-0,004	**0,821**	0,044	

with industrial partner is developed, while firm gets a value of 3 when it has depth orientation to collaborate with the three possible industrial partner. The same rule was applied to capture the depth orientation to collaborate with non-industrial partners.

Technology Capability

Technology capability is measured with the scale of Huang (2011) (**see Appendix**). This construct is captured as a second construct formed with four type of factors of first order: (1) core technology capability; (2) innovation orientation; (3) commitment to R&D and (4) autonomy of R&D decision.

Market capability

Market capability is measured with the instrument proposed by Vorhies et al. (2009) of architectural capabilities. This scale measures the degree to which firms engage in specified routine marketing activities (Day, 1994). It measures how well the respondent performed the marketing activities relative to their closest competitors. It is composed by 4 items: (1) environmental scanning, (2) market planning, (3) marketing skill development and (4) internal coordination and communication.

Control variables

In our study, we included firm size as a control variable, which may provide possible alternative explanations for our results. Specifically, firms' size may affect the flexibility and willingness of the firms to invest in the development of technology and market capability. We therefore included the natural logarithm of the number of full-time employees in the organisation to account for firm size (Veugelers, 1997).

4. ANALYSIS AND RESULTS

4.1 Psychometric properties of the measurement scales

The correlations between the variables included in the empirical analysis and the descriptive statistics are displayed in **Table 2**.

The Content validity was ensured through a revision of extant literature, selecting measurement items already validated in previous studies and through personal interviews with experts from the four industries included in the study: toys, footwear making, ceramic

Table 2. **Descriptive statistics and correlations between variables**

VARIABLES	MEAN	S.D	MIN	MAX.	1	2	3	4	5
1. Industrial partner	1,54	1,10	0,00	3,00	1,00				
2. Non-industrial partner	1,32	1,48	0,00	4,00	0.399**	1,00			
3. Technological Capability	4,98	1,58	1,00	8,00	0.345**	0.436**	1,00		
4. Market Capability	5,42	1,55	1,00	8,00	0.338**	0.237**	0.481**	1,00	
5. Size	2,74	1,38	0,00	7,48	0.167**	0.232**	0.189**	0.251**	1,00

Note: *p≤ 0.05 **p≤ 0.01; to calculate the correlation coefficients, we worked with the means of the items that make up each dimension.

tiles and biotechnology industries (four technicians from each of the industries were interviewed). The interviews confirmed that the questionnaire items were fully understandable in the context of each industry analysed.

To ensure the validity of the measurement instruments used in the study, we evaluate the convergent and discriminant validity. The convergent validity was asses with the average variance extracted (AVE) of the constructs. This measurement allows to identify if a construct explain more than half of the variance of its indicators on average. The AVE values displayed in **Table 3** are higher than 0.5 which ensure the convergent validity of the constructs. For assessing the discriminant validity, we used Fornell-Lacker criterion in which the latent variable must be higher than the squared correlation between the constructs (Henseler et al., 2009). Result on **Table 4** suggests that this criterion is fulfil in all the cases.

The reliability of the construct was assessed through the alpha de Cronbach (α) and the composite reliability (CR) (Henseler et al. 2009). **Table 3** shows that the value of the aforementioned index for each of the constructs analysed in the study exceeds the minimum required level of 0,7 which ensure the reliability.

Finally, the dimensionality of the constructs was evaluated with the loading of the measurement items on their respective factors. The values included in **Table 3** show that all the loading of the measurement items are significant and higher than 0,4 which ensure the dimensionality.

Table 3. **Quality criteria of the measurements**

FACTORS	LOADINGS	SE	α	CR	AVE
Technological Capability			0,857	0,903	0,701
Core Technology capability	0.758***	0,028			
Innovation orientation	0.712***	0,032			
Commitment to R&D	0.877***	0,013			
Autonomy of R&D decisions	0.802***	0,022			
Market Capability			0,939	0,957	0,847
Market Capability 01	0.884***	0,014			
Market Capability 02	0.930***	0,009			
Market Capability 03	0.925***	0,008			
Market Capability 04	0.827***	0,024			
Industrial partner	1	0	1	1	1
Non-industrial partner	1	0	1	1	1
Size	1	0	1	1	1

Note: ***p≤0,001; t- values for n = 5000 subsamples

Table 4. **Discriminant Validity**

FACTORS	1	2	3	4	5
Size	(1.000)				
Market Capability	0.334	(0.920)			
Industrial partner	0.199	0.393	(1.000)		
Non-industrial partner	0.351	0.194	0.344	(1.000)	
Technological Capability	0.186	0.417	0.323	0.308	(0.837)

4.2 Results

A description of the distribution of the sample by industry and size is presented in **Table 5**. Among the main particularities of the sample is that more than 95% of the sample is made up of small and medium size firms (SMEs). The sample composition responds to the need of advancing knowledge on SME's regarding capabilities development, open innovation and innovation performance (Van de Vrande et al., 2009).

Table 5. **Description of the size per industry**

INDUSTRIES	LESS THAN 10	FROM 10 TO 49	FROM 50 TO 249	250 OR MORE	TOTAL
Biotechnology	46	40	12	6	104
Ceramic tiles	28	35	33	11	107
Footwear	61	70	18	1	150
Toy	54	39	12	1	106
Total	189	184	75	19	467

Size categories correspond to the European Commission Recommendation, May 6, 2003 (http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:124:0036:0041:en:PDF).

Table 6 summarise the effect of the orientation to collaborate with industrial and non-industrial partners on the development of technological and market capabilities at the different industries. As it can be seen in **Table 6**, to develop technological capabilities having a depth orientation to collaborate with industrial and non-industrial partners are significant in the biotechnology, toy and footwear Industry. However, at the ceramic industry only the depth orientation to collaborate with non-industrial partners is relevant to develop technological capability.

Concerning the development of market capability, the results in **Table 6** shows that the depth orientation to collaborate with industrial partners is positively related to this capability at the four industries. However, contrary to our expectation, in the footwear industry the depth orientation to collaborate with non-industrial partners has a positive effect on market capability.

To evaluate the magnitude of the effect of each of the orientation on the development of technological and market, we used the f distribution. The f distribution provides a measure of the changes that take place on the R^2 of the dependent variable as a result of the type of orientation adopted by the firm (see **Table 7**).

As it can be observed in **table 7**, beside the depth collaboration with non-industrial partners contributes to the development of market capability at the footwear industry, its contribution on market capability is less important than the depth orientation to collaborate with industrial partners (0,07 vs 0,05).

Likewise, beside the orientation to collaborate with industrial and non-industrial partners is positively related to the development of technological capability in different set of industries, the results of the

Table 6. **Effect of depth orientation to collaborate with external partners on technological and market capability**

	ALL INDUSTRIES			BIOTECHNOLOGY			CERAMIC			FOOTWEAR			TOY		
VARIABLES	Effect	std	P value	Effect	std	P value	Effect	std	P value	Effect	std	P value	Effect	std	P value
Size -> Market Capability	0.189***	0.040	0.000	-0.015	0.083	0.853	0.260***	0.079	0.001	0.203*	0.085	0.016	0.272**	0.086	0.002
Size -> Technological Capability	0.071†	0.038	0.060	0.020	0.091	0.827	0.178*	0.088	0.043	0.133†	0.081	0.102	0.067	0.091	0.462
Industrial partner -> Market Capability	0.273***	0.043	0.000	0.405***	0.093	0.000	0.247*	0.084	0.003	0.239***	0.074	0.001	0.346***	0.095	0.000
Industrial partner -> Technology Capability	0.199***	0.045	0.000	0.198*	0.100	0.048	0.132	0.102	0.197	0.280***	0.079	0.000	0.241*	0.104	0.021
Non-industrial partner -> Market Capability	0.086†	0.045	0.057	0.008	0.109	0.944	0.021	0.097	0.830	0.220***	0.061	0.000	-0.021	0.096	0.830
Non-industrial partner -> Technology Capability	0.345***	0.037	0.000	0.372***	0.090	0.000	0.294*	0.087	0.001	0.229***	0.071	0.001	0.202*	0.094	0.033

Note: †p < 0.10 *p≤ 0.05 **p≤ 0.01 ***p≤ 0.001

Table 7. **Evaluation of the effect size**

	ALL INDUSTRIES		BIOTECHNOLOGY		CERAMIC		FOOTWEAR		TOY	
VARIABLES	Market Capability	Technological Capability	Market Capability	Technological Capability	Market Capability	Technological Capability	Market Capability	Technological Capability	Market Capability	Technological Capability
Size	0,04	0,01	0,00	0,00	0,07	0,04	0,05	0,02	0,08	0,01
Industrial partner	0,07	0,04	0,17	0,04	0,06	0,02	0,07	0,09	0,14	0,06
Non-industrial partner	0,01	0,13	0,00	0,16	0,00	0,09	0,05	0,06	0,00	0,04
R^2	0,16	0,23	0,14	0,21	0,14	0,19	0,20	0,19	0,20	0,13

f distribution highlight that the collaboration with industrial partner is more relevant for fostering this capability in more traditional industries such as the footwear and toy industry.

5. CONCLUSIONS AND MANAGERIAL IMPLICATIONS

This study explores whether firms' depth orientation to collaborate with external partners contributes to enhancing their technological and marketing capabilities. We purposively differentiate two groups of partners (industrial and non-industrial partners) to take into consideration that they may provide different types of knowledge, they can have different interests or pursue different goals (all these ultimately affecting the extent to which they differently contribute to enhancing firms' capabilities). We also distinguish different industrial categories (medium-high tech industries (biotechnology and ceramic) and medium-low tech industries (footwear and toy) to disentangle whether, differences in the development of firms' technological and marketing capabilities may arise across industrial sectors exhibiting different degrees of technological intensity as a result of interacting with different external partners.

Firstly, we focus our discussion on the role played by industrial and non-industrial partners in the development of firms' capabilities. Specifically, our results show that, as expected, regardless of the industrial sector, depth orientation to collaborate with industrial partners is important for developing marketing capabilities (H1a), whereas depth orientation to non-industrial partners contributes to enhance technological capabilities (H1b). These results are in line with the arguments presented in the literature review that already pointed to the potential role of these two groups of collaborative partners in fostering firms' technological and market capabilities. This is especially relevant in the case of SME's (96% of our sample) given their limited internal capabilities, which make them to call upon external partners in order to develop their capabilities (Spithoven et al., 2010).

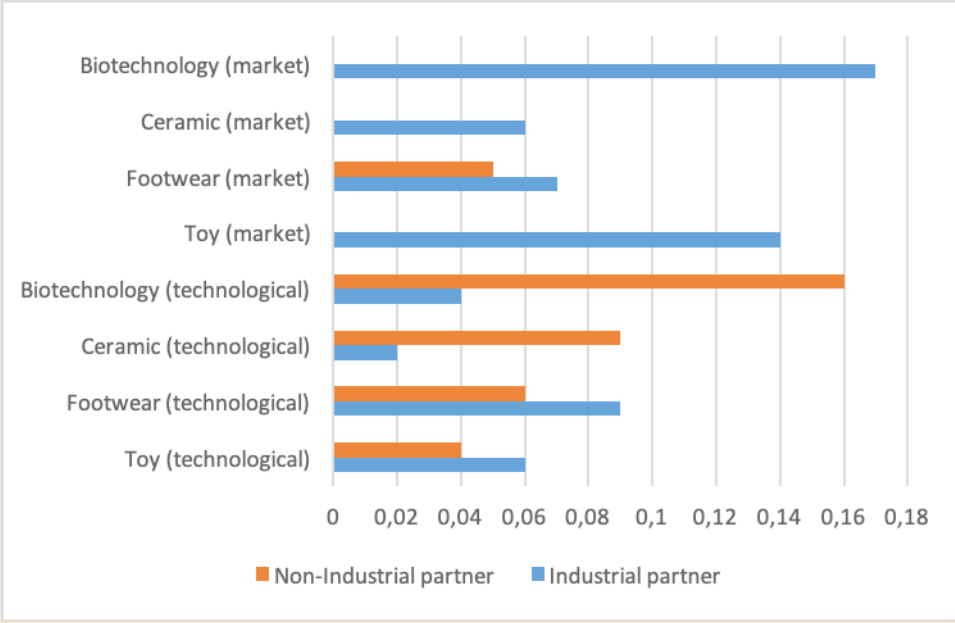
Moreover, our results also highlight the important role of industrial partners in developing technological capabilities, which complements the previously highlighted role of non-industrial partners. These results suggest that managers interested in developing technological capabilities should consider not to restrict their external knowledge search to non-industrial partners, but also to consider the inclusion of industrial partners (such as suppliers, competitors and clients) as

relevant actors to help their firms to develop technological capabilities. Indeed, this may be due to the fact that firms take advantage and benefit from the positive synergies that emerge when interacting with industrial partners with whom they share similar objectives and knowledge base, allowing to complement and reinforce each other to develop their technological capabilities.

An unexpected result is the role played by non-industrial partners in enhancing market capabilities in the footwear sector. This result could be in line with the study conducted by Spithoven et al. (2010) who found that, even if firms consider technology and science partner (such as universities and R&D centres) as ‘‘R&D units” endowed with qualified R&D personnel’, these partners may also provide market information. In other words, firms also value non-industrial partners because of their knowledge broker function (as market information providers) rather than just for their technical support.

Secondly, we focus on the different patterns of collaboration that emerge across sectors to develop firms’ capabilities. For illustrative purposes, **Figure 1** summarise the key results provided in **Table 7** regarding the effect size of firms’ depth orientation to industrial and non-industrial partners according to the industry category and the type of capability developed. It is worthy to highlight the different patterns emerging across low and medium-high technological sectors for the development of their firms’ technological capabilities. Indeed, industries characterised as high-tech (biotechnology) or medium-tech (ceramic) rely more on non-industrial partners than on industrial partners for developing their technological capabilities. Conversely, firms’ belonging to low-tech industries (footwear and toy) rely more on industrial partners than on non-industrial to achieve the same goal (H2b). The rationale behind these results is that medium and high-tech industries need more specialised and explorative knowledge from R&D centres and universities (non-industrial partners) to obtain the necessary support to push their knowledge technological frontier. On the other hand, low-tech firms do not need “edge” technical support, which allows less specialised partners (such as suppliers, clients and competitors) to exert this role of contributing to their technological capabilities. Finally, results indicate that industrial partners play an important role in developing firms’ marketing capabilities regardless of the industrial technological intensity. For instance, biotechnology (high-tech) and toy (low-tech) are the industries that most benefit from establishing intense collaborations with industrial partners

Figure 1. **Effect size of external partners on firms' capabilities across industries**



Source: own elaboration from Table 7.

(thus, we cannot accept H2a). This finding suggests that all industries heavily rely on industrial partners, who are especially relevant for any company aimed at developing its marketing capabilities.

Our findings offer important practical and managerial implications for those managers aiming at developing their firms' marketing and technological capabilities. First, contrary to expected, competitors, clients and providers play an important role in contributing as external partners into the development of technological capabilities, especially in firms operating in low-tech industries. As for every collaboration, managers should also take into account the relevance of establishing the boundaries of the collaborations, along with the expected benefits and obligations for each of the partners involved. Second, our study shows that one-size does not fit all, that is, managers need to first acknowledge the characteristics of the industry where they are operating and the specific needs of the firm (market or technological) as a first step to formulate their knowledge search strategy. Then, managers have to identify the potential partners and their expertise, and analyse whether they fit in with firms' need, in terms of timing,

expected results or property rights, among others.

Interestingly, these findings have important ramifications for innovation and global competitiveness. During this recent crisis period, innovation has been proved to be a critical success factor in the international arena, especially for SMEs. Our study shows that managers need to formulate an external knowledge search strategy allowing the firm to use and integrate knowledge from the competitive environment. This would result in an improvement of market and technology capabilities. These two capabilities constitute the cornerstone of successful innovation since market and technology are the two main sources of the innovation process (OECD, 2005).

This study has some limitations that need to be acknowledged. First, our study analyses two types of capabilities, namely technological and market capabilities, however, future research could address additional capabilities valuable for the firm that has been understudied in the literature such as design capabilities. Second, more research is needed to better understand the role of non-industrial partners in the footwear industry for the development of market capabilities. Future research could address this issue through in-depth qualitative interviews.

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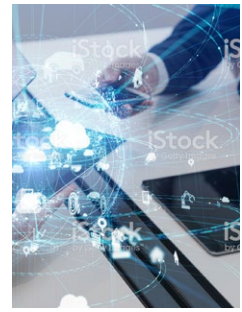

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NOTES

1. **Acknowledgements:** The authors thank the Spanish Ministry of Economics and Competitiveness (Ref. ECO2011-29863 and ECO2015-69704-R) for financial support for this research. The authors would like to thank the editor and two anonymous reviewers for their thoughtful feedback.

APPENDIXS

Technology Capability (Huang, 2011).

Core technology capability
Please, evaluate the grade of agreement with the following statements.
1. Your firm is usually among the first to introduce new products to the market
2. Your firm is this industry's leader in introducing new products
3. Your firm is well known for introducing breakthrough-type products

Innovation orientation
Please evaluate the importance of the following items in your enterprise's innovation?
1. Product innovation
2. Process innovation

Commitment to R&D
Please, evaluate the grade of agreement with the following statements.
1. In your firm, the R&D department receives the most attention
2. A share bonus policy increases the creativity of your engineers

Autonomy of R&D decision
Please, evaluate the grade of agreement with the following statements.
1. Management approves appropriate resources (reverse scaled)
2. The final decision on the adoption is made by the top management (reverse scaled)

Market Capability (Vorhies et al., 2009)

How well does your organisation perform the following activities relative to competitors?
1. Environmental scanning
2. Market planning
3. Marketing skill development
4. Internal coordination and communication

External knowledge sources (Chen et al., 2011; Laursen and Salter, 2006)
Indicate the importance for innovation of the following types of organisations:

1. Suppliers of equipment, material, components or software;
2. Clients of customers;
3. Competitors and other firms from the same industry;
4. Consultants;
5. Commercial laboratories or R&D enterprises;
6. Universities or other higher educational institutes; and
7. Government or private non-profit research institutes.

Note: All the items were evaluated with a Likert scale from 1 to 8.