

# ARTICLES

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## ANALYZING MARKETING INNOVATION IN PERUVIAN MANUFACTURING COMPANIES OF LOWER TECHNOLOGICAL INTENSITY

*Analisando a inovação comercial em empresas manufatureiras peruanas de menor intensidade tecnológica*

*Analizando la innovación comercial en las empresas peruanas de manufactura de menor intensidad tecnológica*

### ABSTRACT

Non-technological innovation, including organizational and marketing innovation, has attracted substantial interest from researchers. The present study focuses on how external sources of knowledge relate to product, organizational, and marketing innovation, as well as analyzing how product and organizational innovation mediate the relationship between external sources of knowledge and marketing innovation. Current studies on marketing innovation do not present its real impact and importance for manufacturing companies. Using data from 557 Peruvian manufacturing companies that possess lower technological intensity, a model of partial structural equations was applied. The results show that external sources of market knowledge are related to product and organizational innovation. Managers should promote product innovations that favor the development of marketing innovations in the company.

**KEYWORDS** | Innovation, external sources of market knowledge, manufacturing, technological intensity, Peru.

### RESUMO

*A inovação não tecnológica, entendida como a realização de inovações organizacionais e comerciais, tem atraído muito interesse dos pesquisadores. O presente estudo concentra-se em como as fontes externas de conhecimento se relacionam com a inovação de produto, organizacional e comercial, bem como analisa como a inovação organizacional e de produto medeia a relação entre fontes externas de conhecimento e inovação comercial. Os estudos sobre inovação comercial não apresentam seu real impacto e importância para as empresas manufatureiras. Utilizando dados de 557 empresas industriais peruanas que apresentam menor intensidade tecnológica, foi aplicado um modelo de equações estruturais. Os resultados mostram que fontes externas de conhecimento estão relacionadas à inovação de produto e organizacional. Os gerentes devem promover inovações de produtos que favoreçam o desenvolvimento de inovações comerciais na empresa.*

**PALAVRAS-CHAVE** | inovação, fontes externas de conhecimento do mercado, manufatura, intensidade tecnológica, Peru.

### RESUMEN

*En la última década, la innovación no tecnológica ha llamado mucho el interés de los investigadores. Este tipo de innovación incluye la organizacional y comercial. El presente estudio se enfoca en dos objetivos principales: identificar la relación entre las fuentes externas de conocimiento y la innovación en producto, organizacional y comercial; y analizar cómo la innovación en producto y organizacional median la relación entre las fuentes externas de conocimiento y la innovación comercial. Actualmente, los estudios sobre este tipo de innovación no presentan su real impacto e importancia para las empresas de manufactura, por lo que es importante prestarle atención. Usando los datos de 557 empresas peruanas de manufactura que presentan una menor intensidad tecnológica, se aplicó un modelo de ecuaciones estructurales. Los resultados mostraron que las fuentes externas de conocimiento están relacionadas con la innovación en producto y organizacional. Por ello, los gerentes deben impulsar las innovaciones en producto que favorezcan el desarrollo de innovaciones comerciales en la empresa.*

**PALABRAS CLAVE** | Innovación, fuentes externas de conocimiento de mercado, manufatura, intensidad tecnológica, Perú

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## INTRODUCTION

Although researchers have thoroughly studied how external sources of knowledge are related to companies' innovation capacity (Caloghirou, Kastelli, & Tsakanikas, 2004), it can be appreciated that a greater number of studies link these sources to technological innovation (Un & Asakawa, 2015) than to non-technological innovation, which includes the development of organizational and marketing innovations (Mothe & Thi, 2010). However, research related to non-technological innovation is rising as a new paradigm (Damanpour, 2014; Volberda, Bosch, & Mihalache, 2014).

Thus, in this field of interest, researchers have investigated how non-technological innovation is related to technological innovation (Mothe & Uyen, 2012). In addition, studies have been carried out that link organizational innovation with product innovation (Camisón & Villar-López, 2014). Furthermore, studies have analyzed how the exchange of tacit knowledge between the sales and marketing areas speeds up the development of marketing innovations (Arnett & Wittmann, 2014). Similarly, studies have investigated how the four most frequent types of innovation, namely product, process, organization, and marketing, are related to each other (Gunday, Ulusoy, Kilic, & Alpkán, 2011).

The relationships between external sources of knowledge and the different types of innovation in countries belonging to the Organization for Economic Co-operation and Development (OECD) have also been studied, for example, Montoro-Sánchez, Ortiz-de-Urbina-Criado, and Mora-Valentín (2011).

Existing studies on marketing innovation, which is the main topic of this present study, do not show its real importance to and impact on company performance (Aksoy, 2017). Moreover, there are not many studies that focused on manufacturing companies with lower technological intensity in emerging economies (Gallegos & Torner, 2018).

In this sense, this study hopes to contribute to the literature on marketing innovation by showing how external sources of knowledge are related to this concept and how product and organizational innovation favor its development in small and medium-sized manufacturing companies with low and medium-low technological intensity in an emerging economy.

To understand this situation, it is necessary to be conscious of the fact that the context of companies in emerging economies is different from those in more developed economies, as indicated by Lee, Özsomer, and Zhou (2015). In other words, in an emerging economy, the context of companies with lower technological intensity is characterized by low levels of political stability (Olavarrieta & Villena, 2014), a high degree of informality (Heredia,

Flores, Geldes, & Heredia, 2017), and high levels of corruption (Paunov, 2016). From this perspective, emerging economies do not possess conditions that are favorable to innovation, which is an indispensable requirement for manufacturing companies with lower technological intensity to survive and be competitive in the global market.

In this way, this study will help in analyzing the relationship between external sources of knowledge and different types of innovation in an emerging economy. In addition, it will help to compare the innovative behavior of companies with lower technological intensity in this type of economy and that of companies in more developed economies.

This article focuses on Peruvian manufacturing companies that participated in the National Innovation Survey of the Manufacturing Industry in 2012 and seeks to answer the question, "How are external sources of knowledge, product innovation, and organizational innovation related to marketing innovation?" Based on this question, the research objective was to explain five relationships: (1) between external sources of knowledge and marketing innovation, (2) between product innovation and marketing innovation, (3) between organizational innovation and marketing innovation, (4) the mediating effect of product innovation on the relationship between external sources of knowledge and marketing innovation, and (5) the mediating effect of organizational innovation on the relationship between external sources of knowledge and marketing innovation.

The article is organized into four sections. The first section explains the theoretical framework and the hypotheses of the study. The second section describes the methodology used. The third section shows the results and includes the mediation model, the structural model, the mediation analysis, and the analysis of the control variables. The fourth section presents the discussion, conclusions, limitations, and proposals for future research.

## THEORETICAL FRAMEWORK AND HYPOTHESES

To introduce the theoretical framework, it is necessary to first present some basic definitions, for example, of technological intensity, product innovation, organizational innovation, marketing innovation, and external sources of market knowledge.

Ang (2008), citing a report from the OECD (1997), defines the technological intensity of an industry as the indicator that is the result of dividing the research and development expenses during a period by the output (generally, sales) during the same period. In terms of technological intensity, manufacturers have

been categorized in different ways. In this article, the OECD classification, which consists of four categories, is used, namely high, medium-high, medium-low, and low technological intensity.

Gunday et al. (2011) assert that product innovation “is the introduction of a good or service that is new or significantly improved regarding its characteristics” (p. 662).

Rajapathirana and Hui (2018) define organizational innovation as “the implementation of a new organizational method in the firm’s business practice, organization or external relations” (p. 46).

Marketing innovation is defined as “improvement in product design, placement, promotion or pricing” (Naidoo, 2010, p. 1311).

Finally, external sources of market knowledge play an important role in the development of innovation. Moilanen, Østbye, and Woll (2014) indicate that these external sources are related to the innovative performance of small businesses. Moreover, Chen, Link, and Chang (2009) and Leiponen and Helfat (2010) believe that companies interact with their customers and suppliers to make the exchange of knowledge easier and, therefore, develop their innovation capability. Additionally, Tödtling, Lehner, and Kaufmann (2009) believe that each external source of market knowledge helps to bring about the development of more innovations; thus, customers provide ideas to inspire new products, providers also play an important role, and competitors goad each other on to develop innovations.

It is necessary to mention that this study focuses on low-tech manufacturing companies. Thus, Zouaghi, Sánchez, and Martínez (2018) indicate that companies with lower technological intensity take into account that suppliers and customers are an important source of knowledge that helps them understand their markets better. Along the same lines, Segarra-Ciprés, Roca-Puig, and Bou-Llusar (2014) indicate that, when comparing companies with higher and lower technological intensity, there are differences in the sources of information, namely customers, suppliers, and competitors. Therefore, in this study, among the external sources of market knowledge, customers, suppliers, and competitors are considered. Then, the following section will provide the theoretical framework that supports the research hypothesis.

## External sources of market knowledge are related to marketing innovation

External sources of market knowledge are associated with companies’ innovation capability (Wang, Wang, Zhao, Lyles, & Zhu, 2016). Moreover, in a study by Varis and Littunen (2010) that

analyzes small and medium-sized Finnish businesses that have obtained knowledge from external sources, it was found that these sources are positively associated with different kinds of innovation, among them, marketing innovation. In addition, studies have been carried out among companies with lower technological intensity. Parra-Requena, Ruiz-Ortega, García-Villaverde, and Rodrigo-Alarcón (2015) conducted a quantitative analysis of the Spanish shoe industry and found that the acquisition of external knowledge favors innovation in those companies. Additionally, Vega-Jurado, Juliao-Esparragoza, Paternina-Arboleda, and Velez’s (2015) case study concluded that companies that participate in collaborative projects develop their innovation capability and carry out marketing innovations. However, whether or not these innovations are carried out depends on how easy it is for each company to access new sources of knowledge (Geldes & Felzensztein, 2013). In the same way, to develop this capability, routines should be implemented to facilitate the exchange of information and knowledge between individual sources of knowledge (Ngo & O’Cass, 2012).

Therefore, the following hypothesis is proposed:

H1: External sources of market knowledge are related to marketing innovation.

## External sources of market knowledge are related to product innovation

Companies that expose themselves to more diverse sources of knowledge improve their innovation capability (Dahlander, O’Mahony, & Gann, 2016). This is demonstrated by the fact that, due to their limited resources, companies with lower technological intensity appeal to external sources of market knowledge to carry out product innovations (Hirsch-Kreinsen, 2008). For example, knowledge from customers can be considered a fundamental contribution to product innovation (Grimpe & Kaiser, 2010). This has been proven in different studies that relate external sources of knowledge to this type of innovation.

Comparing Finnish service industry companies with manufacturing companies, Leiponen (2012), found that companies that seek out diverse sources of knowledge increase the probability that one of these sources will provide them with useful knowledge to develop innovations. In addition, Ganter and Hecker (2013) studied how companies manage external relationships to acquire knowledge that will allow them to develop product innovations. Similarly, Maes and Sels (2014) empirically demonstrated how the development of capabilities oriented toward the acquisition of knowledge contributes to the carrying out of radical product innovations in small and medium-sized

companies. Furthermore, through an analysis of two innovation surveys of Korean manufacturing companies, [Kim and Lui \(2015\)](#) found that companies that interact with their customers, suppliers, and competitors are better able to carry out product innovations.

Thus, [Ardito and Petruzzelli's \(2017\)](#) finding that access to external knowledge has a positive impact on product innovation, since this new and existing knowledge in an organization is the basis for marketing new products, can be confirmed.

This leads to the formulation of the following hypothesis:

H2: External sources of market knowledge are related to product innovation.

### External sources of market knowledge are related to organizational innovation

External sources of market knowledge are related to organizational innovation. Therefore, the process of knowledge acquisition favors the development of organizational innovations ([Liao, Fei, & Liu, 2008](#)). However, it is important to specify that the implementation of new practices that favor the development of organizational innovations is helped by the three sources of knowledge, namely internal, market, and professional sources ([Mol & Birkinshaw, 2009](#)). Additionally, the management of knowledge helps to improve organizational innovation capability, since it involves the company interacting with external sources of market knowledge ([Mehrabani & Shajari, 2012](#)). The more the company interacts with external sources of market knowledge, the greater the level of adoption of organizational innovations ([Ganter & Hecker, 2013](#)). Finally, external sources of market knowledge increase companies' resources and capabilities, which, with the help of the companies' organizational capabilities, will help them to make better decisions regarding innovations ([Hervas-Oliver, Sempere-Ripoll, & Boronat-Mol, 2014](#)).

Various studies that verify this can be mentioned. [Noruzi, Dalfard, Azhdari, Nazari-Shirkouhi, and Rezazadeh \(2013\)](#) analyzed more than 100 Iranian manufacturing companies with over 50 employees each and found that organizational learning and the management of knowledge directly influence organizational innovation. [Brunswicker and Vanhaverbeke \(2015\)](#) also analyzed how small and medium-sized companies interact with external sources of market knowledge within the inbound open innovation model and found that these companies orient their efforts toward developing organizational innovations.

This leads to the following hypothesis:

H3: External sources of market knowledge are related to organizational innovation.

### Product innovation mediates the relationship between external sources of market knowledge and marketing innovation

We have hypothesized that external sources of market knowledge are related to product innovation, and product innovation is related to marketing innovation. Broadly speaking, [Escribano, Fosfuri, and Tribó \(2009\)](#) argue that those companies that develop high levels of absorptive capacity are better able to manage external flows of knowledge and, in this way, to stimulate their innovation capability.

The literature review shows that the relationship between external sources of market knowledge and product innovation has been thoroughly studied. Thus, [Lau, Tang, and Yam \(2010\)](#) examined the impact of the customers and suppliers who, by sharing knowledge with the company, collaborate in the development of its product innovations. [Un, Cuervo-Cazurra, and Asakawa \(2010\)](#), through empirical evaluation, also found that, in the interaction between a company and its customers, suppliers, and competitors, flows of knowledge are generated that help the company to develop product innovation.

It can be appreciated that the said relationship has been analyzed under special economic conditions, as suggested by [Medrano and Olarte-Pascual \(2016\)](#), who studied the effects of a crisis on marketing innovation and identified that the companies that carried out product innovations are more likely to implement marketing innovations.

Moreover, [Aksoy \(2017\)](#) points out that studies have shown a close relationship between product innovation and marketing innovation. Aksoy found that efforts to carry out product and marketing innovations improved the market performance of small and medium-sized Turkish companies. In other cases, studies have been carried out for specific industries, as is the case with [Ganzer, Chais, and Olea \(2017\)](#), who researched companies in the flat knitting industry and found a positive correlation between the amount of money invested in product innovation and investments in marketing innovation.

Even though it has not been proven that product innovation mediates the relationship between external sources of market knowledge and marketing innovation, considering the aforementioned, the following hypothesis is proposed:

H4: Product innovation mediates the relationship between external sources of market knowledge and marketing innovation.

## Organizational innovation mediates the relationship between external sources of market knowledge and marketing innovation

Organizational innovation mediates the relationship between external sources of market knowledge and marketing innovation, as shown by Foss, Laursen, and Pedersen (2011), who studied more than 160 Danish companies. They found that knowledge coming from customers is associated with innovation and that, in this relationship, it mediates organizational innovation through the implementation of new organizational practices.

Additionally, the relationship between organizational and marketing innovation has been studied from different points of view. Weerawardena and Mavondo (2011) indicate that organizational learning is the antecedent of organizational and marketing innovation and that the two interact in order to generate competitive advantages for the company. In the same way, Ceylan (2013) considers activities linked to organizational innovation to be related to marketing innovation and states that this could make it easier to respond to changes in the market.

In this same line, scholars, such as Pino, Felzensztein, Zwerg-Villegas, and Arias-Bolzmann (2016), argue that greater levels of organizational innovation are positively related to marketing innovation. Similarly, Medrano and Olarte-Pascual (2016), who analyzed small and medium-sized companies, affirm that marketing innovation is associated with the different types of innovation, including organizational innovation.

All of this leads to the following hypothesis:

H5: Organizational innovation mediates the relationship between external sources of market knowledge and marketing innovation.

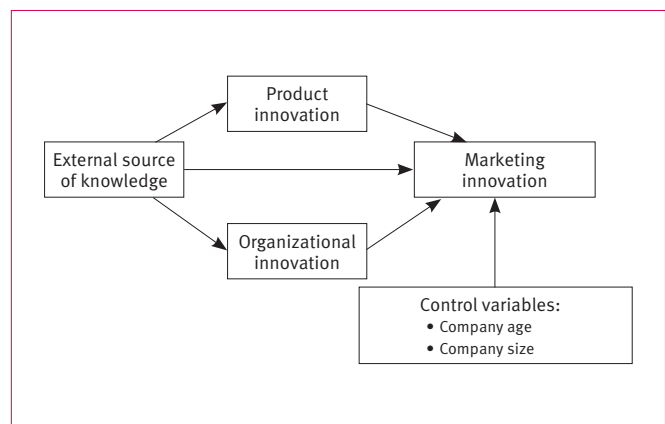
## METHODOLOGY

Data collected in the 2012 National Innovation Survey of the Manufacturing Industry were used in the present empirical study. This study surveyed Peruvian companies in the manufacturing sector to obtain knowledge about their innovation processes. The study was conducted in coordination with the Ministry of Economy and Finance (MEF); the National Council of Science, Technology, and Technological Innovation (Concytec); and the National Institute of Statistics and Informatics (INEI). Its design was developed based on the methodological framework of the Bogotá Manual; this decision, in turn, allowed for the development of indicators that can be compared to the results of other countries in the Latin American region. Data collection (INEI Questionnaire, 2012) was carried out during the reference period 2009-2011

using a representative sample of 1,220 small, medium, and large companies from different regions of the country; however, for purposes of this study and to omit missing values, only 557 manufacturing firms with low and medium-low technological intensity were considered.

Figure 1 shows the conceptual model that connects the four constructs: external sources of knowledge, product innovation, organizational innovation, and marketing innovation.

Figure 1. Proposed model



## Variable measurement

### Dependent variable

In this study, the dependent variable was marketing innovation, which is defined as “improvement in product design, placement, promotion or pricing” (Naidoo, 2010, p. 1311).

The purpose of the study was to find out the relationship between marketing innovation (the dependent variable) and product innovation, organizational innovation, and external sources of knowledge.

In accordance with what the INEI indicated, the database included the following three items related to the importance of marketing innovation implemented by the company during the 2010-2012 period (with the respective codes in parentheses): the maintenance of the company’s participation in the market (MI1), the expansion of the company’s participation in the market (MI2), and the opening of new markets abroad (MI3). The company had to evaluate the level of importance of the marketing innovation that it had conducted during the period 2010-2012 using a four-point Likert scale. The company scored a “4” if it considered the item very important for the period 2010-2012, “3” if the importance level was intermediate, “2” if it considered the item to be of low importance, and “1” if it was not considered relevant.

## Independent variables

First, “external sources of knowledge” was used as an independent variable. The importance of external knowledge to the improvement of the company’s innovation activities during the period 2010-2012 was evaluated. The company selected the sources from which external knowledge had been obtained. To assess the level of importance of external knowledge while continuing to innovate, this study used the following variables: suppliers, customers, and competitors.

Second, the survey defined product innovation as the development of a new product or one that has been substantially improved and will be launched on the market. The survey evaluated the innovative activity of the firm in the reference period according to the level of importance given to the different objectives. It used the following variables related to the objectives, which focused on product innovation (the codes are in parentheses): expansion of the range of products offered (PI1), increased flexibility in production (PI2), and quality improvement of the products offered (PI3).

Third, the INEI survey defined organizational innovation as “the implementation of new organizational methods in the internal operation of the company, including knowledge management methods and systems, in the organization of the workplace, or in relationships that the company has not used” (Fundación Cotec para la Innovación, 2017, p. 48). The survey required the company to indicate the level of importance of the objectives of organizational innovation. This study used the following objectives (with their codes in parentheses): improvement in the use of personnel capabilities (OI1), an increase in productive capacity (OI2), improvement of the company’s quality system according to national standards (OI3), improvement of the company’s quality system according to international standards (OI4), reduction of labor costs (OI5), and reduction of the consumption of raw materials and supplies (OI6).

## Control variables

The size and age of a company can influence how business innovation is carried out. Company size (expressed as a logarithm) was measured by the number of employees in 2011 (Laursen & Salter, 2006; Schoenmakers & Duysters, 2006) and company age (Thornhill, 2006) was determined by the number of years in operation (expressed as a logarithm) from its foundation to the year in which the company data were recorded (2011).

## Statistical method

The study used AMOS version 24 software, which applies the two-step covariance structural equation estimation

model. First, the measurement model was estimated when the relationship between the indicators and the latent construct was determined using Exploratory Factor Analysis (EFA). Second, the structural model was estimated, in which the relationships between the constructs were obtained using the coefficients and the level of significance.

## RESULTS

### Descriptive statistics

The companies included in the analysis carry out various economic activities: 17% are dedicated to the preparation of food products, 12% to the manufacture of other non-metallic mineral products, and 11% to the manufacture of common metals. Other types of companies were not as well represented as the ones above. Table 1 shows various variables: the participation of companies according to their size (a logarithm of the number of employees), the age of the companies since the beginning of operations (before 1975, old; between 1975 and 1992, intermediate; from 1992 onwards, young), and technological intensity.

**Table 1. Description of the manufacturing companies**

<b>Company size</b>	
Small ( $\leq 50$ employees)	262
Medium ( $>50$ and $\leq 250$ employees)	134
Large ( $>250$ employees)	161
Total	557
<b>Company age</b>	
Old (greater than 36 years)	82
Intermediate (between 19 and 36 years)	103
Young (less than 19 years)	372
Total	557
<b>Technological intensity</b>	
Low	333
Medium-Low	224
Total	557

### Measurement model

Table 2 shows the factor loadings of the construct variables. As can be seen, these loads are within the recommended value. All loads are greater than 0.5; therefore they must remain in the model.

Table 2. Factor loading of latent variables

Variable	External Sources of Knowledge	Marketing Innovation	Organizational Innovation	Product Innovation
Supplier	0.696			
Customer	0.820			
Competitor	0.774			
PI1				0.693
PI2				0.668
PI3				0.799
OI1			0.729	
OI5			0.854	
OI6			0.808	
MI1		0.846		
MI2		0.874		
MI3		0.537		

Source: SPSS Software

Table 3 shows the indicators of reliability and validity. The table shows that, for the Cronbach's alpha (CA) coefficient, the constructs possess a value greater than 0.5. In terms of compound reliability (CR), most of the constructs possess values greater than 0.7; the average variance extracted (AVE) was close to 0.5 in some constructs. In addition, multicollinearity, that is, the variance inflation factor (VIF), was controlled, with values less than 5. In addition, all the coefficients of determination  $R^2$  present reasonable values. Based on the results of the indicators, it is possible to apply the structural model.

Table 3. Reliability and validity indicators

Latent variable	CA	CR	AVE	VIF	$R^2$
<b>Marketing innovation</b>	0.588	0.700	0.458		0.683
<b>Organizational innovation</b>	0.715	0.658	0.393	1.322	0.755
<b>External knowledge</b>	0.645	0.621	0.358	1.132	
<b>Product innovation</b>	0.520	0.739	0.502	1.331	0.575
<b>Reference values</b>	<b>&gt;0.5</b>	<b>&gt;0.7</b>	<b>&gt;0.5</b>	<b>&lt;5</b>	

CA, Cronbach's Alpha; CR, Composite Reliability; AVE, Average Variance Extracted; VIF, Variance Inflation Factor

Source: SPSS and AMOS software

Table 4 shows that all the variables achieve discriminant validity following the criteria of Fornell and Larcker (1981).

Table 4. Discriminant validity

	Product Innovation	Marketing Innovation	Organizational Innovation	External Knowledge
Product innovation	<b>0.708</b>			
Marketing innovation	0.671	0.677		
Organizational innovation	0.661	0.666	<b>0.627</b>	
External knowledge	0.413	0.439	0.472	0.598

Note: Fornell-Larcker criterion: the diagonal elements (in bold) are the square root of the average variance extracted shared between the constructs and their measurements (AVE). For the discriminant validity, AVE square root (in bold) is larger than the correlations between the other latent variables

Source: Amos Software

Table 4 shows the goodness of fit indicators of the initial measurement model, highlighting that these indicators consider the following four constructs: external market information, marketing innovation, product innovation, and organizational innovation, with all of their items. To adjust the model, the following organizational innovation items were removed: IO2, IO3, and IO4. In this way, with the defined model, the goodness of fit indicators corresponding to the final measurement model were calculated.

## Structural model

After evaluating the measurement models, the structural model was estimated. Table 5 shows the coefficients and the p-value of the research model.

Table 5. Structural model results

Paths	$\beta$	p-value
EXT_KNO $\rightarrow$ MAR_INN	0.880	0.105
EXT_KNO $\rightarrow$ PROD_INN	0.758***	0.001
EXT_KNO $\rightarrow$ ORG_INN	0.869***	0.001
AGE $\rightarrow$ MAR_INN	0.032	0.427
SIZE $\rightarrow$ MAR_INN	0.026	0.523

Note: n = 557;  $\beta$  = Standardized coefficients

\*p < 0.1; \*\*p < 0.05, \*\*\*p < 0.01

Source: Amos Software

Table 6 shows that the structural model complies with the goodness of fit indices for the following indicators: minimum discrepancy per degree of freedom (CMIN/df), goodness-of-fit index (GFI), Tucker Lewis Index (TLI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). The obtained values helps to verify a suitable fit for the research model.

Table 6. Model fit indicators

Indicators	Initial Measurement Model	Final Measurement Model	Structural Model
CMIN/DF	5.144	2.390	2.773
GFI	0.894	0.971	0.957
TLI	0.784	0.943	0.908
CFI	0.830	0.964	0.936
RMSEA	0.086	0.050	0.056

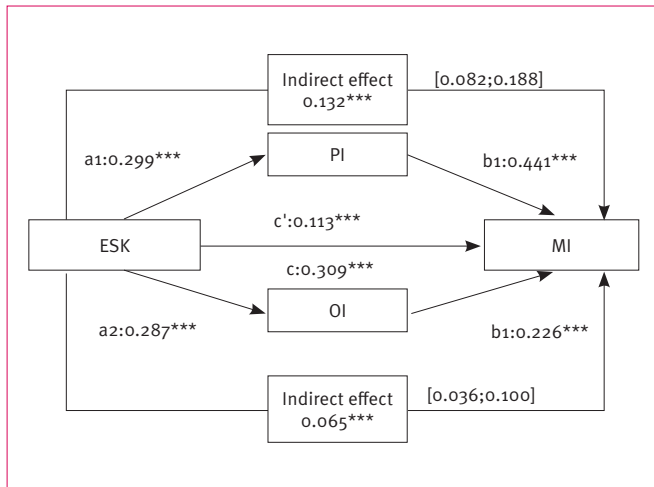
Source: Amos Software

## Mediation analysis

According to Hair, Sarstedt, Hopkins, and Kuppelwieser (2014), mediation is a situation in which a mediator variable, to some extent, absorbs the effect of an exogenous construct (independent variable) on an endogenous construct (dependent variable). According to Zhao, Lynch, and Chen (2010), this mediator variable develops a typology for mediation based on the interpretation of the significance of indirect and direct effects. As shown in Figure 2, product innovation and organizational innovation have a complementary partial mediation.



Figure 2. Mediation results



Control variables

Table 7 shows the coefficients, standard deviations, and p-values of the control variables.

Table 7. Control variables

Control variables	Coefficient	Standard Deviation	p-Value
Company size	0.032	0.033	0.427
Company age	0.026	0.064	0.523

Source: Amos Software

The table shows that the control variables of company size and company age are not statistically significant.

DISCUSSION

The objectives of this study were to analyze how external sources of market knowledge, product innovation, and organizational innovation are related to marketing innovation. In this sense, the statistical results related to each of the five hypotheses are analyzed below.

First, Hypothesis 1 is not accepted. External sources of market knowledge are related to marketing innovation. This result did not coincide with Varis and Littunen’s (2010) finding that small companies that have access to external sources of knowledge are better able to develop marketing innovations. This situation is thought to be due to the structure of the model because, when

only the relationship between sources of market knowledge and marketing innovation is analyzed, the coefficient is positive and statistically significant ( $b = 0.404^{***}$ ,  $p\text{-value} = 0.001$ ).

Second, Hypothesis 2 is accepted. The variable “external sources of knowledge” is related to product innovation, and this result is consistent with the assertion of Maes and Sels (2014), who empirically demonstrated that companies that acquire knowledge from external sources are more likely to develop product innovations. Maes and Sels (2014) studied a sample of fewer than 200 small and medium-sized companies that belonged to the public and private sectors that were carrying out their activities in the manufacturing and service sectors. On the other hand, Kim and Lui (2015), who analyzed the sources of knowledge from customers, suppliers, and competitors (the same sources analyzed in this study), found that manufacturing companies that have access to these sources of knowledge obtain knowledge that favors the development of product innovation.

Third, Hypothesis 3 is accepted. The variable “external sources of knowledge” is related to organizational innovation, and this result concurs with the results of Mol and Birkinshaw’s (2009) study, which showed that companies that interacted with external sources of knowledge from the market directed their efforts toward developing organizational innovations. This suggests that companies should develop their learning and knowledge management capacities, as pointed out by Noruzy et al. (2013).

Fourth, even though it is known that product innovation plays a mediating role, as Lau, Yam, and Tang (2011) point out, so far, it has not been possible to verify the mediating role of organizational innovation in the relationship between external sources of market knowledge and marketing innovation. The findings confirm that product innovation partially mediates this relationship.

Fifth, the literature reviewed has shown that innovation mediates the relationship between sources of knowledge from customers, suppliers, and competitors and company performance (Vincent, Bharadwaj, & Challagalla, 2004). Gunday et al. (2011) finds that there is a relationship between organizational innovation and marketing innovation. The results indicate that organizational innovation acts as a mediator in the relationship between external sources of knowledge and marketing innovation.

With regard to the control variables, the study has shown that neither company size nor company age has a significant impact on the development of marketing innovations in manufacturing companies with lower technological intensity.

## Theoretical implications

It should be considered that the companies analyzed in this study correspond to the categories of lower technological intensity, which means that they put little effort into research and development activities and seek external sources of market knowledge to improve their innovation capability.

This study contributes to the literature on marketing innovation carried out by manufacturing companies with lower technological intensity that carry out their activities in emerging economies.

The study has shown, empirically, that external sources of knowledge are positively related to product and organizational innovation.

Similarly, the study has shown that both product innovation and organizational innovation partially mediate the relationship between external sources of knowledge and marketing innovation, which constitutes one of the study's contributions.

## Practical implications

Managers should appeal to external sources of knowledge such as customers, suppliers, and competitors to improve their innovation capability. In addition, they should make product, organizational, and marketing innovations.

The findings of this study suggest that managers should encourage the development of organizational learning and knowledge management skills in their companies to get the most out of external sources of knowledge.

## CONCLUSIONS

The main objective of this study was to empirically verify five hypotheses that connect external sources of knowledge, product innovation, organizational innovation, and marketing innovation.

The main contribution of the study was to enrich the literature related to the marketing innovation of less technologically intense manufacturing companies in emerging economies. Similarly, it was possible to empirically verify that companies can improve their innovation capability by accessing external sources of market knowledge. These findings assist in the verification of the positive relationship that exists between access to external sources of knowledge and product, organizational, and marketing innovations. Further studies can focus on how different types of innovation can interact with each other, for example, how marketing innovation can influence product innovation.

## LIMITATIONS AND FUTURE RESEARCH

As with any research, this study had limitations. A first limitation is that, as cross-sectional study, it had two problems: bias due to the fact that the questionnaires were answered by a single person and that this type of study does not allow for the establishment of a relationship of causality between constructs (Rindfleisch, Malter, Ganesan, & Moorman, 2008).

A second limitation is that the study sample included different industries. The most represented industries were the food, non-metallic mineral products, and common metals industries. It is important to keep in mind that each industry has its own characteristics and its own innovative behavior.

A third limitation is that this study used a database from a national innovation survey of the manufacturing industry in Peru. This could be addressed by turning to primary sources of information; in other words, surveys that collect specific information from a determined sector or group should be applied.

Due to these limitations, the following line of future research is proposed: studies focusing on emerging economies that emphasize the development of innovation in manufacturing companies with lower technological intensity.

## REFERENCES

- Aksoy, H. (2017). How do innovation culture, marketing innovation and product innovation affect the market performance of small and medium-sized enterprises (SMEs). *Technology in Society*, 51, 133-141. doi: 10.1016/j.techsoc.2017.08.005
- Ang, S. H. (2008). Competitive intensity and collaboration: Impact on firm growth across technological environments. *Strategic Management Journal*, 29(10), 1057-1075. doi: 10.1002/smj.695
- Ardito, L., & Petruzzelli, A. M. (2017). Breadth of external knowledge sourcing and product innovation: The moderating role of strategic human resource practices. *European Management Journal*, 35(2), 261-272. doi: 10.1016/j.emj.2017.01.005
- Arnett, D. B., & Wittmann, C. M. (2014). Improving marketing success: The role of tacit knowledge exchange between sales and marketing. *Journal of Business Research*, 67(3), 324-331. doi:10.1016/j.jbusres.2013.01.018
- Brunswick, S., & Vanhaverbeke, W. (2015). Open innovation in small and medium-sized enterprises (SMEs): External knowledge sourcing strategies and internal organizational facilitators. *Journal of Small Business Management*, 53(4), 1241-1263. doi: 10.1111/jsbm.12120
- Caloghirou, Y., Kastelli, I., & Tsakanikas, A. (2004). Internal capabilities and external knowledge sources: Complements or substitutes for innovative performance? *Technovation*, 24(1), 29-39. doi:10.1016/s0166-4972(02)00051-2

- Camisón, C., & Villar-López, A. (2014). **Organizational innovation as an enabler of technological innovation capabilities and firm performance.** *Journal of Business Research*, 67(1), 2891-2902. doi:10.1016/j.jbusres.2012.06.004
- Ceylan, C. (2013). **Commitment-based HR practices, different types of innovation activities and firm innovation performance.** *The International Journal of Human Resource Management*, 24(1), 208-226. doi:10.1080/09585192.2012.680601
- Chen, Y. S., Lin, M. J. J., & Chang, C. H. (2009). **The positive effects of relationship learning and absorptive capacity on innovation performance and competitive advantage in industrial markets.** *Industrial Marketing Management*, 38(2), 152-158. doi:10.1016/j.indmarman.2008.12.003
- Cuestionario Instituto Nacional de Estadística e Informática. (2012). **Peru: National Survey of Innovation in Manufacturing Industry. Main results.** Retrieved from [http://innovacion.enlacesred.org/pdf/peru/Peru\\_Manufacturera.pdf](http://innovacion.enlacesred.org/pdf/peru/Peru_Manufacturera.pdf)
- Dahlander, L., O'Mahony, S., & Gann, D. M. (2016). **One foot in, one foot out: How does individuals' external search breadth affect innovation outcomes?** *Strategic Management Journal*, 37(2), 280-302. doi:10.1002/smj.2342
- Damanpour, F. (2014). **Footnotes to research on management innovation.** *Organization Studies*, 35(9), 1265-1285. doi:10.1177/0170840614539312
- Escribano, A., Fosfuri, A., & Tribó, J. A. (2009). **Managing external knowledge flows: The moderating role of absorptive capacity.** *Research Policy*, 38(1), 96-105. doi:10.1016/j.respol.2008.10.022
- Fornell, C., & Larcker, D. F. (1981). **Structural equation models with unobservable variables and measurement error: Algebra and statistics.** *Journal of Marketing Research*, 382-388. doi:10.2307/3151335
- Foss, N. J., Laursen, K., & Pedersen, T. (2011). **Linking customer interaction and innovation: The mediating role of new organizational practices.** *Organization Science*, 22(4), 980-999. doi:10.1287/orsc.1100.0584
- Fundación Cotec para la Innovación. (2017). **¿Por qué crecen las gacelas? Relación entre innovación y empleo en las empresas de alto crecimiento. Sevilla, España: Autor.** Retrieved from [http://informecotec.es/media/INFORME-GACELAS\\_2017.pdf](http://informecotec.es/media/INFORME-GACELAS_2017.pdf)
- Gallegos, J. F. Del C., & Torner, F. M. (2018). **Absorptive capacity and innovation in low-tech companies in emerging economies.** *Journal of Technology Management & Innovation*, 13(2), 3-11. doi:10.4067/50718-27242018000200003
- Ganter, A., & Hecker, A. (2013). **Deciphering antecedents of organizational innovation.** *Journal of Business Research*, 66(5), 575-584. doi:10.1016/j.jbusres.2012.02.040
- Ganzer, P. P., Chais, C., & Olea, P. M. (2017). **Product, process, marketing and organizational innovation in industries of the flat knitting sector.** *RAI Revista de Administração e Inovação*, 14(4), 321-332. doi:10.1016/j.rai.2017.07.002
- Geldes, C., & Felzensztein, C. (2013). **Marketing innovations in the agribusiness sector.** *Academia Revista Latinoamericana de Administración*, 26(1), 108-138. doi:10.1108/arla-05-2013-0042
- Grimpe, C., & Kaiser, U. (2010). **Balancing internal and external knowledge acquisition: The gains and pains from R&D outsourcing.** *Journal of Management Studies*, 47(8), 1483-1509. doi:10.1111/j.1467-6486.2010.00946.x
- Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). **Effects of innovation types on firm performance.** *International Journal of Production Economics*, 133(2), 662-676. doi:10.1016/j.ijpe.2011.05.014
- Hair, J. F., Jr., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). **Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research.** *European Business Review*, 106-121. doi:10.1108/ebur-10-2013-0128
- Heredia, J., Flores, A., Geldes, C., & Heredia, W. (2017). **Effects of informal competition on innovation performance: The case of Pacific Alliance.** *Journal of Technology Management & Innovation*, 12(4), 22-28. doi:10.4067/50718-27242017000400003
- Hervas-Oliver, J. L., Sempere-Ripoll, F., & Boronat-Moll, C. (2014). **Process innovation strategy in SMEs, organizational innovation and performance: A misleading debate?** *Small Business Economics*, 43(4), 873-886. doi:10.4067/50718-27242017000400003
- Hirsch-Kreinsen, H. (2008). **Low tech innovations.** *Industry and Innovation*, 15(1), 19-43. doi:10.1080/13662710701850691
- Kim, Y., & Lui, S. S. (2015). **The impacts of external network and business group on innovation: Do the types of innovation matter?** *Journal of Business Research*, 68(9), 1964-1973. doi:10.1016/j.jbusres.2015.01.006
- Lau, A. K., Tang, E., & Yam, R. C. (2010). **Effects of supplier and customer integration on product innovation and performance: Empirical evidence in Hong Kong manufacturers.** *Journal of Product Innovation Management*, 27(5), 761-777. doi:10.1111/j.1540-5885.2010.00749.x
- Lau, A. K., Yam, R. C., & Tang, E. (2011). **The impact of product modularity on new product performance: Mediation by product innovativeness.** *Journal of Product Innovation Management*, 28(2), 270-284. doi:10.1111/j.1540-5885.2011.00796.x
- Laursen, K., & Salter, A. (2006). **Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms.** *Strategic Management Journal*, 27(2), 131-150. doi:10.1002/smj.507
- Lee, R. P., Özsomer, A., & Zhou, K. Z. (2015). **Introduction to the special issue on "innovation in and from emerging economies".** *Industrial Marketing Management*, (50), 16-17. doi:10.1016/j.indmarman.2015.07.005
- Leiponen, A. (2012). **The benefits of R&D and breadth in innovation strategies: A comparison of Finnish service and manufacturing firms.** *Industrial and Corporate Change*, 21(5), 1255-1281. doi:10.1093/icc/dtso22
- Leiponen, A., & Helfat, C. E. (2010). **Innovation objectives, knowledge sources, and the benefits of breadth.** *Strategic Management Journal*, 31(2), 224-236. doi:10.1002/smj.807
- Liao, S. H., Fei, W. C., & Liu, C. T. (2008). **Relationships between knowledge inertia, organizational learning and organization innovation.** *Technovation*, 28(4), 183-195. doi:10.1016/j.technovation.2007.11.005
- Liao, S. H., Fei, W. C., & Liu, C. T. (2008). **Relationships between knowledge inertia, organizational learning and organization innovation.** *Technovation*, 28(4), 183-195. doi:10.1016/j.technovation.2007.11.005
- Maes, J., & Sels, L. (2014). **SMEs' radical product innovation: The role of internally and externally oriented knowledge capabilities.** *Journal of Small Business Management*, 52(1), 141-163. doi:10.1111/jsbm.12037

- Medrano, N., & Olarte-Pascual, C. (2016). **An empirical approach to marketing innovation in small and medium retailers: An application to the Spanish sector.** doi:10.5709/ce.1897-9254.210
- Mehrabani, S. E., & Shajari, M. (2012). **Knowledge management and innovation capacity.** *Management Research*, 4(2), 164. doi:10.5296/jmr.v4i2.1390
- Moilanen, M., Østbye, S., & Woll, K. (2014). **Non-R&D SMEs: External knowledge, absorptive capacity and product innovation.** *Small Business Economics*, 43(2), 447-462. doi: 10.1007/s11187-014-9545-9
- Mol, M. J., & Birkinshaw, J. (2009). **The sources of management innovation: When firms introduce new management practices.** *Journal of Business Research*, 62(12), 1269-1280. doi: 10.1016/j.jbusres.2009.01.001
- Montoro-Sánchez, A., Ortiz-de-Urbina-Criado, M., & Mora-Valentín, E. M. (2011). **Effects of knowledge spillovers on innovation and collaboration in science and technology parks.** *Journal of Knowledge Management*, 15(6), 948-970. doi: 10.1108/13673271111179307
- Mothe, C., & Thi, T. U. N. (2010). **The link between non-technological innovations and technological innovation.** *European Journal of Innovation Management*, 13(3), 313-332. doi: 10.1108/14601061011060148
- Mothe, C., & Uyen, N. T. T. (2012). **The impact of non-technological on technological innovations: Do services differ from manufacturing? An empirical analysis of Luxembourg firms.** *International Journal of Technology Management*, 57(4), 227-244. doi: 10.1504/ijtm.2012.045544
- Naidoo, V. (2010). **Firm survival through a crisis: The influence of market orientation, marketing innovation and business strategy.** *Industrial Marketing Management*, 39(8), 1311-1320. doi: 10.1016/j.indmarman.2010.02.005
- Ngo, L. V., & O'Cass, A. (2012). **In search of innovation and customer-related performance superiority: The role of market orientation, marketing capability, and innovation capability interactions.** *Journal of Product Innovation Management*, 29(5), 861-877. doi: 10.1111/j.1540-5885.2012.00939.x
- Noruzi, A., Dalfard, V. M., Azhdari, B., Nazari-Shirkouhi, S., & Rezazadeh, A. (2013). **Relations between transformational leadership, organizational learning, knowledge management, organizational innovation, and organizational performance: An empirical investigation of manufacturing firms.** *The International Journal of Advanced Manufacturing Technology*, 64(5-8), 1073-1085. doi: 10.1007/s00170-012-4038-y
- O'Cass, A., & Ngo, L. V. (2012). **Creating superior customer value for B2B firms through supplier firm capabilities.** *Industrial Marketing Management*, 41(1), 125-135. doi:10.1016/j.indmarman.2011.11.018
- Olavarrieta, S., & Villena, M. G. (2014). **Innovation and business research in Latin America: An overview.** *Journal of Business Research*, 67(4), 489-497. doi: 10.1016/j.jbusres.2013.11.005
- Parra-Requena, G., Ruiz-Ortega, M. J., García-Villaverde, P. M., & Rodrigo-Alarcón, J. (2015). **The mediating role of knowledge acquisition on the relationship between external social capital and innovativeness.** *European Management Review*, 12(3), 149-169. doi:10.1111/emre.12049
- Paunov, C. (2016). **Corruption's asymmetric impacts on firm innovation.** *Journal of Development Economics*, 118, 216-231. doi: 10.1016/j.jdeveco.2015.07.006
- Pino, C., Felzensztein, C., Zwerg-Villegas, A. M., & Arias-Bolzmann, L. (2016). **Non-technological innovations: Market performance of exporting firms in South America.** *Journal of Business Research*, 69(10), 4385-4393. doi: 10.1016/j.jbusres.2016.03.061
- Rajapathirana, R. J., & Hui, Y. (2018). **Relationship between innovation capability, innovation type, and firm performance.** *Journal of Innovation & Knowledge*, 3(1), 44-55. doi: 10.1016/j.jik.2017.06.002
- Rindfleisch, A., Malter, A. J., Ganesan, S., & Moorman, C. (2008). **Cross-sectional versus longitudinal survey research: Concepts, findings, and guidelines.** *Journal of Marketing Research*, 45(3), 261-279. doi: 10.1509/jmkr.45.3.261
- Segarra-Ciprés, M., Roca-Puig, V., & Bou-Llusar, J. C. (2014). **External knowledge acquisition and innovation output: An analysis of the moderating effect of internal knowledge transfer.** *Knowledge Management Research & Practice*, 12(2), 203-214. doi: 10.1057/kmrp.2012.55
- Schoenmakers, W., & Duysters, G. (2006). **Learning in strategic technology alliances.** *Technology Analysis & Strategic Management*, 245-264. doi: 10.1080/09537320600624162
- Thornhill, S. (2006). **Knowledge, innovation and firm performance in high-and low-technology regimes.** *Journal of Business Venturing*, 21(5), 687-703. doi: 10.1016/j.jbusvent.2005.06.001
- Tödtling, F., Lehner, P., & Kaufmann, A. (2009). **Do different types of innovation rely on specific kinds of knowledge interactions?** *Technovation*, 29(1), 59-71. doi: 10.1016/j.technovation.2008.05.002
- Un, C. A., & Asakawa, K. (2015). **Types of R&D collaborations and process innovation: The benefit of collaborating upstream in the knowledge chain.** *Journal of Product Innovation Management*, 32(1), 138-153. doi: 10.1111/jpim.12229
- Un, C. A., Cuervo-Cazurra, A., & Asakawa, K. (2010). **R&D collaborations and product innovation.** *Journal of Product Innovation Management*, 27(5), 673-689. doi: 10.1111/j.1540-5885.2010.00744.x
- Varis, M., & Littunen, H. (2010). **Types of innovation, sources of information and performance in entrepreneurial SMEs.** *European Journal of Innovation Management*, 13(2), 128-154. doi: 10.1108/14601061011040221
- Vega-Jurado, J., Juliao-Esparragoza, D., Paternina-Arboleda, C. D., & Velez, M. C. (2015). **Integrating technology, management and marketing innovation through open innovation models.** *Journal of Technology Management & Innovation*, 10(4), 85-90. doi: 10.4067/s0718-27242015000400009
- Vincent, L. H., Bharadwaj, S. G., & Challagalla, G. N. (2004). **Does innovation mediate firm performance?: A meta-analysis of determinants and consequences of organizational innovation.** *TIGER Student Working Papers*. Retrieved from https://smartech.gatech.edu/handle/1853/10731
- Volberda, H. W., Bosch, F. A. Van Den, & Mihalache, O. R. (2014). **Advancing management innovation: Synthesizing processes, levels of analysis, and change agents.** *Organization Studies*, 35(9), 1245-1264. doi: 10.1177/0170840614546155

- Wang, Z., Wang, Q., Zhao, X., Lyles, M. A., & Zhu, G. (2016). **Interactive effects of external knowledge sources and internal resources on the innovation capability of Chinese manufacturers.** *Industrial Management & Data Systems*, 116(8), 1617-1635. doi: 10.1108/imds-10-2015-0412
- Weerawardena, J., & Mavondo, F. T. (2011). **Capabilities, innovation and competitive advantage.** *Industrial Marketing Management*, 40(8), 1220-1223. doi: 10.1016/j.indmarman.2011.10.012
- Zhao, X., Lynch, J. G., Jr., & Chen, Q. (2010). **Reconsidering Baron and Kenny: Myths and truths about mediation analysis.** *Journal of Consumer Research*, 37(2), 197-206. doi: 10.1086/651257
- Zouaghi, F., Sánchez, M., & Martínez, M. G. (2018). **Did the global financial crisis impact firms' innovation performance? The role of internal and external knowledge capabilities in high and low tech industries.** *Technological Forecasting and Social Change*, 132, 92-104. doi: 10.1016/j.techfore.2018.01.011

## AUTHORS' CONTRIBUTIONS

The authors declare that they equally participated of the conceptualization and theoretical-methodological construction. The theoretical review (literature survey), data collection, data analysis, and finally, writing and final review was conducted by first author with the supervision of the second author.