

Mexican MSMEs supplier selection under a commercial and environmental approach: Case Pachuca and suburban areas

Selección de proveedores desde un enfoque comercial y ambiental en microempresas mexicanas: Caso Pachuca y municipios conurbados

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Abstract:

The selection of suppliers is a decision that contributes to the competitiveness of companies due to its impact on their costs, efficiency and innovation. The purpose of this research is to distinguish which are the criteria used by a group of Micro, Small and Medium Enterprises (MSMEs) from Hidalgo, Mexico, in order to identify the factors that influence their business and build an suppliers evaluation system to guide them to carry out this process with a broader approach than the technical one. The first phase of the investigation includes the search for data from micro, small and medium-sized manufacturing companies, located in four municipalities of the state of Hidalgo, based on information provided by the National Statistical Directory of Economic Units (DENUE). The second stage consists of the application of a questionnaire among the entrepreneurs of the companies. Finally, the third stage included the analysis of the information collected.

Keywords:

Micro, Small and Medium Enterprises, Business Administration; Supply chain

Resumen:

La selección de proveedores es una decisión que contribuye a la competitividad de las empresas debido a su repercusión en los costos, eficiencia e innovación de las mismas. La presente investigación tiene como propósito distinguir cuales son los criterios usados por un grupo de Micro, Pequeñas y Medianas Empresas (MIPYMES) de Hidalgo, México, con el fin de identificar los factores que influyen en sus negocios y construir a futuro un sistema de evaluación de proveedores que les guíe a llevar a cabo ese proceso con un enfoque más amplio que el técnico. La primera fase de la investigación incluye la búsqueda de datos de micro, pequeñas y medianas empresas manufactureras, localizadas en cuatro municipios del estado de Hidalgo, con base en la información que ofrece el Directorio Estadístico Nacional de Unidades Económicas (DENUE). La segunda etapa consiste en la aplicación un cuestionario entre los empresarios de las empresas. Por último, la tercera etapa incluyó el análisis de la información recopilada.

Palabras Clave:

Micro, Pequeñas y Medianas Empresas; Administración de Negocios; Cadenas de Suministro

Introduction

The selection of suppliers is a decision that significantly influences costs, efficiency and innovation in the organizations, therefore, this research is aimed at distinguishing which are the criteria used by a group of MSMEs located in the municipalities of Pachuca, Mineral

de la Reforma, Tizayuca and Tepeapulco in the state of Hidalgo, in order to identify the impact factors that influence their business. This also gives the basis to build a supplier evaluation system in the future that guides them to carry out this process with a multiple criteria approach.

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The project involves participating in strategic decision making within companies, even more so in the case of Micro, Small and Medium Enterprises (MSMEs), responsible for contributing significantly to the Gross Domestic Product (GDP), particularly due to the effects that are generated in these with respect to costs, risks and the achievement of objectives, aimed at achieving competitiveness.

This research examines the criteria for choosing suppliers used by Mexican MSMEs in the manufacturing sector located in the south of the state of Hidalgo, in a region close to Mexico City, based on the traditional technical parameters used by the companies. However, the conditions that the current world is facing, show the need for an economically profitable, socially responsible and environmentally sustainable approach, whose orientation is aligned with the country's National Strategic Programs (PRONACES), in order to build Socio-ecological and Sustainable Systems to guide the actions of the productive sectors of Mexico, and in particular in the manufacturing and export maquila sector, which employs 2,560,312 people. [1]

The proposal emanates from the approach to the question, what are the criteria used by the entrepreneurs of the manufacturing MSMEs located in the municipalities of Pachuca, Mineral de la Reforma, Tulancingo and Tizayuca? Under this approach, it is possible to propose the following hypothesis:

The entrepreneurs of the manufacturing MSMEs located in the municipalities of Pachuca and the suburban municipalities; do not use quality, commercial and environmental criteria in the selection of entrepreneurs.

The objective of the work is to reaffirm the criteria that businesspersons normally use in the selection of suppliers, which are of a technical nature; in addition to evidencing the lack of application of quality, commercial and environmental criteria. On the other hand, it shows the production factors that influence objective decision making when selecting suppliers. Finally, the results provide the basis for designing a system that allows users to determine their preferences through a mechanism that gives greater weight to priority parameters.

Literature Review

Taherdoost and Brard define the selection of suppliers as a process through which the company identifies, evaluates and contracts a supplier, to which Thiruchelvam and Tookey adhere that the selection of suppliers is a basic component within of the Supply Chain (SCM), and has generated the publication of more than 625 scientific articles between 2019 and 2020 in Science Direct. [2,3]

The processes of acquisition of raw material that will be transformed into new goods to deliver them to final

customers, implies decision making in the choice of suppliers, due to the impact on the profit margin, which constitutes an essential key factor of success in the performance of organizations, in such a way that the increase in the prices of products and services may be conditioned by the threat of suppliers and their dominance of some type of industry. [4,5]

The fundamentals of industrial organization (IO) assume that the attractiveness of an industry in which a company operates is defined by the market structure and affects the behavior of market participants, including suppliers. 6

Therefore, the power of providers can manipulate the number, size and presence of other providers and consequently the availability of customers and reinforces the proposal of, who attributes to providers a high impact on the performance of organizations. However, many of these organizations lack a supplier selection system, due to the scarcity of resources, knowledge and time to be able to evaluate their performance. The situation worsens in the case of MSMEs in the manufacturing sector, which are particularly vulnerable and have recently faced critical conditions by reducing more than 40% of their jobs, due to the COVID-19 Pandemic. [5,7,8]

Previous studies identify as the most recurring supplier evaluation criteria: the price, quality, financing capacity, trained personnel, organization, wages, production techniques, product characteristics, process and organization, infrastructure, information, prices and associativity, innovation in products, processes, marketing and organization and provision of services. [9,10,11,12,13].

From another perspective, only identify the results of 26 articles between 1995 and 2017, which contemplate the supply processes of materials under environmental parameters. However, in the face of the crisis caused by the COVID-19 virus, greater awareness among consumers and industries has been generated. Business conduct through innovation and the use of technology is focused on reducing adverse environmental impacts. [14, 15]

Concerning to commercial criteria, these are strongly conditioned by the negotiation processes and the experience of businessmen in commercial matters, both in national and international contexts, and allows to visualize various scopes within a negotiation process, through the use of Incoterms, which definition includes the terms to agree the responsibilities to export and import and affect the costs, responsibilities in international contracts. [16]

Despite the crisis caused by the COVID-19 pandemic, Mexico ranks 14th among the leading countries in the commercialization of goods and services, which, derived from the benefits of being part of the Free Trade Agreement with the United States and Canada. It gives significant weight to the supply chain, especially with the

United States; situation that has fostered technological innovation and the increase of e-commerce, therefore, the use of tools and strategies that facilitate and improve negotiation conditions, give organizations a competitive advantage.

Previous studies consider that it is necessary to consider technical criteria, environmental and commercial criteria, with special reference to price, quality, delivery time, financial stability of the supplier, payment conditions, reputation, experience, communication information systems, geographic location, responsibility social and environmental, and claim policies and guarantees. In this way, we identify the common criteria in the selection of suppliers within the manufacturing MSMEs of a central region of Mexico, and their best practices to reduce risks in this process, with the purpose that MSMEs can adopt in a future a system to select the best option, under multiple approaches. [17]

Methodology

This research is of a quantitative exploratory nature. The universe of study are the Micro, Small and Medium Enterprises (MSMEs) of the state of Hidalgo in the manufacturing sector located in the municipalities of Mineral de la Reforma, Pachuca, Tepeapulco or Tizayuca, although due to the location of the companies, some are located very close to other municipalities, such as Mineral de la Reforma and Tulancingo. Therefore, it includes some companies located in the limits of the aforementioned municipalities, resulting in a proposal for case analysis. Through the information of the National Statistical Directory of Economic Units (NSDE), 3,588 businesses meet these characteristics, notwithstanding, the effects on MSMEs, caused by the Pandemic produced by COVID-19, have generated important changes in the statistics initially provided, because about 8.07% of small and medium-sized companies and 5.04% of micro-enterprises have had to temporarily close in the first months of 2021. The study calculates a representative sample of 290 economic units, considering a 95% confidence level. [18,19]

In order to identify the most relevant criteria for the selection of suppliers, the questionnaire electronic application to businesspersons in the geographic area was the first option, however, given the uncertainty scenario that the company faces in front of COVID, the survey was supplemented in person. The instrument design on the review of specialized literature on supplier evaluation. Likewise, this one includes criteria regarding environmental management and others of a commercial nature.

The questionnaire data is organized into 4 sections: the first consists of descriptive information about the company;

the second considers 11 criteria to select suppliers based on the user importance and needs, as well as 6 criteria that allow the identification of the main problems related to the performance of suppliers. In both cases, the employer evaluates, through a Likert scale, the relevance of each of the variables or criteria in a specific way; the third section contemplates the requirements that clients seek in terms of quality and environmental certifications; The last one considers the international trade terms (Incoterms) most used by businessmen, in the case of carrying out international operations in export or import processes. 15 In both cases, the employer evaluates, through a Likert scale, the relevance of each of the variables or criteria in a specific way; the third section contemplates the requirements that clients seek in terms of quality and environmental certifications.

The information coming from the application of surveys allows knowing:

- The percentage of economic units that have certifications such as ISO 9000 and 14000;
- The percentage of companies that use a supplier evaluation system; the evaluation of the companies for each one of the 11 criteria referring to the selection of suppliers;
- The most important problems that businesses face with their suppliers;
- The main requirements that companies need in terms of environmental and quality certifications;
- The percentage of companies that outsource their logistics processes; and
- The Incoterms that they use the most.

For the second stage of the project, the proposal for a simple and understandable supplier evaluation system for businessmen will be designed, which also adjusts to the characteristics, business of the company and its material supply needs.

In the first section of the system, the entrepreneur will answer the questionnaire designed in the first stage of this project. In this way, the tool will be able to determine his preferences through a weighting mechanism that gives greater weight to the parameters that the employer identifies as priorities. It is important to note that preferences can be modified as many times as necessary. In the second section, the user will be able to register each of their suppliers in the system according to the type of good or service they provide. Likewise, the employer will evaluate them in a particular way in each of the 11 criteria for the selection of suppliers considered by this project. With these results, the system will apply the individual preferences of the user to determine a value between 0 and 1, in consideration of the performance that the provider has reflected, where 1 will be awarded to the provider with the best performance and 0 to the one that has shown the worst. In this way, once the executive

evaluates different providers of the same good or service, he will be able to compare them and choose the best option.

Results

The following information reflects the findings obtained from the MSMEs studied.

Figure 1 shows the distribution of companies by number of employees, where companies with 0 to 5 employees occupy the highest percentage; and the majority is located in Pachuca, with 44.09%, Mineral de la Reforma and Tulancingo with 40.51%; Tepeapulco with 9.32% and Tizayuca with 6.09%.

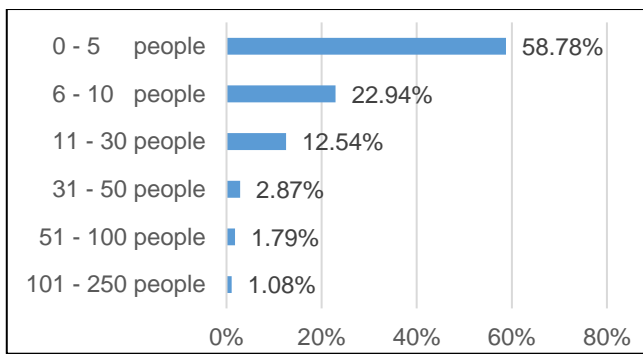


Figure 1 Size of companies according number of employees

The subsectors with the greatest participation are the food industry, which occupies 40.4%; various industries with 15.41% and clothing with 11.11%, as observed in Figure 2, where the subsectors of metal and wood products occupy the third and fourth place respectively, and the other sectors to a lesser extent.

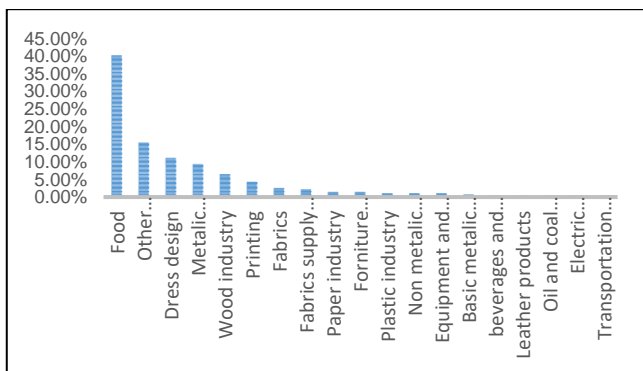


Figure 2 MSMEs manufacturing subsectors

Of the total number of companies, only 11.1% have been certified under ISO 9000 quality standards, however, 47.31% of businessmen acknowledge that clients request them to comply with quality standards, based on non-

standardized parameters and without support in Official standards are only based on criteria such as product appearance, texture, size, durability, finishes, resistance and flavor. However, only 4.35% of the companies, identify official or international standards to measure specific aspects of their products, as is the case of the NMX-E-273-NYCE-2019 standard on the minimum requirements that plastics must meet to organic recovery through aerobic composting, or standards related to construction and building, such as NOM-001-CONAGUA-2011; NMX-C-401-ONNCE-2011; NMX-C-412-1998-ONNCE; rings of rubber for concrete pipes; NMX-CC-9001-IMNC-2015; and ISO 22000 on food safety throughout the entire supply chain.

Regarding the ISO 14000 environmental management certification, 5.38% of the companies comply with environmental standards, since 84% state that they do not have obligations on specific standards, with the exception of some standards established by the Ministry of Environment and Natural Resources (SEMARNAT) related to the management of hazardous waste; separation of plastics; management and moderate use of non-renewable resources and food management. Additionally, only 6.81% of clients require environmental certifications and 12.9% of materials employed require some certification on environmental criteria.

In relation to the selection of suppliers, 89.25% do not have an evaluation system for them and their decisions are empirical. Only two cases base their decisions on the certifications that their clients require, and they are specifically ISO 9000 and related to eco-technological standards for energy saving. In the best of cases, they use questionnaires to be filled out by the suppliers, but without creating a record or database on their performance.

Figure 3 shows the importance of the criteria used in the selection of suppliers, where price has the greatest weight, followed by delivery time, quality certificates, payment terms, information and communication systems, reputation, guarantees or good compliance policies, experience in the industry, financial stability, geographical location and lastly, environmental certifications.



Figure 1 Importance on supplier selection criteria

Among the problems that managers most frequently face with their suppliers, the first of all are delays in deliveries, variations in prices, rejections due to poor quality, and non-compliance with technical specifications, quality standards and environmental standards.

In connection with the use of logistics services, only 12.54% of companies use external companies, since most carry out their processes themselves, given that, 45.52% of companies are supplied by local suppliers, 48.03% of national and 6.45% of international ones.

The previous results offer a limited scenario of the use of Incoterms, as can be seen in Figure 4, where 91% of the MSMEs do not use them and are mostly unaware of them. Considering those who use some type of Incoterm:

- 3.2% empower the supplier to manage all costs and risks, so they deliver their materials directly to their company (Delivered Duty Paid);
- 2.15% collect their materials at the supplier's warehouse and take care of all expenses, transport, risks and documents (Ex Works); 1.79% authorize the supplier to bear all the costs and risks until the merchandise is delivered to your company, with the exception of the expenses associated with the import (Delivery at the Place);
- Lastly, there is the use of CIF (Cost, Insurance and Freight) where the supplier absorbs all expenses, transportation and insurance, until the merchandise is delivered in a place agreed with the client and in the same proportion FCA (Free Carrier), in whose modality the supplier delivers the merchandise in a place within the country of origin, previously agreed with the client and takes care of all the expenses and procedures, until it reaches that place.

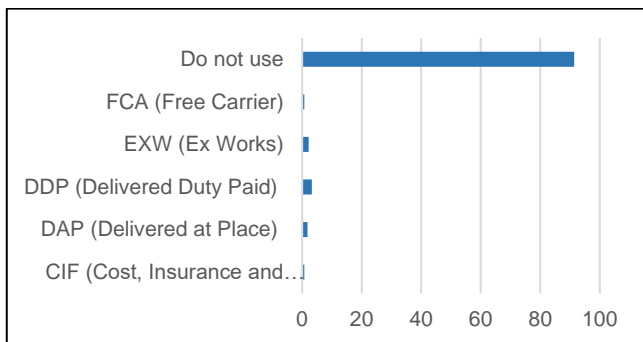


Figure 2 Use of Incoterms by MSMEs

Discussion and conclusion

The results offer information to design a system that allows users to determine their preferences through a

mechanism that gives greater weight to the parameters that they identify as priorities. It is important to note that the preferences may be modified as many times as they require.

In the second part of the system, the user may register each of its suppliers in the system according to the type of good or service they provide. Likewise, the employer will evaluate them in a particular way in each of the 11 criteria for the selection of suppliers considered by this project. With this evaluation, the system will use the individual preferences of the employer to determine a value between 0 and 1 in consideration of the performance that the supplier has reflected, where 1 will be awarded to the supplier with the best performance and 0 to the one that has shown the worst performance. In this way, once the manager evaluates different providers of the same good or service, he will be able to compare them and choose the best option.

Based on the results obtained, Figure 5 presents a proposal for the evaluation of suppliers, in which the supplier's preferences are a basic requirement, based on the industry's turn and reflects a simple and easy-to-understand system by MSMEs managers. The proposal consists of a simple to handle and low-cost system, which can be implemented to achieve more satisfactory and beneficial negotiations for the company, including environmental and commercial criteria.

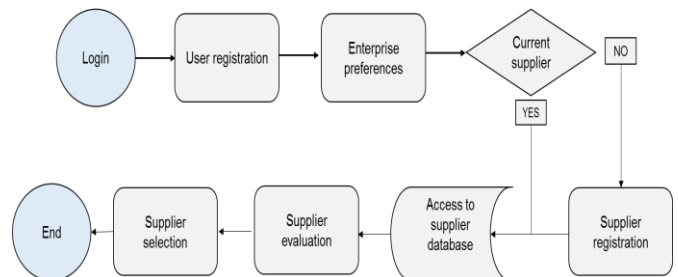


Figure 5 MSMEs supplier selection process

In summary, this study offers four contributions. First, it evaluates the main criteria in the selection of suppliers within Mexican MSMEs. The results are consistent with respect to the findings obtained in previous research, where price and technical aspects identify the greatest impact on the evaluation criteria. Second, the lack of commercial criteria is identified in the evaluation of suppliers, such as Incoterms. It also warns of the need to consider quality and environmental criteria, since they are international market requirements. Third, it identifies the productive factors that face and prevent entrepreneurs from making objective decisions when selecting suppliers. Finally, we identify the most relevant factors that can influence the decision-making of the executives of

MSMEs, and offer us the bases to design a system that helps managers to choose their suppliers in the future.

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