Veritas Et Scientia
Vol. 10. N° 2
Julio - Diciembre del 2021
ISSN Edición Online: 2617-0639
https://doi.org/10.47796/ves.v10i2.566

ARTÍCULO ORIGINAL

UNDERGROUND INNOVATION IN MEXICAN SME

INNOVACIÓN CLANDESTINA EN PYMES MEXICANAS

Saúl Alfonso Esparza Rodríguez [1]
https://orcid.org/0000-0002-9900-6159
sesparza@umich.mx

Jaime Apolinar Martínez Arroyo [2]
https://orcid.org/0000-0002-9926-4801
jmartinez@umich.mx

Enrique Esquivel Fernández [3]
https://orcid.org/0000-0001-9005-7227
enrique.esquivel10@yahoo.com.mx

Aceptado: 20/10/2021
Publicado online: 30/11/2021

RESUMEN

Purpose: Small and Medium Enterprises (SMEs) are significantly relevant in the Mexican economy, employability, and innovation. In terms of understanding innovation on those companies that goes beyond formal innovation, the present work proposes to analyze "underground innovation".

Methodological design: Using the data available in the National Productivity and Entrepreneurial Competitive Survey for Mexican SME´s (ENAPROCE), we made a correlation analysis among organizational innovation, marketing innovation, process innovation, and product innovation to understand the relationship among different types of innovations which are usually related; then, a partial correlation test having the number of registered industrial property (Brands, Patents, Utility Models, and Industrial designs) as a variable control to obtain the partial relation coefficient among variables related to informal non-registered innovation. The partial relationships among interactions related to stakeholders and underground innovation in Mexican SMEs are

[1] Universidad Michoacana de San Nicolás de Hidalgo. Morelia, Michoacán. CRediT: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration
[2] Universidad Michoacana de San Nicolás de Hidalgo. Morelia, Michoacán. Supervision, Writing – review & editing
[3] Centro de Estudios Sociales y de Opinión Pública de la Cámara de Diputados LXV Legislatura
Se ha habilitado la compatibilidad con lectores de pantalla.. Supervision, Writing – review & editing

classified in three categories: positive (the person taking decisions; directive and supervision positions, external training, and participant in productive chains), negative (first-level supplier and commercial banks financing) and general (use of computers, higher education, and supplier of governments) partial relationships.

Findings: The results show that the partial relationships among diverse stakeholders are significant to the innovation that is not registered nor acknowledged in Mexican SMEs, which is an indicator of a dynamic sector that responds to the needs and expectation of internal and internal factors in terms of the introduction of new products, processes, marketing and organizational changes, showing a better approach to understand the phenomena in small and medium business.

Keywords: Innovative vocation, SMEs, Mexico, stakeholders, productive chain.

ABSTRACT

Propósito: Las pequeñas y medianas empresas (Pymes) son significativamente relevantes en la economía mexicana, empleabilidad e innovación. En términos de comprender la innovación informal, el presente trabajo analiza la "innovación clandestina".

Diseño metodológico: Utilizando los datos disponibles en la Encuesta Nacional sobre Productividad y Competitividad de las Micro, Pequeñas y Medianas Empresas (ENAPROCE), se analiza la correlación entre innovación organizacional, innovación de marketing, de procesos y de producto para comprender su respectiva interacción; después, se realizó una prueba de correlación parcial considerando el número de certificaciones formales obtenidas (Marcas, Patentes, Modelo de utilidad y Diseños industriales) como una variable de control para obtener los coeficientes de correlación parcial. Las relaciones parciales entre grupos de interés e innovación clandestina en las Pymes mexicanas se clasificaron en tres categorías de correlaciones parciales: positiva (la persona que toma las decisiones, las posiciones directivas y de supervisión, la capacitación externa y la participación en cadenas productivas), negativas (proveedores de primer nivel y financiamiento de bancos comerciales) y generales (uso de computadoras, educación superior y ser proveedores de gobierno).

Resultados: Los resultados muestran que las relaciones parciales entre diversas partes interesadas son significativas para la innovación que se registra formalmente en las Pymes mexicanas, lo cual representa un indicador relativo a un sector dinámico que responde a las necesidades y expectativas de factores internos y externos en términos de la introducción de nuevos productos, procesos, así como cambios en marketing y de tipo organizacional, mostrando un mejor enfoque para comprender el fenómeno en empresas pequeñas y medianas.

Keywords: Vocación innovadora, PYMES, México, grupos de interés, cadena productiva.

INTRODUCCIÓN

In terms of innovation, factors such as changes in policies, markets, technology, industry structure, and institutions have the potential to influence the introduction of new

products, processes, marketing, and organizational methods in any given company. Since innovation is a relevant factor for companies and organizations to stay competitive, to be productive, and even to survive in a turbulent context, is a substantially important subject for research.

The concept that was provided by Schumpeter in 1934 refers to innovation as the implementation of goods that are new to consumers in terms of uniqueness or higher quality, and also the implementation of new production methods, opening of new markets, the use of new raw materials, considering new forms of competition as well (Bazhal, 2016); also, it can be considered as a new or improved product or process (or a combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process) (Caplow, 1955).

Other relevant authors define the concept in terms of new elements brought to the buyer, whether or not new to the organization (Howard & Sheth, 1969), ideas that can be replicated on a meaningful scale at practical costs (Senge, 1990), an ability to discover new relationships, of seeing things from new perspectives and to form new combinations from existing concepts (Evans, 1991).

The concept is refereed even also to policies, structure, method, process, product or market opportunity that the manager of a working business unit should perceive as new (Nohria & Gulati, 1996), the creation of new association (combination) product-market-technology-organization (Boer & During, 2001), that can be related in a comprehensive concept from the manager view as the efficient coordination of the elements in a social organism that enhances the evolution process of any created invention of an individual regarding the introduction in the market, the organization itself or the industry, resulting in a positive impact in any way of profitability in a social organism.

As a useful guide to understanding further the concept, the Oslo Manual suggests that innovation is a new or improved product or process (or a combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process), according to the Organisation for Economic Co-operation and Development [OECD] and Eurostat (2018), which suggest the major importance innovation has in any given company.

Since innovation represents a complex concept to be understood in the reality of organizations, the main goal of the analysis is to determine the effect of some indicators related to innovation that can be considered as "underground innovation" since is not reported nor acknowledged for any institution, but exist in Mexican SMEs in forms of new products, processes, marketing or organizational innovations and can be traced to the multiple and diverse interactions of the company with their respective stakeholders; because of that, the research question: **How are stakeholders interactions correlated to underground innovation in Mexican SMEs?**

Literature review

Relevant aspects in measuring innovation

In terms of understanding sources, mechanisms, and effects of innovation in organizations it is necessary to measure both inputs (people and the training they receive, physical and financial resources, and how they change over time) and outputs (e.g., scientific papers that directly result from projects or programs) (Perrolle & Moris, 2007).

Because innovation has many components to be measured, it is possible to establish categories related to those factors, in that sense we can understand as inputs, factors related to people, money, processes; on the other hand, there are outputs, such as cash returns; the third category can be defined as indirect benefits, such as stronger brand and acquired knowledge, according to the Boston Consulting Group [BCG] (2007); on the other hand, Fagerberg, Mowery, & Nelson, (2005) argued that an important development has been the emergence of new indicators of innovation inputs and outputs, including economy-wide measures that have some degree of international comparability.

Also, some concepts relate innovation with intensity and propensity, with a distinction between the propensity to innovate at the level of undertaking or not innovative activities, meanwhile, the decision on innovation intensity regards how many resources are allocated to such activities, generally compared with the overall firm's activity or that of its sector. (Eurostat, Devstat, & Higher School of Economics of Moscu [HSEU], 2016).

The concept of "underground innovation" in organizations

As the definition suggests, "underground innovation" refers to the introduction of new products, process, marketing, or organizational changes that are not formally reported nor registered in any established institution or governmental organization (in other words, represent an informal type of innovation that do not count in the formal innovation national system); since the context of many Mexican SMEs is oriented to a changing environment that affects the possibility of survival for the organizations, it is necessary to understand how the companies are innovating even if they are not necessarily registering their innovations formally, but are essential for well-functioning companies in an ever-changing environment.

Firstly, in terms of informal innovation, the dataset of bibliometric information in the website of Scopus shows that there is a positive tendency to research the topic, with a peak of published articles located in recent years; also, the countries that are the most prolific in the subject are United States, United Kingdom, Netherlands, Australia, Germany, China, Canada, Italy, Spain and France, and the related subjects are focused in social sciences, business, management and accounting.

Following that data, the most influential papers (due to the number of cites) refers to a work of (Jansen, Van Den Bosch and Volberda, 2006) which argue that, in addition to formal controls, informal social relations determine the extent to which exploratory and exploitative innovation can be developed, yet the impact of formal hierarchical structure and informal social relations on exploratory and exploitative innovation has not been studied in an integrated model. Focusing on organizational units, this study contributes to

previous research through examining how formal and informal coordination mechanisms influence a unit's exploratory and exploitative innovation.

Another relevant work is (Van Aken and Weggeman, 2000), which states that informal innovation networks are easier to create because of their adaptability and fairly loose, cooperation agreements are better suited for the uncertainties present at the environment, considering main factors such as sharing risk, leverage of resources, injection of variety.

In the other hand, (Conway, 1995) propose that many innovation studies have also long highlighted the importance of informal boundary-spanning relationship, in other word, represent means for sourcing ideas and information during the development process based on multiple and continuous interaction; in that sense, the presence of a certain informal network represents a relevant base for formal innovation, given the nature of multiple and free interactions among persons inside the organizations.

Those interactions are the basis of social contacts and networks that represent the underlying modes of transferring scientific and technical human capital into work that compliments what is being called as individual endowments of tacit and craft knowledge (Grimpe and Hussinger, 2013), in a more comprehensive way of seeing the complexity in the interactions inside organizational life, in where recent models of innovation emphasize the relevance of interactions among firms, customers, suppliers and institutions (Jensen *et al.*, 2007), that allow firms to survive in a rapid technological change by innovation based on interactions among agents (Conway, 1995) which also can be considered as relevant interest parties whom have a certain stake in the company.

In that sense, behaviors that make organizations responsive to the environment can encourage diverse types of innovation, since it is based on a process that is stimulated by the interaction of individuals and groups with different backgrounds, benefits, and perspectives, in where the ability to interact constructively and work in new ways is crucial for the innovation performance (Devaux et al., 2009); those individuals and groups are the stakeholders of the company, indeed.

Following that though, coordinated action between companies and their stakeholders is the central character of the generation of innovative products, processes, services, technologies, and business models that are capable of being viable economically, environment-friendly, and socially responsible (Geissdoerfer, Savaget, Paulo, Evans, & Steve, 2017), since creativity can occur when individuals interact when is possible to get new ideas, insights and even knowledge (OECD, 2017).

Influence of stakeholder's interaction on innovation

The influence of relevant stakeholder in the life of organizations, previous research such as Dollinger (1990) analyzed fragmented industries and outlines that the actors of small firms search for forms of interdependence to survive (Granata, Garaudel, Gundolf, Gast, & Marques, 2016) and adapt to environments of uncertainty in the industry.

A wide accepted concept definition for these interest parties as relevant groups such as shareholders, customers, suppliers, and any other actor "who can affect or is affected by the organization's purpose" (Freeman, 1984, p.52) who are defined in terms of tree relationship attributes power (have certain access to coercive, utilitarian or normative means to impose its will), legitimacy (the legitimate right to claim a determine response in a relationship) and urgency (the time-sensitive call for immediate attention) (Mitchell, Agle, & Wood, 1997).

Consequently, different stakeholders can affect companies representing elements that drive innovation can be related to the value generated among organizations when trying to provide different types of benefits-oriented to satisfy the needs and expectations of various stakeholders (OECD & Eurostat, 2018).

For this reason, companies must collaborate with various interest parties related to input and output factors taking into account some representative groups of interest such as customers, suppliers, and other partners, competitors, and different institutions (Majava, 2016), that are relevant sources of information, knowledge, and even a relevant change in the industry.

Besides, in a multiple-level perspective, there is a recognition that governments, firms, and other interest parties have a determinant role in the changes introduced to the organizational system, where even policymakers are relevant in terms of managing dynamics of diverse nature of transactions (Greenacre, Gross, & Speirs, 2012), which are related to the industry.

Following that thought, for companies such as SME´s, elements like knowledge spillovers, access to networks, and engaging in collaboration with other players represent an essential influence for innovation, in where globalization has brought new opportunities for cross-border collaboration and interchange of ideas, finance, skills, technologies from abroad, with a considerable impact in productions of goods, services, patents, licenses, among others (OECD, 2017).

Hence, what could be called the “entrepreneurial ecosystem”, refers mainly to “the interaction that takes places between organizations and individual stakeholders that are relevant for the companies” (Isenberg 2010 cited by Sorama & Joensuu-Salo, 2016, p.2), being an essential aspect of management issues, even in terms of commercialization activities, that must conduct networked market actors, where new products must attract stakeholders for the diffusion of innovation in the market (Engez, 2018, p. 64). In other words, “nuanced knowledge of stakeholders is closely connected to the potential for product and process innovations and the creation of new inter-organizational relationships” (Barringer and Harrison 2000 cited by Freeman et al., 2010, p.34).

After a substantially search in bibliography, it is relevant to highlight that the basis of such interactions related to innovation can be traced to genre diversity in leadership positions (Romero-Martínez, Ana M.; Montoro-Sánchez, Ángeles; Garavito-Hernández, 2017; Robinson y Dechant; 2011), level of training and education (Morales *et al.*, 2016; Popescu y Crenicean; 2012), participation in supply chains (national and international)

(Alania, 2017; Bustillos and Carballo, 2018) and aspects related to management and organizational subjects (Oliveira *et al.*, 2017; Adams, Bessant and Phelps, 2017), as it is included in table 1.

MATERIAL AND METHODS.

The data for the analysis was extracted from the website of the National Survey of Productivity and Competitiveness of Micro, Small and Medium Enterprises (ENAPROCE in Spanish), which is an instrument of national reach regarding managerial and entrepreneurial skills of the enterprises, that allows knowing characteristics of operation and development of such companies.

This survey was elaborated by a collaboration of organisms such as the National Institute of Statistics and Geography (INEGI in Spanish), the national institute of entrepreneurship (INADEM in Spanish), and the National Bank of Foreign Commerce (Bancomext in Spanish) in 2018.

The size of the sample was 22,188 companies, distributed in Manufacturing (5,189), Commerce (7,130), and Services (9,689); in terms of size, 18,886 were Small and Medium enterprises and 3,302 were Microenterprises. The information was collected from October 1st to November 30th, in the year 2018. The dataset is organized considering the following conceptual definition of each included variable, as follows.

Table 1

Conceptual definition of the considered variables

Variable name	Name	Class	Definition	References
Prod_Inv	Product innovation	Innovation indicator	New products (goods and services) or the substantial improvement of existing ones introduced to the market	(OECD & Eurostat, 2018; INEGI, 2019).
Proc_Inv	Process innovation	Innovation indicator	The inclusion in the production process of new processes (includes methods) or the substantial improvement of existing ones.	
Org_Inv	Organizational innovation	Innovation indicator	The introduction of a new organizational method in the practices, the organization of the workplace, or the external relations of the company.	
Mkt_Inv	Marketing innovation	Innovation indicator	The application of a new marketing method that involves significant changes in the design or packaging of a product, positioning, promotion, or pricing	
Industrial_ property	Industrial property	Formal innovation	Brands, Patents, Utility Models, and Industrial designs registered formally as	

			industrial property titles, acknowledged by an institutional or governmental organization.	
MPTD	A male person taking decisions	Stakeholder related	Number of men in positions able to take decisions	(INEGI, 2019; Monroy Merchán, 2019; Manosalvas Vaca *et al.*, 2020; Romero-Martínez, Ana M.; Montoro-Sánchez, Ángeles; Garavito-Hernández, 2017)
FPTD	A female person making decisions	Stakeholder related	Number of women in positions able to take decisions	
FDSP	Female in Directive and Supervision position	Stakeholder related	Number of females that are in Directive and Supervision positions	
MDSP	Male in Directive and Supervision position	Stakeholder related	Number of males that are in Directive and Supervision positions	
HEdu	Higher education	Stakeholder related	Level of education considering Bachelor, Specialty and Postgraduate.	(Romero-Martínez, Ana M.; Montoro-Sánchez, Ángeles; Garavito-Hernández, 2017)
ETraining	External training	Stakeholder related	Considers hiring external trainers or agreements are made with universities or educational and technical training centers.	
EIncome	Earned income	Stakeholder related	The total amount that the company obtained for all those activities of production, marketing, or provision of services performed during the reference year.	(López-Mielgo, Montes-Peón & Vázquez-Ordás, 2012; Zegarra, 2006; Bárcenas *et al.*, 2009)
PPCh	Participation in productive chains	Stakeholder related	The total number of companies that participated during the period 2016 and 2017 through contracts or programs of collaboration in production chains (integrated processes with other economic units for the design, supply, production, distribution, or marketing of goods, parts, or components or services).	(Martínez and Pérez, 2006; Fernández, 2003; Alania, 2017; Bustillos and Carballo, 2018; Olea-Miranda, Contreras and Barcelo-Valenzuela, 2016; Luzzini *et al.*, 2015; Rosell and Lakemond, 2012;
SGovn	Supplier of government	Stakeholder related	The total amount of companies that are suppliers of governments	
Exports	Exports	Stakeholder related	The total amount of exports that the company made during 2017 in Mexican pesos	

SEComp	Supplier of exporting companies	Stakeholder related	The total amount of companies that are suppliers of exporting companies	He, Gan and Xiao, 2021)
FSPCh	First level supplier (productive chains)	Stakeholder related	First-level supplier of raw materials, parts, or services (they are incorporated directly into final goods).	
SLPCh	Second level supplier (productive chains)	Stakeholder related	Supplier of raw materials, parts, or second-level services (they are incorporated into other intermediate goods).	
MPCh	Marketer (productive chains)	Stakeholder related	Companies that carry out their act of commerce, that is, they acquire goods or merchandise for its subsequent sale, in which two intermediaries interfere, the producer and the consumer.	
SCImp	Solution and continuous improvement	Stakeholder related	Any organizational problem found was solved and actions were taken to ensure that it did not happen again. and a process of continuous improvement was started to anticipate similar problems. (Problems with inventories, transportation problems, technical failures, handling of staff, customer service, etc.)	(Lendel, Hittmár and Siantová, 2015; Stouten, Rousseau and De Cremer, 2018; Kalay, 2015; Adams, Bessant and Phelps, 2017)
UComp	Use of computers	Stakeholder related	Companies that use electronic equipment that serves to process information following instructions stored in the software.	
CBF	Commercial banks financing	Stakeholder related	Loans or financing of any type granted by commercial banks.	(Abel-Koch, Gerstenberger and Lo, 2015; Rubiano *et al.*, 2007)

Source: Own elaboration based on ENAPROCE (2018).

All the information will be treated by the calculation of the partial correlation coefficient considering industrial property as the control variable, that will measure the correlation among variables controlling for the relationship apport of the formal innovation correlation coefficient, leaving only the correlation among variables while controlling the effect of formal innovation measured by the variable Industrial_property (Brands, Patents, Utility Models, and Industrial designs registered formally as industrial property titles, acknowledged by an institutional or governmental organization).

In that sense, to test the hypothesis, the variables involved with underground innovation are calculated with a partial correlation coefficient, controlling the effect of

"industrial property" setting it as control variable; in this sense, the results will show the correlation among all the considered variables in terms of informal innovation (namely, all the innovation that occur considering formal innovation such as Brands, Patents, Utility Models, and Industrial designs registered formally as industrial property titles, acknowledged by an institutional or governmental organization), taking into account the calculation for partial correlation coefficient for all the remained variables, as follows (Amaral, 2017, p.5).

Formula: Partial correlation

$$r_{yx.z} = \frac{r_{yx} - (r_{yz})(r_{xz})}{\sqrt{1 - r_{yz}^2}\sqrt{1 - r_{xz}^2}} \qquad [1]$$

Source: Amaral (2017, p.5)

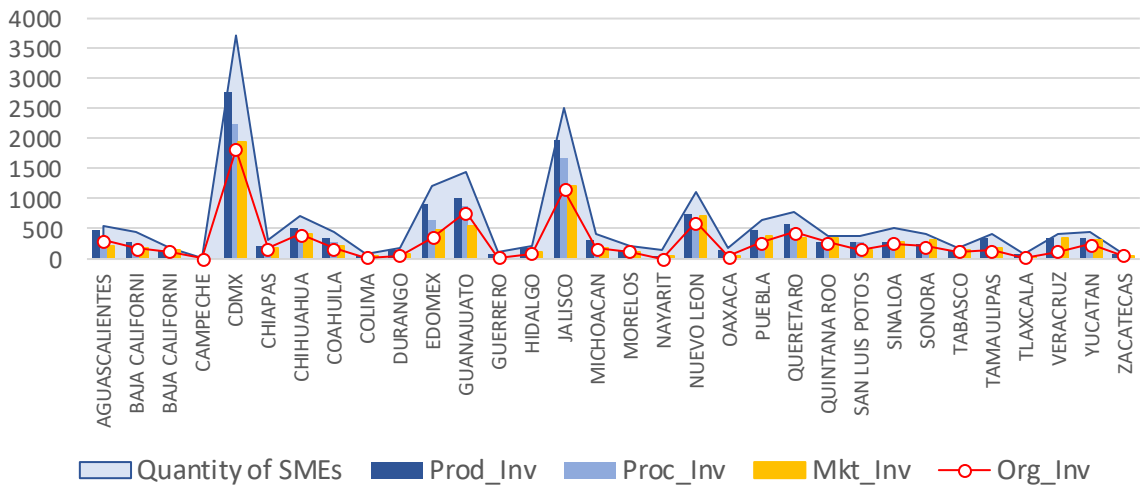
The latter formula allows to determine a measure of "standardized" partial association among the outcomes (Product, Process, Marketing, and Organizational innovation) y and each of the covariates in x'= (X1, . XK) related to the indicators regarding stakeholders of the companies that participated in the survey.

RESULTS

The data related to each type of innovation (Organizational, Marketing, Process, and Product) has similar behavior in all the SMEs of the different Mexican state, as it shows in the next figure.

As is possible to see in the former figure, the different kinds of innovation appear to have similar behavior in the SMEs grouped by state, where Mexico City (CDMX) is acknowledged as the "Frontier state" since presents the higher record of innovation in the country, followed by Jalisco, Guanajuato, and State of Mexico (Edomex).

Figure 1: Total sum of Product Innovation, Process Innovation, Marketing Innovation, and Organizational innovation in Mexican SMEs grouped by state



Source: Own elaboration (2021).

Correlation and Partial correlation indexes

Now, to determine the adequate correlation coefficient technique to use, an important step is to test if the quantitative data is normally distributed; in that matter, we performed a normality test to the set of information available, obtaining the following results.

Table 3

Normality test with a sample of fewer than 50 subjects using Shapiro-Wilk test

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
Prod_Inv	.630	32	.000
Proc_Inv	.607	32	.000
Org_Inv	.654	32	.000
Mkt_Inv	.653	32	.000
MPTD	.671	32	.000
FPTD	.708	32	.000
FDSP	.685	32	.000
MDSP	.676	32	.000
HEdu	.523	32	.000
ETraining	.671	32	.000
EIncome	.659	32	.000
SGovn	.642	32	.000
Exports	.790	32	.000
SEComp	.294	32	.000
SCImp	.660	32	.000
CBF	.720	32	.000
PPCh	.697	32	.000
FSPCh	.638	32	.000
SLPCh	.657	32	.000
MPCh	.671	32	.000
UComp	.573	32	.000

Source: Own elaboration using SPSS (2021).

As we can see in the former table, the quantitative data is normally distributed, so is possible to perform a Pearson correlation test to understand the direction and strength of the relationship among types of innovation. To make the hypothesis contrast, we proceed to calculate Pearson correlation coefficient for each type of innovation, obtaining the following results.

Table 4

Parametric Correlation test for variables directly related to innovation in Mexican SMEs

Correlations					
		Prod_Inv	**Proc_Inv**	**Org_Inv**	**Mkt_Inv**
Prod_Inv	Pearson Correlation	1	.995**	.981**	.978**
	Sig. (2-tailed)		.000	.000	.000
	N	32	32	32	32
Proc_Inv	Pearson Correlation	.995**	1	.987**	.974**
	Sig. (2-tailed)	.000		.000	.000
	N	32	32	32	32
Org_Inv	Pearson Correlation	.981**	.987**	1	.979**
	Sig. (2-tailed)	.000	.000		.000
	N	32	32	32	32
Mkt_Inv	Pearson Correlation	.978**	.974**	.979**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	32	32	32	32

**. Correlation is significant at the 0.01 level

The former table shows that there is a strong and significant relationship among the variables directly related to innovation (>0.9). Continuing with the analysis, when we applied a partial correlation test using the industrial property is an important condition to control the effect of formal innovation in the results of each company, leaving results of correlations considering relationships of innovation outside the formality; in other words, underground innovation measured by a partial correlation considering formal innovation measured as registered industrial property staying constant, obtaining the following results.

Table 5

Partial Correlation using "Industrial_property" (formal innovation) as a control variable for Product Innovation, Process Innovation, Organizational Innovation, and Marketing Innovation

		Prod_Inv	**Proc_Inv**	**Org_Inv**	**Mkt_Inv**
Prod_Inv	Rho	1.000	.873	.687	.643
	Sig.	.	.000	.000	.000
	df	0	29	29	29
Proc_Inv	Rho	.873	1.000	.803	.567
	Sig.	.000	.	.000	.001
	df	29	0	29	29
Org_Inv	Rho	.687	.803	1.000	.709
	Sig.	.000	.000	.	.000
	df	29	29	0	29
Mkt_Inv	Rho	.643	.567	.709	1.000
	Sig.	.000	.001	.000	.
	df	29	29	29	0

Source: Own elaboration using SPSS (2021).

The partial correlation coefficient modifies the former results in terms of relations among variables, resulting in high correlation (Prod_Inv & Proc_Inv; Proc_Inv & Org_Inv; Org_Inv & Mkt_Inv) and moderated correlation (Prod_Inv & Org_Inv; Prod_Inv & Mkt_Inv; Proc_Inv & Mkt_Inv); this noticeable change shows that the control variable "Industrial_property" has a relevant effect in terms of correlations among variables directly related to innovation in Mexican SMEs.

Continuing with the analysis, leaving the control variable "Industrial_property", the results obtained of the partial correlation among all the considered variables show the following results. The information contains the interpretation of each result in terms of significance ($p>0.05$) and strength of relationship among variables (Negligible < 0.19; 0.2 < Weak < 0.39; 0.4 < Moderated < 0.69; 0.7 < High < 0.89; 0.9 < Very High < 1).

Table 6
Partial correlations among innovation with "Industrial property" as the control variable

Variable	Prod_Inv	Proc_Inv	Org_Inv	Mkt_Inv
MPTD	Weak	Negligible	Weak	Moderated
FDSP	Weak	Negligible	Weak	Moderated
ETraining	Weak	Negligible	Weak	Moderated
SEComp	Weak	Negligible	Weak	Negative negligible
SCImp	Weak	Weak	Weak	Moderated
MPCh	Weak	Weak	Moderated	Moderated
FPTD	Moderated	Weak	Weak	Moderated
HEdu	Moderated	Moderated	Moderated	High
SGovn	Moderated	Moderated	Moderated	Moderated
UComp	Moderated	Weak	Moderated	Moderated
CBF	Negative weak	Negative moderated	Negative weak	Negative negligible
FSPCh	Negative weak	Negative moderated	Negative negligible	Negligible
PPCh	Negative negligible	Negative weak	Weak	Weak
MDSP	Negligible	Negative negligible	Negligible	Weak
EIncome	Negligible	Negative negligible	Negative negligible	Weak
Exports	Negligible	Negative negligible	Negligible	Negligible
SLPCh	Negligible	Negative negligible	Negative negligible	Negligible
Mkt_Inv	Moderated	Moderated	High	
Org_Inv	Moderated	High		

Source: Own elaboration using SPSS (2021).

The former table highlights the results of significative moderated and high correlations among the considered variables, taking into account that Industrial property (formal innovation) is considered as the control variable, where is possible to categorize the results in terms of positive, negative, and general relationships.

Table 7

Categories of partial correlations controlling the variable "Industrial property" (formal innovation)

Category	Variable	Correlation
Positive and significative partial relationships	Male person taking decisions Female in Directive and Supervision position External training Female person making decisions Marketer participant in productive chains	**Marketing innovation, Product innovation and Organizational innovation**
Negative and significative partial relationships	First-level supplier of raw materials, parts, or services Commercial banks financing	**Process innovation**
Positive and significative general partial relationships	Use of computers Higher education Supplier of government	**Product, Process, Marketing, and Organizational Innovation**

Source: Own elaboration (2021).

The three categories mentioned before are relevant to better understand the relationship among different stakeholders considering industrial property as the control variable since the innovation that born out of the dynamic relationship with the context of an important number of Mexican SMEs can be related to variables outside of what is considered to be formal innovations.

DISCUSSION

The present study analyzed the relations among variables related to different stakeholders on the innovation of Mexican SEMs using a partial correlation coefficient test for all the independent variables and indicators related to products, process, marketing, and organizational innovations as the quantitative components of innovation in those companies.

First, the control variable regards industrial property, is considered as a quantitative indicator strongly related to formal innovation, since is the number of innovations that are acknowledged for governmental or institutional organizations, and based on that, the partial correlations show a type of innovation related to stakeholders that are not registered nor institutionally acknowledged by any institution; an economic indicator that is being considered as "underground innovation".

Whit that goal, the results were organized in three main categories: variables with positive and significative partial relationships, variables with negative and significative partial relationships, and variables with positive and significative general partial relationships.

The first category presented the variable "Male person taking decisions", which is related to the number of men in positions able to take decisions, shows a moderated partial correlation with marketing innovation, which is the total sum of the application of a new

marketing method that involves significant changes in the design or packaging of a product, positioning, promotion or pricing; other variables with a similar result regarding Marketing innovation are “Female in Directive and Supervision position” and “External training”, which is a quantitative measure for companies hiring external trainers, making training agreements with universities, educational and technical training centers.

In what it comes to the variable "Female person taking decisions", the results suggest a moderated partial correlation with product innovation, in terms of the introduction of new products or the substantial improvement of existing ones.

On the other hand, the variable "Marketer participant in productive chains” has a moderated partial correlation with organizational innovation, in terms of the introduction of a new organizational method in the practices, the organization of the workplace, or the external relations of the company.

In what it comes to the second category related to negative and significative partial relationships, the results showed that the variable “First level supplier of raw materials, parts, or services”, which are incorporated directly into final goods, as well as the variable related to “Commercial banks financing” showed a negative moderated partial correlation with process innovation, that is represented by the inclusion in the production process of new processes (includes methods) or the substantial improvement of existing ones.

Finally, the third category related to positive and significative general partial relationships, then the variable “Use of computers”, that considers an indicator about the use of electronic equipment that serves to process information following instructions stored in the software; the variable “Higher education" that refers to a level of education (Bachelor, Specialty and Pos-graduate) and the variable “Supplier of government”, which accounts for the number of companies that reported participating in that productive chain, presented a moderated positive partial correlation with all the indicators related to innovation (Product, Process, Marketing and Organizational) indicators.

CONCLUSIONS

The outcomes presented leave open lines of research and future developments in the subject of gender diversity, education and regional innovation matters, including the need of further development of new works related to underground innovation in SMEs, to better understand this nature of innovation in different social, political, and economic contexts.

Specifically in terms of management capabilities affecting innovation performance, is relevant to consider the high level of responsibility for strategic and critical decision making as a critical element in maintaining a dynamic process of decision making and continuous improvement that permit the necessary connections that encourage product and process innovation (Ruiz-Jiménez and Fuentes-Fuentes, 2015).

In that sense, the diversity of way of thinking and decisions processes in management are significant incentives that can function as a gateway to innovation, where cultural diversity represent an adequate environment to promote the needed freedom to the formation of innovative ideas by the contributions of flexible and open-minded individuals (Özmutaf *et al.*, 2015)

Finally, In what it comes to gender diversity in organizations, in Mexico women are less likely to have access to entrepreneurship training, a situation that can be explained by factors including low levels of awareness of available support, unappealing training programs, selection bias in program in-take, or even issues of accessibility to such resources (OECD, 2019); this is clearly a situation that can be improved by designing adequate public policies to promote gender diversity in organizations, promoting innovation consequently.

REFERENCES

Amaral, E. (2017) "*Lecture 24 : Partial correlation, multiple regression, and correlation*", pp. 405–441. Retrieved from: http://www.ernestoamaral.com/docs/soci420-17fall/Lecture24.pdf

Bazhal, I. (2016). *The Theory of Economic Development of J.A. Schumpeter: Key Features.* Development Aid and Sustainable Economic Growth in Africa, (69883), 43–77. https://doi.org/10.1007/978-3-319-38936-3_2

BCG. (2007). *Measuring Innovation 2007*. A BCG Senior Management Survey. Available at: https://web-assets.bcg.com/b0/b2/196ef6254aa5ba31c7485388d312/2007-innovation-report.pdf

Caplow, T. (1955). The Definition and Measurement of Ambiences. Social Forces, 34(1), 28–33. https://doi.org/10.2307/2574256

Devaux, A., Horton, D., Velasco, C., Thiele, G., López, G., Bernet, T., … Ordinola, M. (2009). Collective action for market chain innovation in the Andes. Food Policy, 34(1), 31–38. https://doi.org/10.1016/j.foodpol.2008.10.007

Engez, A. (2018). Stakeholders contributing to the commercialization of a radical innovation at global markets: A single case study. Retrieved from: https://dspace.cc.tut.fi/dpub/bitstream/handle/123456789/26571/Engez.pdf?sequence=1&isAllowed=y

Eurostat, Devstat, & Higher School of Economics of Moscu. (2016). New methods for the quantitative measurement of innovation intensity. Retrieved from https://www.dialogic.nl/wp-content/uploads/2018/05/DevStat_WP1-New-methods-for-the-quantitative-measurement-of-innovation-intensity.pdf

Fagerberg, J., Mowery, D., & Nelson, R. (2005). The Oxford Handbook of Innovation. The Oxford handbook of cognitive and behavioral therapies. https://doi.org/10.1093/oxfordhb/9780199988693.001.0001

Freeman, E., Harrison, J., Hicks, A., Parmar, B., & Colle, S. de. (2010). Stakeholder Theory: The state of the art. Retrieved from: https://silo.pub/stakeholder-theory-the-state-of-the-art.html

Geissdoerfer, M., Savaget, P., Paulo, Evans, S., & Steve. (2017). The Cambridge Business Model Innovation Process. Procedia Manufacturing, 8, 262–269. https://doi.org/10.1016/j.promfg.2017.02.033

Granata, J., Garaudel, M., Gundolf, K., Gast, J., & Marques, P. (2016). Organisational innovation and coopetition between SMEs: a tertius strategies approach. International Journal of Technology Management, 71(1/2), 81.

https://doi.org/10.1504/ijtm.2016.077975
Greenacre, P., Gross, R., & Speirs, J. (2012). Innovation Theory: A review of the literature. Imperial College Centre for Energy Policy and Technology (ICEPT), (May), 1–49. https://doi.org/10.1016/j.surfcoat.2008.04.067
Kwak, C., & Clayton-Matthews, A. (2002). Multinomial logistic regression. Nursing Research, 51(6), 404–410. https://doi.org/10.1097/00006199-200211000-00009
Majava, J. (2016). Ecosystem stakeholder analysis : an innovation-driven enterprise ' s perspective. Managing Innovation and Diversity in Knowledge Society Through Turbulent Time. Management, Knowledge amd Learning. Joint International Conference 2016 (pp. 373–379). Retrieved from: http://www.toknowpress.net/ISBN/978-961-6914-16-1/papers/ML16-078.pdf
Mitchell, R., Agle, B., & Wood, D. (1997). Toward a Theory of Stakeholder Identification and Salience: Definint the Principle of Who and What Really Counts. Academy of Management Review, 22(4), 853–886. https://doi.org/10.5465/AMR.1997.9711022105
OECD. (2017). Enhancing the Contributions of SMEs in a Global and Digitalised Economy. Meeting of the OECD Council at Ministerial Level, (June), 1–24. Retrieved from: https://www.oecd.org/mcm/documents/C-MIN-2017-8-EN.pdf
OECD, & Eurostat. (2018). Oslo Manual. https://doi.org/10.1787/9789264304604-en
Perrolle, P., & Moris, F. (2007). Advancing Measures of Innovation: Knowledge Flows, Business Metrics, and Measurement Strategies. Retrieved from: http://www.nsf.gov/statistics/workshop/innovation06/.
Sorama, K., & Joensuu-Salo, S. (2016). A Case Study of Entrepreneurial Ecosystem related to Growth Firms. Retrieved from: https://www.theseus.fi/handle/10024/122436