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Qualitative approach about innovation determinants in an emerging economy

Análisis cualitativo de los determinantes de la innovación en una economía emergente

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Abstract

Manufacturing companies strive to be innovative and competitive. These companies are very important in an emerging economy due to their contribution to a country's gross domestic product and the generation of jobs. Therefore, the objective of this article is to identify the internal and external factors that improve the innovation capacity of Peruvian manufacturing companies and, in turn, favor their competitiveness. A qualitative approach was applied based on the Glaser «six-C model», which is part of the grounded theory; for this, the managers of the Peruvian manufacturing companies were interviewed. From the analysis and processing of this data with Atlas ti® qualitative analysis software (QDA), it was found that suppliers and customers provide valuable information to innovate; additionally, the application of the design and the acquisition of machinery favor the innovations of these companies. To that extent, this qualitative study contributes to identify those factors that help Peruvian manufacturing companies improve their innovation capacity. Thus, manufacturing companies' managers must identify those factors that favor the implementation of innovations to make their companies more competitive.

Resumen

Las empresas de manufactura se esfuerzan por ser innovadoras y, de esta manera, ser competitivas en el mercado. Estas empresas son muy importantes en una economía emergente debido a su contribución al Producto Interno Bruto y a la generación de puestos de trabajo para la población. Por ello, el objetivo de este estudio es identificar cuáles son los factores internos y externos que mejoran la capacidad de innovación de las empresas peruanas de manufactura y, a su vez, favorecen su competitividad. Para ello, se aplicó un enfoque cualitativo basado en el «modelo de las seis C» de Glaser, que forma parte de la teoría fundamentada, y se entrevistó a gerentes de las empresas de manufactura peruanas. A partir del análisis y procesamiento de estos datos con el software de análisis cualitativo (QDA) Atlas ti®, se encontró que los proveedores y los clientes proporcionan valiosa información para innovar, y que la aplicación del diseño y la adquisición de maquinaria favorecen las innovaciones de estas empresas. En esa medida, el presente estudio contribuye a identificar aquellos factores que ayudan a las empresas de manufactura peruanas a mejorar su capacidad de innovación. Así, los gerentes de las empresas de manufactura deben identificar aquellos factores que favorecen la implementación de innovaciones y, de esta manera, lograrán que sus empresas sean más competitivas.

Keywords | palabras clave

Innovation, qualitative analysis, manufacturing, emerging economies, technological development, grounded theory.
Innovación, análisis cualitativo, manufactura, economía emergente, desarrollo tecnológico, teoría fundamentada.

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1. Introduction

Innovation has become a topic of great interest to companies because of the results obtained by those that implement it, in some cases creating a competitive advantage (Herman, Hady & Arafaah, 2018) with their innovative performance (Martínez-Costa, Jimenez-Jimenez & Castro-Del-Rosario, 2018). A review of the literature shows that studies on innovation in developed economies are mainly quantitative (Ketata, Sofka & Grimpe, 2015). There is also a significant number of quantitative applications in innovation research in Latin American countries, such as Colombia (*v.gr.* Albis & Álvarez, 2017). These findings show little attention to research with qualitative approaches in Latin American economies, as for example the case of Brazil (*v.gr.* Ferreira de Lara & Neves Guimarães, 2014).

It should be taken into account that Latin American economies went through a period of economic boom, and then faced a different reality, highlighting the low political stability (Olavarrieta & Villena, 2014), high levels of corruption (Paunov, 2016), and informality (Heredia, Flores, Geldes & Heredia, 2017). It Is this context that it becomes in some cases a constraint to carry out innovations.

This study has focused on Peruvian manufacturing companies, because this economic sector has a high impact on the economy of the South American country. In fact, the manufacturing sector represents more than 16% of national production, according to the National Institute of Statistics and Informatics (INEI, 2018). Therefore, it seeks to identify the internal and external factors that improve the innovation capacity of these companies. In this way, it contributes to the literature on innovation in the manufacturing sector of an emerging economy. Additionally, the article is organized into four parts. In the first place, the literature review is presented and the literature identifies the external and internal factors that favor the realization of innovation. Secondly, the materials and method used are described, detailing the principles of "Glaser six-C" model, how the selection of the sample was done, the selection of the participants, the methods of collecting information and the data obtained. Third, the results are presented according to the structure of the Glaser six C's, to finally present the discussion and conclusions.

1.1. Literature review

1.1.1. Context and conditions of an emerging economy

When analyzing the context of an emerging economy like the Peruvian one, two aspects must be considered: on the one hand, the interest to carry out research on the conditions in which the companies carry out innovations and, on the other hand, the challenges and difficulties these companies face. In relation to the investigations carried out by Castellacci & Natera (2012), they mention that different quantitative investigations have been conducted; however, further research should still be carried out, particularly with qualitative approaches and designs to deepen the findings. It is known that companies that want to improve their innovation capacity must establish linkages with their suppliers, clients, laboratories, universities, among others (Ferraris, Santoro & Dezi, 2017).

From the point of view of the challenges and difficulties, two important studies can be mentioned. The first was carried out by Sanz & Jones (2013), who claim that Latin American countries have gone through a stage of economic prosperity over a decade ago that has allowed them to reduce poverty levels and the growth of a middle class, due to the increase in the prices of minerals. The second study performed by Olavarrieta & Villena (2014) considers that Latin American companies that develop innovation face challenges and difficulties, such as the lack of policies that encourage the development of innovations.

It is not trivial to make some clarifications regarding terms such as "technological intensity", which according to Zawislak, Fracasso & Tello-Gamarra (2018) is obtained by dividing the costs in Research and Development (R+D) between assets or sales. For the Organization for the Economic Cooperation and Development (OECD, 2011), companies according are classified to their technological intensity in low, low-medium, medium-high and high technological intensity.

On the other hand, Kim, Park & Paik (2018) indicate that the innovation capacity of the company, which is the potential to create innovations, can be analyzed in several dimensions and according to the different types of innovation: product, process, organizational or marketing.

1.1.2. Internal Factors

Internal factors, according to Lee, Leong, Hew & Ooi (2013) are the internal variables under the control of the company and that allow it to improve its innovation capacity. These variables are industrial design and engineering, machinery acquisition, certification and quality control, and staff training.

The design refers to an important way of transferring ideas or knowledge (Simeone, Secundo, & Schiuma, 2017). In addition, this helps significantly in the development of new products. In the case of the Peruvian manufacturing companies, Tello (2017) found that they improved their innovation capacity by acquiring machinery. For its part, the ISO 9000 quality standard is based on the definition of quality conformity to assure customers that a quality product or service will be consistently supplied (Bourke & Roper, 2017).

In the management of innovation, the motivation of the professionals plays a crucial role in the collaborative creation process of knowledge for having greater competencies (Papa *et al.*, 2018).

1.1.3. External Factors

Roper, Love & Bonner (2017) say that part of the innovation process undertaken by companies is to collect accurate information from a variety of sources outside the company, such as customers, suppliers, universities, among others, which help to reduce uncertainty in the chances of innovating. Additionally, Saldanha, Mithas & Krishnan, (2017) mention that clients are a source of knowledge that help the enterprises in the modification of existing products for their better use; therefore, it is necessary to involve them in the innovation processes of the company.

On the other hand, suppliers play an important role in the company's innovation process. In this sense, a strong relationship between suppliers and company

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allows to achieve an adequate innovation environment by improving the quality of the product and the adequate cost management (Jajja *et al.*, 2017).

Companies face competitors by applying different strategies. In some cases, they imitate new products offered at low prices and, in other contexts, they offer their consumers differentiated products, trying to generate loyalty in customers (Liu & Atuahene-Gima, 2018). In this sense, organizations implement innovation processes influenced by companies and individuals. In this process, the role of consultants is of paramount importance due to their knowledge and experience (Musiolik *et al.*, 2018).

2. Materials and methods

For purposes of this research, it was decided to use Glaser's "Six C model" (Gandomani *et al.*, 2013) as a methodological tool for obtaining primary information about the main factors that impact the development of innovation in manufacturing companies. The proposed model is part of the based theory, which allows researchers to develop the theory through the information collected and it favors a constant feedback with the problem studied (Strauss & Corbin, 1994).

It has been preferred to use the based theory because innovation is a process of interaction between different variables and actors that are both internal and external, which allow the company to accumulate knowledge to convert it into innovative products or processes. In addition, it has been preferred to use, as a tool, a semi-structured interview guide because it allows the interviewer to mention variables or situations that go beyond the questions. Thus, data to identify a theory can be obtained. Then, through the use of these interviews to staff of companies in the sector and the contrast of the information obtained with the corresponding literature, it was started to generate a behavior pattern for each factor, which will be the basis for the research. Although the grounded theory does not imply formulating the research problem from the outset based on an important review of the literature, the application is not prohibited (Dunne, 2011).

For the theoretical codification, Glaser's "Six C model" was used (Gandomani *et al.*, 2013), as the last step of the study. This model helps the investigator to look for connections and relationships between the central and other categories that emerged. The following is the terminology used by the above model:

> [...] context (the place where the category is), condition (a factor that is a prerequisite for the category to arise), cause (a reason for the category to occur), consequence (a result or effect of the category occurrence), contingency (a moderator factor between categories and consequences), and covariance (categories that may vary from one to the other) (Van Waardenburg & Van Vliet, 2013, p. 2158).

Those interviewed, for the most part, work as general managers, area managers and designated staff of representative companies in the sector. In addition, most of them represent textiles and food companies (40%). Below (Table 1), the relation of the companies under study is presented and the business rotation, the technological intensity, the size and age of the company is indicated.

Table 1. Information of the selected enterprises

Enterprise	Industrial	Technological intensity	Size of the enterprise
E01	Food	Low	Medium
E02	Food	Low	Small
E03	Food	Low	Small
E04	Textile	Low	Small
E05	Textiles	Low	Big
E06	Textile	Low	Medium
E07	Manufacturing of rubber and plastic products	Low-medium	Small
E08	Manufacturing of rubber and plastic products	Low-medium	Medium
E09	Manufacturing of motor vehicles	Medium-high	Small
E10	Manufacturing of motor vehicles	Medium-high	Small
E11	Manufacturing of motor vehicles	Medium-high	Small
E12	Manufacturing of metal-based products	Low-medium	Big
E13	Manufacturing of metal-based products	Low-medium	Medium
E14	Other manufacturing enterprices (Ceramics)	Low	Small
E15	Manufacturing of leather products	Low	Small
E16	Manufacturing of machinery and eqquipments	Medium-high	Big

Some interviews were recorded digitally, while others were answered by email. The collection began on February 1, 2017. It should be mention that at the end, when it was observed that there were omissions in the answers of some questions, it was decided to interview one more time these people. The entire recording is then written using the Microsoft Word® text processor. A total of 97 codes were used and grouped into 2 categories (Table 2).

Table 2. Number of quotes from internal and external factors

Categories	*f*
Internal factors	
Design and industrial engineering	13
Acquisition of machinery	7
Certification and quality control	5
Personnel training	5

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Categories	*f*
Internal factors	
Acquisition of the software	4
Trainned personnel	3
Market study	3
Total	40
External factors	
Clients	16
Suppliers	13
Competencce	12
External advirsors	7
Universities	5
Enterprise associations	3
Government research institutes	1
Total	57
Total of codes	97

Note: for the codification, analysis and network elaboration, the qualitative analysis software (QDA) Atlas ti® was used. The final analysis of the results was completed on May 31, 2018

The analysis consists of classification, comparison, weighting and the combination of data obtained by the interviews, so that meanings and implications are extracted to reveal patterns or make a coherent narrative. The analysis model consists of two parts. In the first part, transcripts were prepared, and concepts, themes and events were found, refined and elaborated. Then, the interviews were codified to clarify what the interviewee has said about the concepts identified, topics and events. In the second part, several steps were followed: concepts and topics were compared throughout the interviews or separate events were merged to formulate a description of the information. The aim was to answer the research questions in order to draw general theoretical conclusions.

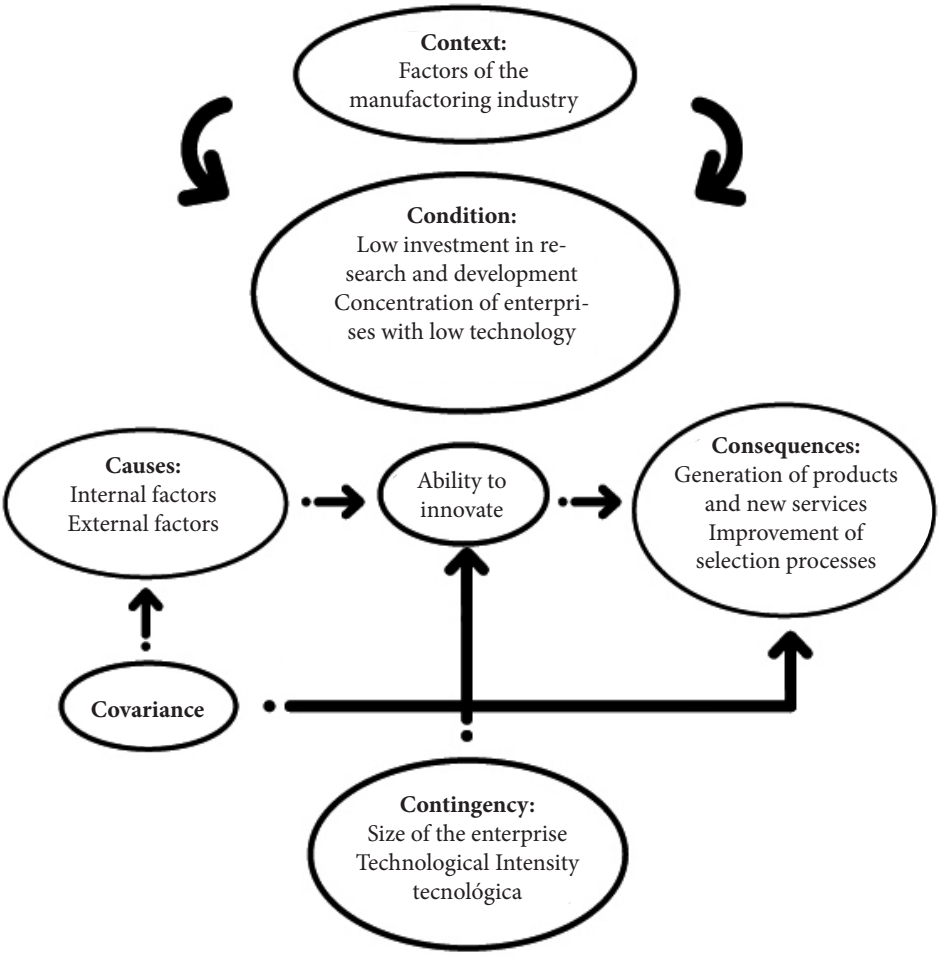
3. Analysis and Results

The results are presentedfrom the application of Glaser´s "six C model" and the use of the Atlas TI® qualitative analysis software (QDA).

3.1. Application of Glaser's six-C model

Figure 1 shows Glaser's "Six C" model (Gandomani *et al.*, 2015), which will be used to present the results of the present study.

Figure 1. Glasser´s six C model



Source: Gandomani *et al.* (2015, p. 300)

3.2. Context

Fifteen years ago, the Peruvian economy showed sustained growth (Scott & Chaston, 2012), which turned it into one of the fastest growing economies in the region. However, after the commodities crisis (Brenes *et al.*, 2016) companies were forced to face a change of reality. Despite this situation, Peruvian companies tend to invest very little in research and development (R+D), and prefer to innovate by buying machinery, hardware and software (Tello, 2017). They also face informal competition (Heredia *et al.*, 2017) and have trouble obtaining financial resources to promote innovation (Pérez *et al.*, 2018).

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3.2. Conditions

The Ministry of Production (2016), in the study of the current situation of innovation in the manufacturing industry, noted that "manufacturing is one of the sectors that have greater participation in the Gross Domestic Product, reaching 13.5% in the 2015" (*ob. cit.*, p. 15). He also indicated that in 2014, "more than 95% of manufacturing companies are national and mostly small enterprises" (*ob. cit.*, p. 16).

3.4. Causes

Table 3 shows representative examples of the responses obtained in relation to the internal factors that encourage the development of the innovation capacity of enterprises:

Table 3. Answer of the interviewee on the internal factors

Description of the type of internal factors	Example of quotes
Description of the type of internal factors	"In the footwear sector, the evolution is almost constant, because the technology clearly manifests its contribution. Beyond increasing productivity, it increases quality" (Manufacturing of leather products, enterprise 15)
Acquisition of machinery	"The acquisition of machinery, that involves the incorporation of machinery and tools to improve the process and to optimize all the resources" (Manufacturing of ceramics, Enterprise 14)
Certification and quality control	"Not all companies apply quality control in all areas. Therefore, they are not maintained and many fail as time passes... We have an innovation and management area that helps keep the ISO updated" (Manufacturing of iron and steel, Enterprise 12)
Personnel training	"To acquire knowledge in working and professional life, improving aptitudes and skills" (Manufacturing of metals, enterpise 12)

Low and low-medium intensity manufacturing companies develop design and industrial engineering activities, machinery acquisition, certification and quality control, and staff training. In this way, they manage to improve their innovation capacity. These activities are done regardless the size of the company. Table 4 shows representative responses obtained in relation to external factors that encourage the development of business innovation capacity:

Table 4. Answer of the interviewee on the external factors

Description of the type of external factors	Example of quotes
Consumers and/o Clients	[…] "Customers help us know if we are going in the right direction with every change made in the company, in both the processes and the products" (Manufacturing of other food products, enterprise 3)
Suppliers	[…] "Feedback with vendors that keep you up to the best of your products and customers that drive you to continuous improvement" (other manufacturing industries, Enterprise 14)
Competence	"There is constant benchmarking with competing companies, analyzing their sales strategies" (manufacturing of textile, big enterprise, enterprise 5)
External consultants	"In addition, the company considers the expansion in the business units, for which the company is working in internal and external activities related to R+D, with assistance of external consultants" (Manufacturing of textile fibers, enterprise 5)

Low-and low-medium-intensity manufacturing companies tend to link with consumers, customers, suppliers and consultants to obtain information or knowledge that will enable them to improve their innovation capacity. Some of these companies see the competition as a benchmark that encourages them to be more competitive. Finally, in table 5, we have the answers of the different companies on innovation:

Table 5. Answer of the interviewee on innovation

Description of the type of innovation	Example of quotes
Innovation of the product	[...] "The company identified a need on a new product that were the Mill balls, and that we did not sell before, and it was observed that the miners use it frequently" (iron and steel industries, enterprise 12)
Innovation under process	[...] "After a thorough analysis of each process, it was possible to modify certain steps in order to optimize the time and significantly decrease the losses" (Elaboration and conservation of meat, enterprise 1).

3.5. Consequences

The development of the innovation capacity of the company has as consequence the implementation of technological and non-technological innovations.

- **Food enterprises (Low technological intensity)**
- Enterprise 1 carried out innovation in processes with the purpose of reducing time and losses; in addition, it implements innovation in the area of marketing to improve the strategies that allow them to increase the sales.
- **Textile Companies (Low technological intensity)**

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Enterprise 5 acquires production machines and laboratory equipment to improve the formulation of recipes for the dyeing of tissues. Also, the company always improves the relationship with its clients.

- **Companies of plastic or rubber products**
  Enterprise 8 has launched two new products and are registering two new patents. Also, through the acquisition of the software, it has been able to make improvements in the production processes.
- **Vehicle Parts Manufacturing**
  Enterprise 9 has entered a new production line that consists of the manufacturing of spare parts for trucks. In non-technological innovations, it has implemented a Web page that allows to be in contact with the clients the 24 hours a day and 7 days a week.
- **Machinery Manufacturing**
  Enterprise 16 is planning to launch a new type of machinery called Scoop, which improves the line of rock drilling equipment. Also, in the innovation process it implemented a study of time and movements, and bought an instrument of adjustable torque, which is used by a single operator and reduces the mounting times from 5 hours to almost 8 minutes.

3.6. Covariances

To the extent that companies develop more innovation capacity, they have a greater willingness to implement innovations in products and processes. Therefore, it can be said that at a greater innovation capacity, greater number of innovations.

3.7. Contingencies

Peruvian manufacturing companies face particular contingencies for the performance of their activities. Thus, the Ministry of Production (2016), in analyzing the national survey of manufacturing industry innovation in Peru of 2015, found that most of the companies surveyed are small and medium, and have a low and medium-low technological intensity.

4. Discussions and conclusions

The findings can be divided in relation to two aspects: internal factors and external factors, which are associated with the innovation capacity of the company. In relation to the internal factors, it must be pointed out that the design and application of industrial engineering techniques is one of the most performed activities by small companies with low technological intensity. The design is a relevant activity in the footwear industry, especially in the elaboration of new models (innovation in products), or in the textile fiber industry, in which, applying techniques of continuous improvement manages to reduce time and costs, leading to the improvement of the company's performance.

The following most successful activity is the acquisition of machinery, which is very common in companies with low technological intensity. Small companies do so

because they are able to introduce innovation in processes. Medium-sized enterprises allow them to enter new markets with improved products. This result is indicated by Tello (2017), who mentions that the acquisition of the machinery allows companies to improve their innovation capacity and implement innovations in products and processes.

In relation to the companies that obtain certification and quality control, it can be seen that for the most part they are large companies and present medium-low technological intensity. These quality control practices lead companies to develop innovation in processes, and in other cases to implement "ERP systems", leading to the implementation of organizational innovations. This agrees with Bourke & Roper (2017), who argue that the quality consistency of the products will generate more satisfaction in the customers.

On the other hand, Papa *et al.* (2018) indicate that the personnel training improves the innovation capacity of the company, which is consistent with the results indicated by the interviewees in small and big enterprises, both in low and low-medium-tech intensity enterprises. They also show that staff training allows them to know better the operation of the machines, as well as the development of skills that will encourage innovation.

Analyzing the findings for external factors, it was found that one of the factors that most influences the development of the innovation capacity of companies is their relationship with customers or consumers. This is seen in small and big companies of low intensity. Customers provide valuable information to improve products and processes. This result is similar to the indicated by Saldanha *et al.* (2017), who claim that the consumer helps to improve the company's innovation capacity.

The following external factor is the relationship or linkage with suppliers, which allows small and big enterprises with low and medium-low technology intensity to improve their innovation capacity of the company. It is observed that small companies of low technological intensity obtain valuable information from their suppliers, leading them to make a continuous improvement, while medium-low technology companies visit the fairs of suppliers to improve their products and processes. Providers are an important source of knowledge, as also mentioned by Roper *et al.* (2017).

Similarly, competition helps big and low-tech enterprises improve their innovation capacity. Low-tech companies consider competitors to be a benchmark for improving their own sale strategies and medium-sized enterprises as an incentive to innovate. This result agrees with the stated by Qian & Wang (2017), who argue that the competition of the market forces the companies to innovate, and in this way to differentiate themselves from the competitors.

External consultants are also a valuable source of knowledge for small and low-tech companies. Big companies that have greater resources hire external consultants to develop research and development activities, while small enterprises hire external consultants to orient them in improving the manufacturing and administrative processes. To that extent, our findings are aligned with those obtained by Musioliket *et al.* (2018).

This study contributes to the literature, because the internal and external factors that favor the development of the innovation capacity, according to their size and technological intensity, are identified. The development of internal innovation activities, such as the design and application of industrial engineering techniques, the acquisition

of machinery, the obtaining of quality certificates and the application of quality control techniques, as well as the training of personnel, allows the development of the innovation capacity of the companies and, in this way, the implementation of innovations in products and processes. Manufacturing companies are linked to customers or consumers, suppliers, competitors and external consultants to improve their innovation capacity. In most cases, linkages generate information or knowledge that help companies develop innovations in products or processes and, in others, provide them with the knowledge to carry out research and development activities that contribute to improve the performance of their companies.

Three main constraints can be observed: first, it is difficult to decide whether theoretical saturation has been achieved. In this time, we were able to interview 16 people working in companies of different industries, different sizes, or that show three out of the four technological intensities. However, it was not possible to interview any company with high technological intensity. Secondly, the way in which the sample was selected is also a constraint, since participants were chosen taking into account the different industries (items) to which they belonged or the different sizes of the companies, and according to their convenience for interviewing them. Thirdly, the information collected is the one provided by the respondents. There was no opportunity to directly observe the relationships established between companies and their suppliers or customers.

Although this study has limitations, it is also a contribution to the innovation literature of manufacturing companies in an emerging economy, because it opens lines of future research. It is recommended that organizational and marketing innovations be analyzed, as well as how they influence product and process innovations. It would also be interesting to analyze how innovations are related to the best performance of the company or analyze a single industry, taking into account that heterogeneous behaviors can occur, depending on the type of product offered to the market.

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