

## Bibliometric analysis of the use of technological strategies in micro, small and medium-size enterprises

Gustavo Alli Cruz Pérez\* 

Edificio de Posgrado Universidad Popular Autónoma del Estado de Puebla (UPAEP), Calle. 17 sur 901, Barrio de Santiago, CP. 72410, Puebla, Puebla, México.

\*Email de autor para correspondencia: [gacp--@hotmail.com](mailto:gacp--@hotmail.com)

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### ABSTRACT

Acting with a broad spectrum in mind leads to a landscape of certainty, which is why its application in Mexican MSMEs is a priority for economic evolution, through the best strategies it is possible to be a unique offerer, endowed with competitive advantages; that is why the objective of this analysis is to determine the current focus and research trends of technological strategies applied to MSMEs globally in order to direct future research towards a path focused on the best practices with application in Mexico; based on a review of the current state of the art and a prospection of future trends using a co-occurrence analysis, a remarkable synergy between MSMEs-Technological strategies-Innovation-Sustainability-Technological Inclusion has been identified, which has given rise to several assertions among which stand out: the importance of applying technological strategies to MSMEs with replicability effect, the current scenario of disadvantage in relation to increased global competitiveness, the use of best practices applied by current research leaders and the orientation of a government to achieve revolutionary change.

**Keywords:** Competitiveness; innovation; MSMEs; sustainability; technological inclusion; technological strategies.

### RESUMEN

Actuar con una perspectiva de amplio espectro conduce a un panorama de certeza, razón por la cual su aplicación en las Micro, Pequeñas y Medianas Empresas (MIPYMES) mexicanas es una prioridad para la evolución económica. A través de las mejores estrategias, es posible ser un oferente único, dotado

de ventajas competitivas; por eso, el objetivo de este análisis es determinar el enfoque actual y las tendencias de investigación de estrategias tecnológicas aplicadas a las MIPYMES a nivel mundial, con el fin de dirigir futuras investigaciones hacia un camino enfocado en las mejores prácticas con aplicación en México. Con base en una revisión del estado actual del arte y una prospección de tendencias futuras utilizando un análisis de co-ocurrencia, se ha identificado una notoria sinergia entre las MIPYMES, las estrategias tecnológicas, la innovación, la sostenibilidad y la inclusión tecnológica. Esto ha dado lugar a varias afirmaciones, entre las que destacan: la importancia de aplicar estrategias tecnológicas a las MIPYMES con efecto replicable, el escenario actual de desventaja en relación con el aumento de la competitividad global, el uso de las mejores prácticas aplicadas por los líderes actuales en investigación y la orientación de un gobierno para lograr un cambio revolucionario.

**Palabras clave:** Competitividad; innovación; MIPYMES; sostenibilidad; inclusión tecnológica; estrategias tecnológicas.

## INTRODUCTION

Micro, small and medium-sized enterprises (MSMEs) are today a fundamental part of a country's economy, accounting for 99.8% of businesses in Mexico [1], 99.9% in the United States [2] and 99.9% in Italy [3], while in a more generalized landscape; the United Nations (UN) reported 99.5% participation in the rest of the world [4]. On the other hand, the generation of jobs by MSMEs has been reflected in 70% in Mexico [5], 46.4% in the United States [6],

76% in Italy [7] and 70% in the world [8] (Table 1).

Considering these data, it is remarkable the importance of their participation in the creation of wealth and employment generation, so that the emphasis on their survival is relevant to a large number of interests such as employability in the population, economic stability in families, co-dependence on the government [9] or even the needs of the owners themselves.

**Table 1**

LOCATION	PERCENTAGE OF PARTICIPATION	EMPLOYMENT GENERATION
MEXICO	99.8%	70%
UNITED STATES	99.9%	46.4%
ITALY	99.9%	76%
WORLD DATA	99.5%	70%



Therefore, one way to achieve an increase in the survival rate is to know what is the current focus of research towards MSMEs in the world and based on these direct efforts towards trends to achieve a correct implementation of technological strategies of the current market in Mexico, taking into account the disparity between a developing country and first world countries.

The resilience spectrum of companies can be treated from different perspectives such as from the most integral as is the human resource, the search to achieve greater operational effectiveness [10] in its functions or go beyond and consider the entire chain in which it is immersed to achieve its ultimate goal, however, every company must know the target point [11] so to continue its efforts dismissing the path to follow, can lead to undesirable results and therefore, omitted for replicability in other organizations.

For this reason, a correct structuring of the strategy [12] to be followed is vital for its uniqueness, since the distinction in the market will originate a high life expectancy, less direct competition, unique objectives and the inclusion of one or several competitive advantages, while the current technological development [13] has created endless opportunities that have achieved great advancements in operational effectiveness for all productive sectors while at the same time, the generation of information by the technological inclusion has facilitated a real time analysis [14] that in turn, increases

certainty in decision making; Thus, the objective of this analysis is to know the current focus and research trends of technological strategies applied to MSMEs globally in order to steer future research towards a trajectory focused on best practices with local application in Mexico.

## METHODOLOGY

The methodology used for the development of this analysis was aimed at identifying the current landscape of publications made by the research community in relation to the use of technological strategies in micro, small and medium enterprises, consisted of a search through the ELSEVIER SCOPUS [15] database of all types of documents including: articles, conference articles, book chapters, reviews of articles or conference articles, books and notes; the search was performed on May 01, 2023 using the advanced search to delimit the search dates covering from the year 2017 to the year 2023, this for taking into consideration that very little of the last year has elapsed; the keywords used for the information search were “technological strategy”, “smes”, “small AND medium AND enterprises”, “small AND business”, “msmes”, “mSES” all in lower case since the search engine does not differentiate between the two.

Thus, the search string is as follows: (TITLE-ABS-KEY (technological AND strategy) AND TITLE-ABS-KEY (smes) OR TITLE-ABS-KEY (micro AND small AND medium AND enterprises) OR TITLE-ABS-KEY (small

AND business) OR TITLE-ABS-KEY (msmes) OR TITLE-ABS-KEY (mses)) AND PUBYEAR > 2016 AND PUBYEAR < 2024 AND PUBYEAR > 2016 AND PUBYEAR < 2024, it can be identified that the logical operator 'OR' was used in the search to include all possible ways in which researchers refer to MSMEs. Following this, the data was exported in .CSV format and analyzed by the VOSviewer processor in a co-occurrence analysis to identify research trends and the most important existing relationships between the most used keywords with minimum occurrences of 15 per keyword.

Subsequently, it was exported for analysis and graphing in “.CSV” and transferred to Microsoft Excel, where particular information regarding the origin of the research was included, such as affiliation, countries of origin, sponsors, area of research, among others.

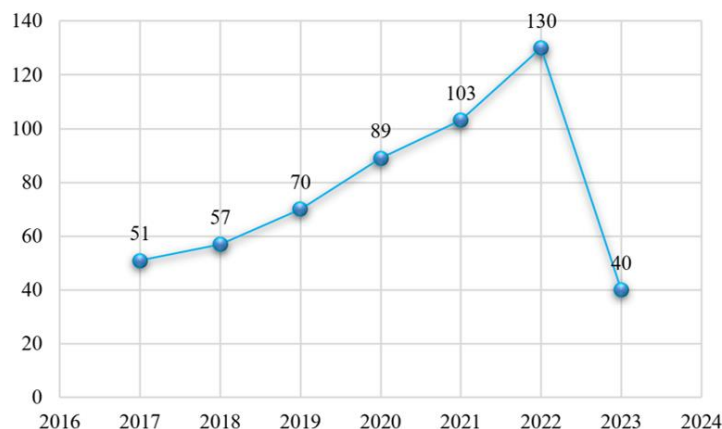
## RESULTS

In relation to the search, 540 documents were found that met the search characteristics, which were tabulated and graphed by concepts useful for the analysis.

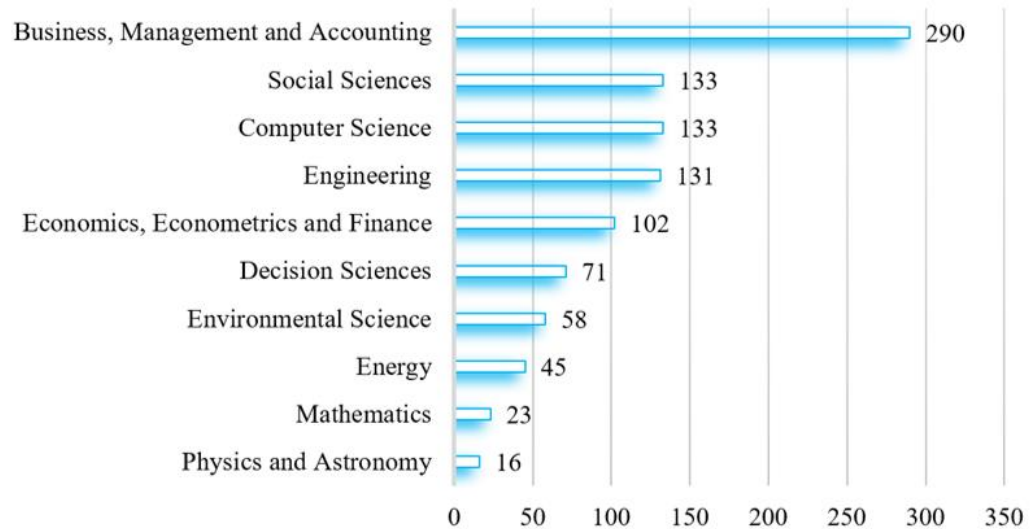
### Utility concepts

Figure 1 show the number of publications related to technological strategies applied to MSMEs per year, where it can be seen that the trend has been upward, and only four months have elapsed since the year 2023.

Figure 2 show the 10 subject areas that have focused the most research on technological strategies applied to MSMEs. It can be seen that the areas of business, management and accounting, which are mainly related, receive the most attention, while environmental sciences, economics and finance do not represent even half of these areas.



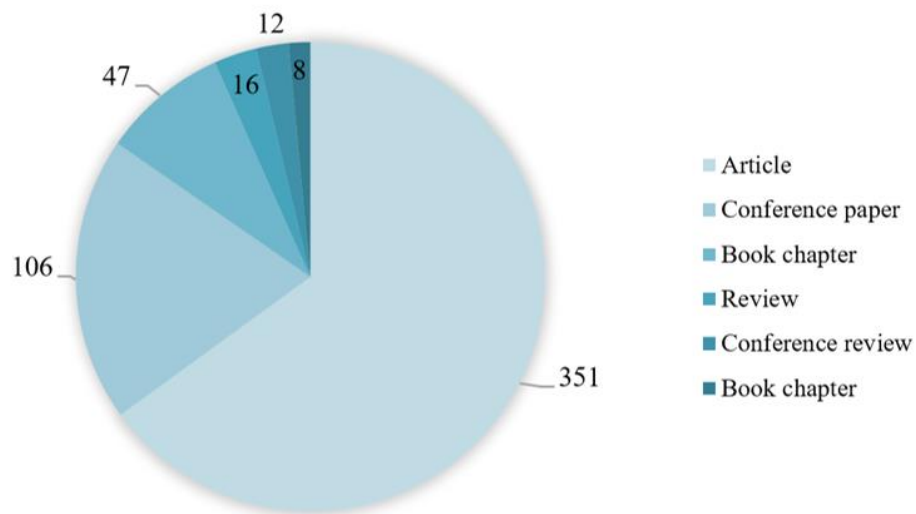
**Figure 1.** Publications per year.



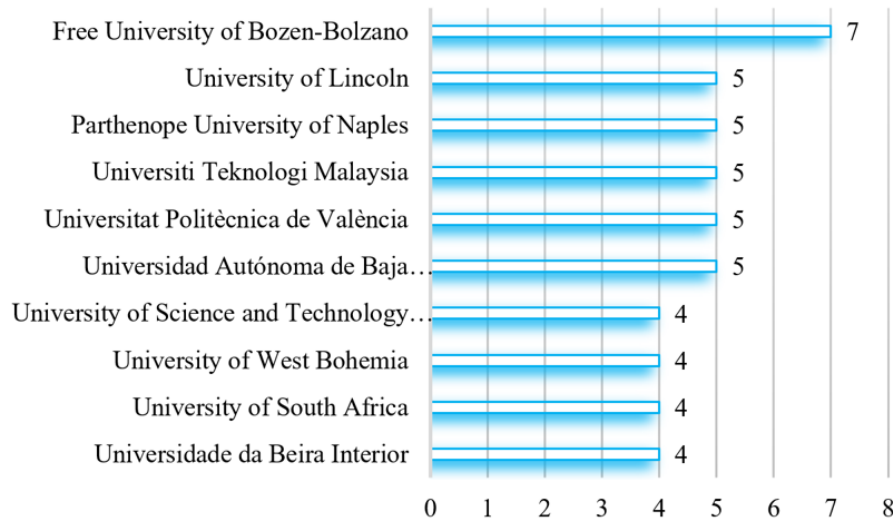
**Figure 2.** Subject area.

The largest number of documents analyzed were articles, followed by conference papers and then, in less significant quantities, the remaining types of documents, as shown in Figure 3.

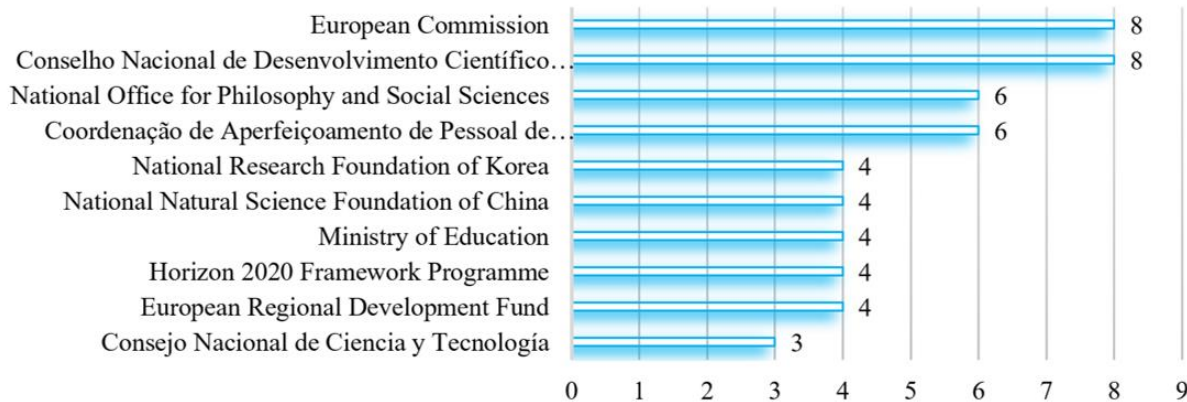
In terms of affiliation, the top three positions are held by Italy, Mexico and Spain, but with a minimal difference among other institutions, since most of them have three or two publications (Figure 4).



**Figure 3.** Documents by type.



**Figure 4.** Affiliation.



**Figure 5.** Sponsor.

It can be identified that the largest sponsor is the European Union followed by Brazil with two institutions that promote research along with China, the National Council of Science and Technology (CONACyT) in Mexico has sponsored only three research projects related to this topic (Figure 5).

In relation to the concepts useful for the analysis, the review by country is the last one,

where can be seen a clear advantage of Italy over the United States, Mexico, and the rest of the world, almost tripling the number of publications in relation to Mexico, which in synchrony with the data regarding the generation of jobs by MSMEs a relationship of great importance can be noticed; added to this, it can be identified that the Asian continent is focusing many efforts on the subject (Figure 6).

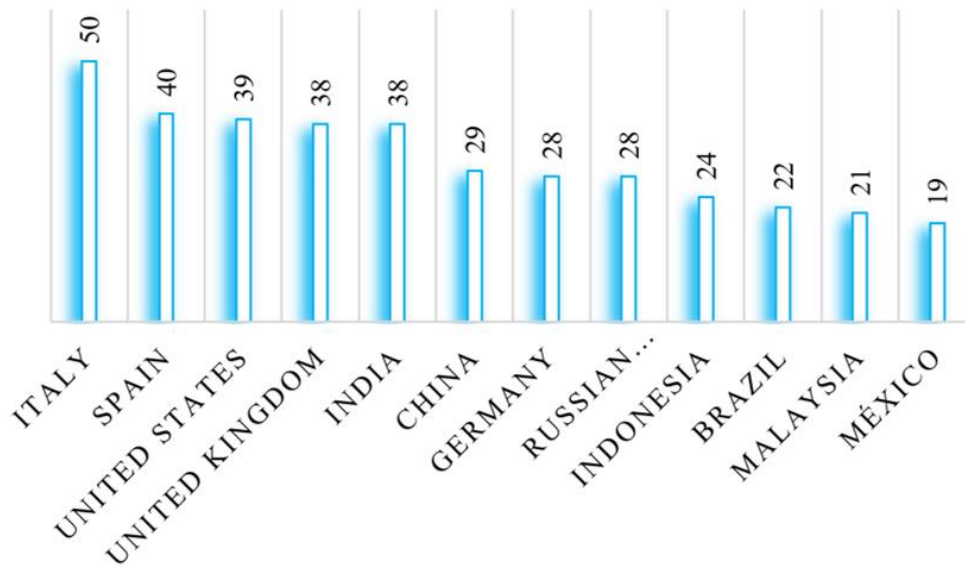


Figure 6. Country.

### Co-occurrence analysis

According to the VOSviewer processing (Figure 7), there is a significant relationship in the research approaches, among which the following are mentioned:

~The greatest interdependence is between “MSMEs”, “innovation”, and “technological development”.

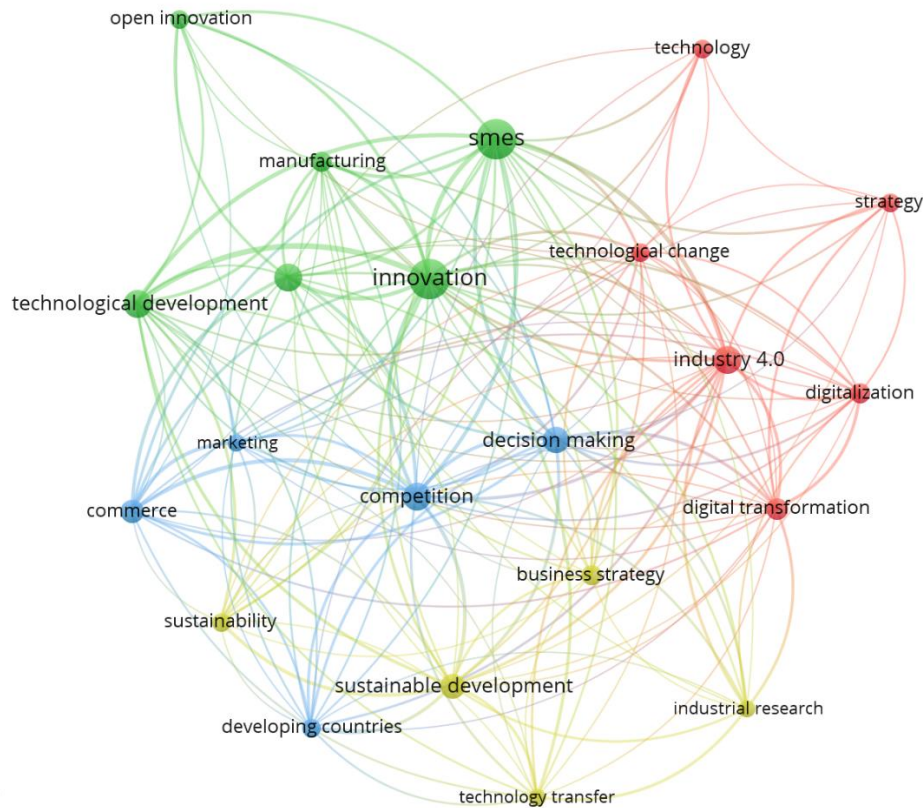
~The red cluster, focused on the application of technological strategies in MSMEs, has six items where the first place is obtained by “industry 4.0” followed by “technological change”.

~The blue cluster has a distinction towards trade and includes a significant relationship with MSMEs; it has five items of which the first place is in “competition” followed by “decision making” and in third place “commerce”.

~In the green cluster, a trend towards operational effectiveness can be identified where “innovation” leads followed by “technological development” and “technological innovation”.

Finally, in the yellow cluster, it can be identified the approach to corporate sustainability, where the first place goes to “sustainable development”, followed by “sustainability” and “business strategy”.

A “smes” approach shows that there is a significant relationship between innovation, industry 4.0, technological development, decision making, without forgetting that competition is also a very important factor in interdependence (Figure 8).

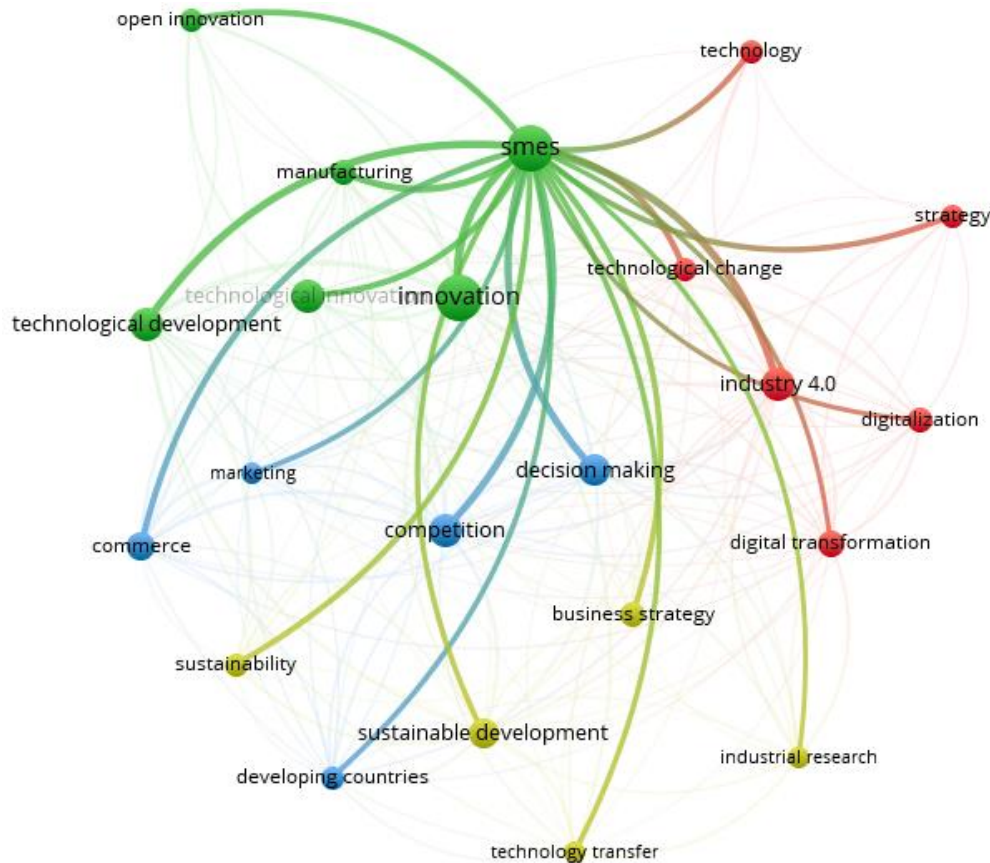


**Figure 7.** Relationships in the research approaches according to the VOSviewer processing.

## CONCLUSIONS

Through the analysis it has been possible to identify certain trends and ideas that complement the current knowledge. Among them can be emphasized and point out below, the importance of MSMEs to the economy [16], which, through a correct definition of the strategy to follow and with the support of technology, can by themselves achieve a revolutionary change that drastically improves the life and well-being [17] of both citizens and their own interests. Likewise it is possible to conjecture the importance of these in

environmental care; Another of the inferences that could be identified was the increase in world competitiveness due to the use of technological strategies applied to MSMEs [18]; it is also possible to find that the relationship between environmental science research and MSMEs can be improved; another idea that emerged from the analysis is the possible similarity between the performance of Italian and Mexican MSMEs; the importance of the European continent as a leader in research on trends in technological strategies applied to MSMEs.



**Figure 8.** Relationships in the research approaches according to the SMEs approach.

Similarly, it can be speculated through the co-occurrence analysis the evident relationship between MSMEs, sustained strategy with technology, innovation and sustainability; as well as technological inclusion as part of research efforts [19]; finally, the four clusters as dimensions of importance in MSMEs.

Thus, the conclusions reached based on the results are as follows:

### **Importance of MSMEs in the mexican economy**

Considering that MSMEs represent 52% [20] of the contribution to GDP in Mexico and generate

70% of the jobs, a replicable approach to MSMEs [21] can bring about changes that will affect the economy and the well-being of both entrepreneurs and citizens.

Although, uniqueness in companies is the cause of a prevailing competitive advantage, this is mostly obtained by a well perceived and implemented strategy [22], which is currently supported by the use of technology, this is why a research approach applied to this area, can cause truly significant changes but given the results obtained, it has been possible to see that Mexico only has nineteen researches carried out since 2017.

This is why, if research were to be redirected to the analysis and generation of knowledge on these issues, a positive impact could be applied systemically and methodically, with exponential use and therefore exponential benefits.

### **Environmental science research**

Considering the foregoing conclusion and the idea of replicability [21], environmental application research focused on MSMEs can have a substantial impact on the country's environmental activity [23].

### **Increased global competitiveness in relation to the application of technological strategies to MSMEs**

Based on the results obtained, it has been perceived a linear increase in the use and creation of best practices for MSMEs. Such data have come from a multitude of countries that are currently applying them while Mexico is lagging behind in research. This landscape creates a disadvantage for Mexican companies that will find themselves in a future growth scenario when companies from other countries have already applied the knowledge generated and therefore will have greater strengths in comparison with these [24], which will make rivalry difficult and keep the country as one of minimum competition, with more foreign companies coming to the country, obtaining and processing the resources and making the perceived profits flow out of Mexico [25].

### **Mexican MSMEs on a par with Italian ones**

Italy is the country that has developed the most research focused on the application of technological strategies for MSMEs, while Mexico has fallen short so far. Although this is an obvious disadvantage, the use of knowledge from these investigations [26] is mostly open access, so that a thorough study of the current development by Italy on these issues could be a sufficient boost for both the Mexican economy and companies to achieve progress that would balance the current unfavorable situation.

### **Creation of synergy between the government and Mexican MSMEs**

Nowadays, the Mexican government has a way of working in which it complements many of its actions with the companies that supply goods and services; however, MSMEs usually encounter many barriers, most of which are related to access to information and its submission; since it implicitly seeks the survival of Mexican companies, the elimination of barriers and their attraction to trade with the government and the complement of their functions as suppliers can be a key facilitator for the sustainability of Mexican businesses [27].

### **Derived approaches for future research**

Although the results obtained in the present investigation are mostly clear, there are still a few unknowns and initial steps for further investigations stemming from these results:

1. Although in Mexico there is

CONACyT, which serves as a body to promote and sponsor research, efforts in this area of study have not been substantial enough to generate a truly significant change in relation to the inclusion of technological strategies in MSMEs that have a sense of replicability and, through this, achieve a general improvement in the Mexican well-being and adapt to new trends and the current generation [28].

2. As it could be found in the results, the European Union is promoting to a greater extent the research on the inclusion of strategies supported by technology with Italy as its greatest exponent, further research can consider the results obtained by the European continent with a refinement included for its adaptation in Mexican markets.

3. It is imperative not to neglect the inclusion of technological tools such as social networks that facilitate the execution of the business strategy in the Mexican market since their use is of great feasibility for entrepreneurs and can by itself create a major improvement in the Mexican economy [29].

### CONFLICT OF INTEREST

The author confirms that there is no conflict of interest in the content of this article.

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