

Open innovation and superior performance in SMEs: The mediating role of marketing capabilities and innovation

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Recibido: 17 de Octubre de 2021
Aceptado: 25 de Marzo de 2022

<https://doi.org/10.37610/dyo.v77i0.620>

Abstract

Even though many enterprises apply open innovation practices in the search for external sources of knowledge, this does not necessarily translate to improved performance. This issue is especially important for medium and small enterprises (SMEs) which need to expand their knowledge frontiers to survive and achieve superior performance. The objective of this research is to analyze the role of marketing capabilities and innovation in the relationship between open innovation and organizational performance. Using structural equation modeling, this research presents empirical evidence from 154 manufacturing SMEs. Research findings reveal that open innovation alone does not influence organizational performance, confirming that marketing capabilities and innovation play individual and sequential mediation roles in the relationship between open innovation and performance. From this, SME managers, in addition to looking for external knowledge, should develop marketing and innovation capabilities to capitalize this external knowledge and develop effective strategies to significantly impact performance.

Keywords

Open innovation, performance, marketing capabilities, innovation.

1. Introduction

Open innovation allows organizations to improve their innovation processes (Chesbrough, 2003; Garriga et al., 2013), therefore positively impact organizational performance (Van de Vrande et al., 2009; Dahlander & Gann, 2010; Lichtenthaler, 2011; Wang et al., 2015; Popa et al., 2017; Singh et al., 2019). This is achieved by focusing on value creation for the company by using internal and external sources of knowledge (Chesbrough, 2003).

Bigliardi et al., (2020), who carried out an exhaustive review of the literature on open innovation, also conclude that there is little research on the relationship between open innovation and performance (Lopes & Carvalho, 2018), and thus, there is still a gap in the empirical evidence in regards to the understanding of other variables that companies must integrate into their open innovation processes to generate better results. Moreover, there are very few studies on the implications of open innovation in the context of SMEs (Gassman et. al., 2010; Van De Vrande et al.; 2010; Kovács et al.; 2015; Hosainn et al., 2016; Popa et al., 2017; Lopes & de Carvalho, 2018; Radziwon & Bogers, 2019).

Additionally, a review of empirical research on open innovation shows that investing in open innovation practices does not necessarily generate better organizational performance unless companies develop capabilities that lead them to take advantage of external knowledge sources (Lane, Koka, & Pathak, 2006; Chen, Lin, & Chang, 2009; Lewin, Massini, & Peeters, 2011; Foss, Laursen, & Pedersen, 2011).

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With this, we can conclude that there is not necessarily a direct and significant relationship between open innovation and organizational performance (Foss, Lausen & Pedersen, 2011). Thus, despite the research that has been carried out on open innovation (Bogers, et al., 2017), there are still many gaps, for example, few studies have delved into the role of a company's functional capabilities (Liao, et al., 2020). Hence, it is necessary to incorporate new variables to better understand how open innovation could influence small and medium-sized enterprises' (SMEs) performance (Appleyard & Chesbrough, 2017; Albats et al., 2019). Furthermore, exploration of the roles of new variables critical to an organization may contribute to a better understanding of the complexity of open innovation and the mechanisms that improve company performance (West & Bogers, 2014; Randhawa et al., 2016; Bogers et al., 2017; Lopes & Carvalho, 2018).

Although most studies on open innovation focus on its effect on innovation performance (Laursen & Salter, 2006; Chen, Chen & Vanhaverbeke, 2011; Saebi & Foss, 2015; Hossain & Kauranen, 2016; Jugend et al., 2018), there is not much evidence demonstrating the effect that open innovation has on SME performance in combination with specific capabilities (Sisodiya, Johnson & Grégoire, 2013; Hung & Chou, 2013; Popa et al., 2017; Lopes & de Carvalho, 2018; Albats et al., 2019). For low-tech SMEs, the literature on open innovation continues to be scarce and fragmented with a lack of understanding of the prevailing dynamics for this type of company (Popa et al., 2017; Albats et al., 2019).

Organizations may face dynamic and uncertain environments, where knowledge is constantly updated through open innovation (Jansen et al, 2006; Popa et al., 2017). For SMEs with limited resources (Van de Vrande et al., 2009), adopting open innovation is critical to maintaining competitiveness and surviving in the long term (Cheng & Shiu, 2015). Singh et al., (2019) explain that, in this specific SME context, very little has been written to clarify the relationship between open innovation and organizational performance.

The above has generated an important gap in the literature which requires a better understanding of the complex relationship between open innovation and performance to identify other variables which could explain why open innovation practices by themselves are not enough to achieve superior performance. Knowledge acquired from external sources alone does not generate income, therefore it requires other capabilities so this knowledge can be leveraged to develop strategies and actions that really impact business performance. Concluding, it is relevant to understand what other capabilities SMEs need to develop to achieve superior performance from their open innovation practices

Specifically, the research objective is to evaluate the mediating effect of marketing capabilities and innovation on the relationship between open innovation and business performance.

There is empirical evidence linking marketing capabilities and innovation to open innovation (Kim, Lim & Yoo, 2019; Ferreras-Méndez et al., 2019) and organizational performance (Vorhies & Morgan, 2005; Cabral et al., 2015). There is also evidence that marketing capabilities have a significant influence on innovation (Weerawardena, 2003; Mariadoss et al., 2011). Therefore, we argue that open innovation alone is not enough for SMEs to achieve superior performance and in this regard a theoretical model is proposed in which open innovation influences performance through the mediation of two variables marketing capabilities and innovation.

This research focuses on open innovation activities differentiating the effect on business performance of two different types of external sources of knowledge: industrial sources (DIND) and non-industrial sources (DNOIND) (Ferreras-Méndez et al., 2019).

External industrial knowledge sources (DIND) correspond to suppliers, customers and competitors that provide companies with information and knowledge about the market, customer perceptions and preferences, trends and competitive dynamics. On the other hand, external non-industrial knowledge sources (DNOIND) correspond to research centers, laboratories and universities, among others, which provide knowledge about new technologies, and advances in process, equipment, materials, formulations, packaging, etc.

Both types of external sources (industrial and non-industrial), provide different types of knowledge to companies (Chen, Chen & Vanhaverbeke, 2011) and therefore we propose that each of these can provide a different contribution to the development of SMEs capacities, strategies and performance (P).

As Figure 1 illustrates, this research for the first time proposes to evaluate in the same model the role of individual and sequential mediation of marketing capabilities and innovation in the relationship between open innovation and P. Our proposal is that through marketing and innovation capabilities SMEs could leverage knowledge from external sources through open innovation to achieve superior performance.

Accordingly, this paper explores three avenues of mediation in the relationship between open innovation (OI) and business performance. First, marketing capabilities as a mediating variable in the relationship between OI and P. Secondly, innovation as a mediating variable in the relationship between OI and P. Third, based on the strong relationship between marketing capabilities and innovation, a sequential mediation of marketing capabilities and innovation between OI and P is also proposed.

Given that there is very little empirical evidence that analyzes the complexity of the relationship between OI and P in SMEs in low-tech sectors (Popa et al., 2017; Albats et al.,

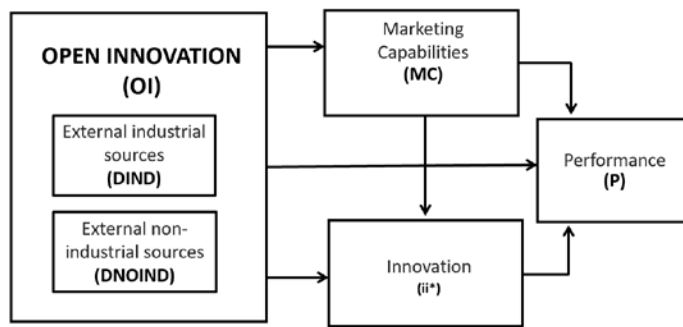
2019) and especially in developing markets (Bernal-Torres et al., 2015), this research focuses on this type of companies and therefore acquires special relevance. SMEs have a very important impact on the economic performance of countries, which demands the attention of researchers, public policy makers and governments.

In summary, because of the gaps identified in open innovation empirical evidence, it is necessary to further analyze the relationship between open innovation and performance in the context of SMEs. Therefore, this research aims to answer this question: What is the role of marketing capabilities and innovation in the relationship between open innovation and performance in the context of SMEs?

We propose that marketing capabilities and innovation act as mediating variables for SMEs to take advantage of the external knowledge coming from their open innovation practices to develop effective strategies and actions to capitalize on market opportunities and achieve superior performance (see Figure 1).

The structure of this paper is as follows: Section 2 includes the theoretical framework and formulation of direct and mediation hypotheses. Section 3 describes the methodology used in the empirical study. Sections 4 and 5 have results and conclusions. Section 6 includes theoretical and practical implications and section 7 presents limitations and guidelines for future research.

Figure 1 Theoretical Model



2. Theoretical framework

2.1. Open innovation, marketing capabilities and innovation

2.1.1. Open innovation and external industrial and non-industrial sources of knowledge

Open innovation is the process that allows knowledge and resources to flow between organizations and the environment to enhance the success of organizations (Chesbrough, 2003; Garriga et al., 2013, Liao et al., 2020). From the perspective of open innovation, the boundaries of organizations become permeable allowing an inward and outward flow of knowledge among members of the ecosystem including external sources (Gassmann & Enkel, 2004, Laursen & Salter, 2006; Enkel et al., 2009; Bogers & West., 2012). External sources include suppliers, consumers, universities, research institutes, and even competitors (Bigliardi & Galati, 2013).

External sources give organizations access to resources and technologies that improve and complement their internal processes (Nieto & Santamaría, 2007; Rodríguez-Ferradas & Alfaro-Tanco, 2016; Ferreras-Méndez et al., 2019). Examining these relationships with external partners, the literature on open innovation mentions that it is characterized

by two aspects which are breadth and depth (Laursen & Salter 2006). Breadth is the number of external sources a company relates with and depth is the intensity of these relations that the company has with the external sources. Comparing the breath versus depth strategy, the search for external sources focused on depth allows a company to develop strong and long lasting relations with external sources that may represent great knowledge potential (Terjesen & Patel, 2017). Thus, strategies for the search of external knowledge based on depth may have a greater benefit for companies to achieve better levels of innovation and performance (Ferreras-Méndez et al., 2019).

Additionally, depending on the type of external sources of knowledge with which the company cooperates in open innovation practices (either to obtain market information or have access to cutting-edge technologies), these external sources are classified as industrial sources (DIND) as suppliers, customers and competitors or non-industrial sources (DNOIND) as scientific and technological sources that include laboratories, universities, consultants and R&D centers (Nieto & Santamaría, 2007; Terjesen & Patel, 2017).

This classification of the 2 types of external sources of knowledge (industrial and non-industrial sources) is due to the fact that each of these sources may provide vital and different knowledge for the company’s competitive advantage and growth. Cooperation with industrial sources (DIND) provides companies with market and consumer

knowledge, while non-industrial sources (DNOIND) offer know-how on new technologies and technical advances to promote innovation (Un et al., 2010; Ferreras-Méndez et al., 2019). Hence, depending on their needs, companies could focus external knowledge efforts towards collaboration and alliances, with external industrial sources and / or external non-industrial sources.

This research therefore addresses and analyzes the effect of open innovation considering these two external sources of knowledge (DIND and DNOIND), given that companies require both types of knowledge (market knowledge and know-how on technological advances) to develop successful strategies and launch products that are aligned with consumer needs (Ferreras-Méndez et al., 2019). Consequently, this research focuses on open innovation evaluating the different effects of external sources of knowledge as drivers of marketing capabilities, innovation and performance.

2.1.2. Marketing capabilities

Marketing capabilities are integration processes through which company knowledge and resources are applied to market requirements, so that companies add value to their products and meet market demands (Day, 1994; Vorhies & Morgan, 2005). There is ample empirical evidence that confirms that marketing capabilities contribute significantly to results (Vorhies & Morgan, 2005; Krasnikov et al., 2008; Morgan, Vorhies & Mason, 2009).

Vorhies & Morgan (2005) identified 8 marketing capabilities: Product Development related to the ability to develop and differentiate products according to customer demands, Pricing as an ability to extract the optimal revenue for value delivery, Channel Management, Communications (advertising, promotion and public relations), Sales Skills, Market Research, Strategic Planning and Implementation.

2.1.3. Innovation

The concept of innovation is usually defined as the successful exploitation of new ideas (Amabile et al., 1996) and the ability to introduce new processes, products or ideas into the organization (Hurley & Hult, 1998). Innovation is "the introduction of a new, or significantly improved, product or a process, a new marketing method or a new organizational method" (OECD-Eurostat, 2005). The most innovative companies have a great ability to adapt to changes in the environment and are therefore able to react more quickly and accurately to the fluctuating needs of the market (Miles & Snow, 1978). Likewise, the growing and sustained success of companies depends on their ability to identify and efficiently take advantage of opportunities related to these changing needs of the environment (Gálvez & García, 2012). The dynamism and turbulence of competitive environments has made innovation an increasingly critical

factor for business survival and success (Damanpour & Gopalakrishnan, 2001; Newey & Zahra, 2009). Innovation therefore allows companies to protect themselves from highly uncertain and unstable scenarios, making them better able to seek new opportunities and exploit existing ones more efficiently (Matzler et al., 2013).

2.2. Direct relationship between open innovation and business performance

The literature on open innovation suggests that the use of external sources leads to better business performance (Laursen & Salter, 2006; Chen, Chen & Vanhaverbeke, 2011; Saebi & Foss, 2015; Popa et al., 2017). However, the analysis of this relationship and the concept of open innovation by itself are complex (Lopes & de Carvalho, 2018) and this is even more so in the context of SMEs where the literature is not enough and results on the impact of usage of external knowledge source on performance have been inconclusive (Singh et al., 2019; Albats et al., 2019).

Although studies indicate that participating in open innovation activities allows companies to access new ideas, knowledge and technology from various sources (Albats et al., 2019), some studies suggest that acquiring external knowledge does not necessarily guarantee better performance because companies require additional mechanisms that allow them to exploit and convert this new knowledge into effective strategies and actions (Ferreras-Méndez et al., 2015). This is relevant, and even more so in the case of SMEs where performance results are not guaranteed given that these types of companies have specific conditions such as limited internal information and limited resources (Verbano, Crema & Venturini, 2015; Lopes & de Carvalho, 2018). Accordingly, it is proposed that the external knowledge sources (industrial and non-industrial) are not enough to achieve superior performance:

H1a: External industrial knowledge sources (DND) do not directly affect performance.

H1b: External non-industrial knowledge sources (DNIND) do not directly affect performance.

2.3. The mediating role of marketing capabilities in the relationship between open innovation and business performance

Marketing capabilities allow to deliver superior value to the customer and reflect the company's ability to design and implement marketing strategies (product, price, distribution and promotion) that effectively attract and retain customers (Song et al., 2005; Morgan, Vorhies & Mason, 2009; O'Cass & Sok, 2012). Because knowledge is a part of the foundation of any capability (Zollo & Winter 2002), it can be stated

that the search for external knowledge could thus drive the development of company capabilities such as marketing capabilities.

The effect of open innovation on marketing capabilities has been analyzed by Ferreras-Méndez et al. (2019) who found that collaboration with industrial partners is positively related to marketing capabilities in various industrial sectors with differing technological intensities. This implies that independently of the type of industry and its technological maturity, collaboration with industrial sources (DIND) such as clients, suppliers and competitors, plays an important role in the development of marketing capabilities at organizations. Suppliers, clients and competitors classified as industrial partners (D'Este et al., 2016) contribute with fundamental knowledge about the market, consumers and competition so companies can identify market opportunities and better respond to market requirements by more effectively focusing their marketing strategies.

Thus, this research proposes that industrial sources (DIND) due to their extensive knowledge and connection with the market are essential for the development of marketing capabilities and therefore companies that have close contact with these sources respond adequately to market changes and requirements. This is especially relevant for SMEs, because of their limited resources and internal capabilities that prompt them to search for collaboration with external sources to develop their capabilities and acquire new knowledge that then allows them to drive innovation and superior performance (Spithoven et al., 2010). Thus, the following hypothesis is proposed:

H2: External industrial sources of knowledge (DIND) are positively related to marketing capabilities

Also, there is extensive empirical evidence that confirms that marketing capabilities contribute significantly to performance (Vorhies & Morgan 2003; Vorhies, Morgan & Autry, 2009). The different marketing capabilities act synergistically to capture customer interest and generate demand for products which is reflected in better performance indicators (Vorhies & Morgan 2003; Vorhies, Morgan & Autry, 2009). Thus, the following hypothesis is proposed:

H3: Marketing capabilities are positively related to business performance

Since the search for knowledge from external industrial sources (DIND) drives the development of marketing capabilities and these in turn impact the company performance, it is proposed that marketing capabilities mediate the relationship between open innovation (DIND) and company performance:

H4: Marketing capabilities play a mediating role in the relation between the external industrial knowledge sources (DIND) and company performance

2.4. The mediating role of innovation in the relationship between open innovation and business performance

Deep and intense relationships with external sources increase the likelihood that external knowledge will be used to develop highly novel innovations (Ferreras-Méndez et al., 2015). Thus, having knowledge from different external sources is critical for businesses to improve their innovation results (Sidhu et al., 2007; Cheng & Huizingh, 2014; Bengtsson et al., 2015; Kim et al., 2019).

In fact, various advantages may be achieved through external knowledge search strategies that positively influence company innovation: Access to new knowledge, development of new competencies, sharing innovation process risk and costs, potentiation of creativity, shorter development and sales times, greater diversity in new product development, timely and efficient exploitation of new market opportunities and updating of technological advances (Drechsler & Natter, 2012; Tidd, 2014).

Companies that take on open innovation practices improve their understanding of client needs and increase their innovative performance and their speed and efficiency in launching new products (Li et al., 2014; Pavlou & El Sawy, 2006). When companies connect with external partners, they have access to multiple knowledge sources, external experience and capabilities, which may promote the process of ideation, collective cooperation, and creativity in designing innovative value proposals for the market (Pavlou & El Sawy, 2006; Chesbrough, 2007; Mount & Garcia, 2014; Tsou & Hsu, 2015; Kim et al., 2019). In line with the aforementioned, Kim et al. (2019) empirically demonstrated that the external search for knowledge is positively related to innovative performance because the combination of external and internal information stimulates a company's innovative dynamics.

It is probable SMEs are specifically in the process of searching for external knowledge through external experience and capabilities to nurture and successfully carry out their innovation ideas (Duran et al., 2016; Liñán & Fayolle., 2019; Kim et al., 2019). Given the essence of external non-industrial knowledge sources, we propose that universities, technological and research centers could offer scientific and technological knowledge, which contributes to propel their innovation initiatives. Based on the above, the following hypothesis is formulated:

H5: External non-industrial sources of knowledge (DNOIND) positively influence innovation

The relationship between innovation and business performance has been widely proven and has a strong theoretical and empirical support (Damanpour & Evan, 1984; Han et al., 1998; Hurley & Hult, 1998; Calantone et al., 2002;

Hult, Hurley & Knight, 2004). Innovation enables companies to achieve better performance because they can react more effectively to market demands by delivering relevant value to the customer (Jansen et al., 2006; Damanpour, Walker & Avellaneda, 2009; Mehmet et al, 2013). Based on this, the following hypothesis is proposed:

H6: Innovation is positively related to business performance

Since the search for knowledge from external non-industrial sources (DNOIND) drives the development of innovation and this in turn impacts the company performance, it is proposed that innovation mediates the relationship between open innovation (from external non-industrial sources - DNOIND) and company performance:

H7: Innovation mediates the relationship between external non-industrial knowledge sources (DNOIND) and business performance

2.5. The sequential mediation role of marketing capabilities and innovation in the relationship between open innovation and business performance

The empirical literature presents evidence that marketing capabilities significantly affect innovation in two ways (Weerawardena, 2003; Mariadoss et al., 2011, Arunachalam et al., 2018). First, they guide progress in new product development through marketing studies that assure attractive potential, relevant value and alignment with consumer needs (Calantone et al., 1993; Song et al., 1996). Second, they facilitate the innovation's success in the market by way of sales plans so the new products successfully penetrate the market (Calantone & di Benedetto, 1998; Byrd, 2002; Arunachalam et al., 2018). Supporting the empirical evidence contributed by Weerawardena (2003), other authors have proven the positive relation and synergy between marketing capabilities and innovation results (Mariados et al., 2011; Merrilees et al., 2011; O'Cass & Sok, 2014; Mu, 2015; Sulisty & Siyamtinah, 2016; Dias & Pereira, 2017; Miocevic & Morgan, 2018; Medase & Barasa., 2019).

Similarly, marketing capabilities are closely linked to the value creation and value capture processes so that innovation is aligned with market needs and in turn the sales strategy generates the expected levels of demand and profits (Sok et al., 2013; Arunachalam et al., 2018; Rahomee, 2020). For SMEs in emerging countries, this is notably important because the marketing function in general is focused on sales such that specialized studies to guide, validate and reduce uncertainty are not applied to advance the innovation process in line with client needs. Also, sufficient resources are not invested to develop and implement a robust sales plan for new products in order to promote successful market entry (Medase & Barasa, 2019). In other words, it is proposed that the strong relation between marketing capabilities and innovation may be an important mechanism that fills the

gap in the literature to understand of why applying open innovation practices do not necessarily achieve superior performance.

H8: Marketing capabilities are positively related to innovation.

Based on this, this research proposes that SMEs could take full advantage of knowledge from external industrial sources (DIND) and achieve better results by developing marketing capabilities and innovation that enables them to deliver superior value to the customer and achieve a positive impact on performance. Because marketing capabilities and innovation results affect performance (Morgan, 2012; Morgan et al., 2009; Arunachalam et al., 2018) and are connected to each other, this research propose that this relationship could be a bridge that can facilitate the utilization of the external knowledge from open innovation to generate better business results. In summary, it is proposed that through the marketing capabilities that influence innovation, external knowledge acquired through open innovation practices can effectively impact performance.

H9: Marketing capabilities and innovation play a sequential mediation role in the relationship between the external industrial knowledge sources and business performance

3. Methodology

3.1. Sample selection and data analysis method

This research focuses on 154 manufacturing SMEs in traditional low-tech sectors such as food and beverages, footwear and leather goods, textiles and apparel. These sectors have been defined as low-tech sectors according to technological intensity classification defined in NACE (Statistical Nomenclature of Economic Activities of the European Community) (Eurostat, 2008). This ranking was based on R&D intensity (R&D expenditure in relation to production) weighted by sector and country, and led to a list that places manufacturing industries in four categories (high, medium-high, medium-low and low technology), which has been widely used by OECD (Organization for Economic Cooperation and Development) member countries and many others as well.

Table 1 presents a description of the distribution of the sample by type of industry, number of employees, age and size. Among the main particularities of the sample is that 100% is composed of small and medium-sized enterprises (SMEs). As mentioned above, the focus of the sample in SMEs and the low-tech sector responds to the need to advance knowledge in this particular type of companies in relation to open innovation, development of capabilities and performance (Van de Vrande et al., 2009; Popa et al., 2017; Lopes & Carvalho, 2018 Albats et al., 2019).

Table 1 Sample profile (N=154 manufacturing SME's)

Sectors	Frequency	Percent
Food and beverages	62	40%
Clothing	28	18%
Cosmetics and toiletries	19	12%
Other manufacturing industries	24	16%
Footwear and leather goods	10	6%
Furniture, mattresses and bed bases	6	4%
Textile products	5	3%
Size and number of employees	Frequency	Percent
Medium (51-200 employees)	98	64%
Small (31-50 employees)	56	36%
Age	Frequency	Percent
> 30 years	56	37%
Between 21 and 30 years	37	24%
Between 11 and 15 years	32	20%
Between 5 and 10 years	29	19%

The database of manufacturing companies was provided by the National Chamber of Commerce of Colombia. The universe of companies corresponding to the low-tech sector was 1540 companies. An email requesting a personal interview was sent to all companies in the universe to apply the research questionnaire. An effective response rate of 10% was achieved.

For this research, structural equation modeling (SEM) was used, specifically the variant-based PLS (Partial Least Square) method with the SmartPLS 3.0 software package.

3.2. Questionnaire design and measurement scales

Each of the variables that make up this research was measured using the measurement scales validated in the literature. To ensure that the items in the questionnaire were clear and understandable by the respondents, while maintaining the meaning of the original scales, a pretest was conducted with managers and marketing managers from 20 SMEs. Vorhies & Morgan's (2003; 2005) scale was used to measure marketing capabilities, which include: CCMPRE (pricing), CCMP (product development), CCMC (distribution channel), CCMPU (advertising and promotion), CCMV (sales), CCMPPL (marketing planning), CCMIM (implementation of marketing strategies) and CCMI (marketing information management).

To measure innovation, Weerawardena, 2003 and Weerawardena & O'Cass (2004) scales were used including the type of innovation, the intensity with which the company works on innovation (it^*), and the degree of novelty of the innovation (gn). To measure open innovation, the depth

dimension was selected differentiating between two types of external knowledge sources (Ferreras-Méndez et al., 2019) such as external industrial sources of knowledge (DIND) and external non-industrial sources of knowledge (DNOIND). The scale of Reinartz et al., (2004) was used to measure organizational performance and it includes: global results, sales growth, profitability, market share, customer satisfaction and productivity.

Taking into account the empirical studies reviewed to develop the theoretical framework, age and size of the company were taken into account as control variables.

4. Results

Specifically, PLS involves following a two-step approach that includes a measurement model evaluation and a structural model. The assessment of the measurement model that measures the reliability and validity of the model (Table 2 and Table 3) allows us to conclude that the criterion of individual reliability is met because according to Chin (1998) and Hair et al., (2014) all loads must be equal to or greater than 0.707 (Table 2).

As presented in Table 2, all constructs meet the reliability criterion because all values of composite reliability and Cronbach's alpha are greater than or equal to 0.7 (Nunnally, 1978). Furthermore, the latent variables reach convergent validity because their Average Variance Extracted (AVE) exceeds the 0.5 level (Fornell & Larcker, 1981). As shown in Table 3, all the variables meet the requirements of discriminant validity since the square root of AVE exceeds the correlations between constructs in all cases (Fornell & Larcker, 1981).

Table 2 Construct reliability and Convergent validity

Construct	Dimension	Factor Loading	Construct reliability		Convergent validity
			Composite reliability	Cronbach's alpha	AVE
Marketing Capabilities (MC)	CCMI	0,801	0,902	0,872	0,606
	CCMIM	0,805			
	CCMP	0,824			
	CCMPL	0,732			
	CCMPRE	0,740			
	CCMPU	0,761			
Innovation (ii*)	it*	0,899	0,882	0,734	0,790
	gn	0,878			
External industrial sources	DIND	1,000	1,000	1,000	1,000
External non-industrial sources	DNONIND	1,000	1,000	1,000	1,000
Performance (P)	P7_1P1	0,885	0,872	0,803	0,633
	P7_2P2	0,775			
	P7_3P3	0,814			
	P7_6P6	0,697			

Table 3 Discriminant validity (Fornell-Larcker Criterion)

	MC	Age	P	DIND	DNOIND	ii*	Size
MC	0,778						
Age	-0,062	1,000					
P	0,502	-0,166	0,795				
DIND	0,271	-0,010	0,192	1,000			
DNOIND	0,141	-0,009	0,083	0,402	1,000		
ii*	0,405	-0,083	0,502	0,266	0,304	0,889	
Size	0,200	0,134	0,178	0,216	0,158	0,275	1,000

To estimate the significance of the direct effects of the path model, a bootstrapping process (5,000 samples) was carried out (Roldán & Sánchez-Franco, 2012). The result of the structural model evaluation confirms that all the proposed direct hypotheses are statistically significant

(Table 4), excluding the relationship between external source (industrial and non-industrial) and performance. It is also noted that control variables do not have a significant effect on performance.

Table 4 Results of direct hypotheses

Notes:ii*Innovation MC: Marketing capabilities. P: Performance. DIND: External industrial sources. DNOIND: External non-industrial sources. ***p< 0.001, **p<0.01, *p<0.05 (based on t (4999), one-tailed test). t (0.05, 4999) = 1.645, t (0.01, 4999) = 2.327, t (0.001, 4999) = 3.092.

Hypothesis and direct effects	Direct effect	P-value	t-value (bootstrap)	Correlation	Percentile 95% confidence intervals
H1a: DIND→P	0,031ns	0,720	0,358	0,192	[-0,141; 0,206] No Sig.
H1b: DNOIND→P	-0,095ns	0,235	1,188	0,083	[-0,253; 0,068] No Sig.
H2: DIND →MC	0,256*	0,003	2,998	0,271	[0,092; 0,422] Sig.
H3: MC →P	0,346***	0,000	4,992	0,502	[0,212; 0,484] Sig.
H5: DNOIND→ii*	0,222*	0,020	2,335	0,304	[0,038; 0,403] Sig.
H6: ii* →P	0,364***	0,000	4,600	0,502	[0,209; 0,516] Sig.
H8: MC→ii*	0,352***	0,000	4,661	0,405	[0,202; 0,503] Sig.
Size → P	0,034ns	0,666	0,432	0,178	[-0,122; 0,173] No Sig.
Age→ P	-0,119ns	0,133	1,504	-0,166	[-0,270; 0,042] No Sig.

To visualize the calculation process for the mediation hypotheses (H4, H7 and H9), two models are proposed in Figure 2. The first model (Figure 2 model A) corresponds to the total effect of open innovation (DIND and DNOIND) (represented by b1 and b2, respectively) on P. These total effects can be achieved through a variety of direct and indirect routes (Hayes, 2009). In Figure 2 (Model B), the

total effect of open innovation on performance is made up of the direct effects (b3 and b4) and indirect effects that correspond to the 3 mediation hypotheses (H4, H7 and H9). Applying the analytical approach described by Preacher & Hayes (2008), these mediation effects were tested for the 3 mediation hypotheses (Table 5).

Figure 2 Evaluation of Mediation hypothesis
Model A: Total effect of DIND and DNOIND on P

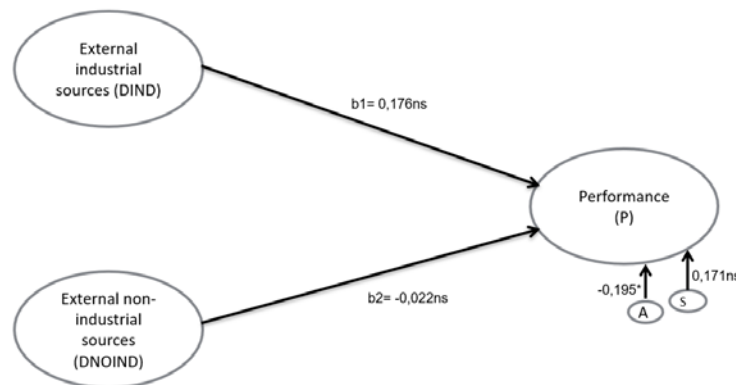
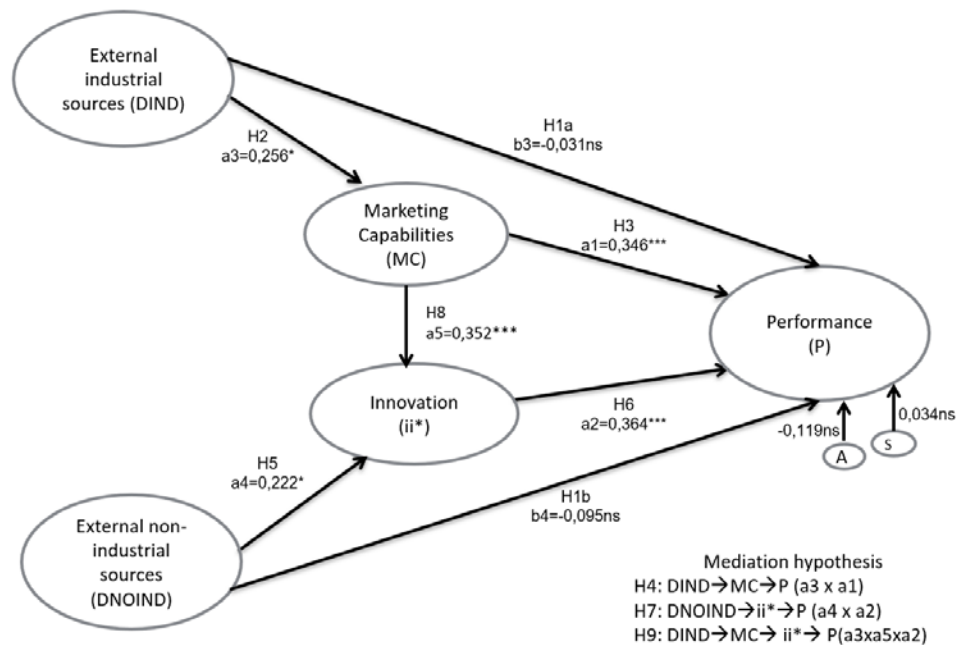


Figure 2 Evaluation of Mediation hypothesis
Model B: Direct effects + Indirect effects between DIND, DNOIND and P



The bootstrapping procedure was selected to test the indirect effects (mediation hypothesis) (Williams & MacKinnon, 2008) and a two-step procedure was applied to test the mediation in PLS (Chin, 2010). First, this model was used with both direct and indirect routes included, and 5,000 bootstrapping resamplings were conducted (Hayes, 2009). The product of the direct routes that form the evaluated indirect route was calculated. Secondly, their significance was estimated using the bootstrap percentile (Williams & MacKinnon, 2008). This generated a 95% confidence interval (CI) to evaluate the significance of the mediation hypotheses. In the evaluation of a mediating effect, a confidence interval (CI) without zero means that the indirect effect is significantly different from zero at a 95% confidence level.

With this, and based on model B (Figure 2), the indirect effects of external knowledge sources (DIND and DNOIND) on performance (P) were calculated as indicated: First, the indirect effects of external industrial sources (DIND) on performance (P) mediated by MC (H4) (a3xa1); second, the indirect effects of external non-industrial sources (DNOIND) on performance (P) mediated by innovation (H7) (a4xa2), and third, includes the indirect effects of external industrial

sources (DIND) on performance (P) with multiple sequential mediation by MC and innovation (H9) (a3xa5axa2).

Table 5 shows the results of these tests for the mediating effects. Open innovation measured for external industrial and non-industrial sources (DIND and DNOIND) does not have a significant overall effect on Performance ($b1 = 0.176ns$ t -value = 1.542 and $b2 = -0.022ns$ t -value = 0.197) (Figure 2 Model A). Table 5 shows that when the mediating variable marketing capabilities (MC) is introduced in the relationship between open innovation (DIND) and performance, the confidence intervals show that the mediating effect of MC in this relationship is significant (H4). Table 5 shows also that when the mediating variable innovation (ii) is introduced in the relationship between open innovation (DNOIND) and performance, the confidence intervals show that the innovation mediating effect in this relationship is significant (H7). Because the direct relationships between external industrial and non-industrial sources (DIND and DNOIND) and performance (P) are not significant, these results show that MC totally mediate the relationship between external industrial sources (DIND) and P (H4) and innovation also totally mediates the relationship between external non-industrial sources (DNOIND) and P (H7).

Table 5 Results of mediating hypothesis

MODEL A					
Total Effect of DIND and DNOIND on P					
Path coefficients	t value	P value	Percentile bootstrap 95% Confidence Interval		
			Lower	Upper	Significance
DIND→P $b1 = 0,176ns$	1,542	0,123	-0,078	0,384	No Sig.
DNOIND→P $b2 = -0,022ns$	0,197	0,844	-0,232	0,202	No Sig.
MODEL B					
Direct Effect of DIND and DNOIND on P					
Path coefficients	t value	P value	Percentile bootstrap 95% Confidence Interval		
			Lower	Upper	Significance
H1a: DIND→P $b3 = -0,023 ns$	0,247	0,805	-0,207	0,163	No Sig.
H1b: DNOIND→P $b4 = 0,026 ns$	0,327	0,744	-0,133	0,185	No Sig.
Indirect Effects of DIND and DNOIND on P					
Mediation Hypothesis	Point estimate		Percentile bootstrap 95% Confidence Interval		
			Lower	Upper	Significance
H4: DIND→MC→P (via MC)	0,048		0,008	0,095	Sig.
H7: DNOIND→ii*→P (via ii*)	0,063		0,140	0,011	Sig.
H9: DIND→MC→ii*→P (via MC and ii*)	0,0130		0,0013	0,0315	Sig.

Therefore, MC and innovation are important explanatory variables to better understand the effect of open innovation on performance, previously mentioned as an important gap in the existing literature. Finally, the results show that the multiple sequential mediation of MC and innovation is significant for the relationship between external industrial (DIND) sources and performance (P) (H9).

5. Conclusions

This research seeks to answer the research question: What is the role of marketing capabilities and innovation in the

relationship between open innovation and organizational performance in SMEs? By answering this question we seek to contribute relevant knowledge to the existing gap in the literature to better understand the complex relationship between OI and P in the context of SMEs.

Based on existing empirical research, we argue that although open innovation is very important to obtain knowledge from external sources, it is not enough for SMEs to achieve superior performance. Therefore, we argue that marketing capabilities and innovation could have a mediating role through which open innovation could significantly influences performance.

As stated above, this paper differentiates two external sources of knowledge: external industrial sources and external non-industrial sources (DIND and DNOIND), which provide different types of knowledge (either related to the market or technology respectively) and hence each source has different effects on business performance.

The results indicate that the relationship between OI and P is not significant, which allows us to conclude that open innovation is not enough for SMEs to achieve superior performance (H1a and H1b). Many companies adopt open innovation with broad and deep relationships with different external sources (industrial sources/DIND and non-industrial sources/DNOIND) to improve their business results through the transfer of external knowledge. However, the empirical evidence provided by this research in line with the empirical evidence cited above, corroborates that open innovation practices are not enough by themselves for SMEs to achieve superior performance. Therefore, it is concluded that the knowledge absorbed from relationships with external sources by itself does not generate a significant and positive impact on the performance of SMEs.

Likewise, the results reveal that open innovation has an indirect effect on performance through marketing capabilities and innovation, highlighting that external sources of knowledge (industrial sources and non-industrial sources) have different effects on business performance (H4, H7, H9).

The results confirm the role of individual (H4, H7) and sequential mediation (H9) that marketing capabilities and innovation play in the relationship between open innovation and performance and therefore contribute to empirical research that to date has sought to analyze the mechanisms that are required for SMEs that have open innovation practices to achieve superior performance. This research helps to partially explain why some SMEs with weaknesses in marketing and innovation do not always achieve superior performance and highlights the important role played by these two capabilities as mediators that facilitate the exploitation of the transferred external knowledge and therefore its significant impact on performance.

Specifically, this research reveals empirical evidence of the three indirect effects of open innovation (from both industrial and non-industrial sources) on performance through the individual and sequential mediation of marketing capabilities and innovation.

First, the results reveal the first indirect effect of open innovation on P through MC (H4). These marketing capabilities based on market knowledge (from external industrial sources) allow SMEs to deliver superior value to the customer through the implementation of effective marketing strategies that connect customers with the company's brands. Thus, market and customer trend knowledge from external industrial sources such as customers, suppliers

and competitors (DIND) allows SMEs to develop market knowledge skills that drive the development of marketing capabilities (H2) to significantly impact performance (H3).

Secondly, the results reveal the second indirect effect of open innovation on P through innovation (H7). These results point out the importance that SMEs develop innovation capabilities by taking advantage of technological knowledge from external non-industrial sources (DNOIND - laboratories, research centers, universities, R&D centers, etc.). This technological knowledge may allow them to improve innovation and respond in a timely and aligned way to market requirements.

This mediation reveals that technological knowledge from external non-industrial sources (DNOIND) plays a key role in promoting innovation (H5) which in turn significantly influences the performance of SMEs (H6). These results indicate that non-industrial sources of knowledge allow SMEs to improve their business performance, but only if SMEs have improved their innovation capabilities.

Third, the results reveal the third indirect effect of open innovation on P through sequential mediation of marketing capabilities and innovation (H9). Therefore, the strong relationship between marketing capabilities and innovation (H8) acts as a mediation mechanism through which SMEs practicing open innovation can achieve superior performance.

The confirmation of hypothesis H8 contributes also to the scarce empirical evidence on the link between marketing capabilities and innovation (Weerawardena, 2003; Mariadoss et al., 2011). These results confirm how important it is for SMEs to focus efforts in promoting the development of marketing capabilities to improve their innovation results.

The results of this third mediation between open innovation and performance show that by developing both marketing and innovation capabilities, SMEs that practice open innovation with different types of external partners can capture and leverage market and technological knowledge to develop effective strategies aligned with customer needs to improve their results.

In conclusion, SMEs that look for cooperation agreements with external sources of knowledge and want to successfully capture marketing opportunities, should promote the development of their marketing and innovation capabilities.

6. Theoretical and practical implications

From the theoretical point of view, this research makes important contributions. First, it contributes to the gap identified in the literature on open innovation, specifically in the context of SMEs, as it complements previous studies that have analyzed the inconclusive effect of open innovation

on business performance (Sisodiya, Johnson & Grégoire, 2013; Hung & Chou, 2013; Popa et al., 2017; Lopes & de Carvalho, 2018). Additionally, this research points out the differential effect on performance of external industrial and non-industrial knowledge sources.

The relationship between open innovation and business performance should not be considered a simple direct relationship, since it is conditioned by the type of external knowledge and a series of variables such as MC and innovation that interact with each other to achieve better business results.

The evidence indicates that SMEs must consider using both external industrial and non-industrial sources because each of these sources contributes in a different way (marketing and technological knowledge) to achieve superior performance. Therefore, SMEs that lack specialized marketing resources, market trend information and technological knowledge should promote cooperation agreements with industrial and non-industrial sources to boost their marketing and innovation capabilities to achieve superior performance.

7. Limitations and guidelines for future research

One of the limitations of this research is the cross-sectional nature. Another limitation is the specific context, so it is recommended that future research examine this relationship between open innovation and performance in other contexts. For future lines of research it is suggested to evaluate the mediating effect of other capabilities such as absorption or learning capabilities that could contribute to better understand this complex relationship.

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