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Innovation and patents as a business success factor

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Abstract

Purpose – The purpose of this paper is to expose the impact of innovation and patent registration, as a strategy that contributes to business success in the current competitive and globalized market conditions.

Design/methodology/approach – This paper presents a study on the innovation and contribution of the patent registry in the growth of economic sales of 1,746 companies in the Colombian manufacturing sector, whose applied methodology was a statistical correlation analysis and a binary logistic regression.

Findings – The results reveal a positive relationship among incremental product innovations with the achievement of sales success, although it is evident that patent registration negatively influences business success as a factor in innovation.

Originality/value – This study allows organizations to understand the importance of developing innovation processes and patent registration as a competitive factor that drives sales growth and success.

Keywords Innovation, Business success, Patent registration, Sales growth

Paper type Research paper

1. Introduction

Generally, the concept of business success is associated with the positive analysis of an organization when it demonstrates growth through financial and management indicators, results of efficient management of production processes and the adequate use of resources as market opportunities. From this perspective, Darroch (2005) and Chittithaworn *et al.* (2011) express that the development of new products that meet customer needs and expectations is an essential strategy to achieve corporate success as it guarantees the company's permanence in its commercial environment with the generation of greater benefits associated with sales, profits and profitability.

Although these results are a direct consequence of the management model and human resource competencies, innovation in products, goods or services is a factor that potentiates this good performance in companies, given their conditions, growth needs and market positioning (Loan, 2018). This is why innovation is currently considered as a variable that boosts organizational performance and contributes to success as it positively influences financial results while creating competitive advantages (Damanpour and Gopalakrishnan, 2001; Gálvez and García, 2012).

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In this regard, Artz *et al.* (2010) state that innovating and registering product patents is a key factor for business success. This is because it shortens the periods of long and medium-term investment recovery while increasing the value of intangible assets such as Goodwill. Therefore, betting on innovation and patents allows for a better market positioning and attracts investors, who are motivated by more stable benefits to their investments given the greater probabilities of obtaining profits with more attractive products that boost sales and brand positioning.

In this sense, the present study analyses business success from the annual sales revenue variable results, considering that it is an explanatory element of this phenomenon based on the postulates of the theory of industrial organization and the theory of Resources and Capabilities (Mascarenhas *et al.*, 2002; Huerta *et al.*, 2004; Zawislak *et al.*, 2017). Consequently, based on the annual sales revenue database of 1746 Colombian manufacturing companies supplied by the National Administrative Department of Statistics (DANE), a correlational statistical analysis as well as a binary logistic regression analysis was carried out to establish the three possible contributions exerted by the development of product innovation and the registration of patents on business success sales.

It is appropriate to highlight that the relevance of this research is established based on the fact that, in Colombia, there are still very few studies that provide an in-depth analysis on this topic (Gálvez and García, 2012; Sánchez *et al.*, 2007; Velásquez *et al.*, 2018), although companies are making greater investments in science, technology and innovation (CT+I) as a fundamental part of their competitive strategy. Therefore, to be able to contribute with new arguments of discussion in the academic and business field in the subject of innovation and registration of patents represents a contribution that promotes the successful management of organizations and their sustainability.

2. Theoretical framework and work hypotheses

2.1 Importance of innovation in the business context

Understanding innovation as a key factor that drives both business competitiveness and the sustained economic growth of a nation (Lederman *et al.*, 2014), helped King and Anderson (2002) determine that its main importance is centralized in being a dynamic strategy that significantly increases the productive conditions of any organization while at the same time increasing the competitive level as well as providing a wealth-generating factor along with new knowledge appropriation. Based on this, Crespi and Zúñiga (2012) and Schot and Steinmueller (2018) point out that by increasing productivity and organizational competitiveness based on innovation, not only economic benefits can be achieved, but also generates an integrating effect that encourages the implementation of technological and procedural changes that allow for more beneficial and effective use of corporate resources and the development of new business capabilities.

Based on the theory of the advantage of resources and capacities (Penrose, 1958), the concept of innovation has become an essential element that contributes to building the value chain and consequently competitive advantages in the market that represent better performances for organizations, particularly in companies that are located in countries with emerging economies (Nason and Wiklund, 2018; Ho *et al.*, 2019). Therefore, Orji and Liu (2020) support that those companies that adopt innovation as a driving force that contributes to improving the sustainability of the supply chain, have significantly improved their potential to retain and generate customers in periods of medium and long-term, citing as an example the processes developed by electronic goods companies in China.

For this, innovation currently becomes a variable that provides better economic and social development conditions for a nation given that it causes an integrating effect among

organizations, productive sectors and government, which in turn, generates business competitiveness and wealth creation, a fact that represents a valuable opportunity for developing countries to create differentiation and targeting factors for their products/services within international markets (Geroski *et al.*, 1993). To illustrate the above, the importance of innovation can be shown by what is indicated by the OECD (2010), which stated that in the USA about 85% of companies that belong to sectors where there is a strong focus on innovation and technological development manage to remain in the market after ten years of operation, while in companies that maintain conventional technologies or do not set innovation as a strategic axis of their business, around 80% of them disappear before the first three years of existence.

In other words, innovation is one of the great organizational challenges of the 21st century given the high levels of competitiveness that promote the globalization of markets, a situation that imposes the permanent development of new products or services with quality and satisfaction for customers in mind, while sustained wealth is generated for sales, guaranteeing the welfare of the company and all its stakeholders (Rueda and Rueda, 2017). This is why strategies like the one outlined by Bouncken *et al.* (2018), pointing out that cooperation between competitors is an effective way to generate product innovation, demonstrating that greater benefits are built through a shared irrigation system that minimizes the level of impact, proving that this type of unions is more advantageous to carry out through incremental innovation for the design and pre-launch phase, while radical innovation for the product launch.

In the Latin American environment, Ávila *et al.* (2019) also demonstrate that there is a strong causal relationship between business innovation and the per capita economic growth of each country in the long term (study between 1996 and 2015), a fact that is consistent with the analyses of Maradana *et al.* (2017) carried out in European countries, where it is also evident that innovation promotes the economic growth of the nations under study. For Mendoza (2017), studies that were done in Mexico also show that there is a positive convergence between the innovative activity of companies and the economic diversification of the regions as a result of the diffusion of technology, which promotes the generation of better income for the population and new jobs.

In Colombia, the deficit in terms of technological innovation such as the hiring of human capital with scientific training is still an incomplete task, as evidenced by the studies carried out by Sánchez *et al.* (2007) and Velásquez *et al.* (2018) that show the low investment that is destined to develop innovative processes, a fact that makes it impossible to reduce the technological gap when compared to other countries. Although large Colombian and multinational companies are the organizations that present the greatest advances in the field of innovation, much of their results are not a fruit of their own business activities in research and development (R&D), they are, although, the product of the technological adoption or purchase of patents developed abroad, a phenomenon that is similar in countries of the region, where there is a low budgetary commitment in this aspect, such as the scarce job opportunities for hiring personnel PhD or scientific profile.

Thus, in the case of Colombia, it is evidenced by an investment that is 21 times lower than Amazon Corp and does not exceed 0.67% of the gross domestic product (GDP), of which only 35% are contributions made by the private sector (Bustamante, 2018). It should be considered that the innovative property is associated with the intellectual property variable, which includes elements such as copyright, domain name, trademark registrations, indications of origin, test data and patent registration, the latter being an important factor for the quantitative measurement of the scientific and technological progress of the organization, region or country (Lederman *et al.*, 2014). Although in Colombia the patent

registration has had a positive trend in the past four decades and has increased fivefold between 2005 and 2012 (SciDev, 2017), the levels reached today are not the most adequate in comparison with the indexes of countries as Brazil, Mexico and Argentina, in which the development of new products increases by 30% (Sánchez *et al.*, 2007; Naranjo *et al.*, 2018).

For this reason, Juliao-Rossi *et al.* (2019) through their empirical evidence demonstrate that companies, by carrying out radical or incremental innovation, gain access to better external financial resources and develop better interaction with the market, aspects that explain the persistence in the innovation of its products in new international trade scenarios. Therefore, Damanpour *et al.* (2009) and Fagerberg *et al.* (2010) highlight that promoting innovation allows competitive companies to create more adaptable products with better attributes for international markets, as well as more realistic adaptability within the markets of third world countries who prefer incremental innovations.

Restrepo *et al.* (2019) highlight that in Colombia small and medium enterprises only manage to generate benefits in this sense when they make innovation efforts focused on creating new products for their market, but they are almost nil if it is about innovating through strategic alliances (R&D), highlighting that even companies that make imitations of products obtain benefits similar to those that invest in innovation. Specifically, the Colombian manufacturing industry based on R&D – innovation has been making greater investments in methods as techniques for the selection and linking of more capable human capital, because the positive effect that people generate in the company for the development of new innovative processes such as the significant increase in labour productivity (Ramírez *et al.*, 2019).

2.2 Product innovation and its relationship with sales success

Lamb *et al.* (2013) and Gálvez and García (2012) agree that scientific and technological development based on innovation directly influences the economic growth of the company, this is why it is necessary to structure corporate policies that encourage investment and concrete actions in CT+I, especially when product life cycles are increasingly shorter owing to the competitive growth generated by the globalization of markets. For this specific reason, innovation must be a constant to achieve positive results in terms of success and sustainability over time, given that the timely introduction of a new product into the market restricts the capabilities of the competition and boosts sales revenue, although, over time, other companies can be identified having similar products and so, the profit margin is reduced (Montgomery, 1995; Artz *et al.*, 2010).

In other words, implement innovation processes on an ongoing basis becomes an essential factor to guarantee corporate success reflected in sales revenue in manufacturing companies, demonstrating in this a strong positive influence of innovation in the indicator of economic profitability or on return on assets (ROA) asset profitability – an aspect that has been evidenced by the research done of Roberts (1999), DeCarolis and Deeds (1999); Maldonado *et al.* (2009), Artz *et al.* (2010); and Zawislak *et al.* (2017). Also evidenced by the authors is the fact that, at the same time it creates a possibility of an increase in the share price in the stock market, not only for the value it represents the company in the market but also brand positioning.

Although much of the research focuses on this type of analysis for manufacturing companies, some studies show that in companies dedicated to providing services, the influence of innovation is as positive as significant in the successful performance of sales and profitability, which can be said to be a phenomenon that applies and benefits all types of organizations regardless of the economic sector to which they belong (Salavou, 2002; Hsueh and Tu, 2004; Prajogo, 2006; Hua and Wemmerlov, 2006). It is important to highlight that to

validate these arguments and given that in the literature review done, no studies were found having this type of approach for the Colombian manufacturing business context, the present study analysed the data derived from the Technological Development and Innovation Survey (EDIT) conducted by the DANE. The previous was done to verify whether product innovation favours sales success, so the following research hypothesis was formulated:

H1. Product innovation in Colombian manufacturing companies contributes to sales success.

2.3 Patent registration based on sales success

In addition, studies made by MacDonald (2004), Cho and Pucik (2005); and Artz *et al.* (2010) conclude that there is also a positive relationship between the variable patent registration based on sales success, to the extent that gives the company the rights to commercially exploit an invention for 20 years. Thus, allowing the creation of favourable conditions in the market to recover investments in the short or medium-term and increase revenue from the sale of the product, goods or service. It means that patent registration allows companies to limit the scope of their competitors as they cannot make product design replica, an aspect that gives great economic benefits, especially at the time of introducing the product in the market by maintaining the character of exclusivity and attractiveness to customers (Bogner and Bansal, 2007; Encaoua *et al.*, 2006).

This is confirmed in the research done by Lee *et al.* (2000), Ernst (2001); and McMillan *et al.* (2003), who point out that patent registration is an effective measure not only to protect the asset, which represents developing an innovation but also significantly boosts sales growth, an aspect that Mann and Sager (2007) complement when concluding that there is a positive correlation in terms of business survival as well as increasing economic performance with higher incomes and profits.

It should be noted that the work of Artz *et al.* (2010) found a negative relationship between innovations and patent registration in terms of sales success, particularly when its effect on asset profitability (ROA) was analyzed as it did not effectively promote an increase in sales. Griliches *et al.* (1991) and Arora *et al.* (2008) suggest that this phenomenon is because of patents particularly being developed to create limited protection for new inventions for strategic purposes and to maintain monopoly as well as a competitive advantage. But, in certain sectors such protection does not necessarily favour sales success owing to the few safeguards that exist against product counterfeiting.

Given this postulate and owing to the lack of complementary studies, it was of great relevance for this research to analyse whether the registration of patents effectively favours sales success in Colombian manufacturing companies, so a second hypothesis was formulated to contrast the effects of this variable, which is stated as follows:

H2. Patent registration by Colombian manufacturing companies contributes to sales success.

In this order of ideas, although it is recognized that the registration of patents can favour the success of sales in companies as an indirect positive effect when introducing products to the market exclusively (Artz *et al.*, 2010; Zawislak *et al.*, 2017), the analysis indicates that this is valid as long as these patents are recognized and protected not only by law but also by consumers, an aspect that allows an adequate recovery of R&D costs along with exclusive product and brand positioning (Gallini, 2002; Martínez and Guellec, 2004; Encaoua *et al.*, 2006; Arora *et al.*, 2008; Meng and Chen, 2019). This being true as it is observed in some

chemical, pharmaceutical manufacturing industries, in biotechnology, medical instruments, electrical equipment, computers and specialized machinery, among others, where patents are recognized for strengthening the protection of innovations and improving the impact on increased sales volume and return on investment (ROI).

Therefore, it was also contrasted whether patents could be considered as a mediating factor that positively influences the effect of product innovation on sales success in Colombian manufacturing companies, so an additional hypothesis was formulated as follows:

H3. The patent registration influences the effect of innovation on the success in sales of Colombian manufacturing companies.

3. Methodology

3.1 Population and sample

To compare the variables of the present study, the EDIT survey database done by DANE was used as base information, collecting data between the 2013 and 2014 period for product innovation and patent registration analysis, and between 2015 and 2016 for the variable sales success. This time window aims to create a prudent space that would allow the collection of evidence of the possible effects of innovation and patents based on sales success.

These periods were selected because they are the only ones available as of 2018. To calculate the sample, the following two criteria were considered:

(1) manufacturing companies that were operating and without incident; and

(2) manufacturing companies with sales reports, patents, innovations and R&D expenses.

Thus, the initial population was made up of a total of 7,567 companies, of which 873 (12 %) achieved sales growth above the sample average of 60,791 million Colombian pesos, which made it necessary to use balanced samples, that is to say, the same number of companies with sales growth equal to or greater than the average and some companies with sales performance below the average, this to be able to contrast the hypotheses raised and give greater robustness to the regression models, avoiding errors related to the atypical sample observations based on the results (Chambers, 1986), thus arriving at a final sample consisting of a total of 1,746 manufacturing companies.

3.2 Measurement of variables

To measure the dependent variable sales success, those companies that had a growth equal to or above the average in the period 2015–2016, were identified as successful (Duarte and García, 2018). In this order of ideas, success in sales was taken as a dichotomous variable with value 1 if it reached a sales performance equal to or greater than the sample average and 0 if the performance was below average (Hernández *et al.*, 2006).

This study measured the innovation of products, goods or services through dichotomous variables, where the value of 1 was assigned to companies that implemented innovations and 0 for those that did not innovate (Simonen and McCann, 2008), discriminating whether the type of innovation was radical (with technological characteristics that differ significantly from previous concepts) or incremental (creates value or improvement to an existing product) as expressed by the Oslo Manual (OECD, 2005). Concerning the variable patent registration, it was defined based on the concept of Grant (2008) and the

Superintendence of Industry and Commerce (Superintendencia de Industria y Comercio, 2011) by Decision 486 of 2000, expressing that a patent is a privilege granted by a State to an invention as recognition of the investment and effort made by an entity or organization to achieve a technical solution to a problem. The patent registration is a document of territorial coverage, in which the condition or privilege is granted that, in terms of the law, is granted to its holder to exploit the invention commercially and exclusively for a determined period.

Therefore, the variable invention patent registration was measured based on the total number of legal recognitions granted to the companies under study in the 2013–2014 time window, while for the analysis of the mediating effect of patent registration in relation to product innovation and sales success, a term of interaction has been obtained between the patent indicator divided by the business success indicator. It is worth mentioning that two control variables were included that can have some effect on innovation and sales success, which were internal R&D expenses and external R&D expenses (Galende and Fuente, 2003; Orser *et al.*, 2006), data that were measured in thousands of Colombian pesos in the period between 2013 and 2014 (Zawislak *et al.*, 2017).

4. Research development

Using the Stata statistical package, it was first obtained the initial analyses of the descriptive statistics and the correlations of each of the variables, which are shown in Table 1. In this statistical analysis it is observed that the variables patent registration and product innovation (radical and incremental) have a weak positive correlation with the variable success in sales, that is, the greater the registration of patents and innovation, there is greater success in sales. Likewise, the internal and external R&D expenditure variables have a weak positive correlation with the success in sales variable, so it is established that the greater the success in sales, the greater internal and external expenditure is carried out in R&D, proportionally. Also, Table 1 shows a positive and strong correlation between the variables, mediating effect and internal R&D expenses, which translates into, the greater the number of patented inventions, the greater the internal R&D expenditure.

Secondly, to contrast the hypotheses, binary logistic regression was used to estimate five models and to establish the success in sales of Colombian manufacturing companies, based on a 95% confidence level that identified that Models 1, 3, 4 and 5 proved to be significant, as shown in Table 2. Regarding *H1*, the results of Models 1 and 3 allowed to confirm a positive and significant effect, specifically when incremental innovation is made, so that results indicate that if Colombian manufacturing companies carry out product innovation, the estimated logit increases on average 0.3541, while that if innovations are incremental, the logit increases on average 0.5623, which suggests a positive and significant relationship between incremental product innovations and sales success.

This result is in accordance with the research of Yu *et al.* (2020), who demonstrated that the development of new products increases sales revenue in high-tech industries such as the USA and China. Likewise, González-Fernández and González-Velasco (2018) carried out a study in the Spanish context that concludes that economic profitability from sales is strongly influenced by innovation and is stronger in large companies, as demonstrated by Lu and Chen (2010), by claiming that companies that make incremental innovations have a greater market share and therefore higher sales income, data that validate the results previously exposed.

On the other hand, *H2* is confirmed negatively and significantly according to Model 4, defining that if the patent registration is developed, the estimated logit decreases on average 0.6798, suggesting a negative relationship of patent registration with sales success. Similarly, *H3*, the results obtained in Model 5 are negative and significant, that is, if

Table 1. Descriptive statistics and Pearson correlation coefficients

Variable	Average	SD	Frequency	Sales success	Correlations Product innovation	Radical innovation
Sales success			1 = 873/ 0 = 873	*1*		
Product innovation			1 = 189/ 0 = 1.557	0.0861	*1*	
Radical innovation			1 = 118/ 0 = 1.628	0.0307	0.7753	*1*
Incremental innovation			1 = 113/ 0 = 1.633	0.0987	0.7483	0.3083
Patent	0.145454	2.353446		0.0060	0.1122	0.0395
Internal R&D expenditure	736,093.5	1.50×10^7		0.0325	0.1067	0.0327
External R&D expenditure	88,729.68	973,303.7		0.0328	0.1520	0.1622
Mediator effect	0.088200	2,313.23		0.0167	0.0958	0.0211

Source: Own elaboration

(*continued*)

Table 1.

Variable	Incremental Innovation	Patent	Correlations Internal R&D Expenditure	External R&D Expenditure	Mediator Effect
Sales success					
Product innovation					
Radical innovation					
Incremental innovation	*1*				
Patent	0.1349	*1*			
Internal R&D expenditure	0.1243	0.9707	*1*		
External R&D expenditure	0.0715	0.2285	0.2457	*1*	
Mediator effect	0.1206	0.9945	0.9823	0.2286	*1*

Table 2. Dependent variable regressions

Sales success	Model 1. Product innovation Coef.	Std. err.	z	$P > \|z\|$	Model 2. Radical innovation Coef.	Std. err.	z	$P > \|z\|$	Model 3. Incremental innovation Coef.
Product innovation	0.35	0.15	2.21	0.02	–	–	–	–	–
Radical innovation	–	–	–	–	0.04	0.19	0.21	0.83	–
Incremental innovation	–	–	–	–	–	–	–	–	0.56
Patents	–	–	–	–	–	–	–	–	–
Mediator effect	–	–	–	–	–	–	–	–	–
Internal R&D expenditure	6.57×10^{-9}	1.19×10^{-8}	0.55	0.58	1.18×10^{-8}	1.58×10^{-8}	0.75	0.45	5.52×10^{-9}
External R&D expenditure	4.60×10^{-8}	5.86×10^{-8}	0.78	0.43	5.93×10^{-8}	6.03×10^{-8}	0.98	0.32	5.44×10^{-8}
Constant	−0.045	0.05	−0.9	0.37	−0.013	0.49	−0.26	0.79	−0.04
Number of obs		1,746				1,746			1,746
LR chi2(3)		8.39				3.52			11.19
Prob > chi2		0.0385				0.3186			0.0107
Pseudo R2		0.0035				0.0015			0.0046

Source: Own elaboration

(*continued*)

Table 2.

Sales success	Model 3. Incremental innovation Std. err.	z	$P > \|z\|$	Coef.	Model 4. Patents Std. err.	z	$P > \|z\|$	Coef.	Model 5. Mediator effect Std. err.	z	$P > \|z\|$
Product innovation	–	–	–	–	–	–	–	–	–	–	–
Radical innovation	–	–	–	–	–	–	–	–	–	–	–
Incremental innovation	0.20	2.74	0.0	–	–	–	–	–	–	–	–
Patents	–	–	-–	–0.67	0.16	–4.2	0.0	–	–	–	–
Mediator effect	–	–	–	–	–	–	–	–0.62	0.21	–2.95	0.00
Internal R&D expenditure	1.10×10^{-8}	0.50	0.61	1.07×10^{-7}	2.53×10^{-8}	4.23	0.0	1.02×10^{-7}	3.34×10^{-8}	3.07	0.00
External R&D expenditure	5.80×10^{-8}	0.94	0.34	5.36×10^{-8}	6.87×10^{-8}	0.78	0.4	4.10×10^{-8}	6.41×10^{-8}	0.64	0.52
Constant	0.049	–0.86	0.38	0.01	0.048	0.24	0.8	0.029	0.048	0.60	0.54
Number of obs	1,746				1,712						
LR chi2(3)	11.19				37.54				17.91		
Prob > chi2	0.0107				0.0000				0.0005		
Pseudo R2	0.0046				0.0155				0.0075		

companies carry out product innovations and these are patented, sales success decreases with an average logit of 0.6271. It is noteworthy that these findings contradict studies that positively associate business success with the development of product innovations and patent registration since they argue that companies by introducing products with exclusive rights in the market can maintain their competitive advantage for a longer time and therefore a significant increase in sales revenue (Boso *et al.*, 2016; Guarascio and Tamagni, 2019).

Finally, concerning the marginal effect after the logit of the product innovation variables, the results show that the probability of sales success is 58%, observing that in the case of companies that made incremental innovations, the success of sales probability is associated with a value of 63%, which means that the latter may be the best strategy for organizations in the manufacturing sector. In this sense, the results turn out to be coherent with those proposed in the study presented by Bhaskaran (2006), concluding that incremental innovations can be relatively easily adopted by companies in the short term, allowing them to compete in better conditions of success within their markets.

5. Conclusions and discussions

Product innovation is considered as a critical factor for the success of companies because it positively influences economic profitability and maintains their competitive edge in the market, an aspect that adds to the patent registration as another element that generates success by allowing an organization to maintain in a better measure their positioning and overcome the breakeven point easier as well as their ROI (Artz *et al.*, 2010; Gálvez and García, 2012). In Colombia, studies on the effect of innovation and patent registration turn out to be limited, which is why this research focused on the analysis of success based on sales in manufacturing companies nationwide. All this with scientific support that serves to establish mechanisms that favour the innovative attitude and boost profitability to survive in the medium and long term, understanding it as a key factor to boost the country's socio-economic growth and competitive edges (Zawislak *et al.*, 2017).

Likewise, although Colombia has improved in the investment in CT+I and that there is a greater interest in this field by manufacturing companies, scientific progress has been slow and few jobs are perceived that allow providing hard evidence of the importance of innovation to achieve corporate success (Sánchez *et al.*, 2007; Velásquez *et al.*, 2018). Therefore, taking into account those researches that highlight the importance of product innovation and patent registration for the growth of sales and the economic profitability of a company in any sector (DeCarolis and Deeds, 1999; Salavou, 2002; Encaoua *et al.*, 2006; Prajogo, 2006; Bogner and Bansal, 2007; Maldonado *et al.*, 2009; Zawislak *et al.*, 2017), it was concluded that the effects of innovating in Colombian manufacturing companies are positive and significant against sales growth, especially when the company implements incremental product innovation.

Within these same results, a negative relationship was observed between patent registration and sales success in Colombian manufacturing companies, which can be explained by the fact that overconfidence arises in relation to competition when registering patents and not developing continuous improvement or innovation processes, which affects the competitive position of the company and the sale of its products, which added to the fact that the patent registers focus more on the creation of substitute products than on complementary ones, significantly affects the sales revenue because the positioning period of substitute products is longest in any type of market Likewise, it was shown that the effect of product innovation on sales success in Colombian manufacturing companies decreases when these innovations are patented, to the extent that it can be better related to other types

of variables such as the increase in intangible assets, the brand positioning in the market and the sector monopoly, as it provides protection and blocks the entry of similar products in the market (Encaoua *et al.*, 2006; Meng and Chen, 2019).

Therefore, patent registration can be beneficial for companies by granting a competitive edge that allows developing better radical products in the local market and limiting the arrival of substitutes which is more beneficial for industries such as pharmaceuticals, biotechnologies, medical equipment, auto parts among others, for having products with great brand recognition by consumers and strongly protected by the Law (Arora *et al.*, 2008; Meng and Chen, 2019). These results may vary because the registration of patents has an effect on sales in the medium and long term, while in this study the analysis time was only two years, which is why if Colombian manufacturing companies want an increase in sales in the short term, it is recommended to carry out a greater number of incremental innovations that allow positioning in a highly dynamic market in less time, although it does not mean neglecting strategies focused on patent registration to obtain exclusive rights to an innovation.

In this case, it means that the results obtained provide new empirical evidence for the Colombian business context because it highlights the need for manufacturing companies to continuously develop and implement R&D activities, especially in incremental innovations that satisfy the needs not covered in the market and help in sales success (Hsueh and Tu, 2004). Therefore, it is concluded that innovation is a complex corporate skill that is built with research, learning, and continuous improvement, in order to create differential elements that symbolize added values for the client and competitiveness and survival in local and international markets (Porter and Kramer, 2011).

It is appropriate to point out that the level of innovation of a company is largely achieved by the competitive influences of a country and the sector to which it belongs, one more reason to promote strategic alliances, government policies, and a greater vocation of organizations to invest in The development of elements of research, technological development and innovation, as a strategic line of work to promote the creation of new management models, process design, knowledge generation and hiring of qualified human resources (González, 2015). Therefore, in Colombia, it is necessary to review and improve public and private policies to boost this type of process and boost organizational competitiveness with sustained growth in each of the different sectors of the national economy, as observed in GDP investment in countries such as Korea (4.23%), Japan (3.29%), Germany (2.93%), USA (2.79%) or France (2.22%).

Therefore, Colombia needs its business sector and national government to deploy joint strategies to promote the hiring of qualified personnel to carry out research and innovation in every sense, to support change processes that increase the low average of 22% of the investment that it is used for this purpose, a value that is generally only associated with large companies (Lederman *et al.*, 2014; Revista Dinero, 2018). Finally, it is proposed that based on the results presented, new lines of research are developed with studies that analyse the impact that patent registration has on business success in the medium and long term, as well as research focused on analysing innovation and its correlation with human resources, business model and productive sectors, among others.

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