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The Innovation Strategy and Effects in Organizational Learning: The Manufacturing Sector in Colombia

La estrategia de innovación y los efectos en el aprendizaje organizacional: el sector manufacturero en Colombia

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ABSTRACT

This paper contributes to the analysis of the innovation strategy and organizational learning, concentrating on manufacturing companies with innovative processes, investment in research and development, better organizational methods and technology equipment, using databases from the National Department of Statistics-DANE to carry out the empirical study, the research establishes that companies with innovative strategies present greater organizational learning, the results confirm that an industry with an innovation strategy tends to get better and improved processes, and this learning allows firms to achieve value creation for the customer, turning into better types of products; also, through the use of communication and computer equipment, and innovations in organizational methods generates a better organizational learning for the company.

Key Words: Innovation, manufacturing industry, strategy, organizational learning, processes.

RESUMEN

Este trabajo contribuye al análisis de la estrategia de innovación y aprendizaje organizacional, concentrándose en empresas manufactureras con procesos innovadores, inversión en investigación y desarrollo, mejores métodos de organización y equipos tecnológicos, utilizando bases de datos del Departamento Nacional de Estadística-DANE para llevar a cabo la investigación empírica, la investigación establece que las empresas con estrategias innovadoras presentan un mayor aprendizaje organizativo, los resultados confirman que una industria con una estrategia de innovación tiende a mejorar y a mejorar los procesos, y este aprendizaje permite a las empresas lograr la creación de valor para el cliente, convirtiéndolos en mejores tipos de productos; además, a través del uso de equipos de comunicación y computación que ayudan en las innovaciones en los métodos organizacionales, se genera un mejor aprendizaje organizacional para la empresa.

Palabras clave: Innovación, industria manufacturera, estrategia, aprendizaje organizacional, procesos.

INTRODUCIÓN

Competitive strategy has been for decades the panacea for doing business, studying organizations and promoting successful management of companies, however, multiple factors have been included in the analysis of the strategy: through the complexity of organizations, the typology of them, uncertainty environments, social responsibility, environmental concern, creation of shared value and in the last 20 years innovation.

Authors such as Berkowitz (1987), Porter (1991), Saleh and Wang (1993), Adner (2006), have included in their studies the concept of strategic innovation, which indicates that even if it is not a totally new concept, it becomes a differentiating element for the organizations, which has been going for years, but has not managed to materialize into a single concept; the strategic innovation as it is known in the literature, has counted on several axes of observation between the most important can be emphasized: research and development, know-how, purchase of external knowledge, technological levels, activities for environmental protection and highly specialized human capital.

In management, strategic innovation has a privileged place since it allows to understand how organizations can generate more value. Therefore, the present analysis seeks to contribute to the study of strategic innovation in the manufacturing sector in Colombia, analyzing the large companies that compound the sector, especially examining the variables of research and development, innovation process and technology equipment for organizational learning in organizations. The purpose is to understand *how innovation strategy measure by organizational methods and technology equipment, affects to organizational learning measured by improvement in production, distribution and logistics systems.*

The document is divided as follows: first, the innovative strategy in manufacturing processes is explained, the manufacturing in Colombia sector is characterized where the hypothesis to be

studied is supported, afterward the quantitative methodology is explained, indicating the databases that have been taken from the National Department of Statistics-DANE, followed by the results, ending with the conclusions and research limitations.

THEORETICAL FRAMEWORK

Innovative Strategy

What innovation represents ranges from a product designed totally different from others, an improved product in its function, processes that are more efficient, or processes that include technology; however, the variety in innovation by the companies has made almost impossible to determine an exact formula, as it happened at the time with the strategy, where it was known that the analysis of external characteristics added to the internal characteristics of the organization that could be controlled, which would allow finding the best strategy; given specific characteristics of each company in a changing environment of total uncertainty. The debate over what an innovative strategy means and its impact on business for both the consumer and the stakeholders over the last few years has made it, one of the most fruitful fields of management; in the last decade, the remarkable increase of publications and citations on the topic, makes it a subject of permanent interest.

Innovative strategy is transformed for enterprises into the most common source of competitiveness, especially companies that have in mind an international strategy to global markets, the strategy is defined as the process that allows creating a position into the market (Porter, 1979), but the innovation strategy is defined as this process that includes value creation and share value, novelty, corporate social responsibility; a definition for this research is: Innovative strategy is the process of creation of competitive advantage with technology, changing products and services, flexible process and constant adaptation to the environment.

The most representative authors (see Table No. 1) in the area as Teece (2010), Zott et al. (2011) show the companies' relentless interest, in generating added value for their clients,

who must perceive in the product and/or service the intrinsic characteristics of the good, but also the emotional and particular qualities that generate the "hook" of the consumer with the product and the subsequent repurchase; consumers perceive easily when a good does not present any innovation, so many organizations start investing in research and development departments in order to experiment with new resources, better materials and develop unique products and services (Jiménez and Sanz (2011), Ferreras et al. (2016), Kumar et al. (2010)), generating organizational learning that becomes a competitive advantage (Villar et al., 2014).

Table 1.
Authors and Citation 2010 – 2017. (Data Analysis of Web of Science)

Authors	Total Citations
Teece, David J.	663
Zott, Christoph; Amit, Raphael; Massa, Lorenzo	389
Adner, Ron; Kapoor, Rahul	208
Demil, Benoit; Lecocq, Xavier	171
Zhang, Yan; Li, Haiyang	144
Jimenez-Jimenez, Daniel; Sanz-Valle, Raquel	142
Pache, Anne-Claire; Santos, Filipe	135
Kumar, V.; Aksoy, Lerzan; Donkers, Bas; Venkatesan, Rajkumar; Wiesel, Thorsten; Tillmanns, Sebastian	132
Schaltegger, Stefan; Wagner, Marcus	127

Source: Self made.

The industrial sector has explored new techniques to improve its products and processes, generally colombian organizations have focused on importing technology to transform their products and processes into radical and incremental innovators, but have not achieved higher levels of competitiveness (Porter and Heppelmann (2016), Porter 2015), it has achieved greater productivity and first steps in incremental innovation, which is a step forward in the positioning of colombian companies in international markets (Hitt et al., 1997).

Thus, manufacturing processes are being extensively modified by technological tools, but other factors associated with manufacturing are

allowing effective and less costly processes (Pinto et al., 2006), which change thanks to innovations ranging from processes of information, management of costs, through the training of employees, to the design of new and better materials. These dynamic processes, resulting from the mobilization of resources towards dynamic capacities, have led traditional companies to seek new horizons in international markets, creating products with unique characteristics, fulfilling the traditional VRIO of the theory of resources and capabilities.

Organizational Learning

Organizational learning has generally been limited to explaining how organizations from their processes identify what they can or can not do to be successful in the market, but a special link has not been generated between this organizational learning and innovation, the factor that explain how organizational learning can lead the organization to be more innovative, and how its strategy can be aligned so that this learning becomes a determinant of strategic direction, which allows the organization to position itself and evolve in different markets thanks to those skills created from that learning.

For its part, innovation has been studied both from the process and from the product, where organizations consider that the innovation process leads exclusively to organizational learning, but it is the product and its positioning that can offer additional and specific characteristics to create a continuous learning process, given that the innovation process occurs with the ultimate goal of developing a product and / or service with specific characteristics that the client considers valuable. The firm can achieve a greater advance in innovation if its organizational learning starts from the product it seeks to position, going backward in the creation process and every detail that is not visible to the consumer.

The market positioning tells the firm what their particular interest in innovation should be, the organizations that enter long after the most innovative ones focus, especially on process innovation, while those that enter just after the first entrants try to do market innovation focused on customer relations, the first entrants can make innovation in product or service from advanced technological systems.

Therefore, the point of departure or connection between the innovative

strategy of the organization and the organizational learning of the firm corresponds to that new product or service and its positioning; For example, the organizations dedicated to the creation of applications do not learn only by generating the application, but the errors that the application presents once in the market are sources of valuable knowledge for the company. Authors such as McDonough and Zack (2008) have shown that an integration between innovation and competitive strategy based on knowledge allows organizations to be more effective and have a better performance than those organizations that remain working exclusively from the competitive strategy without considering knowledge or innovation as fundamental factors.

The innovative strategy consequently does not depend exclusively on the capacity in itself to generate new products and services, but on the organizational learning that the firm obtains each time it tries to innovate, each process with the client, with the production, with the suppliers, with the product itself, are unique learning moments that make the organization a wealth of capabilities, which allows them in the long term to obtain unique knowledge to have a better organizational performance.

The Industrial Sector in Colombia

The manufacturing sector in Colombia is as diverse as interesting, it is formed from very small companies to large multinationals, in this research, we have focused only on the big organizations, the following are the 43 types of industries of complete population, then was chose a sample of 33 industries to be included in the study:

Table 2.

Classification of industries in Colombia (Source: The Authors)

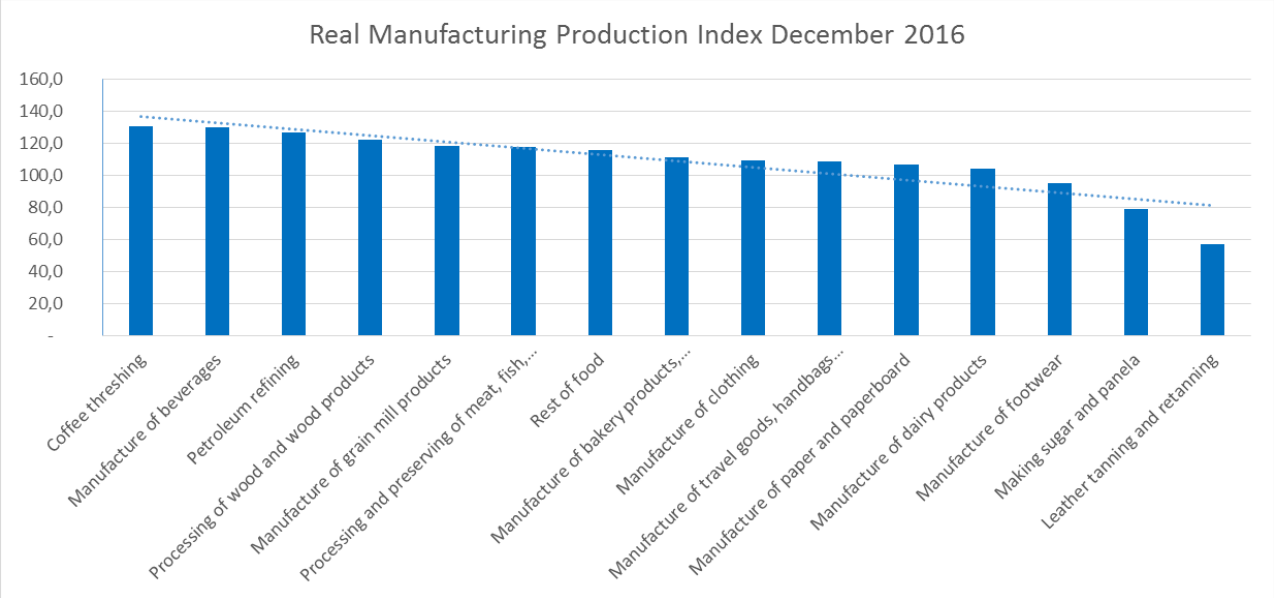
Manufacturing Industries in Colombia	
Processing and preservation of meat and fish	Manufacture of glass and glass products
Processing and preserving of fruits, vegetables, and tubers	Manufacture of non-metallic mineral products n.e.c.
Manufacture of oils and fats	Basic industries of precious and non-ferrous metals
Manufacture of dairy products	Manufacture of metal products for structural use
Manufacture of grain mill products, starches and their derivatives	Manufacture of other fabricated metal products
Manufacture of coffee products	Manufacture of computer, electronic and optical products
Making sugar and panela	Manufacture of electrical appliances and equipment
Manufacture of other food products	Manufacture of special-purpose machinery and equipment
Manufacture of prepared animal feed	Manufacture of motor vehicles and their engines
Manufacture of beverages	Manufacture of bodies for motor vehicles
Spinning, weaving and finishing of textile products	Manufacture of parts, pieces (autoparts) and accessories for vehicles
Manufacture of other textile products	Manufacture of other transport equipment
Leather tanning and retanning and manufacture of travel goods	Furniture manufacturing
Manufacture of footwear	Manufacture of mattresses and bed bases
Manufacture of parts and pieces of wood	Manufacture of games, toys and puzzles
Manufacture of paper and paperboard	Manufacture of instruments, appliances and medical and dental materials
Print activities and related services	Other manufacturing industries n.e.c.
Coking, oil refining and fuel mix	Manufacture of pesticides and other chemicals for agricultural use
Manufacture of rubber products	Manufacture of paints, varnishes and similar coatings
Manufacture of plastic products	Manufacture of soap and detergents, perfumes and toilet preparations
	Manufacture of other chemical products n.e.c
	Manufacture of pharmaceuticals, medicinal chemical substances
	Basic iron and steel industries - Casting of metals

Source: Self made.

The manufacturing sector as a whole is one of the main productive activities in the country, the most important industries are textiles, food, beverages and chemicals (Banrepublica 2015); being a sector that traditionally generates many direct jobs as well as labor stability for the population.

Its main strengths correspond to the quality of the production and the installed capacity in a factory that allows them to deliver to international markets, considerable numbers of intermediate and finished products. According to the National Association of Industrials (ANDI, 2016) production grew by 3.5% and data published by Portafolio.co (2017) “they stand out for their contribution to the total variation of the sector the petroleum refining industry, and fuel mix with a variation of (19.4%), beverage processing with (7.6%) manufacturing of processed products of metal with 9.8%, elaboration of mill products, starches and their derivatives (8.7%), manufacture of soaps and detergents (3.7%) and manufacture of bakery products (6.1%)”.

According to the Dane in its monthly Manufacturing Survey (December 2016, 10) “During the year 2016, the number of workers in the manufacturing industry increased by 0.7% compared to the same period in 2015. According to the type of relationship, the indefinite term staff increased 0.9% and the fixed-term staff 0.6%, according to functional area, the personnel linked to the production processes in the industry increased 0.6% And the one related to administrative and sales tasks 1.0%”. The Colombian manufacturing industry has the RPI or real production index that allows understanding the behavior of the sector, during 2016 the index stood at 110.7 (Banco de la Republica 2016), then the real production indexes by subsectors of the Manufacturing sector from highest to lowest are:



Graphic 1.

Real Production Index (Source: The Authors)

Source: Self made.

Therefore, the manufacturing sector becomes an important area of study to know the innovative strategy as a fundamental element of competitiveness and its capacity to develop organizational

learning, both the sectors that compose it and the tools used to achieve innovation in their improvement in processes will be the object of the present analysis. A differentiating factor in companies in the industrial sector is research and development, most organizations have worked from a resource and capabilities based view, which can offer the discovery of new improvements in processes, new products and/or Services (Villar et al., 2012) as well as best practices in each department or functional area. Companies that have research and development departments or those who invest in research and development should, therefore, submit higher levels of intellectual property, better processes, production and, distribution; thus the organizations that make more research and development should have greater records of organizational learning.

On the other hand, the processes themselves tend to be modified continuously, according to who does it, but especially when they have the necessary tools to develop and modify these processes, research and development allows the human resource of every company to transform processes into better processes, into innovative processes (Adner and Kapoor, 2010), it is clear that the greater investment in research and development companies will have more expertise in each process, innovating them, this research and development is turning into better organizational methods than improves in different levels the practices of those companies.

Generally, organizations with continuous learning have been able to enter demanding markets by their adaptive capacity, but especially by the previous study that is carried out in the markets to which they want to enter (García et al., 2014), this analysis happens thanks to the research and development areas, access to first-hand information where the characteristics that the organization can offer in their products and/or services and the value offer they can design for each type of market are recognized; otherwise, it is not possible to identify the strengths and weaknesses of the company to compete in international markets and to generate sustained innovation (Schaltegger and Wagner 2011), the organizational learning that allows companies to enter international

markets by improving their processes will be affected by a good investment in research and Development, better technology equipment and organizational methods that includes better relations with stakeholders, a dynamic organizational structure and specific functions between employees which allows firms to develop unique capabilities and far superior to those of its competitors, being its exclusive value offer within the sector, in consequence, the following hypothesis is suggested:

H1 The Innovation strategy positively affects organizational learning in the manufacturing sector

Once companies manage to establish a unique value proposition in processes and products (Von et al., 2001), that other competitor will imitate them will be more complex, the distinctive capabilities become a competitive advantage, therefore, companies can establish wider market niches, including even foreign markets in which that unique capability can attract new customers, although the processes of organizations are not visible to customers because they become intrinsic elements within the product and/or service, the levels of innovation and proposal of a good can transform a company into a pioneer in its field, generating a substantial increase in organizational learning, creating an exclusive business model. (Demil and Lecocq, 2010), it is important to emphasize that every time an organization decides to sell in the foreign market with a higher level of innovation, its sales will be better, generating a superior position in the market.

The construct (Figure No. 1) of this analysis exposes the main variables and their relationships, it is important to recognize that the sector chosen for research includes several subsectors within the industrial sector, the innovation strategy and organizational learning are the main constructs to analyze measure by variables obtained in the Administrative Department of National Statistics (DANE).

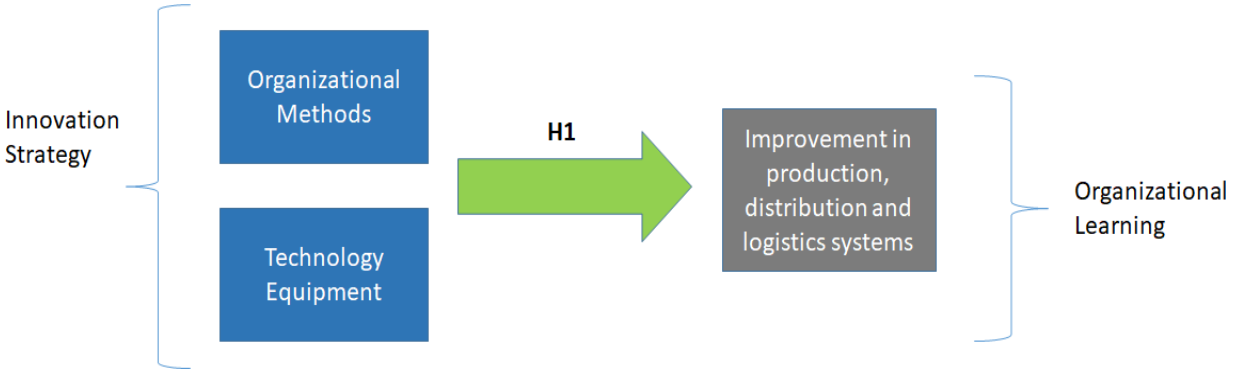


Figure 1.
Construct (Source: The Authors)
Source: Self made.

METHODOLOGY

For this analysis, we have taken the Survey of Development and Technological Innovation EDIT with data of 2014 the organizations surveyed that responded constitute a total of 8835 companies, investment in scientific, technological and innovation activities was 2.2 billion pesos (Dane, 2014), the chosen sample was 33 subsectors with a total of 6284 companies, it was made a stepwise multiple regression analysis (backward) in SPSS.

The survey is characterized by classifying the subsectors of the industrial sector by an ISIC classification which corresponds to international codes this time in revision number 4. The survey shows that there are important patents and investments in research and development, but not enough compared to the investment and innovation needed to compete in the international markets for 2014, "Industrial companies obtained a total of 2,137 mark and trademark records, 102 industrial design records, 53 invention patents, 44 software records, 29 copyright records and 11 utility model patents." (Dane, 2014). This survey is very interesting to analyze different perspectives of innovation in the sector, also to understand how the industry behavior about innovation and research depends on the type of industry and the ability to find resources for innovation.

Dependent Variable

Variable Innovation in production, distribution processes and logistics systems: corresponds to the number of innovations in new or significant improvements in methods of production, distribution, and delivery or logistics systems, which are presented in the amount of innovations up to 106.

Variable Control

Type of industry or subsector: There is a total of 33 different subsectors within the manufacturing industry by ISIC classification Rev. 4.

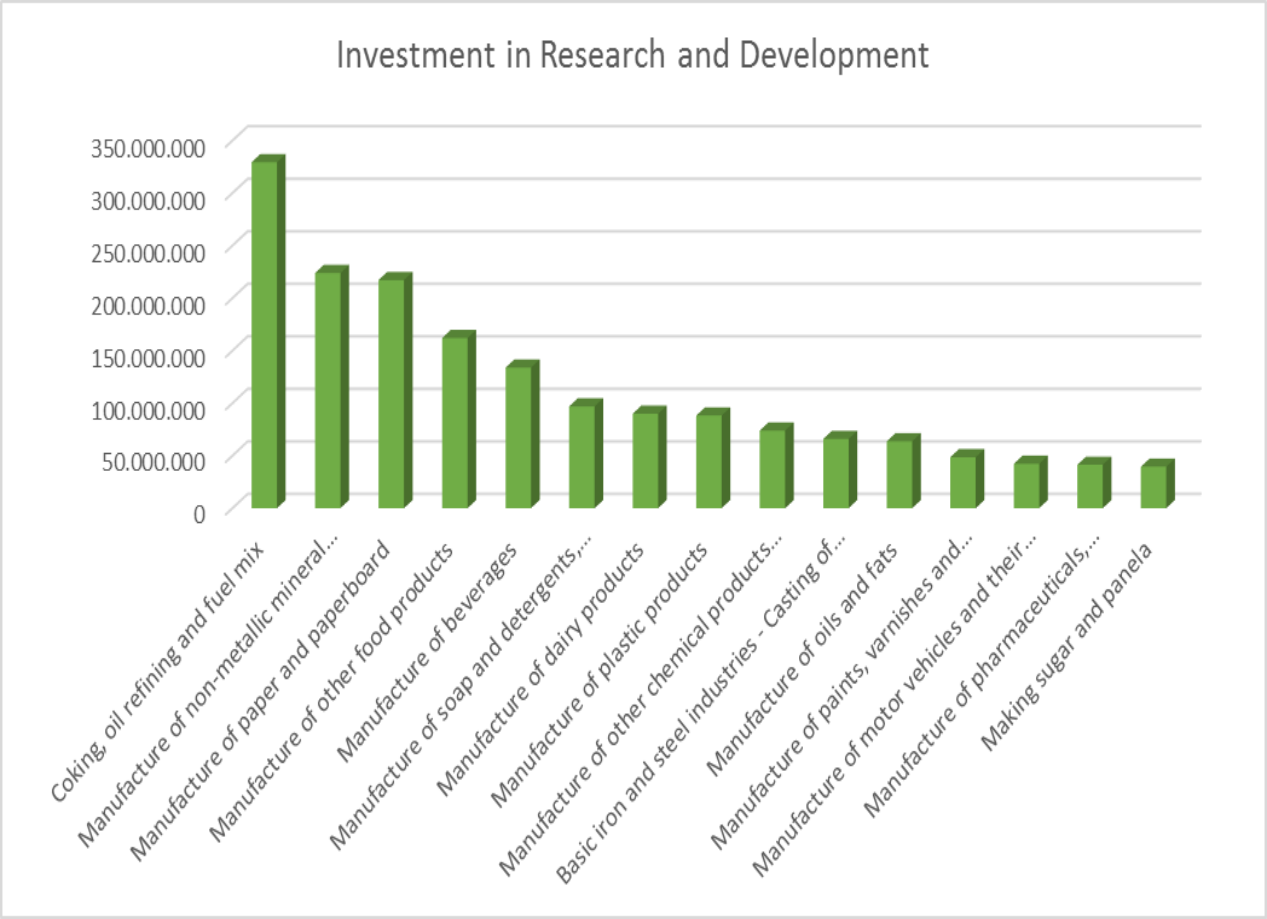
Independent variables

Computer and Communication Equipment: includes the amount of investment in this equipment by the different subsectors in thousands of pesos.

Innovations in organizational methods: corresponds to the number of innovations for the internal function of the firm.

RESULTS

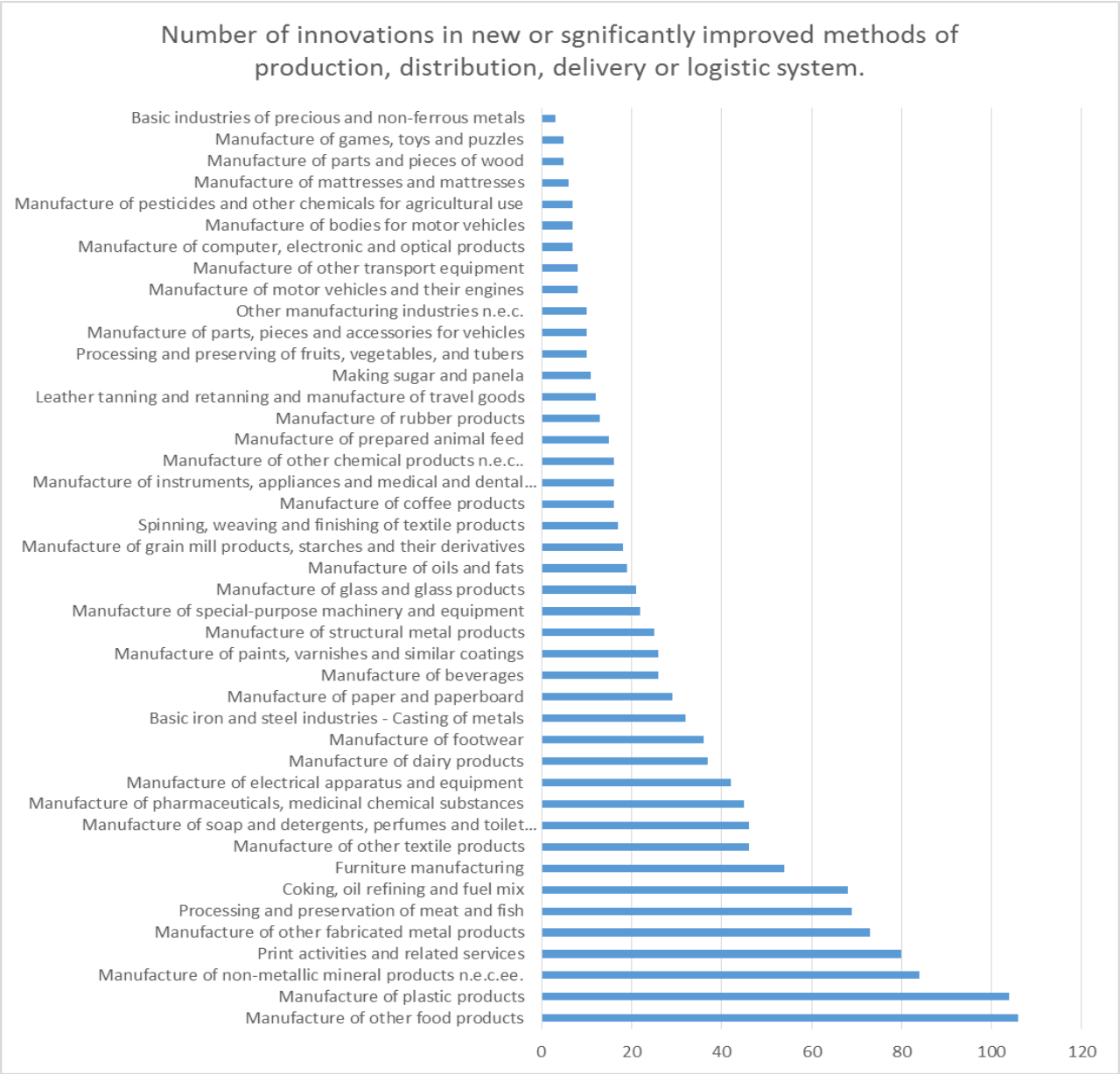
The empirical analysis allowed to find several interesting elements of the sector, first, the sector displays a variety of innovative processes and to a lesser extent protection to the industrial property, of the 8835 companies studied at least they have generated 30 innovations in their processes, being the sector more representative in process innovation with 106 innovations in the sector of production of other food products, which manifests itself in the international business that accomplish to establish with sales abroad, with at least 4 in the last year, generating an added value for the sector. Second, organizations are more likely to invest in research and development (see Graphic 2) when this investment translates into improvements in their processes (see Graphic No. 3), as is the case in coking, oil refining and fuel mix and Manufacture of non-metallic mineral products n.e.c.



Graph 2.

Higher Data in Research and Development by Subsectors (Source: The Authors)

Source: Self made.



Graphic 3.
Innovation in processes (Source: The Authors)
Source: Self made.

On the other hand, the industries with the greatest innovation in processes (see Graphic No. 3) correspond to manufacture of other food products, manufacture of non-metallic mineral products n.e.c, manufacture of other metal products, coking, oil refining and fuel mix, manufacture of other textile products.

The 5 subsectors with the highest international sales in their order are: Manufacture of plastic products, manufacture of pharmaceutical products, medicinal chemical substances, manufacture of soaps and detergents, perfumes and toilet preparations, manufacture of other food products.

It is important to emphasize that although the coffee-processing sector is representative of the country, it does not have a strong intellectual property protection record, as opposed to sectors such as the manufacture of plastic products and the manufacture of other food products. The following are the descriptive statistics and correlations (Table No. 3 and Table No. 4).

Table 3.

Descriptive Statistics (Source: The Authors)

	N	Minimum	Maximum	Mean	Std. Deviation
SIC (Control Variable)	33	101	329	198,97	83,112
Improvement in production, distribution and logistics systems	33	,4771	2,0414	1,324827	,4100905
Organizational methods	33	,0000	1,6628	,850573	,4749810
Technology Equipment	33	8,1751	10,3684	9,357782	,5397053
Valid N (listwise)	33				

Source: Self made.

Table 4.
Correlations (Source: The Authors)

(Control Variable)			log Improvement in production, distribution and logistics systems	logOrganizational methods	log Technology Equipment
ISIC	log Improvement in production, distribution and logistics systems	**Correlation**	1,000	,851**	,726**
	logOrganizational methods	**Correlation**	,851**	1,000	,714**
	logTechnology Equipment	**Correlation**	,726**	,714**	1,000

**** Correlation is significant at 0.01 level**

Source: Self made.

The variables were taken with logarithm transformation, the correlations and Anova shows that variables are shown in tables 5 and 6.

Table 5.
ANOVA (Source: The Authors)

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
2	**Regression**	4,063	2	2,031	46,201	,000[c]
	Residual	1,319	30	,044		
	Total	5,382	32			

a. Dependent Variable: log Improvement in production, distribution and logistics systems

c. Predictors: (Constante), logOrganizational methods, log Technology Equipment

Source: Self made.

For the model was taken out the research and development investment, without this variable, the fit is better, R square is 97% explaining the relationship between Innovations strategy and organizational learning.

Table 6.
Model (Source: The Authors)

Summary Model[d,e]

Model	R	R Square[b]	Adjusted R Square	Std. Error of the Estimate
2	,989[c]	,977	,976	,2157088

d. Dependent Variable: log Improvement in production, distribution and logistics systems

c. Predictors: logOrganizational methods, log Technology Equipment

Source: Self made.

Table 7.
Coefficients (Source: The Authors)

Coefficients[a,b]

Model		Unstandardized Coefficientes		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
2	logOrganizational methods	,647	,086	,454	7,502	,000
	logTechnology Equipment	,083	,009	,562	9,288	,000

a. Dependent Variable: log Improvement in production, distribution and logistics systems

Source: Self made.

Our hypothesis "the innovation strategy generates a positive effect on organizational learning" was confirmed, an industry with an innovation strategy tends to get better and improved processes, and this learning allows firms to achieve value creation for the customer, turning into better types of products offered with unique characteristics to compete in the challenging markets. Where the greatest improvement in methods of production, distribution, delivery, and logistics will be the result of a very well manage innovation, especially associated with the capacity of this sector in generating processes that comply for example with international standards, generating trust in customers and stakeholders, this will be a cyclic process, to more innovation strategy more organizational learning, then more innovation strategy is created and improved.

It can be concluded, therefore, that greater communication and computer equipment, and innovations in organizational methods generate a better organizational learning for the company, which will have improvement in their production, distribution and logistics processes; also is possible to consider that innovation strategy also has a double effect in the future of the company corresponding to the generation of patents or protection of industrial property for

example, and the access to international markets. which represents for companies and for the sectors a superior performance than their competitors in the Latin American market; generating a competitive advantage that promotes growth for the industry in the long term, and results to re-invest in research and development, equipment, methods, this innovative cycle turn into the generation of value for customers and stakeholders with all the effects for brand image and market positioning.

CONCLUSIONS AND LIMITATIONS

An analysis of the manufacturing organizations in Colombia in different subsectors has been carried out, in order to understand how the innovative strategy affects the organizational learning, explained innovations in organizational methods, computer and communication equipment, which is become into learning that allows to give value for the customers and compete in broad markets.

This empirical study establishes, two special contributions, first identify special characteristics in innovation in one of the most representative sectors of the colombian economy that even though address incremental innovations especially through processes, it is also recognized that the industry has some first steps in organizational learning to improve their competitiveness and start developing better products for international and broad markets.

The second element is to recognize that the innovative strategy becomes a differentiating factor for companies of this sector, beyond technological barriers and culture of innovation that may appear, to a higher level of innovations in organizational methods, investment in computer and communication equipment, all manufacturing companies without matter their size manage to generate greater value for the market, in a difficult context the colombian to make radical innovations which had not been emphasized in previous studies.

However, the present study has several limitations, on the one hand, the type of innovations in process were heterogeneous and the data do not allow to clarify the innovation or specific improvement, on the other hand, the type

of processes are included in one variable, if there was a detailed variables per each one, it will better in order to recognized the most important kind of learning between production, distribution, and logistics, it is recommended for future analysis to include more precise measures in this regard, and to conduct a comparative research by subsectors or a more extensive study of a single subsector.

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