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Evaluation of Technological Innovation and Specialized Methods Used in the Metallic Industry of Tijuana, Mexico

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Abstract – The import of materials used in a metal-mechanic industry located in the city of Tijuana is an important part of the generation of industrial processes in this industry, which allowed the realization of an investigation, where thematic analysis, surveys, and proposals for improvement were elaborated. One of the important aspects was the analysis of customs tariffs on the import of raw materials from this metal-mechanic industry, where evaluations and controversies were generated among the respondents, both at a prestigious educational institution located in the city of Tijuana. For this reason, the application of technological innovation and internal marketing techniques is very important to compensate for the cost of taxes in the metallic industry of Tijuana City. This relevant scientific study is of great support in determining the main market strategies (obtaining raw materials and sales of manufactured products) and the proposal to apply innovation technology and internal marketing programs in a metallic industry in Tijuana City in order to reduce import costs and thereby obtain higher economic profits. This investigation was made in 2023.

Keywords: Customs taxes, metallic industry, technological innovation, raw material, economic profits.

1.INTRODUCTION

The high costs of raw materials for the Mexican taxes, which are utilized in the industries that are located in the border cities of the Mexican side, between the Mexican Republic (MR) and the United States of America (USA) (MCOT, 2023), are be evaluated for a lot experts of this relevant thematic (MTL, 2024). This is very important to determine the application of some specialized strategies to compensate this high cost of the raw materials to make the manufacturing activities with the optimal operative yielding of workers and industrial machines and equipments of the manufacturing areas. For this reason, was made a relevant

investigation to evaluate specialized methods and techniques to support to workers of industrial processes and obtain the efficient productivity and quality indices.

1.1 Metallic Industry

Is an important industry worldwide, where are installed in a lot cities of the world, including the Tijuana city, which is considered an industrial city. This relevant industry fabricates a lot types of metallic products of metallic materials as raw material as aluminum, copper, nickel, steel and zinc; essentially. The principal metallic products manufactured in this type of industry are presented in figure 1 (López Badilla Gustavo et al, 2016).

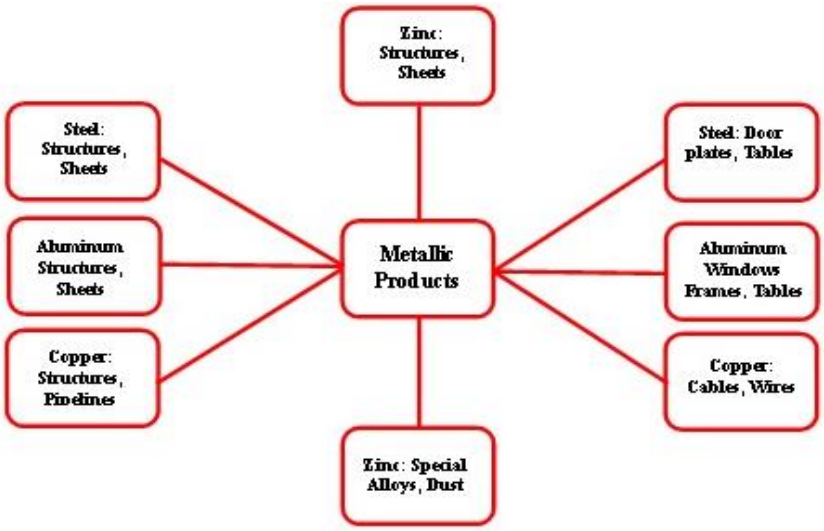

Fig -1: Principal metallic products manufactured in the Tijuana industry (2022)
Source. Analysis of investigation

As is showed in figure 1, in this industrialized city that is Tijuana, are a lot of industrial companies focused to the metallic industry with different types of metallic materials as aluminum, copper, diverse types of steel and zinc, as principal metallic materials; and others with less quantity and the same importance is the titanium.

1.2 Manufacturing of Metallic Products

Manufacturing activities include actions of the efficiency of workers in industrial processes and industrial equipment and machines, which are part of the manufacturing processes of products in each type of industry. The industrial processes of the metal industry are of great importance in the manufacturing of any type of metal product, using the appropriate industrial equipment and machinery for each stage of the manufacturing processes. In the metallic industry are some industrial operations that supports to fabricate diverse metallic products, which are expressed the principal products manufactured in the metallic industry of Tijuana city, and is showed in table 1, and that is based the fabrications products to the automotive industry (López Badilla G., et al, 2012b).

Table -1: Principals metallic products fabricated to be used in the automotive industry of Tijuana city (2023)

Products manufactured	Function
Battery terminals	Have the function to joint the electrical cable of cars to the battery
Bearings	Supports to reduce friction between the axles of the mechanical damping system
Car ball joints	This function is to supports the steering system car to make the rotating movements
Car chassis parts	Are for the transmission section, whose function is to support the transmission
Car break discs	Are used to supports to reduce the speed of cars
Car transmission parts	Are used to the function of the transmission
Mechanical terminals	Have the function of making the connections of the ball joints with the chassis part of the car.
Structure of electrical car alternators	Are used to cover the parts of the car alternators
Structures of electrical car starters	Are used to cover the parts of the car starters
Wheels	Are utilized in the tires of cars

Table 1 shows the principal products manufactured in Tijuana in this metallic industry, to fabricates essentially to the automotive industry. The others metallic materials mentioned in the last section, were used to other types of manufactured products of the metallic industry installed in this industrialized and technological city. The metallic industry in Tijuana es very important to this city, because generates a lot jobs for the people of this city.

1.3 Customs Taxes

The tax contribution from foreign and national industrial companies to the government of Mexico is a contribution in monetary action, as a fiscal responsibility on the part of taxpayers in our country (MCG, 2010; TSM, 2023). Direct taxes generate the economic taxation of taxpayers, which is according to economic income and expenses, focusing in this investigation especially on the contribution of industrial companies (GRBGM, 2020). That is, specifically in foreign industries that must import materials for the manufacture of their products, as well as basic and specialized industrial equipment and machines, with which they manufacture their products. The tax requested from national or foreign industries in Mexico is 30% in any part of the territory of our country, in addition to 15% for foreign companies for establishing themselves beyond the border zone with the United States. In addition to this, taxes are presented for the import of the aforementioned (material, equipment and industrial machinery). This tax is 15% for both import and export of products manufactured by each industry in our country, which are considered as indirect taxes as customs taxes. A great diversity of industrial companies is located in the border area between the States and Mexico, essentially from the United States, in addition to, Australia, Brazil, Canada, China, England,

France, Germany, Holland, Italy, Japan, Korea, and Spain; especially. In table 2 are illustrated the countries mentioned above and the principal products fabricated in this industrialized city (IFSRTRM, 2023).

Table -2: Main countries that have industrial companies in Mexico (2023)

Countries	Products manufactured
Australia	Fabricates semiconductors to cellular phones
Brazil	Manufactures mechanical parts for personnel buses and metallic products
Canada	Fabricates computer systems to personnel use
China	Manufactures normal clothes
England	Fabricates electro domestic systems and metallic products
Holland	Manufactures musical products
Italy	Fabricates elegant clothes
Japan	Manufactures electronic products
Korea	Fabricates electronic products
Spain	Manufactures metallic products

Table 2 illustrates the principal countries that have foreign industrial companies and their essential products manufactured in our country, which pay a lot customs taxes as monetary resources to the Mexican government, and for this reason are concerned the directive and managers, principally (Anadon et al, 2016; Saman Qaisar Fátima et al, 2021).

1.4 Technological Innovation

It involves the creation of new technologies, with respect to industrial processes, where new industrial operations are generated to improve the efficiency of industrial equipment and machinery (Cavallo et al, 2016) and with-it operational performance of these and the operational personnel of the manufacturing areas (Martínez Sánchez María Eugenia et al, 2021). There are mainly two types of technological innovation: (1) development of new methods or techniques of operation, analysis and inspection in a manual and automated manner and (2) development of basic and specialized automated systems. In figure 2 is showed the principal types of technological innovation mentioned above (Christensen et al, 2015; Coccia, 2018).

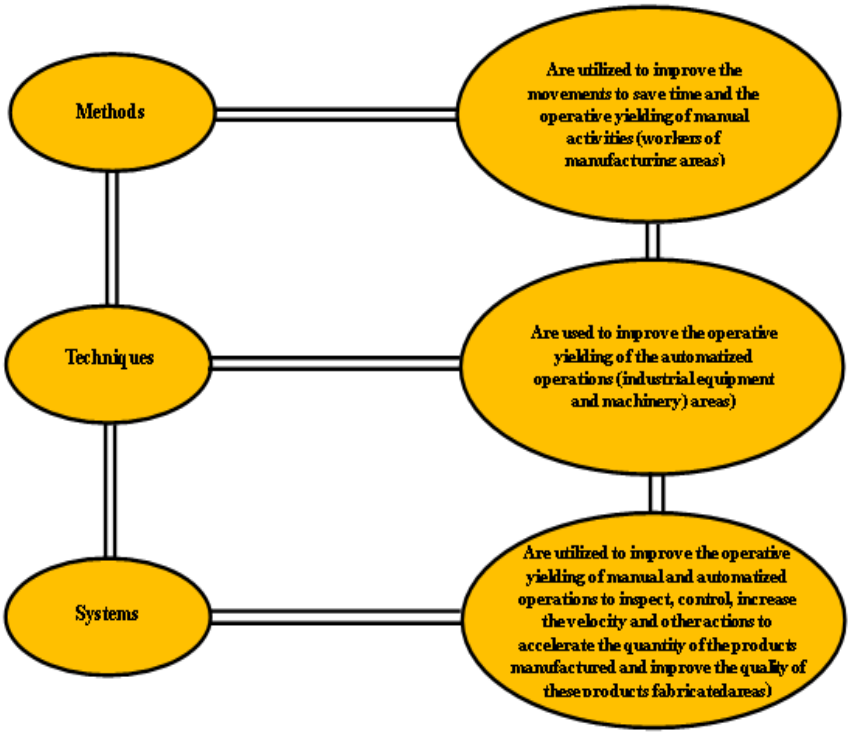

Fig -2:Essential technological innovation concepts
Source. Analysis of investigation

Figure 2 represents the principal aspects of the technological innovation used in the metallic industry and other types of industrial companies of this important city of the Mexican Republic, to compensate the high customs taxes that need to pay to the Mexican government and obtain better operative yielding of the workers of the manufacturing areas and of the industrial equipment and machinery of the metallic industry evaluated and other types of industrial companies.

1.5 Internal Marketing

This part of the investigation was contemplated to evaluated specialized methods used in the internal marketing to supports added with the technological innovation factors to compensate the payment of the high costs of customs taxes of the metallic materials utilized in the metallic industry evaluated (Won Doyeon et al, 2023). In this scientific study, was utilized three principal aspects of the internal marketing to regulate and increase the operative yielding of the workers of the manufacturing areas of this industrial company, where was made the investigation (Zandiyeh Khatereh et al, 2022). The three aspects mentioned are expressed in table 3 (Swapan Deep Arora, 2023).

Table -3: Essential aspects of the internal marketing utilized in the metallic industry evaluated (2023)

Aspects	Results obtained
Courses	Was important to capacitate workers of manufacturing areas and increase this operative yielding

Conviction for Job Promotions	Was made to stimulate to workers of manufacturing aeras to obtain a better job in this industry and better job conditions, increasing the competitiveness and with this his operative yielding
Conviction for Economic Stimulation	Was utilized to stimulate workers of manufacturing areas, obtained and improvement in the operative yielding of the workers

2. METHODOLOGY

In this investigation was obtained relevant information about the relation of the payments of customs of the metallic industry evaluated and the possibility of apply the technological innovation and compensate the high payments of the customs taxes. This investigation was made in two steps, which are mentioned next:

a. Analysis of the customs taxes of the metallic industry evaluated/

b. Evaluation of the possibility of the application of the technological innovation in the industry where was made this scientific study.

3. RESULTS

This investigation was relevant to the industry of this city and others industries of our country, obtained interesting information to improve the industrial operations of the metallic industry evaluated and other industries.

3.1 Analysis Of The Customs Taxes

The payment of the customs taxes is generated concern in directive and managers of the industrial companies located in the Mexican Republic, and for this reason was evaluated this important factor of the economy of the industries, which is represented in figure 3.

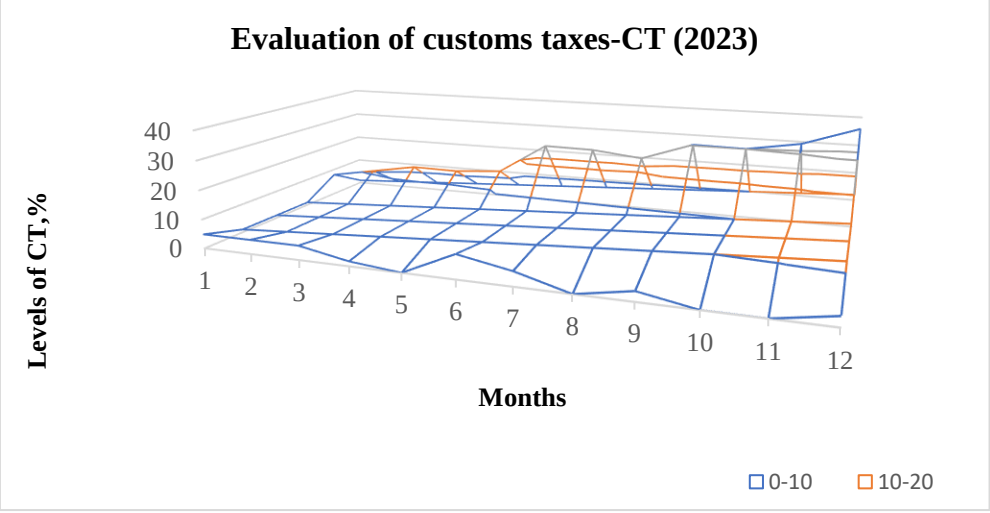

Fig -3:Evaluation of the customs taxes depending on the metallic material utilized

This evaluation represents the variation of the customs taxes from 0% to 40% (as the highest value), about the changes of customs taxes in according to type of metallic materials used in the metallic industry, where was made this scientific study. Figure 3 illustrate the variation of metallic materials, where the stainless steel, for its good physicochemical properties in this manufacturing process and in this use in the real life, principally for avoid the corrosion phenomena. The analysis considered by colors, where the light blue color represents from 0% to 10%, orange color 10% to 20%, gray color 20% to 30% and dark blue color 30% to 40%.

3.2 Evaluation of Technological Innovation

This section of the investigation consisted of the analysis of the three types of technological innovation aspects considered in a section mentioned above, where the is illustrated in figure 4, the three types and the quantity of use represented as a percentage. The graph shows the analysis, where was begin from 0% to 100%, indicating the percentage of each technological innovation aspects contemplated in this scientific study. This part of the study was a compensation action of the payment of the high customs taxes in some metallic materials utilized in the metallic industry evaluated. This analysis was illustrated by color representation, where the light blue color represented the design and application of the method factor utilized, orange color the technique aspect and gray color automatized system, showing that the major aspect utilized was the method factor.

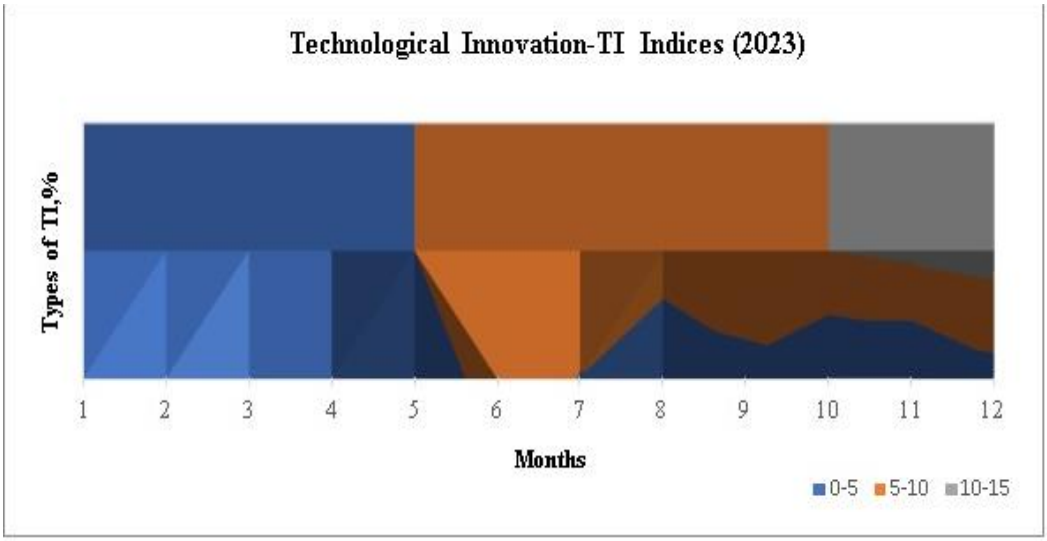

Fig -4:Analysis of the types of technological innovation used in the investigation (2023)

This figure indicates the necessity of use the technological innovation with the three aspects mentioned above, compensating the high payment of customs taxes, and obtaining economical gains in the metallic industry where was made this investigation.

3.3 Internal Marketing Evaluation

This part of the investigation was made to improve the operative yielding of the workers of the manufacturing areas and supports to compensate the high payment of customs taxes of the materials. The internal marketing aspects utilized in this scientific study were relevant to convince to workers to make its industrial operations with high quality to obtain high productivity and quality levels of the products

manufactured. The three essential aspects mentioned above are illustrated in figure 5, where was represented by colors: light blue color the analysis of the first aspect that was the courses in a period of two months, being the aspect that understand better than others, being represented by the light blue color. Then, was applied the conviction for job promotions with a period of two months, where supervisors and specialized people of this industrial company evaluated, need make more effort to convince to workers of the manufacturing areas, being illustrated in a part of the figure 5 with more range of length with the orange color. Finally, was showed the third aspect, as the conviction to economic stimulation factor, where supervisors and specialized people of this industrial company evaluated made a high effort to convince to workers to make its operative functions with high quality, being illustrated by the major length with the gray color in figure 5.

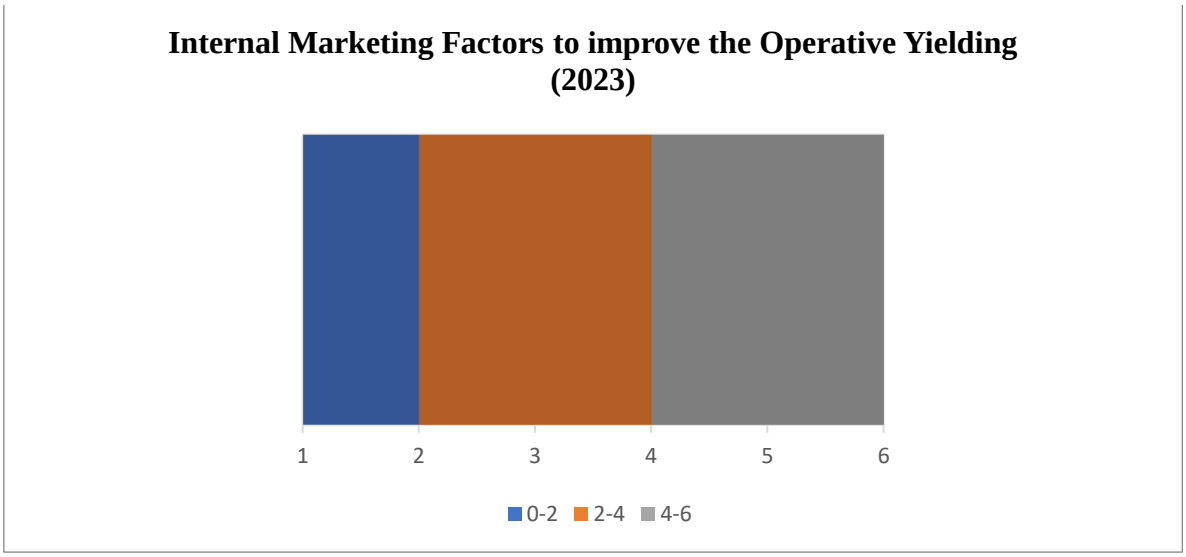

Fig -5:Relevant aspects of internal marketing methods to improve the operative yielding of workers

4. CONCLUSIONS

This investigation obtained relevant information and was supports to improve the productivity and quality levels of the manufacturing products of the metallic industry, where was made this scientific study. The application of the specialized strategies as technological innovations factors and internal marketing aspects, supports to convince to workers of manufacturing areas to make his operative functions with major quality and can compensate the high costs of the customs taxes of this industrial company and all industries located in the Mexican Republic, and can generates jobs to people of Tijuana and other cities of Mexico.

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