

Effects of Innovation on Competitiveness and Performance: Empirical Evidence in the State of Guanajuato in Mexico

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Abstract

The globalization of markets, the advancement of technology and innovation determine in a high percentage the speed at which companies must adapt to new challenges demanded by an increasingly competitive market, therefore competitiveness is becoming one of the key challenges on the corporate agenda. In this sense, innovation appears in the literature as the cornerstone for growth and is commonly manifested through technology, products and management processes. In fact, implementing innovation strategies is crucial for the firms to remain competitive. Therefore, the essential objective of this paper is to analyze the effects of innovation on competitiveness and performance of manufacturing companies with an emphasis in the automotive and auto parts industry, using for it a sample of 108 firms of the Guanajuato State in Mexico. The obtained results show that innovation has a positive influence on competitiveness and performance of the manufacturing companies in Guanajuato.

Keywords: Innovation, Competitiveness, Performance, Guanajuato

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1. Introduction

Nowadays the globalization of markets, the advancement of technology and innovation in processes allow the development of new products, techniques and even ideas, which determine in a high percentage the speed at which companies must adapt to new challenges demanded by an increasingly competitive market, therefore, competitiveness is becoming one of the key challenges in the corporate agenda (Sánchez, González, Gutiérrez and García, 2012). In addition, due to a combination of situational factors and with the result of the global business framework, those companies that are not competitive tend to disappear from the business scene (Martínez, Palos, León and Ramos, 2011), so in changing and competitive environments, innovation is a key factor for the survival of any business (Martínez *et al.*, 2011). In other words, innovation is the most important factor in increasing competitiveness (Najib, Ratna and Widyastuti, 2014).

Similarly, Kumar (2014) affirms that innovation, the cornerstone of growth, equips and keeps companies against market fluctuations and prepares them for long-term growth, and is commonly manifested through technology, products and management processes. Innovation provides companies with a significant competitive advantage by helping them build stronger brands, more successful products and improve the value of the company. In fact, it also acts as a stimulus for the growth, profitability and success of companies, focusing on key organizational aspects such as people, leadership, creativity and organizational culture (Prahalad, 2012).

According to the Organization for Economic Cooperation and Development (1996), competitiveness is the ability of companies, industries (sectors), regions, nations or supranational regions to generate, while exposed to international competition, a high level of income and jobs on a sustainable basis (Martínez *et al.*, 2011). In addition, according to Van der Horst (2006), for some, competitiveness is the result of the macroeconomic environment in which companies operate, which are affected by exchange rates and the level of public deficits. Others argue that competitiveness is basically achieved in the relative abundance of resources and low costs of available labor. Some others relate it to the natural resources of each country or the type of government policies (Martínez *et al.*, 2011).

Within this framework, one of the determining factors of competitiveness is the periodic development of new products that can meet the demands of the market. According to Datar *et al.* (1997), companies that are able to offer new high quality products faster than their competitors, will receive a greater economic benefit. In this case, companies must continuously innovate to maintain their competitiveness in a sustainable way (Najib *et al.*, 2014). It should be noted that, although there are different studies in the literature that address the issue of innovation, competitiveness and business performance; there is no study that analyzes these variables together in the state of Guanajuato, within the context of the auto parts and automotive manufacturing industry.

According to Mendoza-Velazquez, Santillana, Zárata-Mirón & Cabanas (2018), for years, Mexico has staked a place for itself on the international economic platform as one of the most attractive countries for investment in the automotive sector. Competitive labor cost higher than in other sectors of the economy, strategic country location, the opening of oil and gas industry to foreign investment, and specific reforms have had the potential to accelerate innovation and boost the nation's competitiveness, while strengthening the manufacturing sector (Lauridsen, Lerdo de Tejada, Petersen, Puyana, & Rosales, 2013).

Accordingly Martínez-Martínez, Santos-Navarro & García-Garnica (2017) in their study of the automotive industry in Guanajuato state that in recent years Mexico's automotive industry has revealed itself to be very dynamic and in the first semester of 2016, "the presence of FCA, Honda, KIA, Mazda, Nissan, Toyota and Volkswagen...have pushed up the production of vehicles to almost 1.7 million" (Toguna, 2016, p. 8). In addition, according to data from the Mexican Automotive Industry Association (AMIA, for its initials in Spanish) between 2014 and 2020, the Mexican automotive industry will grow by 60 percent, with 5 000 000 automobiles a year. In fact, Mexico is currently the world's fourth-largest exporter and seventh in terms of automobile manufacture.

Likewise, Mendoza-Velazquez *et al.* (2018) believe that the automotive industry is one of the largest in the country. In fact, Mexico ranks among the top ten worldwide producers of cars, trucks, car parts and components (eight largest manufacturer of vehicles and the first in Latin America). At the moment, there are 20 assembly plants in Mexico (eight more than ten years ago), with an annual production capacity of over 3.1 million units, as well as solid domestic and foreign supply chain. Within this context and according to Martínez-Martínez *et al.* (2017) is important to highlight that the geographical area known as the "Bajío" (consisting of Guanajuato, Querétaro and Aguascalientes) is gaining prominence for its production of automobiles and auto parts, and due to the high levels of foreign investment flowing into the region. In Guanajuato alone there has been almost a 20 percent growth in annual output volumes recorded recently (Flores, 2015).

Martínez-Martínez *et al.* (2017) track the history of the automotive industry in Guanajuato back to 1995 with the entry into operation of the General Motors assembly plant at the Silao complex, and the arrival of its respective suppliers of the auto parts and services. When this assembly plant firstly arrived to Mexico, they choose Mexico City as location for the company. However, afterwards, they transferred its manufacturing to the state of Guanajuato to improve its competitiveness by reducing its labor costs, given its closer proximity to the United States (García and Lara, 1998; García 2002; Martínez, García and Munguía, 2009; Micheli, 2016).

In the same way, some of the largest investments in Guanajuato have included the arrival of Volkswagen to Silao in 2013. Similarly, in the fourth quarter of that same year, Mazda set up its plant in Salamanca. Recently in 2014, Honda established its plant in Celaya. Likewise, Toyota began construction in Apaseo el Alto in November 2016 and on February 2020 the Japanese automaker officially opened its

new plant, a project in which 700 million dollars were invested (Martínez-Martínez et al., 2017; El Financiero, 2020).

Given the above, it can be concluded that it is essential to study the effects of innovation on competitiveness and performance and particularly this study provides empirical evidence in the State of Guanajuato, considering the automotive and auto parts industry and given the relevance of this industry in the economy and also considering its impact on the employment of the citizens in the State of Guanajuato. For instance and as previously described innovation is a vital factor not only for company's growth, but definitely for ensuring its survival in today's highly competitive markets.

2. Theoretical Foundation and Hypotheses Development

At present, in an environment characterized by instability, uncertainty and dynamism, it is essential that company managers direct their efforts to implement business strategies that allow their companies to remain competitive in today's changing business environment, where maintaining a competitive advantage is not an option but a primary requirement for its survival (Karami, Sahebalzamani and Sarabi, 2015). From this perspective, the vision of innovation as the main driver of long-term development is widely recognized, and is considered today as inevitable for all companies. Thus, to succeed in the rapidly changing business context, or even to survive, companies must respond with innovation (Costa, Fernández-Jardon and Figueroa, 2014), since an organization that does not innovate over time will fail (Chen and Chen, 2013).

In this regard, it is pertinent to note that the importance of innovation in the manufacturing industry has been widely recognized in the literature (Gallowj and Weinstein, 1997; Boyer and Metters, 2004). Indeed, taking into account the dynamic competitive environments that many innovation-oriented organizations face, it is those that are capable of producing a continuous flow of new products that are in a better position to achieve a sustainable competitive advantage (Henard and McFadyen, 2012). Seen in this way, in a changing and highly competitive environment such as the one companies face, innovation is definitely a key factor for the survival of any business (Martínez, Palos, León and Ramos, 2011).

In fact, globalization, the development of technology and innovation in processes that favors the development of new products, techniques and even ideas, determine the speed at which companies must adapt, therefore, competitiveness has become one of the main challenges in the corporate agenda (Sánchez, González, Gutiérrez and García, 2012). In addition to the above, it is important to highlight that regardless of the approach that is given to competitiveness, it is considered a fundamental factor to ensure sustainable economic growth (Paraian, 2013). Thus, it should be stressed that in an environment characterized by instability and dynamism, managers must seek performance measures that represent the strategies and competitive advances of companies, therefore that the measurement of performance is transcendental to align the organization with their objectives in order to achieve

them (Karami, Sahebalzamani and Sarabi, 2015).

In particular, in high-speed environments, a greater range of decisions and speed is required for decision-making, with the intention of developing strategic decisions and improving organizational performance. Thus, given a situation in which there are multiple alternatives, making decisions quickly and in a more effective way allows the company to perform better (Patel and Cooper, 2014). In the following sections, the effects of innovation activities on the level of competitiveness and organizational performance will be analyzed in more detail, in order to analyze and discuss separately the relationship between innovation and competitiveness, and to illustrate also the correlation between innovation and organizational performance.

2.1 Innovation and Competitiveness

In past decades, the relationship between innovation and competitiveness has been a central focus in the study of economic growth by researchers, academics and industry professionals (Kuznetsova and Roud, 2014). Thus, innovation is a key piece that defines the competitiveness strategy (Zamora, 2014). In addition, according to the Schumpeterian notion of competition through the innovation process, aptly described as creative destruction in its first writings, the term creative destruction recognizes that there are winners and losers within a competitive innovation process and this is beneficial for society, since while innovation is beneficial to the performance of companies, rapid innovation by other companies in the same sector decreases the ability of the company to obtain a profit from its own innovations in the short term (Greenhalgh and Rogers, 2012).

However, Porter (2004) defines the national innovative capacity as the potential of a country to produce commercially relevant innovations, in addition to analyzing the determinants of innovation capacity in the context of global competitiveness. In its analysis, innovation capacity is not simply about the level of innovation, but also aims to measure the fundamental conditions that create the environment for innovation in a country (Taranenko, 2013). In addition to this, innovation is frequently studied in relation to productivity and competitiveness, because these notions appear strongly interrelated. For example, technology and innovation can influence economies of scale, process time and the introduction of new methods, and therefore, affect the competitive advantage of companies (Carayannis and Grigoroudis, 2014).

It should also be noted that innovation is currently considered a strategic pillar for global organizational competitiveness. The current economic globalization, accelerated by the elimination of tariff barriers, the reduction in transport costs, the advance in communication technologies and the internationalization of investments, have drastically changed the scenario in which socio-economic players are developing. It is for this reason that companies, universities, research centers, regions and nations are being challenged to remain competitive (Pellicer, Yepes and Rojas, 2010). Therefore, it is necessary to emphasize that the strategic objective of maintaining long-term competitiveness can be achieved through the development

of innovative capacity (Taranenko, 2013).

In fact, the Global Competitiveness Index (GCI) of the World Economic Forum measures the various aspects of competitiveness through 12 categories, which are grouped into 12 pillars according to the following: institutions, infrastructure, macroeconomic environment, health and elementary education, higher education and training, efficiency of the goods market, efficiency of the labor market, development of the financial market, technological preparation, market size, business sophistication and innovation (World Economic Forum, 2015). According to the World Economic Forum (2015) the last pillar of competitiveness, Pillar 12, referring to innovation focuses on technological innovation. Innovation is particularly important for economies when they approach the frontiers of knowledge, and the possibility of generating more value through the integration and adaptation of exogenous technologies tends to disappear.

In these economies, companies must design and develop cutting-edge products and processes to maintain a competitive advantage and move towards activities that generate greater added value. This progression requires an environment that is conducive to innovative activity and needs to be supported by the public and private sectors. In particular, it means a sufficient investment in R&D, especially in the private sector; the presence of high quality scientific research institutions that can generate the basic knowledge necessary to build new technologies; extensive collaboration in research and technological development between universities and industry; as well as the protection of intellectual property (World Economic Forum, 2015).

These days, the competitive advantage in the current market is based mainly on the effective management of product innovation strategies within a regional strategic framework (Rubera, Griffith and Yalcinkaya, 2012). Small businesses and their ability to transform ideas into products and services are the main drivers of innovation, countries with the best results place a strong emphasis on supporting research and innovation. Universities in these countries also play an essential role in supporting innovation efforts (Paraian, 2013). However, from a resource-based perspective, the deployment of innovation resources aims to strengthen or strengthen the competitiveness of a company in its target markets. However, the scarcity of resources implies that a decision of a new product project is replaced by other projects in the innovation portfolio (Moenaert, Robben, Antioco, De Schamphelaere and Roks, 2010).

Additionally, innovation is a social process that if efficient, reliable, sustained and fast, can provide a region or nation with the conditions that are necessary for competitiveness. A business environment that fosters excellence in innovation in its product markets and in the company's strategy will generate the microeconomic conditions necessary for competitiveness (O'Malley, 2008). In other words, innovation is considered a fundamental factor for the competitiveness of a company (Cho, Park and Kichul, 2012). In this order of ideas, removing the obstacles of innovation and achieving the transformation of ideas into products and services is the heart of the innovation strategy, which contributes to increasing competitiveness

and encourages economic growth, while generates jobs (Paraian, 2013). However, the way in which competition affects innovation efforts may vary depending on various circumstances and factors. All this being the same, there are many more incentives to innovate when competition is healthy and markets are open. Experts believe that higher levels of competition in the market, as well as strong government policies favor innovation (Kuznetsova and Roud, 2014). However, due to increased competition, it has become very important to protect innovation to improve competitiveness. This is how keeping innovation secret, including knowledge and information about innovation, is a fundamental strategy to protect innovation, and in the long term it will be a mechanism to maintain the competitiveness of the company (Cho *et al.*, 2012) .

It is important to highlight that the speed, cost and effectiveness of innovation processes affect the competitiveness and prosperity of a community (O'Malley, 2008). It is clear that the competition that exists between the companies stimulates innovation in each company and improves its competitiveness, likewise, this innovation seeks the excellence of the business and the reduction of the global costs, as well as, the improvement of the product quality in the industry and, therefore, stimulates the growth of the industry by increasing demand (Cantwell, 2005; Sushil, 2009). On the other hand, the performance of innovation, a result of innovation management by a firm, is seen as a crucial determinant of its competitiveness. To conclude, it is important to mention that in the past, Drucker (1995) pointed out that companies necessarily need to focus on innovation to achieve sustained competitiveness.

Finally, it is important to point out that the fact that economies reap the benefits of the latest innovations or not will depend largely on their levels of competitiveness. Politicians, companies and society leaders must work together to ensure continued growth and greater inclusion in economic development. Improving competitiveness requires not only markets that work well, but also requires other key factors for success that include strong institutions that ensure adaptive capacity, talent availability, and high capacity for innovation. These essential ingredients will be even more important in the future because companies that are competitive are more risk resistant and better equipped to adapt to a rapidly changing environment (World Economic Forum, 2015).

2.2 Innovation and Business Performance

Today, technological innovations are considered in the current literature as important engines of economic progress, increased productivity and long-term performance (Tornatzky and Fleischer, 1990; Sorescu *et al.*, 2003; Burgelman *et al.*, 2004; Dogson *et al.*, 2008; Xiao *et al.*, 2013). As a consequence, researchers have been interested in understanding the processes through which innovations evolve over time (Singh, Mathiassen and Mishra, 2015). Thus, the knowledge-based world economy places special emphasis on the ability of a country to develop its innovative potential, this is because the competitive performance of a national

economy depends on the development of intellectual capital and the ability to innovate from the society. Therefore, innovation-based competitiveness is essential for the long-term economic performance of a country (Carayannis and Grigoroudis, 2014).

It should be noted that the performance of national innovation is frequently studied in relation to productivity and competitiveness, as they appear strongly interrelated (Carayannis and Grigoroudis, 2014). In the same order of ideas, Compagni, Mele and Ravasi (2015) affirm that innovations improve organizational performance. However, the growing concern about the emerging global competition and the need for continuous innovation has focused its attention on the strategies available to respond to these challenges. Consequently, this has aroused interest in industrial clusters because there is a close relationship between clusters and competitiveness and business performance (Bramwell, Nelles and Wolfe 2008).

In the same way, the effectiveness of regional strategies for launching new products has effects on market performance (Rubera *et al.*, 2012). It happens, then, that people who work in a company that fosters an environment that favors creativity are more likely to generate novel ideas that may be useful in the process of developing new products, and this can result in improved performance in product innovation (Dul and Ceylan, 2014). Hence the importance of instilling individual and organizational creativity through appropriate motivation mechanisms is essential to achieve optimal performance in the innovation of the company, even in cases where the company is under strong pressure (Bhat, 2010).

According to Antioco, Moenaert and Lindgreen (2008), the quality of decision making during the development of new products is critical for organizational performance. Within this order of ideas, service innovation improves the performance of an organization and creates core competencies to achieve competitive advantage through a systematic approach to service development, which is vital to survive and maintain competitiveness in the current financial markets (Reza, Rezvani and Afshar, 2015). Likewise, innovation in services improves the overall performance of an organization and is an important source of competitive advantage (Ramakrishna, 2012).

For instance, researchers have found that there is a positive relationship between technological innovation and company's performance. For example, Hung and Chou (2013) reveal that technological innovation is one of the most important factors, so that the company improves its performance in the recent global industry. Additionally, in companies that are innovative, they are more likely to enjoy an increase in their income, regardless of the industry in which they are operating (Hong, Kim and Cin, 2015). On the other hand, to improve the productivity and performance of the company, a key route is to develop a clearer understanding of the innovation processes of the company. This is because with a greater understanding of these processes, companies can improve their innovation management and make use of their capabilities (Gajendran, Brewer, Gudergan and Sankaran, 2014).

Additionally, the ability of a company to integrate resources in order to respond to the opportunities that arise in dynamic markets, in their results they reflect the ability to change and that is how the company improves its performance through innovations (Gajendran *et al.*, 2014). To conclude, according to Ruiz, García-Morales and Llorens (2013), researchers have sought the basic principles to explain the connection between innovation and performance. As for strategic management, the adaptation between the strategy and its environment has positive implications for the performance of a company (Venkatraman and Prescott, 1990). This approach is rooted in the belief that a company's performance deteriorates when strategic organizational resources are not aligned with the corresponding environment (Staughton and Williams, 1994; Hill and Brown, 2007).

As a result, adapting to internal and external context factors will allow the company to gain a competitive advantage and better performance. In other words, choosing the right innovation is central to the process of adaptation between the company and its environment. Therefore, when different changes occur in the environment, different degrees of innovation or adaptation are required, as a means to align the company's resources with the opportunities and threats of the environment (Ruiz *et al.*, 2013).

3. Research Methodology

In order to test the model of the impact of innovation on the competitiveness and performance of companies in the State of Guanajuato, the questionnaire method design was chosen. This questionnaire was applied to company managers and the responses were subsequently recorded in IBM SPSS Statistics in order to analyze them. It's important to point out that the questionnaire facilitated the development of latent variables for the use of factor analysis. On the other hand, the type of research was: explanatory, because it focuses on explaining the relationship between two or more variables (innovation, competitiveness and business performance); causal, because empirical evidence was obtained of the relationship between innovation and competitiveness and business performance; and transversal, since the research project was carried out in a single moment through the application of a survey.

Likewise, the method used to obtain data is a very traditional quantitative method known as the survey or questionnaire method. The questionnaire is an instrument used to collect information, designed to quantify and universalize information and standardize the interview procedure. Its purpose is to achieve the comparability of information (Arribas, 2004). It is important to note that it is one of the most used data collection techniques, and helps to study specific situations and even make future predictions based on the reaction of a specific population segment (Lema, 2017).

In addition, the subjects of this study are the manufacturing companies of the state of Guanajuato. The National Statistical Directory of Economic Units (DENUE) of INEGI was used to obtain the directory of companies in the manufacturing segment,

a database from which 216 manufacturing companies were selected to begin the application of the questionnaires. As well, the sampling method that was used was non-probabilistic, which is characterized by being based on the experience of the researcher. According to Alaminos and Castejón (2006), it is a sampling characterized by the intentionality of the investigator, who tries to locate cases that can provide a maximum of information. Additionally, within the non-probabilistic sample, the convenience procedure was used, which is also called accidental or fortuitous.

In this method the researcher simply selects the cases that are most available. In other words, in convenience sampling, the researcher makes the decision on who to interview (Alaminos and Castejón, 2006). Regarding the determination of the sample, it is important to note that the sample size was determined taking into account that the information will be analyzed later using the Structural Equation Models technique, hereinafter SEM by its acronym in English: Structural Equation Modeling.

Ruiz, Pardo and San Martín (2010) state that in SEM techniques it is advisable to have large samples, that is, it is specifically to have a sample size greater than 100 or 200 cases. In other words, it is customary to demand sample sizes greater than 100 subjects and sizes greater than 200 subjects are a better guarantee. In addition, “the larger the number of variables, the larger the sample size should also be (a rate higher than 10 subjects per observed variable is recommended)” (Ruiz, Pardo and San Martín, 2010: 44). Thus, for the purposes of this research, and based on the fact that the information would be analyzed later using the Structural Equation Models technique, it was determined to establish a sample size of at least 200 cases of companies belonging to the State of Guanajuato.

In regards to the measurement of the variables used in this study, the measurements of various constructs are established: innovation, competitiveness and business performance. The approach was made using previously developed scales implementing adaptations of them. It is important to note that to verify the validity of the instrument, pilot tests were carried out.

For the evaluation of the reliability and validity of the three measurement scales, a Confirmatory Factor Analysis (CFA) was applied, using the maximum likelihood estimation (MLE) with the support of the EQS 6.2 software (Bentler, 2005; Brown, 2006; Byrne, 2006). Therefore, for the measurement of reliability, Cronbach's Alpha and Composite Reliability Index (CRI) were used (Bagozzi & Yi, 1988), and according to the results obtained in the CFA all the values of the three scales they are higher than 0.7 for both indices, which provides evidence of the reliability of the scales and justifies their internal reliability (Nunally & Bernstein, 1994; Hair *et al.*, 2014). In addition, as evidence of convergent validity, the CFA results indicate that all items of related factors are significant ($p < 0.001$) and the size of all standardized factor loads is greater than 0.60 (Bagozzi & Yi, 1988).

The results of the application of the CFA are presented in Table 1 and suggest that the measurement model provides a good fit of the statistical data ($S-B \chi^2 = 1,814.248$; $df = 1,193$; $p = 0.000$; $NFI = 0.780$; $NNFI = 0.849$; $CFI = 0.859$; $RMSEA$

= 0.070). In addition, Table 1 shows a high internal consistency of the constructs, in each case Cronbach's Alpha exceeds the value of 0.70 recommended by Nunally and Bernstein (1994). The composite reliability represents the variance extracted between the group of observed variables and the fundamental construct (Fornell & Larcker, 1981), so that a CRI greater than 0.60 is considered desirable (Bagozzi & Yi, 1988), and in this study this value it is widely exceeded. The index of the Extracted Variance Index (EVI) was calculated for each of the constructs, resulting in an EVI greater than 0.50 (Fornell & Larcker, 1981), and in this research 0.50 is exceeded in all factors.

Table 1: Internal consistency and convergent validity of the theoretical model

Variable	Indicator	Factorial Loading	Robust t-Value	Cronbach's Alpha	CRI	EVI
Product Innovation (F1)	IP1	0.762***	1.000 ^a	0.826	0.828	0.549
	IP2	0.801***	12.324			
	IP3	0.613***	5.774			
	IP4	0.772***	8.930			
Marketing Innovation (F2)	IM1	0.699***	1.000 ^a	0.924	0.926	0.583
	IM2	0.778***	10.002			
	IM3	0.796***	7.797			
	IM4	0.815***	8.638			
	IM5	0.741***	8.133			
	IM6	0.852***	9.009			
	IM7	0.799***	7.184			
	IM8	0.675***	7.722			
Process innovation (F3)	IS1	0.773***	1.000 ^a	0.930	0.931	0.729
	IS2	0.884***	11.116			
	IS3	0.784***	8.065			
	IS4	0.924***	9.677			
	IS5	0.894***	9.421			
Management Innovation (F4)	IO1	0.841***	1.000 ^a	0.933	0.935	0.618
	IO2	0.868***	11.816			
	IO3	0.825***	10.782			
	IO4	0.902***	13.337			
	IO5	0.887***	12.125			
	IO6	0.715***	7.777			
	IO7	0.616***	7.142			
	IO8	0.732***	7.599			
	IO9	0.630***	6.821			
Innovation	F1	0.770***	3.845	0.901	0.903	0.702
	F2	0.880***	4.443			
	F3	0.717***	4.945			
	F4	0.963***	4.339			
Financial Performance (F5)	FP1	0.761***	1.000 ^a	0.908	0.910	0.632
	FP2	0.782***	8.579			
	FP3	0.883***	9.178			
	FP4	0.868***	8.402			
	FP5	0.822***	7.377			

	FP6	0.624***	5.688			
Cost Reduction (F6)	PC1	0.897***	1.000 ^a	0.952	0.954	0.690
	PC2	0.886***	21.002			
	PC3	0.804***	11.227			
	PC4	0.817***	12.083			
	PC5	0.832***	13.705			
	PC6	0.735***	8.433			
Technology Use (F7)	TE1	0.833***	1.000 ^a	0.941	0.943	0.785
	TE2	0.873***	11.497			
	TE3	0.869***	13.344			
	TE4	0.863***	10.559			
	TE5	0.846***	9.435			
	TE6	0.858***	10.000			
Competitiveness	F5	0.919***	5.185	0.852	0.854	0.663
	F6	0.788***	5.546			
	F7	0.723***	4.218			
Performance	PE1	0.877***	1.000 ^a	0.920	0.922	0.665
	PE2	0.911***	14.964			
	PE3	0.808***	10.554			
	PE4	0.658***	6.791			
	PE5	0.826***	10.400			
	PE6	0.789***	10.305			
S-BX ² (df = 1,193) = 1,814.248, p < 0.000, NFI = 0.780, NNFI = 0.849, CFI = 0.859, RMSEA = 0.070.						
^a = Constrained parameters to such value in the identification process.						
*** = p < 0.01						

Additionally, the discriminant validity of the theoretical model of innovation, competitiveness and business performance were measured by means of two tests, which are presented in Table 2. First, the confidence interval test is presented (Anderson & Gerbing, 1988), which establishes that with a 95% confidence interval, none of the individual elements of the latent factors of the correlation matrix has the value of 1. Second, the extracted variance test is presented (Fornell & Larcker, 1981), which states that the variance extracted from each pair of constructs is lower than its corresponding EVI. Therefore, according to the results obtained from the application of both tests, it is possible to conclude that both tests demonstrate sufficient evidence of the existence of discriminant validity.

Table 2: Discriminant validity of the theoretical model

Variables	Innovation	Competitiveness	Performance
Innovation	0.702	0.169	0.476
Competitiveness	0.351 – 0.471	0.663	0.609
Performance	0.508 – 0.872	0.559 – 0.999	0.665

The diagonal represents the Extracted Variance Index (EVI), whereas above the diagonal the variance is presented (squared correlation). Below diagonal, the estimated correlation of factors is presented with 95% confidence interval.

4. Results

To respond to the two hypotheses raised in this empirical study, a structural equation modeling (SEM) was applied with the support of the EQS 6.2 software (Bentler, 2005; Byrne, 2006; Brown, 2006), analyzing the nomological validity of the theoretical model of innovation, competitiveness and business performance through the Chi-square test, through which the results obtained between the theoretical model and the measurement model were compared, obtaining non-significant results which allows an explanation of the relationships observed between latent constructs (Anderson & Gerbing, 1988; Hatcher, 1994). Table 3 shows in greater detail the results obtained from the application of the SEM.

Table 3: Results of the SEM

Hypothesis	Structural Relationship	Standardized Coefficient	Robust t-Value
H₁ : The higher level of innovation, higher level of competitiveness.	Innovation → Competitiveness	0.774***	4.049
H₂ : The higher level of innovation, higher level of performance.	Innovation → Performance	0.696***	3.393

$S-BX^2$ (df = 1,185) = 1,660.737, $p < 0.000$, NFI = 0.807, NNFI = 0.884, CFI = 0.892, RMSEA = 0.061.
*** = $P < 0.01$

Table 3 shows the results obtained from the application of the SEM and, with respect to the **H₁** hypothesis, the results obtained, $\beta = 0.774$ $p < 0.001$, indicate that the innovation has significant positive effects on the competitiveness of the manufacturing companies of Guanajuato. Regarding the **H₂** hypothesis, the results obtained, $\beta = 0.696$ $p < 0.001$, indicate that innovation has significant positive effects on the business performance of manufacturing companies in Guanajuato. In

summary, the existence of a significant positive relationship between innovation, competitiveness and business performance can be corroborated.

5. Conclusions and Discussion

The results obtained in this research paper generate different conclusions, among the most important are the following. First, by verifying that innovation does have significant positive effects on competitiveness, it can be concluded that the factors that are part of innovation (product innovation, marketing innovation, process innovation and management innovation) are critical in terms of the competitiveness of the company refers, either by comparing the financial performance or the purchasing costs with the average of the sector or in terms of technology. Statistically, the value of β indicates the importance of innovation (independent variable) in competitiveness (dependent variable). It should be noted that the value of t confirms that the independent variable (innovation) is significantly related to the dependent variable (competitiveness).

Regarding theoretical evidence, it is important to note that Schumpeter (1934) stated that innovation has been recognized as one of the sources of competitive advantage in companies. In fact, when reviewing the literature, it was found that the study of the relationship between the innovation and competitiveness variables has been widely studied. Among the researchers who have studied this relationship, Porter (1990) can be mentioned; Baregheh, Rowley and Sambrook (2009), Lewandowska (2014), Kvedariene (2015), Florian and Tudor (2015), Vargas-Hernández and Vargas-González (2015), Collins and Troilo (2015), as well as Duran, Kammerlander, van Essen and Zellweger (2016). All these researchers found a positive relationship between these variables.

While Florian and Tudor (2015) sustain that innovation is the key driver of competitiveness and sustained long-term growth, Vargas-Hernández and Vargas-González (2015) consider that the ability to innovate is of vital importance when talking about competitiveness of a company, industry or country. In particular, Duran *et al.* (2016) point out that currently in highly competitive industries characterized by having shortened product life cycles, innovation has been considered one of the most important competitive advantages of companies.

In addition to the above, there is evidence of empirical research that confirms the innovation-competitiveness relationship and concur with the results obtained in this research. On the one hand, Zhuang, Williamson and Carter (1999) concluded that innovation encourages the competitiveness of companies and even most organizations are willing to involve their staff in innovation projects, because they consider it necessary to deal with to the competitive and changing environment.

From the previous evidence, it can be concluded in general terms that the result of the analysis of hypothesis one coincides with both theoretical and empirical conclusions about the innovation-competitiveness relationship. Similarly, they confirm the existence of positive and significant influence of innovation on competitiveness. In particular, in the case of the present research, the values

obtained demonstrate that the innovation has positive and significant effects on the competitiveness of the companies of the manufacturing industry of Guanajuato. For instance, the first study hypothesis is accepted.

Second, by establishing the positive and significant relationship that exists between innovation and business performance of the manufacturing industry of Guanajuato (Mexico), it is possible to conclude that the factors that conform the innovation (product innovation, marketing innovation, process innovation and management innovation) are transcendental as far as business performance is concerned, since for the measurement of business performance the level of return on investment (ROI) was considered, as well as the level of benefits, the level of increase in its sales, the degree of satisfaction of its customers and employees, as well as the overall results in its company in the last year, all in relation to its objectives.

It should also be mentioned that, according to the theoretical review, there are several researchers who have studied the innovation-business performance relationship. Among them are Voss, Johnston, Silvestro, Fitzgerald and Brignall (1992), McDermott and Prajogo (2012), Vargas-Hernández and Vargas-González (2015) and Duran, Kammerlander, van Essen and Zellweger (2016). According to Vargas-Hernández and Vargas-González (2015), innovation has gained importance in the new global scenario and is essential in the development of business strategies that have as their goal the search for optimal performance in the industry. Duran *et al.* (2016) point out that the innovative behavior of organizations, specifically the constant renewal of products and processes, is associated with sustainable competitive advantages and better business performance.

On the other hand, regarding the empirical evidence found on the study of the variables innovation and business performance, the studies by Brentani (2001) and Vargas-Hernández and Vargas-González (2015) can be mentioned. Accordingly, Brentani (2001) discovered that the degree to which products produce benefits to companies in terms of business performance is significantly affected by the innovation of the products delivered. Alternatively, Vargas-Hernández and Vargas-González (2015) found that the ability to innovate is a factor that positively affects the performance of companies in the industry, which in turn is reflected in the competitiveness of the sector. It should be noted that these researchers agree that innovation has a positive and significant impact on the performance of companies. Additionally, this research paper also has a series of implications for both the managers and the companies themselves, in fact, it is vitally important to raise awareness among executives to implement product innovation practices (changes or improvements in existing products or marketing new products), marketing, processes (changes or improvements in the production processes or acquisition of new equipment goods) and management (changes or improvements in management, purchases and supplies) in your organization. This, because innovation is an essential factor for the company to perform well and remain competitive in today's market. In particular, it is proposed the close collaboration between universities and research centers with companies in Guanajuato, in order to build trust, so they can work together to carry out research in strategic areas or topics to improve the

competitiveness of the region in the long term.

Nevertheless, taking into account the above, which confirms the relevance of innovation practices in the manufacturing industry of Guanajuato, as well as the growing search for companies to be more competitive in their environment and improve their business performance. Moreover, a second implication of these results is that it is considered pertinent that the government of the State of Guanajuato favors the creation of public policies that in turn become actions that foster innovation. This, then, has been recognized in the literature and empirically confirmed in the present study a close relationship between innovation and competitiveness.

Likewise, it is also considered practical that the Secretary of Economic Development of the State of Guanajuato increase the number of programs aimed at innovation and technological development, because although there are already some programs, the majority are focused on the software industry and technology development. Therefore, it is recommended that efforts be made to develop innovation programs in products, services, processes and management systems specifically for the manufacturing industry of Guanajuato, given its relevance in local and national GDP.

Finally, it is also considered relevant that the government of the State of Guanajuato favors the close collaboration between universities and research centers with the state manufacturing companies. It would even be a good initiative to incorporate scientists into companies so that the most recent findings in terms of innovation can be used as tools to improve the competitiveness and performance of companies in the long term. To cover the salary of scientists who work in companies, it would be a good initiative for the government to consider a budget for it, so that the economic aspect to cover this cost does not have to be fully covered by the company and thus entrepreneurs have more openness to this initiative.

6. Limitations

It should be noted that during the course of the present research, there were several limitations specifically in regard to fieldwork. The first limitation was to have the necessary financial resources to carry out surveys. Given the current situation in Mexico and budget cuts for research projects, there was no financial support from the government for this research. Therefore, the questionnaires were applied with the support of four undergraduate students from the University of Guanajuato.

The second limitation was that due to the current situation of insecurity that the State of Guanajuato is going through, there was a high non-response rate. Although initially it was intended to survey 200 manufacturing companies located in the State of Guanajuato, with great effort and great difficulty, only 108 observations were collected. As a strategy they were shown a formal legal document from the University of Guanajuato, to give them confidence, but still, they were afraid and refused to make an appointment for the application of the questionnaire.

Within this framework, it should be noted that the support received by the company

of the automotive sector Honda of Mexico, Celaya Plant, was of vital importance. Executives from the Finance Department of the company supported the researchers to have contact with their suppliers in order to apply the research questionnaires. Thanks to this significant support, research was enriched and included in the sample various companies of the automotive and auto parts sector.

The third limitation concerns the willingness of managers to answer the survey. In most cases it was very difficult to get appointments for the application of the surveys, since in general the companies did not show an interest in academic research activities. Even when access to an appointment was finally achieved, on several cases they canceled the meetings at the last-minute and asked to reschedule the appointment for another date.

Within this framework, the executives expressed distrust when answering the survey, because they argued that the information requested was confidential, specifically the information related to annual sales revenue and those questions associated to the company's financial performance. However, after explaining that the information collected would be analyzed in general and not in particular, most of the managers surveyed agreed to answer the entire questionnaire.

Finally, another limitation that can be considered is that the fact of applying the questionnaire only to managers only represents the opinion of a person in the company, therefore, the information collected can be subjective. It would be appropriate for future studies to apply the survey to both employees and customers of the organization, in order to obtain information from another point of view and even be able to compare such data with the information collected from the questionnaires applied to the managers.

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