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Article

Digital tools for SMEs in Mexico. Systematic review

Herramientas digitales para las Pymes en México. Revisión sistemática

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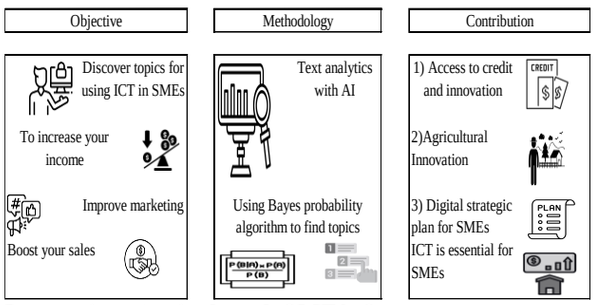
Abstract

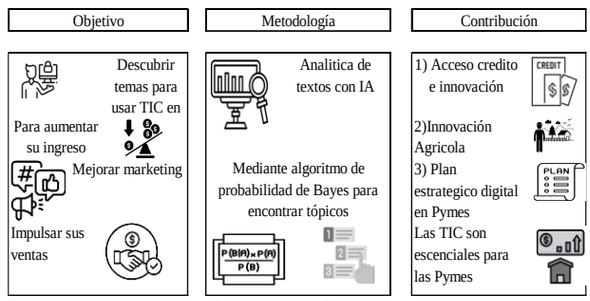
A systematic review was conducted using the PRISMA methodology, the objective was to discover topics related to the use and implementation of ICT that support SMEs to increase their income and improve their digital marketing processes and boost their sales. 45 documents were analyzed with a text analysis through natural language with a Python language library and a Bayes probability algorithm. As a result, three topics were found: 1] Access to credit and innovation as inclusion factors for SMEs, 2] Innovation in the Agricultural sector: The impact of IoT on small farmers, 3] Strategic plan to implement digital tools in SMEs. Finally, it was concluded that tools such as digital platforms, e-commerce, the website, email, IoT, and the smartphone, accompanied by a strategic plan and training are essential for Mexican SMEs.

Resumen

Se realizó una revisión sistemática utilizando la metodología PRISMA, el objetivo fue descubrir temáticas relacionadas al uso e implementación de TIC que apoyen a las Pymes para aumentar sus ingresos y mejorar sus procesos de marketing digital e impulsar sus ventas. Se analizaron 45 documentos con una analítica de textos a través de un lenguaje natural con una librería de lenguaje Python y un algoritmo de probabilidad de Bayes. Como resultado se encontraron tres tópicos: 1] Acceso al crédito e innovación como factores de inclusión para las Pymes, 2] Innovación en el sector Agrícola: El impacto del IoT en pequeños agricultores, 3] Plan estratégico para implementar herramientas digitales en las Pymes. Finalmente se concluyó que herramientas como las plataformas digitales, el e-commerce, la página web, el correo electrónico, IoT, y el teléfono inteligente, acompañados de un plan estratégico y capacitación son esenciales para las Pymes mexicanas.



Innovation, Agricultural, SME´s Sector



Innovación, Agrícola, Sector Pymes

Area: Development of strategic leading-edge technologies and open innovation for social transformation

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Introduction

Currently, small and medium-sized enterprises represent a fundamental pillar for Mexico's economic growth and development. It should be noted that according to statistics from the INEGI [2023] in Mexico there are a total of 4,221,603 MSMEs [micro, small and medium-sized enterprises]. This sector contributes more than 52% of the Gross Domestic Product [GDP] and generates around 70% of formal employment, particularly in sectors such as commerce, services and manufacturing, making it important to study MSMEs.

In this sense, a decisive period of time for these companies was from 2019 to 2023, due to the fact that 1.7 million new MSME establishments were born during this period. This represents significant growth for these companies in a challenging context, which was the COVID-19 pandemic. This crisis highlighted the imperative need for these companies to innovate and adapt emerging technologies in order to remain competitive [Leong, 2022; INEGI, 2023], to carry out a digital transformation of SMEs, which is defined as the process of change and implementation of technological tools in the activities and functions of the company. This process of digital transformation and innovation has important repercussions for SMEs, including the revitalisation of global markets, the creation of new jobs that contribute to poverty reduction, the empowerment of communities and an increase in inclusive economic growth and development [Leong, 2022; Malodia, 2023].

In this sense, the main function of digital transformation in SMEs is the automation of tasks and the optimisation of internal processes, to achieve a reduction in operating times and the elimination of human error, thus improving efficiency and effectiveness within the company. Furthermore, this breaks down geographical barriers and offers new business opportunities that were previously unattainable for small companies [Ghobakhloo and Iranmanesh, 2021].

In this context, the adoption of technological tools has proven to be a key factor in boosting the competitiveness and efficiency of SMEs. However, many of these SMEs are still exposed to barriers that prevent their implementation, such as digital illiteracy and financial inclusion [UNESCO, 2023].

In addition to the fact that ICT in SMEs boosts economic growth [Kusuma et al., 2020] and is of great support to SMEs in rural areas [Fanelli, 2021; Khorshed et al., 2022; Ndimbo et al., 2023], with the support of the Internet of Things [IoT] [Horváth, 2023], and achieve a digital transformation in SMEs in the agricultural sector [Ndimbo, et al., 2023], as well as in the manufacturing sector, as IoT is a pillar of Industry 4.0. [Peláez & Aguirre-álvarez, 2024].

Similarly, ICTs help SMEs with e-commerce [Kumar, Syed and Pandey 2020]. It is also necessary to generate government policies that support the use of ICT [Shahadat et al., 2023] and support strategic plans for the implementation of ICT in SMEs in any sector [Rozak et al., 2023]. This includes the education sector, as these should promote a technological and digital environment to strengthen expansion into a globalised market [Benavides et al., 2025].

In this research, the topics most used worldwide by SMEs and which can be implemented in these companies are added as value, which are explained in the results section and the most important is considered to be the use of IoT in agriculture.

For this reason, the objective of this research was to carry out a systematic review to detect topics related to the use and implementation of ICT that support SMEs in achieving economic growth and improvement in their digital marketing processes and boosting their sales. To this end, the research questions formulated were: Does innovation through the use of ICT help SMEs to grow? Does innovation through the use of ICT help SMEs to perform better financially? How do ICTs help SMEs? Is it necessary for the government sector to support SMEs? These questions will be answered with the discussion of results.

Methodology

In this research, a systematic review was carried out using the PRISMA methodology, with the aim of detecting the current state of ICT in SMEs and detecting issues related to the use and implementation of ICT that support SMEs in achieving economic growth and improvement in their digital marketing processes and boosting their sales. The introduction justifies the systematic review and the research questions are indicated.

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Database of documents

In order to form the database of evaluated scientific articles, the inclusion and exclusion criteria were applied so as not to consider those that would not be suitable for the objectives of this systematic review and to be able to eliminate some that had adequate information but did not meet the objectives of this systematic review.

Searches were carried out in the databases of Web of Science, Scopus and Google Scholar, searching with equation 1, i.e. that the terms SMEs, technology and ICT appeared at the same time ['SMES' AND 'Technology' AND 'ICT'], the Boolean operators OR and NOT were not used, similarly in the advanced search a filter was applied so that only scientific articles were included and they were within the time period from 2019 to 2023.

Inclusion criteria

The inclusion criteria were that only scientific and academic articles indexed in the Web of Science, Scopus or Google Scholar databases from the dates in the proposed period and specifically containing the words SMEs, Technology and ICT would be used.

$$Y = SMES + Technology + ICT \quad [1]$$

Table 1 summarises the criteria used for each database.

Box 1

Table 1

Inclusion Criteria

Databases	Period	Documents found
Web of Science	From 2019 to 2023	569
Scopus		273
Academic Google		18400

Source: Own elaboration

Document análisis

The search found 19242 records, then a review of the title, abstract and conclusions was carried out and most of the documents were discarded as they did not fit the topic of study and most of them were from academic Google which includes grey literature. Forty-five papers were reviewed for abstract and conclusions.

The analysis was carried out through a Python software program, using text analytics, through the natural language toolkit, as well as "stopwords" or words without content, then the data of the words were vectorised and the words were assigned using a Bayes algorithm and 3 topics were assigned to obtain the number of most important words per topic in the conclusions of the selected documents.

By having the words per topic, a thematic proposal is made that can be approached jointly or interdisciplinary, as the analysed documents use the words of the topics separately.

Results

In this research, articles were consulted within the period of time from 2019 to 2023, as shown in figure 1. Similarly, the analysed articles are mostly of quantitative research type, followed by qualitative and finally a minimum percentage of mixed type, as can be seen in figure 2.

Box 2

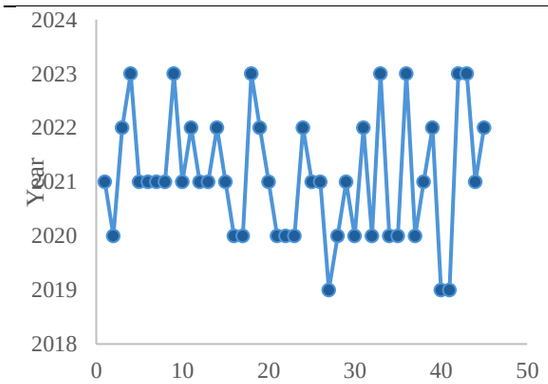

Figure 1

Year of publication of articles

Source: Own elaboration

Box 3

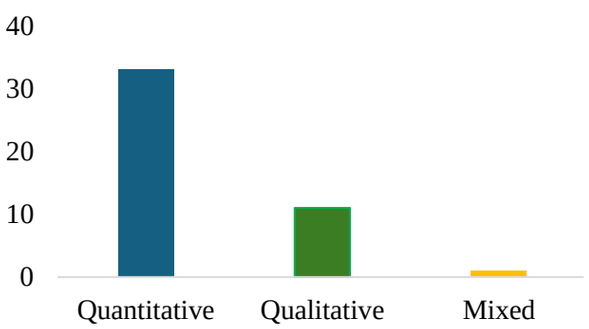

Figure 2

Type of research

Source: Own elaboration

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Box 4

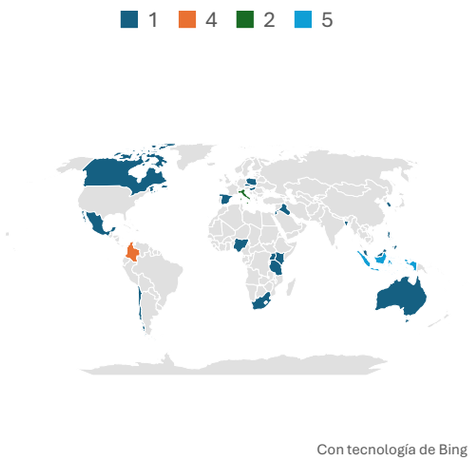

Figure 3

Geographical area

Source: Own elaboration

Also derived from the documentary analysis, the articles were categorised into 3 topics. First, as explained in table 2, are the topics found in the abstract of these articles. Followed by the topics found in the conclusions of the articles, as shown in table 3.

Box 5

Table 2

Topics found in the summary.

Abstrac	Found words	Thematic
Topic 1	Changes, performance, global, economic, implementation, performance, innovation, performance, innovation	Impact of global economic changes on the performance of SMEs.
Topic 2	Technologies, framework, MSMEs, capacity, municipalities, adoption, alignment	Implementation of technologies in MSMEs to improve productive capacity in municipalities.
Topic 3	Farmers, capacities, productivity, agricultural, small, access, sector, access, sector	Improving the capacities of small farmers to increase agricultural productivity.

Source: Own elaboration

Box 6

Table 3

Topics found in the conclusions

Conclusions	Found words	Thematic
Topic 1	Credit, innovation, access, access, inclusion, SMEs	Innovation in SME Credit; Access to Credit for SMEs; Financial Inclusion of SMEs.
Topic 2	Farmers, agricultural, innovation, small, IoT, innovation, small, IoT	The Future of Agriculture: IoT Applications for Smallholder Farmers.
Topic 3	strategic, plan, communication, digital, implementation	Strategic Communication Plan: Digital Tools for Efficient Implementation.

Source: Own elaboration

Consequently, based on this categorisation in table 3, three new topics were constructed, which are described below, and a brief analysis of the conclusion of the articles according to the topics is presented.

Topic 1: Access to credit and innovation as inclusion factors for SMEs

The analysis of ICT in SMEs is relevant, as ICT is one of the outstanding forces driving economic growth. Therefore, SME owners or managers can take priority measures to support the adoption of ICT in their organisations by identifying the most appropriate technology and considering the most important acceptance factors. Given the important role played by SMEs and the challenges posed by Industry 4.0, the Indonesian government must make a strong commitment to support SME entrepreneurs by building e-commerce platforms for SMEs and creating technology banks to improve their ability to acquire technology. and providing mentoring support to boost innovation, specific ICT tools should also be used, such as internet-based technology and social networks [Kusuma et al., 2020].

The performance of SMEs depends on the ICT capabilities to which they have access, as well as on product innovation [Gaviria-Marin et al., 2021].

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In this sense, companies with ICT-trained personnel are more likely to facilitate and implement innovation, given that start-ups and companies in the incubation stage have not established the necessary ICT resources, skills and processes required for technology-driven innovation. Similarly, the size of SMEs has a positive association with overall financial performance, so start-ups in rural areas lack ICT management, finance and innovation skills [Khorshed et al., 2022]. Therefore, rural SMEs that experience job creation as a result of technology adoption are likely to generate more revenue, such that greater regulation and limited support from local policymakers is required for greater business profitability [Fanelli, 2021].

On the other hand, ICTs play an important role in transforming the agricultural sector and rural livelihoods in Tanzania, mainly by helping to access agricultural knowledge and technologies and providing information on markets, climate and financial services to small farmers. The convenience of obtaining agricultural information, communications and money transfers makes it easier for small farmers to use mobile phones than any other technological tool. In this way, by strengthening the ICT infrastructure, small farmers will increase their capacity to obtain timely and adequate agricultural information and expand the market through online marketing platforms, which are booming in many parts of the developing world [Ndimbo et al., 2023].

Similarly, in terms of innovation, e-commerce is made possible by the inclusion of the Internet and other resources, so the owner should encourage employees to use technology to achieve better financial performance. To this end, it must be considered that during the pandemic, both the owner and the employees realised the perceived usefulness of adopting technology as it helped them to continue operating the company in the absence of physical interaction [Kumar et al., 2020].

It is also necessary to consider that among the main obstacles suffered by e-commerce are the mistrust of users due to cyber fraud and theft of personal data, as well as mistrust of payment methods and lack of knowledge to carry out this activity [Béjar-Tinoco et al., 2022].

Similarly, it is necessary to measure the risks of a project for SMEs, such as lack of financial capacity, lack of ICT infrastructure, lack of knowledge of IoT [Parra & Guerrero, 2020]. On the other hand, innovation in ICT infrastructure must be adapted to the internal environment of the company and must also take into account the market environment [Horváth, 2023]. Likewise, technological innovation is the basis for a competitive advantage in SMEs as this is useful for new business owners, policy makers and government agencies in the private sector or governments, societies and other institutions [Her et al., 2020]. Therefore, investment in the development of intellectual capital, learning capacity and technological orientation allows for a better use of the innovation capacity of companies [Siahaan & Tan, 2020].

In such a way that technological inclusion among SMEs encourages financial inclusion as their probability of accessing external credit increases, likewise the use of the Internet through a website and email effectively encourages financial inclusion, as SMEs have access to credit services. Therefore, credit providers can take advantage of the technological conveniences available to reduce their exposure to the risk of granting credit to SMEs in emerging markets. However, it is not yet clear how long it takes for a company to reach a level of financial inclusion after implementing these technological services [Agyekum et al., 2022]. Likewise, the adoption of ICT increases the likelihood that banks will grant loans and finance projects and the working capital needs of innovative SMEs, such that SMEs with greater access to and use of new technologies are more likely to acquire financial resources from banks [Mushtaq et al., 2022].

The technological context has been important, as it has been the most important determinant influencing the intention of SMEs to adopt ICT in developing countries such as South Africa [Jere & Ngidi, 2020]. In the same sense, there is a positive relationship between process, product and management innovations and the performance of Jordanian pharmaceutical SMEs, as organisational performance related to social, economic and environmental responsibility is improved [Al-Momani et al., 2023].

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Topic 2 Innovation in the Agricultural sector: The impact of IoT on small farmers

The process of digital transformation in small and medium-sized enterprises should be guided by the implementation of business solutions in the Internet of Things [IoT], so it is necessary for staff to be trained in IoT technologies.

On the other hand, in terms of industrial sectors, rural SMEs are more likely to generate jobs from the adoption of technology in the primary and tertiary sectors than in the secondary sector, as approximately 63% of rural SMEs generate profits after implementing new technologies [Fanelli, 2021].

Similarly, the search for agricultural knowledge forces most small farmers to opt for ICT tools as an alternative source of agricultural information. For example, with the increasing access to and use of mobile phones, most farmers in Tanzania use mobile information through the IoT to access agricultural information rather than other ICT tools such as radio, television and the Internet [Ndimbo et al., 2023].

Topic 3 Strategic plan for the implementation of digital tools in SMEs

Regarding the effectiveness of a policy, the technological environment in general must be well defined, as institutional capacities are controllable parameters that have an impact on SMEs and are measured in terms of the availability of the latest technology: the absorption of technology at the business level, the transfer of technology, individuals using the Internet, fixed broadband Internet subscription and international Internet bandwidth. However, external capacity is a parameter that cannot be controlled [Das et al., 2020].

With regard to the performance of SMEs, this is influenced by IT business alignment factors [communication, governance, competition, partnership] and, as such, SMEs should consider it as a useful marketing tool in Iraqi SMEs [Slim et al., 2021]. Therefore, some relevant aspects must be taken into account, such as: 1] The adoption of emerging technologies improves the productivity of SMEs. 2] A strategic alliance is a crucial route for SMEs to accept new technologies of the 4th Industrial Revolution.

Therefore, the government must consider a variety of policy measures, such as personalised consulting services, tax benefits or training [Hwang & Kim, 2022]. Similarly, in Bangladesh, competitive pressure and government support are two valuable environmental factors for ICT adoption in SMEs [Shahadat et al., 2023].

Similarly, platforms are socially viable tools, as the same SME workers who are lagging behind other industries in the use of advanced ICTs are using even more advanced tools in their private lives, provided by platforms such as Facebook, Uber, Teams, among others [Turk 2023].

Similarly, in the digital and post-pandemic era, all members of SMEs must also possess digital skills, from staff to leaders, managers or owners, to strengthen the digital strategic plan that consists of the use of ICT, participation in social networks and organisational agility. Furthermore, it is also an effort to minimise the negative impact of interacting with social networks. This implementation of the digital strategic plan in the use of ICT will help companies to reduce their costs, as well as improve communication skills with national and international customers and suppliers. Meanwhile, the implementation of the digital strategic plan in the field of participation in social networks helps SMEs to participate in information exploration, entertainment, socialisation and incentives both internally and externally [Rozak et al., 2023].

Likewise, digital innovation in SMEs has several outcomes, including profitability, competitiveness and internationalisation [Ramdani et al., 2022].

As such, the adoption of technology is much more in demand in SMEs, and after COVID-19, the intensity of technology adoption is much higher. A systematic review spanning 20 years found that managers face different types of challenges and obstacles in technology adoption, namely data security, low technical skills, efficiency, high infrastructure cost, training cost, adoption challenges, less government support, less organisational support, local sources, administrative challenges, organisational challenges, attitude problems and several other issues [Shaikh et al., 2021].

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It should be noted that when technology SMEs implement product innovation, they achieve positive innovation results, so innovation in processes should also be sought, in order to obtain better results [Alzamora-Ruiz, del Mar Fuentes-Fuentes, and Martínez-Fiestas 2021].

Thus, SMEs seeking growth through digital innovation need to develop a set of capabilities, specifically with regard to partnership, customer relations and business process management, as well as investing in ICT resources and cyber resilience [Westerlund, 2020].

In the hospitality sector, SME managers and owners should consider the implementation of ICT as a source of competitive advantage that will facilitate the implementation of corporate social responsibility practices in hotels, which will improve the performance of SMEs, which can benefit both their company and society [Santos-Jaén et al., 2022].

The most important thing is to make ICT value propositions for SMEs, in terms of improvements in business operations and efficiency, as the use of ICT significantly influences economic benefits, user confidence and ease of use [Kyakulumbye & Pather, 2022].

Therefore, more research should be carried out on the current development of business and management communication in a broader geographical context, from the perspective of ICT departments, focusing on how they see the situation and what they suggest as possible improvements [Pikhart & Klimova, 2020].

With regard to economic growth, information technology has an influence on the economic development of SMEs, although the use of information technology is still limited to the use of computers and the Internet in the management of their businesses.

However, the importance of the use of information technology in all categories of SMEs has been established, in order to have a positive impact on organisational performance [Mukhtar et al., 2020].

It should be added that the adoption of Information and Communication Technologies [ICT] is crucial for the growth, productivity and competitiveness of small and medium-sized enterprises [SMEs], in addition to the fact that SMEs play an important role in the economy, and their ability to take advantage of ICT effectively can have a profound impact on their performance and success, by expanding market reach, improving decision-making and thriving in a digital economy. Governments can help SMEs overcome barriers, improve their competitiveness and boost innovation through investment in training, infrastructure and incentives for ICT implementation [Orjuela et al., 2022]. Similarly, support is needed for SMEs that sell digital access, as they not only provide access to ICT but also foster economic opportunities and self-sufficiency within marginalised communities [Uy-Tioco, 2019].

Discussion of Results

To answer the question, 'Does innovation through the use of ICT help SMEs to grow?', the answer is 'yes' they help to achieve growth, because using ICT makes companies competitive [Leong, 2022] and boosts economic growth [Uy-Tioco 2019; Kusuma et al. 2020; Westerlund,2020, Mukhtar et al. 2020].

In relation to the question 'Does innovation through the use of ICT help SMEs to perform better financially?', the answer is 'Yes', as UNESCO has indicated that financial inclusion is a barrier to growth [UNESCO, 2023], and financial management makes SMEs competitive [Khorshed et al., 2022], it helps smallholder SMEs [Ndimbo et al., 2023], it helps in financial management processes [Kumar, Syed & Pandey 2020]; [Béjar-Tinoco et al., 2022]. It also strengthens financial capacity [Her et al., 2020]. It also strengthens the likelihood of access to credit [Agyekum et al., 2022].

To answer the question, 'How do ICTs help SMEs?', there is a wide range of support for SMEs, among which the most prominent are aspects of innovation for digital marketing [Slim et al., 2021] and aspects of product or service logistics [Béjar-Tinoco et al., 2022]. As well as in product innovation [Gaviria-Marin et al., 2021], job creation [Fanelli, 2021], e-commerce [Kumar et al., 2020], and secure operations without leaving home [Béjar-Tinoco et al., 2022].

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In relation to the question 'Is it necessary for the government sector to support SMEs?', the results indicated that technological environment policies must be aligned with the internal capacities of SMEs and with external capacities [Das, Kundu and Bhattacharya 2020], likewise the government must support ICT use policies [Hwang & Kim, 2022] and support the strengthening of platforms that SMEs can use [Turk, 2023].

Conclusions

Based on the systematic review and the classification of the articles by topic, it can be concluded that digital transformation based on the digital tools that SMEs can use represents a vital instrument for Mexican SMEs. Because it facilitates access to credit, it promotes innovation and, with this, expansion into new markets through the use and strengthening of ICT infrastructure such as digital platforms, e-commerce and technological tools such as websites and email.

In this sense, the agricultural sector has benefited from the use of ICTs, as the adoption of innovative technologies such as the Internet of Things [IoT] has managed to position itself as a key tool for maximising production and thus increasing the competitiveness of SMEs. In addition to tools such as smartphones, with which entrepreneurs can access information in real time, have effective and instantaneous communication, carry out business management tasks, sell and advertise products and services online, among others.

Finally, for this implementation of technologies in SMEs in Mexico to bear fruit in the digital economy, it must be based on a comprehensive strategic plan, which, in addition to contemplating the use of digital tools such as those mentioned above, must also emphasise the importance of implementing a good training process in digital skills for all members of the company.

Declarations

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' Contribution

The contribution of each researcher to the points developed in this research is specified below in this section.

Jiménez-García, Martha: Contributed to the idea of the Project, the documentary review, methodology, analysis of the results and conclusions.

Pérez-Castillo, América: Contributed to the documentary review, theoretical framework and conclusions.

Gómez-Miranda, Pilar: Contributed to the introduction and the analysis of the results.

Tavera-Cortes, Maria Elena: Contributed to the methodology and the analysis of results.

Availability of data and materials

The articles analysed in this research are found in the Web of Science, Scopus and Google Scholar databases.

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Abbreviations

COVID-19	Pandemic caused by the coronavirus SARS-CoV-2
e-commerce	Electronic commerce
INEGI	National Institute of Statistics and Geography
IoT	Internet of Things
MSMEs	Micro, small and medium-sized enterprises
GDP	Gross Domestic Product
PRIMA	Preferred Reporting Instrument for Systematic Reviews and Meta-Analysis
SMEs	Small and medium-sized enterprises
IT	Information Technology
ICT	Information and Communication Technology

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UNESCO	United Nations Educational, Scientific and Cultural Organisation

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Background

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