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Article

Correlation of the performance indicators of MiPyMes in the city of León Guanajuato and their internal attention

Correlación entre los indicadores de rendimiento de las MiPyMes de la ciudad de León, Guanajuato, y su atención interna

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Abstract

This descriptive correlational study aims to explore the level of performance of MiPyMes based on the Intellectus Model made up of four dimensions (Bueno, 2011) and its alignment with business Megatrends. The Mexican Institute for Competitiveness (IMCO, 2025) ranks León, Guanajuato, 13th in the Urban Competitiveness Index, which requires the constant improvement of performance indicators. The model was adapted to construct a 38 statement Likert-scale instrument: Strongly Agree, Agree, and Disagree. This instrument was applied to 69 MiPyMes of product makers and service providers and was administered to management-level personnel. Data were analyzed using descriptive statistics by grouping and weighting data, followed by nonparametric statistics using a Chi-square (X^2)

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Objetives | **Methodology** | **Contribution**

Correlation, Analysis, Indicators

Resumen

Este estudio descriptivo correlacional tiene como finalidad explorar el nivel de desempeño de las MiPyMes en base al Modelo Intellectus conformado por cuatro dimensiones (Bueno, 2011) y su alineación a las Megatendencias empresariales. El instituto mexicano para la competitividad (IMCO, 2025) posiciona León Guanajuato en el lugar 13 en el índice de competitividad urbana, lo que obliga a mejorar los indicadores de desempeño constantemente. El Modelo se adaptó para construir un instrumento de 38 afirmaciones con escala Likert: Totalmente de acuerdo, De acuerdo y en Desacuerdo, que fue aplicado en 69 MiPyMes de productos y servicios, la aplicación se realizó al personal con puestos de nivel directivo. Los datos se analizaron mediante estadística descriptiva agrupando y ponderando datos, posteriormente con estadística no paramétrica mediante una prueba de independencia Chi cuadrada (X^2)

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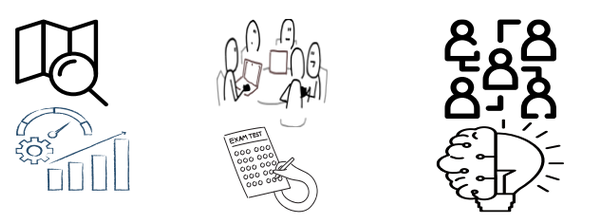
Objetivos | **Metodología** | **Contribución**



Correlación, Análisis, Indicadores

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Introduction

Micro, small and medium-sized enterprises (MiPyMes) are managed under a context of high uncertainty, so it is important to evaluate their performance based on their categorization. The National Institute of Statistics and Geography (INEGI, 2024) is responsible for classifying companies, first defining them as " single-establishment " when they do not share the company name with any other economic unit, or " multi-establishment " when they have more than one establishment or branch, for example, water operators, construction companies, etc., and then classifying them by the number of people who work in them.

Box 1

Table 1
Clasification of MiPyMes

Classification	Micro	Small	Median	Big
People	1a10	11 to 50	50 to 250	More than 250

Source INEGI (2019)

Micro, small, and medium-sized enterprises (MiPyMes) are fundamental to the business fabric in Latin America, as evidenced by the percentage of companies they represent. Currently, in Mexico, they account for 99.8% of the total, contributing 52% to the Gross Domestic Product (GDP), and globally they represent 94%. They employ 68% of the working population (Secretariat of Economy, 2024).

With respect to global imports, they represent 41% and 36% of global exports (Secretariat of Economy, 2024).

While in the United States there are 3.3 million of these companies contributing 44% to GDP and employing 46% of the total workforce in that country, in Canada there are 1.2 million companies in this category, contributing 50% to its domestic product and employing 88% of the people who have one (Secretariat of Economy, 2024).

These data show the powerful force that SMEs represent for countries in the world and particularly for those countries that form the Free Trade Agreement.

Characteristics of MiPyMes in Mexico

It is important to consider some other important elements in the business landscape, such as the gender perspective, since the participation of women is relevant, considering that 76% of micro-enterprises are owned by a woman, 18% in the case of medium-sized enterprises and 5% in the case of micro-enterprises (INEGI, 2019), which identifies women as key drivers of entrepreneurship in the country, without sufficient evidence to support that gender is a significant variable in business management (Carranza, 2025).

In terms of finance, only 34.40% of business owners use banks, and 25.80% identify savings and loan associations as a source of financing, as explained by INEGI (2019). Even though efforts have been made to stimulate credit demand (Escalera et al., 2025), this suggests other, unclear sources of financial leverage. This indicates that these businesses, at least in Mexico, do not use credit for growth; perhaps this is not the perspective of business owners. Another relevant aspect is the use of financing. According to the Secretariat of Economy (2024), 47.9% of financed businesses acquire supplies, and 58.9% use it for equipment or business expansion. This aligns with the fact that only a very small percentage of businesses view financing as a growth strategy.

On the other hand, decision-making in MiPyMes falls to family members of the owners in the following percentages: for the case of micro-enterprises 15%, for small enterprises 7.4% and medium-sized enterprises 3.1% (INEGI, 2021), which can be identified as an area of opportunity in the strategic part of the company.

Context of León, Guanajuato

In Guanajuato there are 242,534 economic units (INEGI, 2019), placing the state in fifth place nationally, with more companies, with significant representation in the country's economic activities.

As a side note, it is important to point out that Mexico has a thousand companies categorized as larger, by federal entity, where Guanajuato occupies the fifth position with 56 companies of this type, after Jalisco (INEGI, 2019).

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In the city of León, the leather and footwear sector remains the main source of business, followed by vehicle parts and accessories (Secretariat of Economy, 2024). It is important to mention that the Mexican Institute for Competitiveness (IMCO, 2025), categorizes León in position 13 in the urban competitiveness index, which makes it necessary to pay attention to these indices, seeking to maintain the positions achieved that favor the economy of the State. Other important factors include internet access, since according to the Data Mexico portal only 59.7% of households have this service, 44% have a computer and 92% of Leon residents have a cell phone (Secretariat of Economy, 2020).

The Guanajuato State Education Secretariat (SEG, 2024) indicates that, in terms of education, among the population of León aged 15 and over, 4.6% have no schooling, 6.5% have incomplete primary education, 14.1% have completed primary education, 3.4% have incomplete secondary education, 27.8% have completed secondary education, and 20% have completed high school. The State Economy Secretariat (2020) indicates that only 13.4% hold a bachelor's degree and 1.15% a master's degree. Furthermore, changes in the labor market and legal reforms represent an additional challenge for MiPyMes, especially due to the shortage of specialized talent (Hernández, 2024).

These data are merely a general description of the economic, educational, and social conditions faced by MiPyMes in the country and specifically in the city of León. Therefore, they are obligated to strengthen the indicators that help them be competitive and seek to incorporate qualified personnel into their companies, facilitating the adoption of technologies. and work on its own internal management, giving equal priority to all areas that comprise it, as well as recognizing women in the development of the region.

Based on this data, the following hypothesis arises: MiPyMes do not give equal importance to the different areas that make them up internally, which consequently affects their development.

So the question is: How do MiPyMes in the city of León, Guanajuato, prioritize or address internally the areas that comprise them according to the dimensions established in the Intellectus Model?

Literature review

Intellectus Model and its dimensions

The Intellectus Model for measuring and managing intellectual capital was created in 2003 and is called Intellectus Document No. 5. Although its main precursor was the Intelect Model of the Euroforum Escorial University Institute, established in 1998, the Intellectus Model can be considered adapted to the current business environment, according to the findings. by Bueno, Salmador and Merino (2008), among others.

Over time, the Intellectus Model has been analyzed in terms of its structure, operation, and applications. This study resulted in an updated Intellectus Model, taking into account the dynamism and consideration of elements such as entrepreneurship and innovation processes, as well as the Research and Development (R&D) function, without altering its essence, but rather its structure, both in terms of changes and additions.

Systemic, Open, Flexible, Adaptive, and Dynamic operating characteristics. The Model is divided into four dimensions as described below. Bueno et al. (2011).

Human Capital

According to Bueno, (2011) the elements of human capital refer to the knowledge (explicit or tacit and individual or social) that people and groups possess, as well as their ability to generate it, the ability to learn and to share said knowledge with others so that once codified they can benefit the organization.

They are directly related to how people feel at work, the knowledge they possess, and the application of that knowledge in their daily work.

Structural Capital (organizational and technological)

These are intangible assets resulting from procedures carried out with the knowledge of human capital, and which remain the property of the company once that human capital leaves. They are divided into the following types of capital:

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Organizational capital

It refers to intangibles of an explicit and implicit nature, both formal and informal, such as the organization's culture, its structure, its learning methods, and the processes it employs.

Technological capital

It comprises the set of intangibles linked to the technical system responsible for obtaining goods and services, with efficient production processes and technology, plus the effort that the company makes in the research and development of new technologies, to develop future innovations in products and processes

Relational Capital (Business and Social)

This refers to the body of knowledge acquired through the company's interaction with external agents in the surrounding society. Its components are:

Business Relational Capital

The elements of business capital focus on the relationships one has with customers, suppliers, shareholders, competitors, employees, and external institutions.

Social Relational Capital

It is associated with the image that the organization presents to the outside world, that is, the reputation it has, the corporate image, public and social relations, etc.

Entrepreneurship and Innovation Capital

This capital encompasses the company's efforts in improvements or new products whose benefits are seen in costs, quality, time, and performance, as well as innovations that have a technological and social impact. It also adds the valuable component of Being + Being Present, meaning it considers people's willingness to generate the innovations mentioned and constitutes an update of the model itself. The model is presented below, describing the dimensions of capital, its elements, and variables.

Box 2

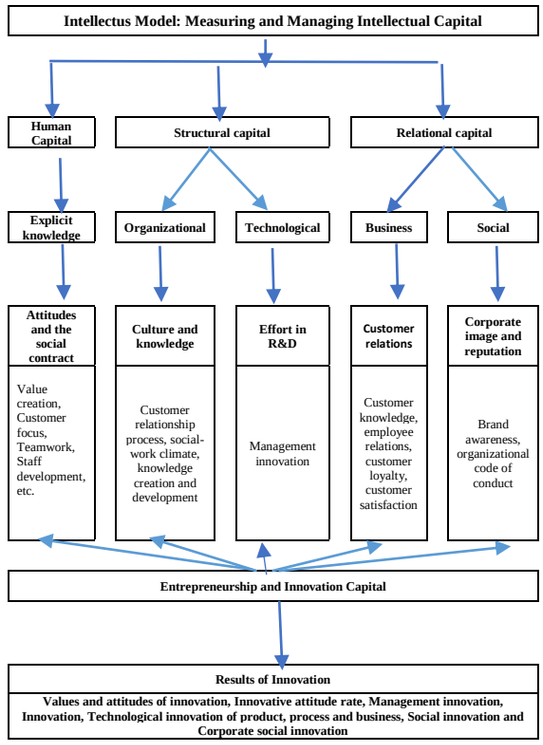

Figure 1

Intellectus Model

Source Bueno et al. (2011)

2.2 Megatrends

On the other hand, megatrends and macrotrends represent a categorization of large-scale, long-term changes that impact society and the economy. These key concepts allow us to understand the major changes that are profoundly and lastingly shaping the future of our societies, categorizing them under five approaches according to their relevance, urgency, and potential impact (Government Municipal of León, 2021).

Box 3

Table 2

Mega trends

Approach	Impact
Human	Health
	Education
	Values
	Communication
Technology	Science
	Automation
Business	Economy
	Finance
	Science
	Job
Environment	Climate change
	Resources
	Urbanization
World	Governance
	Global economy
	Systems

Source Government Muinicipal of León (2021)

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Considering that the Intellectus Model is a structured measurement and management tool, with clear indicators for each dimension and adaptable to each organization, and that it is powerfully influenced by macro and micro trends in Innovation and Development Capital, and given that trends are dynamic, contextual, and adaptable to immediate technological, social, and economic changes, then the need to address all areas that make up MiPyMes with equal importance can be established, as they are affected by these changes, and to accept that trends in the present context and their projection over time influence them as explained in the following figure.

Box 4

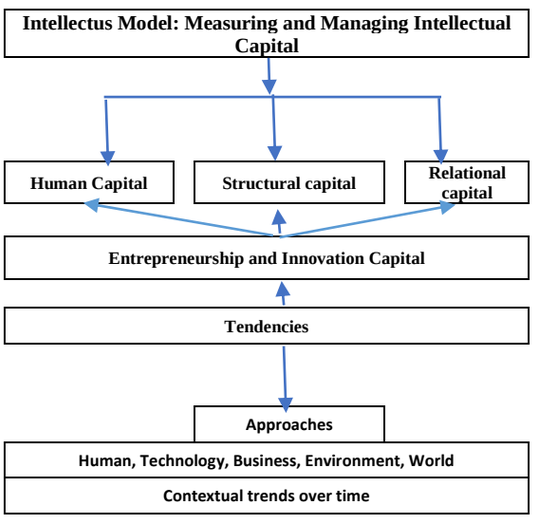

Figure 2
Intellectus Model and Evaluation Approches
Source Own elaboration

The integration of both approaches allows León's MiPyMes not only to adapt to the present, but also to measure and strengthen their intangible assets for the future.

Methodology

This work was approached from the inductive method, connections were made between the objects of study and the causal relationships, supported by observation and the direct application of surveys aimed at measuring the realities experienced in companies, using quantitative measurements through Likert scales, with a descriptive approach grouping and weighting data by cluster, subsequently with inferential statistics.

Different techniques were used that facilitated data processing, thus achieving the research objective. The analysis allowed the data collection to be adapted to the Intellectus Model, identifying the organization in current and global perspectives, namely: 1 Human Capital, 2 Structural Capital (Organizational and Technological), 3 Relational Capital (Business and Social) and 4 Entrepreneurial and Innovation Capital.

The survey is divided into two parts: the first with company identification data and the second subdivided into the 4 types of capital with their respective subcategories, resulting in 6 response categories.

The items are formulated as positive statements with a 3-dimensional Likert scale: Strongly agree, agree, and disagree.

The analysis was conducted using simple random sampling (SRS) with 69 companies and a 90% confidence level. The data collection strategy focused on identifying companies that currently have students completing professional internships. Companies located in various neighborhoods of León, Guanajuato, were also visited, providing a broad overview of the city. The companies have a physical address, which is registered and cataloged in the database derived from this study. Fieldwork was carried out from September to November 2024.

The confidentiality of the information provided by the companies that enabled the collection of empirical evidence has been respected. The companies included operate in the Manufacturing and Services sectors.

Results

Two stages of analysis were carried out. The first consisted of a statistical description by simple grouping by dimension, establishing first a range based on the total score, that is, if the number of statements is 7, it is multiplied by 3 maximum points (Totally agree), then the total points reached will be 21 and it was weighted according to the positive statements presented, resulting in 0 to 7 points for the option in “Disagree”, that is, the statement is not fulfilled and from 8 to 14 points “Agree” considering that the participants do observe this element in their organizations and finally the interval of 15 to 21 points for the category “Totally agree” evidenced that the statement is observable.

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The second step consisted of a non-parametric statistical analysis using a Chi square test of independence (X^2), under the following hypotheses:

H_0: There is no relationship between performance indicators and internal attention

H_1: Is there a relationship between performance indicators and their internal attention?

A 90% confidence level and a 10% significance level were used for the test.

$$x^2 = \frac{\sum(f_o - f_e)^2}{f\text{e}} \quad (1)$$

The decision rule was constructed using a Chi-square distribution table, with (r-1) degrees of freedom in the numerator by (c-1) degrees of freedom, that is, 4 rows by 3 columns = 12 degrees of freedom, which establishes a critical value (X^2) from the table of 19.812

The following table presents the data obtained by grouping.

Box 5

Table 3

Contingency Table

Capital	Totally agree	OK	Disagreement	Total
Human	31	26	11	68
Structural	31	18	20	69
Empren e Inno	8	22	37	67
Relational	24	23	22	69
Total	94	89	90	273

Source Own elaboration

Subsequently, the row-column relationship or matrix transposes were established to obtain the derived value of the statistic.

HTA stands for Human Capital Totally Agree, HA stands for Human Capital Agree, and Human Capital Disagree. Therefore, each of the initials of the capitals is taken, and the 3 possible responses from the instrument are taken.

Box 6

Table 4

Transposed Table

Transposed	Fo	Faith	Fo-Fe	(Fo-Fe)2	(Fo-Fe)2/Fe
HTA	31	23.41392	7.58608	57.5486	2.45788
HA	26	22.1685	3.83150	14.6804	0.66222
HD	11	22.41758	-11.41758	130.361	5.81513
ETA	31	23.75824	7.24176	52.4431	2.20736
EA	18	22.49451	-4.49451	20.2006	0.89802
ED	20	22.74725	-2.74725	7.5474	0.33179
EITA	8	23.0696	-15.06960	227,093	9.84381
EIA	22	21.84249	0.15751	0.02481	0.00114
EID	37	22.08791	14.91209	222.37	10.06751
RTA	24	23.75824	0.24176	0.05845	0.00246
RA	23	22.49451	0.50549	0.25552	0.01136
RD	22	22.74725	-0.74725	0.55839	0.02455
					32.32324

Source Own Elaboration

Table 3 shows in the column called observed frequency minus expected frequency (Fo-Fe) the correlation between the four types of capital with the responses of the instrument (relating row column), the results obtained show positive and negative values in the different rows which reveals on the one hand that there is a correlation between the categories and the data and on the other hand the sign that in some cases is positive and in others negative, indicating that there is a difference in the development or attention of the capitals aligned with the Model; the rest of the table uses the least squares technique to comply with the test statistic.

The null hypothesis is rejected if the value obtained using the test statistic is greater than the critical value obtained from the table ($X^2 > X^2$ u), so 32.3232388 is greater than 19.812.

With these results, it can be concluded that H0 is rejected; the evidence indicates that there is a significant difference in the way the areas of the company considered in the suitability and evaluation carried out according to the four dimensions of the Intellectus Model are managed, and the reason why companies are managed with difficulty.

Testing the assumption that MiPyMes do not give equal importance to the different areas that make them up internally, which consequently affects their development.

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Conclusions

When evaluating business performance based on the categories of the Intellectus Model aligned with megatrends and the levels of attention by categories, it is shown that there is a significant correlation between the performance indicators and the weak management that the MiPyMes of León Guanajuato make of their areas or types of capital according to the Model, this unequal attention reflects fragmented business priorities.

Through statistical analysis and the Chi square test, it is confirmed that companies do not address the different areas that constitute them in a homogeneous way; the differences are observed as follows:

It is identified that Human Capital (HD) is only partially addressed in relation to statements oriented towards worker safety.

In the case of Structural Capital (EA, ED), the values in the table refer to the scarce documented information and planning. limited and lack of technology in the processes.

In the case of Relational Capital (RC), whose These statements relate to the knowledge and monitoring of the value chain, which has also been partially addressed.

Innovation and Entrepreneurship Capital (EITA), which focuses on the existence of areas or departments that promote and develop innovation, which may be incipient since the organizational structures are shown to be poorly documented as observed in this same study, which then limits their ability to adapt to current technological and organizational trends.

This situation is exacerbated by low levels of education, limited access to technology, and a disconnect between the business sector and academia, which are necessary for building solid foundations for companies, for the benefit of both the companies themselves and the professionals in training.

This can be achieved through the development of alliances seeking not only to improve efficiency and productivity, but also to foster a more sustainable, collaborative, inclusive and socially responsible work environment.

For this purpose, digital strategic alliances become relevant for MiPyMes, as they promote engagement and interaction in technological environments (Garcia, 2023). This evidence clarifies that in the city of León there are specific trends that must be addressed urgently, including:

The adoption of artificial intelligence, personalized digital marketing, process digitization, and other essential tools for the growth of MiPyMes, with digital solutions as a key driver of strategic transformation (Pérez, 2023), requires the incorporation of hybrid work, sustainability, nearshoring, and the transition to a Net Zero Economy, promoting healthy environments, as well as the implementation of organizational structures and processes (Polo, 2023). However, for these trends to materialize into real benefits, a profound transformation in organizational culture is needed, along with greater investment in technical and professional training, and public policies that facilitate formalization and access to emerging technologies.

A level of technical and professional training is required to facilitate and promote innovation. Corporate governance training is essential for companies to incorporate it at a certain stage of their development to guarantee their growth and permanence as part of their business vision. This will facilitate strategic decisions. Equally important will be possessing "creative" soft skills (Acosta, 2023) such as: flexible minds, neuroplasticity in the face of extreme specialization, adaptability to rapid and agile change, proactivity, courage and forbearance towards mistakes without dwelling on them, critical yet non-aggressed spirits, a culture of connections, networks, and evolutionary hybridity, understanding that there are generational changes and customs and traditions must become more flexible to survive, as the only certainty is uncertainty.

Therefore, emphasis should be placed on strengthening the business performance of MiPyMes in León, as their ability to to comprehensively manage your Intellectual Capital, giving equal importance to your Capital Human Capital Structural, Relational Capital and Entrepreneurship and Innovation Capital, thus promoting the improvement of the indicators that make them strong, sustainable and permanent.

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Statements

The authors declare that there is no conflict of interest, nor is there any financial interest or personal relationship that influences the article presented here.

Author's contribution

Ordaz-Picón, Carla conceived the idea for the article, participated in the sampling, theoretical framework, statistical analysis technique and contributions to the conclusions.

Díaz-González, Claudia contributed the project idea, research technique, sampling and interviews, as well as contributions to the conclusions.

Alatorre-Herrera, Raquel collaborated with the sample, the methodology and made contributions to the theoretical framework and the conclusions.

Martínez-Aguilar, Libia participated in the sampling and made contributions to the theoretical framework.

Availability of data and materials

The data obtained was used to build a database. The processing includes graphs and can be consulted through the following link https://docs.google.com/spreadsheets/d/1glD35zzz2qoS5z088Nbm7w1Ju7dyTiCX/edit?gid=1776619371#gid=1776619371, after prior communication with the authors.

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Abbreviations

EA	Structural Capital of Agreement
ED	Structural Capital in Disagreement
EIA	Entrepreneurship and Innovation in agreement
EID	Entrepreneurship and Innovation at odds
EITA	Capital, Entrepreneurship, and Innovation fully agree
ETA	Structural Capital fully agree
HA	Human Capital Agreement
HD	Human Capital in Disagreement
HTA	Human Capital - Totally Agree
FURTHER	Simple Random Sampling
MiPyMes	Micro, Small and Medium Enterprises
GDP	Gross domestic product
RA	Relational Capital Agreement
RD	Relational Capital in Disagreement
RTA	Relational Capital Totally Agree
USMCA	Free trade agreement

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