

SUCCESSFUL MANAGEMENT SYSTEM BY A METALWORKING MEXICAN COMPANY DURING COVID-19 SITUATION. ANALYSIS THROUGH A NEW INDEX (CASE STUDY).

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ABSTRACT

The implications of the COVID-19 pandemic have jeopardized many corporations around the globe, especially those that were centered around what is considered to be a non-essential activity. The objective of this research is to discover what strategies the company in question applied successfully within its diverse areas, leading its system management to an overall positive outcome, despite having to adapt to 7 months of COVID-19. In order to achieve this, the company's data will be examined before the pandemic began to identify the processes within the main areas, where they could find their strengths and weaknesses. For the purpose of this investigation, the PDCA methodology was implemented to identify the different successful strategies related to the main activities at the company, followed by a validated questionnaire applied to main directors where the principal strategies previously identified have been evaluated. Considering all of this, a new index rate is proposed in this paper. By applying the organizational prevalence index, the sales result has a total prevalence of around 100.4%, so that sales remain the same. The prevalence for the stock has been observed to increase significantly, and in the case of personnel, there has been a minimal increase. Despite there being a noticeable decrease in the national context, there has been a decrease in the employment rate. This study was carried out with the goal of being a reference for resilience for companies where strategies are related to the results when applying the index. Because the study was conducted in only one company, the recommendation for the future is to replicate the study in a large number of companies to correlate data and verify that the index shows a more reliable relationship with company performance. Also, it is considered to apply this index in different company categories, but that will depend on confidentiality and data transparency in every organization.

KEYWORDS: *COVID-19; Strategies, Economics, Prevalence Index, Resilience, Mexico.*

JEL CLASSIFICATION: F63, M11, 054

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1. INTRODUCTION

The constant transformations and changes to which companies are exposed lead the different organizations to implement measures and strategies that allow them to expand and ensure the commercialization of their products to maintain their power in the market. One of the essential

requirements for the companies has been to obtain a high index of competitiveness, offering products of high quality, looking for the customer satisfaction and customer loyalty (Rodríguez & Pérez, 2020). The baseline forecast envisions a 5.2 percent contraction in global GDP in 2020, the deepest global recession in eight decades, despite unprecedented policy support (World Bank 2020).

During the second quarter of 2020, the effects of the COVID-19 pandemic on economic activity increased. This was due to a significant decrease in production in all regions of Mexico and the measures taken to contain it. However, the regions of the country were affected differently in terms of their participation in those sectors that have most suffered from the impact of supply and demand shocks resulting from the health emergency. (BANCO DE MÉXICO).

The manufacturing sector, one of the most important in the country, deteriorated for the second quarter of the year, resulting in the loss of several assets in the market due to the health contingency strike. However, in June there was a slight recovery caused by the reactivation of some sectors and companies that were able to face the sudden changes that they faced and redesigned their strategy (BANCO DE MÉXICO).

The research company was chosen for being the first in the state to develop efficient solutions focused on combating the COVID-19 virus. While other companies in the country were ceasing activities, this company empowered its innovation and product development department to face the current crisis with immediate solutions. Due to the strict privacy policies of the research company, the data presented in the study are expressed in percentages and not in numbers. Therefore, the objective of this research is focused on analyzing the strategies adopted by a successful company in the current situation of health contingency using first the PDCA methodology evaluating the strategies through a questionnaire and validating the results through an Alpha Cronbach's (Riana et al., 2020), (Zajkowski & Domańska, 2019), (Palamary, 2012) utilizing SPSS software and proposing a business prevalence index.

2. LITERATURE REVIEW

Control is one of the factors that most impact on a company's performance, therefore the function of the control arises as an obligatory requirement to understand and contrast the business model and evaluate the result of the delegated decisions as well as the interest and convenience of each of the company's activities. Every control system defines a specific management style capable of integrating and favorably motivating people's behavior and enhancing their capabilities or, on the contrary, nullifying them and subjecting them to the leader in charge. (Pérez-Carballo Veiga, 1990)

Several authors established distinctive characteristics and factors that identify a successful team. According to Villalba et al., (2017), citing Macmillan, the main characteristics of these teams, which are aimed at achieving goals more efficiently, are the establishment of well-defined roles, accepted leadership, common and clear purposes, and effective execution processes.

In terms of competitiveness the research from Habanik et al., (2020), reveals that in manufacturing companies the factor and benefit that affects employees most is motivation, and this leads them to higher work performance.

Business management is a complex process that incorporates knowledge management, creativity, innovation and the development of proactive approaches, for which it is necessary for organizations to develop skills for the creation of new methods and innovations. For this reason, it is important that companies identify and analyze needs and opportunities, and plan and control actions to generate strategies to achieve organizational objectives (Torres & Lamenta, 2015). Just as in the study of "The

Impact of Technology on the Transfer of Innovation "by Abdurazzakov et al, that speaks of increasing the competitiveness of a company by building a know-how through technologic transfer, the same occurs with the transfer of other types of information that could serve as a reference for decision making.

According to Garrido (2017), one of the most important subjects within a company are the communication strategies, where corporate communication resources are integrated in a long-term design, according to coherent, adaptable and profitable objectives for the company.

The control structure must be designed as a tailor-made suit for each company and undoubtedly the personal traits of the company's top manager have a decisive influence on the operation of the control system (Pérez-Carballo Veiga, 1990).

In the model proposed by López-Lemus and De la Garza Carranza (2019), the effective use of business management practices based on leadership and strategic planning enhance business performance.

The results of the company's financial statements reveal a solidity in terms of liquidity, and inventories. In terms of financial resources, the greatest savings occur if there is good planning and the coordinated decision-making of all responsible persons can completely prevent an emergency. If it is not possible to prevent the emergence of extraordinary events, then at least minimize their consequences. The essence of emergency management is a systemic and coordinated approach to the application of preventive measures and emergency management (Tüser & Hoskova 2020).

In this research it is considered that a crisis or extraordinary periods where the conditions of a business have been exposed to a critical point needs the evaluation of different parameters that relate or evaluate efficiency and performance for the management system in the organization.

For the evaluation of the organization being analyzed in this article, the organizational prevalence index is proposed. A prevalence rate is defined by the Center of Disease Control and Prevention (2012) as the proportion of persons in a population who have a particular disease or attribute at a specified point in time or over a specified period of time. Also, the same agency defines that the prevalence differs from other indexes as the incidence which is limited to evaluate new cases only when it's a virus or disease, the one being evaluated. The prevalence rate has been recently used in many papers where several diseases are analyzed with this index, some recent examples are the evaluation of prevalence of COVID-19 inside international travelers (Niehus et al., 2020), or the analysis of persistence of obesity and overweight in different practical cases around the world (Ogden et al., 2010, V. V. Khadilkar et al., 2011), and also the review for hypertension and dyslipidemia rates in the US (Brown et al., 2012).

But some other research has implemented the prevalence index to evaluate other parameters non exclusively from the medical and biological sciences as diseases or viruses, some authors as Salari et al., (2020) implement this index for the evaluation of stress and anxiety, and also in a particular research by Carney et al., (2017) the prevalence index is applied to evaluate the persistence of business groups in multiple countries between 1978 and 2012 focus in the impact of business groups inside the macroeconomy outcomes.

3. METHODOLOGY AND DATA

The methodology to be used in PDCA research (Plan-Do-Check-Act) has numerous benefits for the organization by contributing to quality improvement, increasing productivity and competitiveness, reducing costs, increasing market share and in general the survival of the company (Silva et al., 2019), (Jimenez Coronado et al., 2016). Planning is the phase in which the problem is identified and its

characteristics are defined and a resolution plan is drawn up. To do, consists in executing what was planned with actions determined by the diagnosis first that allow to correct the possible problems detected. Check, is the stage where the results of the implemented actions are evaluated and interpreted. Act is determined by the relationship between inputs and outputs of the process to improve and optimize it. Finally, it is a controlled stage in which the possible changes that have arisen in the evaluation stage (verify) are introduced and a new cycle begins (Narciso Carboni et al., 2020, Sánchez Pineda & Cardenas Olivo,2014).

In the research of Jimenez Coronado et al. (2016), PDCA methodology is applied to attend an environmental management system performance analysis. Even when the target of the present article it's a different one, PDCA methodology has shown facilities to evaluate several processes inside management systems, giving results that allow continuous improvement.

3.1 Plan

After knowing the main features of a high-performance work-team, a questionnaire has been designed to identify the appreciation that the top management directors have in relation with the success of the management system that has been implemented under the new working conditions regarding to COVID-19. A non-probabilistic study has been made where the questions from the questionnaire were divided in 5 strategies inside the 5 company areas; human resources, direction, production, suppliers and finance department.

Table1 Development strategies taken to make the instrument

AREA	SUBJECT	STRATEGY
Human Resources	Health and Safety	Security Strategies to avoid the spread of COVID-19.
Management	Operational control	Risk inventories control, planning and company accreditation as "essential" by national regulatory agencies.
Production	Production planning	New products manufactured focus on mitigate the spread of COVID-19.
Suppliers	Materials	Advance purchase of materials and suppliers' payments.
Finance Department	Forecast	Reducing expenses and forecast adjusting.

(Source: own research data)

In the area of human resources under the category of safety and health, the security strategies where to prevent the spread of COVID-19; in the area of management under the category of management, control strategies and planning of risk inventories and accreditation of companies are "essential" for national regulatory bodies; in the area of production, the manufacture of new products focused on mitigating the

spread of COVID-19 are identified as planning strategies. Finally, in the areas of suppliers and finance, strategies are identified for the advance purchase of materials and payments to suppliers and for the reduction of expenses and adjustment of forecasts. in this way, a measurement instrument is made, considering the previous strategies, to evaluate the veracity of the importance of successful strategies.

The instrument developed to obtain the results of the develop strategies was a Questionnaire made through a census with size 10, which was distributed personally to company managers, all of them on average between 35 and 50 years old, with a degree or engineering completed. Once the answers from the sample were obtained, the instrument was validated by means of Cronbach's Alpha coefficient using IBM SPSS statistical software. To evaluate the instrument, the Likert scale method was used considering a five-category scale: 1 totally disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, 5 totally agree.

3.2 Do

Once the strategies to be implemented to achieve a successful management system were identified, the research instrument was implemented, giving a reliability index as shown in table 2.

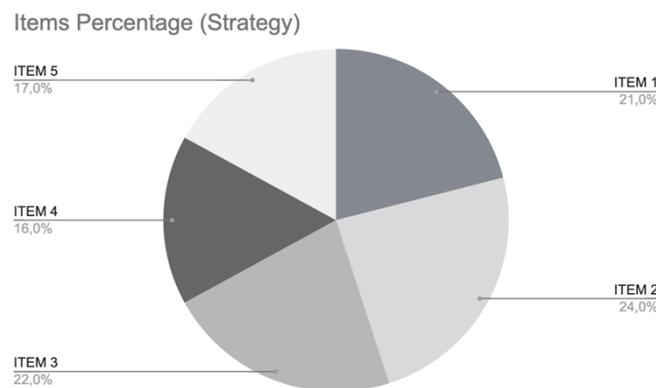
Table 2 Results of Cronbach's SPSS software for Alpha with sample 10. Reliability Statistics

Cronbach's Alpha	N of elements
0.803	5

(Source: own research data)

The qualitative analysis developed after the application of the instrument affirmed that the 5 strategies proposed in the face of the crisis correspond to successful practices in question for the company. However, the managers surveyed gave greater importance to the strategy of planning and controlling the propagation of COVID-19 followed by the production of new products focused on mitigating the transmission of the virus. Fig 1 shows the percentage distribution of responses by item for each strategy.

Fig 1 Items Percentage (strategy)



(Source: own research data)

Note: Item 1: Human Resources, Item 2: Management, Item 3: Production, Item 4: Suppliers, Item 5: Finance Department.

3.3 Check

Inside the check part of this methodology, a new index rate is proposed. In this research it is considered that a crisis or extraordinary periods where the conditions of a business have been exposed to a critical point needs the evaluation of different parameters that relate or evaluate efficiency and performance for the management system in the organization.

For the evaluation of the organization being analyzed in this article, the organizational prevalence index is proposed.

A prevalence rate is defined by the Center of Disease Control and Prevention (2012) as the proportion of persons in a population who have a particular disease or attribute at a specified point in time or over a specified period of time. Also, the same agency defines that the prevalence differs from other indexes as the incidence which is limited to evaluate new cases only when it's a virus or disease, the one being evaluated. The prevalence rate has been recently used in many papers where several diseases are analyzed with this index, some recent examples are the evaluation of prevalence of Covid-19 inside international travelers (Niehus et al., 2020), or the analysis of US children persistence of obesity (Ogden et al., 2010), and also the review for hypertension and dyslipidemia rates in the US (Brown, C et al., 2012).

But some other research has implemented the prevalence index to evaluate other parameters non-exclusively from the medical and biological sciences as diseases or viruses, some authors as Salari, N., et al., 2020 implement this index for the evaluation of stress and anxiety, and also in a particular research by Carney, M et al., in 2017 the prevalence index is applied to evaluate the persistence of business groups in multiple countries between 1978 and 2012 focus in the impact of business groups inside the macroeconomy outcomes.

Following the literature review, in this article is considered that a prevalence index is not for exclusive use for the medical or biological sciences, but some adaptations are needed to attend before it's applied to organizational context. In the case shown inside this article, it is considered that every company has a particular behavior inside the market. So far, the organizational prevalence index looks to evaluate the performance and efficiency inside a crisis situation, being a resilience reference for the companies where the strategies are related to the results of the index application. Saying this, it's necessary to specify that the quantity of values or parameters being evaluated in this article depend on the confidentiality and specifications of the organization being analyzed inside this paper.

So, the parameters where the prevalence index is applied are sales, inventory and personnel. These parameters are considered to be related to strategies and responses for a critical situation as the pandemic period of COVID-19. The following operations have been applied for the evaluation of organizational prevalence index.

$$\begin{aligned} & \left(\frac{\text{total sales 2020}}{\text{total sales 2019}} \right) 100 \\ & \left(\frac{\text{inventory 2020}}{\text{inventory 2019}} \right) 100 \\ & \left(\frac{\text{personnel 2020}}{\text{personnel 2019}} \right) 100 \end{aligned}$$

For the research proposals, the comparison from 2020 and 2019 take place in the critical period of COVID-19 where the organizations and business have presented several difficulties to accomplish their targets marked in the key performance indicators. Consider this, a comparison with a previous year's behavior seems fair enough for a nonconventional year.

3.4 Act

In this case, as the study is merely for informative purposes, this part of the methodology will be to present the new proposed prevalence index as an instrument to evaluate the performance and efficiency inside a crisis situation, being a resilience reference for the companies where the strategies are related to the results of the index application. All this information obtained by this new index could help the management system by standardizing or adapting some strategies that seem to work in a crisis situation. The identification of the main strategies used by this company were:

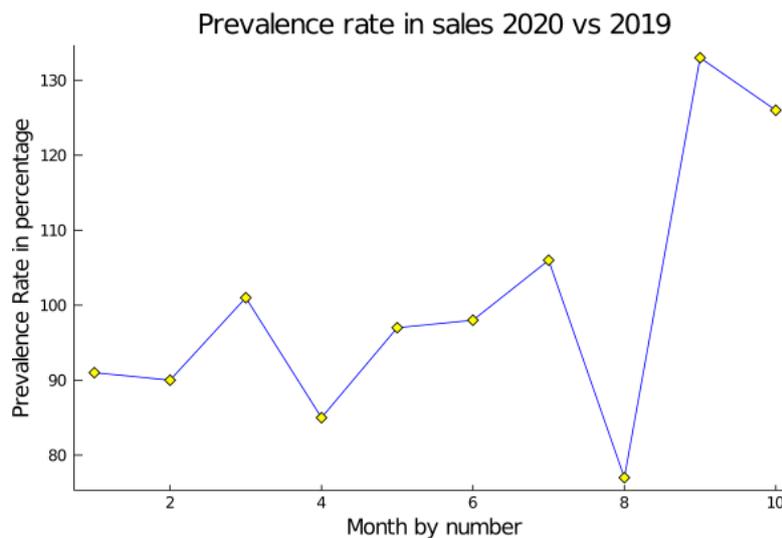
1. Advance Planning.
2. Healthy finances .
3. Innovation.
4. Strong working teams.

4. RESULTS

Through the implementation of the organizational prevalence index for parameters as the sales, inventory and personnel, efficient strategies implemented inside the organization can be concluded. The results are a comparison of the 2019 data against 2020 first and second quarter data.

In the case of the prevalence of sales in comparison with the previous year there is no significant difference related to losses in the organization, this comparison is shown in figure 2. The total prevalence rate for this parameter is about 100.4%, so, the sales remains almost the same, also there is a minimum increase in this parameter. Although the value for sales remains at 100% when a point prevalence is applied, it is possible to see the behavior from January to October, where at a first point sales of January 2020 where under the one's for January 2019, also February, April, may, June and August. Figure 2 shows how the strategies implemented had a positive impact in the sales through the time.

Figure 2 Prevalence rate in sales 2020 vs 2019

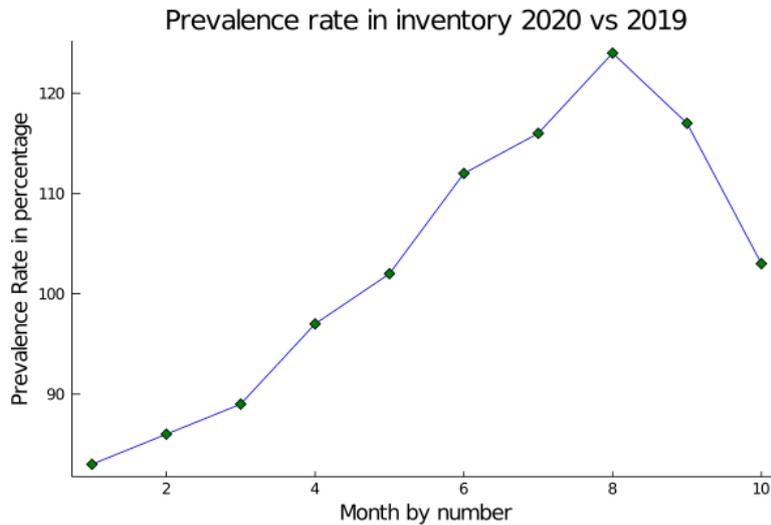


(Source: own research data)

For inventory prevalence a significant increase has been observed. In this particular case, a growth tendency can be identified, shown in Figure 3. Although the inventory shows a big increase, it is necessary to show that international sales and inventory decrease but the national products manufactured increase

significantly, thus because the national market for this year has shown an important opportunity due to COVID-19, migrating from some other markets.

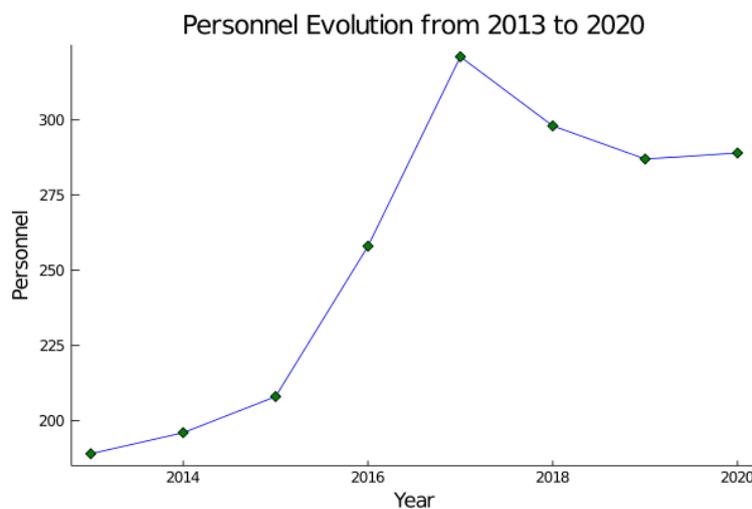
Figure 3 Prevalence rate in inventory 2020 vs 2019



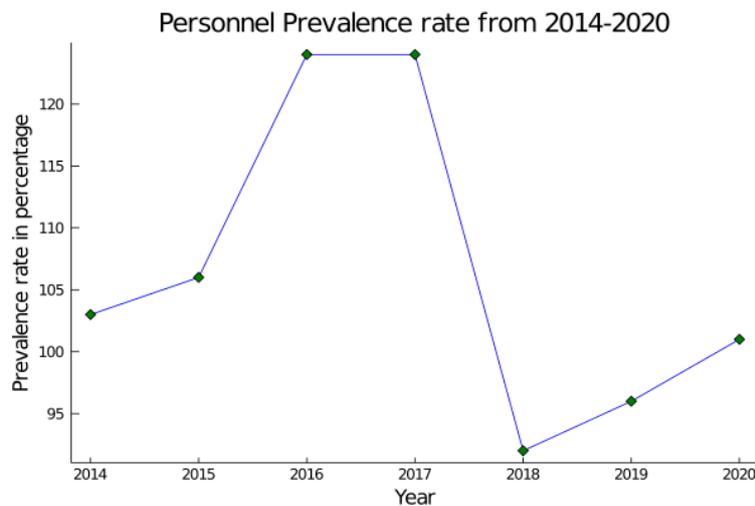
(Source: own research data)

When it comes to personnel analysis, a minimum increase has been observed in reference to the last year, even when in the national context a decrease in employee rate has occurred, where according to INEGI having 15.7 million losses in employees. Notwithstanding, in the case of personnel the data given by the company appears from 2013 to 2020, in this data a growth tendency shows up (Figure 4), but there is a decrease in the years of 2018 and 2019, having a prevalence rate of 92% and 96% respectively, and a minimum increase for 2020 with a prevalence of 101% (See Figure 5 for more details). Thus, even in a year where millions of employees were expected to occur, the company strategies allowed to maintain the labor force.

Figure 4 Personnel Evolution from 2013 to 2020



(Source: own research data)

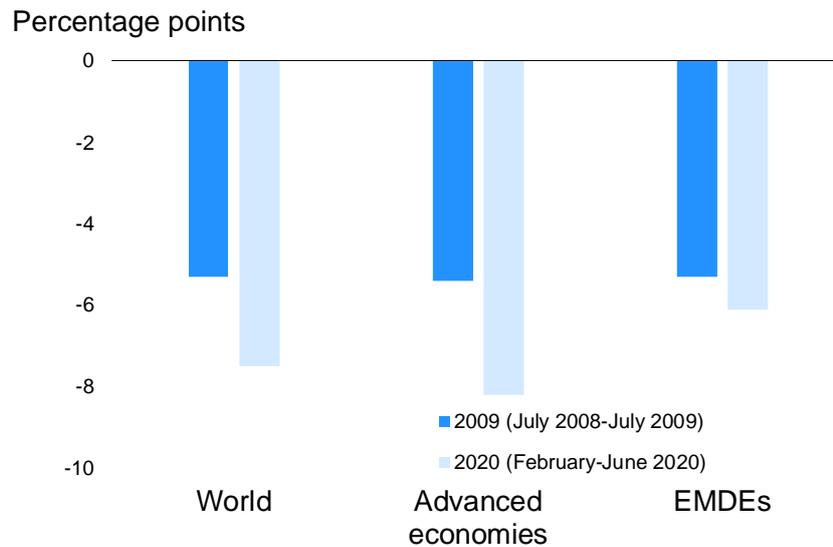
Figure 5 Personnel Prevalence rate from 2014-2020

(Source: own research data)

5. DISCUSSIONS

The implications of the COVID-19 pandemic around the globe, had left many corporations in jeopardy, especially those who were from a non-essential activity. Very few were prepared for the catastrophic implications on their economy, nor other factors such as their human resources, the collapse of the supply chain and many other situations that companies have to deal with. In this case study, the main purpose was to define whether the strategies used by the company were successful to achieve their objectives and define through the new index the prevalence of the company in terms of inventory, sales and personnel. The results show that all the parameters from the prevalence rate had an increase in relation to the year 2019 (see figures 2-5). That means that even if this increment was small in some parameters, if the general numbers of the country are taken as a reference, the company demonstrates excellent performance. As an international company with offices in several countries, the scope of planning is greater than for local companies and it was observed that a trigger for advance planning was the global situation analysis that arose due to the pandemic, especially in the subsidiary in Wuhan China. When the stability of the company in China was threatened by the total closure, the strategy that the Mexican company carried out focused on attempting to anticipate the situation that might play out in the coming two months. This, resulted in the following initiatives: the creation of new products focused on combating COVID-19, the purchase of buffer inventory, the adaptation of financial management in the wake of the crisis and the formation of working teams. Together, this sought to reinforce the stability of the company.

To validate this study, a comparison from the World Bank between the forecast of Gross domestic product (GPD) growth from 2009 and 2020 was made. The comparison involved mainly the world, the advanced economies and the EMDEs to which Mexico belongs. The result is clearly a decrease of as much as -8% by 2020 in advanced economies and -6% for EMDEs countries. (Fig 6)

Figure 6 Changes in consensus forecasts of GDP growth

(Source: Consensus Economics, World Bank.)

6. CONCLUSIONS

The methodology used in this study and particularly for the company in question, reflected results according to reality (as shown in the results section), since the strategies implemented in the crisis situation by COVID-19 pandemic, kept the company's finances healthy.

The expansion of the COVID-19 pandemic is in part the result of international mobility, of a model of global interdependence that is now in question, for this reason the pandemic caused by COVID-19 is a global problem but is mostly faced locally (Rodríguez Pinzón, 2020). In Mexico as well as throughout the world the negative effects of the pandemic have affected many areas, even today, new affectations are being found in health as well as in the economy, environment and the daily life of human beings. An example is that in the U.S. and the rest of the world, the pandemic caused by COVID-19 affected the consumer's purchasing decision, and spending more time at home seemed to lead to an impulsive purchasing behavior (Ahmed et al., 2020). The inventory purchases for the study's company increased significantly, but not precisely because of panic shopping, instead of that, they were purchases to supply an inventory to meet market demands, thus the domestic manufactured products increased.

The health crisis maintains an obligatory preventive social isolation in many countries of the world and Mexico is not the exception. The impacts of this isolation in Mexico and countries such as Spain, Colombia and Argentina were gradual, restrictions were mainly at the sector or activity level, essential productive activities continued relatively normally and others whose activity was notably reduced (transport) or directly suspended indefinitely (tourism, leisure, cultural services), (Torres & Fernández, 2020), (Rodríguez Pinzón, 2020), (Niembro & Calá, 2020). The economic impact began in the business sector in Mexico from March 2020, and even though approximately 8 months of pandemic and restrictions have passed, the economic recovery has not been the desired one and it seems that the affectations continue in the business and economic sector, for July 2020 the National Institute of Statistics and Geography (INEGI) informed that they already add up to more than 15.7 million adults (over 18 years of age) unemployed in Mexico due to the COVID-19 pandemic and although the last INEGI report issued at the end of September 2020, the Mexican unemployment rate fell in August to 5.2% by

incorporating 608,000 people into the PEA (Economically Active Population), with which there are 2.8 million unemployed. According to Kolkova (2020), one of the keys of competitiveness companies is an accurate forecast of its business variables that it's necessary in this globalized and digitalized world.

The metal-working company referred to in the study did not have significant impacts in its areas as indicated by the results and this is largely due to the implementation of its strategies immediately, being able to counteract the negative impacts and in its case completely mitigate the risks to the company, but how to anticipate?, the answer is simple, this is because the company has a presence in several countries, one of its subsidiaries is located in Wuhan, China. The information on impacts and mitigation strategies to something new like COVID-19 were created early in the Wuhan subsidiary, changed processes, restrictions, strategies and even the way of life that was considered normal for people, and when in Wuhan were dominating all these new considerations, in other parts of the world were beginning, and when in Mexico was being released COVID-19, the study company already had enough information about the strategies to follow, and for that reason the results of this research showed minimal impacts.

The literature on COVID-19 is new, so it makes it difficult to have information on the impacts and it is even more complicated because as we move forward in time new things are discovered respecting to COVID-19, so it is advisable to do studies of this kind frequently, this will give us updated knowledge of future impacts and the efforts that businesses and governments maintain facing COVID-19 pandemic.

REFERENCES

- Abdurazzakov, O., Illés, C. B., Jafarov, N., & Aliyev, K. (2020). THE IMPACT OF TECHNOLOGY TRANSFER ON INNOVATION. *Polish Journal of Management Studies*, 21(2), 9–23. <https://doi.org/10.17512/pjms.2020.21.2.01>
- Ahmed, R. R., Streimikiene, D., Rolle, J.-A., & Duc, P. A. (2020). The COVID-19 Pandemic and the Antecedents for the Impulse Buying Behavior of US Citizens. *Journal of Competitiveness*, 12(3), 5–27. <https://doi.org/10.7441/joc.2020.03.01>
- Brown, C. D., Higgins, M., Donato, K. A., Rohde, F. C., Garrison, R., Obarzanek, E., Ernst, N. D., & Horan, M. (2000). Body mass index and the prevalence of hypertension and dyslipidemia. *Obesity Research*, 8(9), 605–619. <https://doi.org/10.1038/oby.2000.79>
- Carney, M., Van Essen, M., Estrin, S. and Shapiro, D. (2017), "Business group prevalence and impact across countries and over time: What can we learn from the literature?", *Multinational Business Review*, Vol. 25 No. 1, pp. 52-76. <https://doi.org/10.1108/MBR-10-2016-0037>
- Garrido, F. (2017). *Comunicación estratégica* / F.J. Garrido M.
- Habanik, J., Martosova, A., & Letkova, N. (2020). The Impact of Managerial Decision-Making on Employee Motivation in Manufacturing Companies. *Journal of Competitiveness*, 12(2), 38–50. <https://doi.org/10.7441/joc.2020.02.03>
- Instituto Nacional de Estadística y Geografía. El Inegi presenta resultados del impacto del COVID-19 en la actividad económica. Disponible en: <https://www.inegi.org.mx/contenidos/saladeprensa/boletines/2020/OtrTemEcon/COVID-ActEco.pdf> [Consultado el 28 de noviembre de 2020]
- Jiménez Coronado, A. M., Ferreira Simmonds, J. O., León Castro, N. A. G., Martínez Sierra, D. E., & Villarreal Fernández, J. E. (2016). Sistema de gestión por procesos para la evaluación del desempeño ambiental a partir de la implementación de diagnósticos PHVA. *Producción + Limpia*, 11(1), 150–161. <https://doi.org/10.22507/pml.v11n1a14>
- Kolkova, A. (2020). The Application of Forecasting Sales of Services to Increase Business Competitiveness. *Journal of Competitiveness*, 12(2), 90–105. <https://doi.org/10.7441/joc.2020.02.06>

- López Lemus, J. A., & De la Garza Carranza, M. T. (2019). The practices of business management, innovation and entrepreneurship: influencing factors in the performance of entrepreneur firms. *Nova Scientia*, 11(22), 357–383. <https://doi.org/10.21640/ns.v11i22.1795>
- MÉXICO, B. D. (1 de septiembre de 2020). Banxico. Obtenido de Banxico: <https://www.banxico.org.mx/publicaciones-y-prensa/reportes-sobre-las-economias-regionales/%7BADAD9347-8867-4177-C9ED-86587B4480FD%7D.pdf>
- Narciso Carboni, B., Navarrete De la Cruz, N. and Quiliche Castellares, R., 2020. Aplicación de la metodología PHVA para incrementar la productividad en una empresa conservera de pescado. *INGnosis Revista de Investigación Científica*, 5(2), pp.92-105.
- Niehus, R., De Salazar, P. M., Taylor, A. R., & Lipsitch, M. (2020). Quantifying bias of COVID-19 prevalence and severity estimates in Wuhan, China that depend on reported cases in international travelers. *medRxiv: the preprint server for health sciences*, 2020.02.13.20022707. <https://doi.org/10.1101/2020.02.13.20022707>
- Niembro, A., & Calá, C. D. (2020). Análisis exploratorio del impacto económico regional del COVID-19 en Argentina. 1–16. [En revisión], <http://nulan.mdp.edu.ar/3359/1/niembro-cala-covid19.pdf>
- Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM. Prevalence of High Body Mass Index in US Children and Adolescents, 2007-2008. *JAMA*. 2010;303(3):242–249. doi:10.1001/jama.2009.2012
- Palamary, R. E. (2012). Alto Desempeño Y Estrategias Gerenciales En Proyectos De. *Universidad Del Zulia, Venezuela*, 28(122), 69–81. <http://www.scielo.org.co/pdf/eg/v28n122/v28n122a05.pdf>
- Pérez-Carballo Veiga, J. F. *Control de la Gestión Empresarial (Vol. Octava Edición)*. Pozuelo de Alarcón, Madrid, España: ESIC EDITORIAL.
- Riana, I. G., Wiagustini, N. L. P., Aristana, I. N., Rihayana, I. G., & Abbas, E. W. (2020). HIGH-PERFORMANCE WORK SYSTEM IN MODERATING ENTREPRENEURIAL LEADERSHIP, EMPLOYEE CREATIVITY AND KNOWLEDGE SHARING. *Polish Journal of Management Studies*, 21(1), 328–341. <https://doi.org/10.17512/pjms.2020.21.1.24>
- Rodríguez Henao, C. G. y Pérez Díaz J. S. (2020). Implementación de un sistema de gestión de calidad basado en la norma ISO 9001 versión 2015, en la empresa intermediadora Mauro Jackson en su proceso de cambio a empresa transformadora de materia prima. (Tesis de Pregrado. Universidad Cooperativa de Colombia).
- Rodríguez Pinzón, É. (2020). Colombia. Impacto económico, social y político de la COVID-19. *Análisis Carolina*, 1–14. https://doi.org/10.33960/ac_24.2020
- Ruiz de Villalba Flórez, J. M., Gentilin, M., & Franco Ruiz, C. (2017). La adquisición de un equipo de alto desempeño como alternativa en la estrategia de crecimiento inorgánico. *Ciencias Administrativas*, (9), 001. <https://doi.org/10.24215/23143738e001>
- Salari, N., Hosseinian-Far, A., Jalali, R. et al. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. *Global Health* 16, 57 (2020). <https://doi.org/10.1186/s12992-020-00589-w>
- Sánchez Pineda, J., & Cardenas Olivos, J. (2014). Implementación de Mejora Continua Aplicando la Metodología PHVA de la empresa International Bakery SAC. *Cómo Implementar El Kaizen En El Sitio de Trabajo*, 10. https://www.usmp.edu.pe/PFII/pdf/20141_8.pdf
- Silva, R. O. da, Oliveira, E. S., Sá Filho, P. De, & Nascimento e Silva, D. (2019). O ciclo PDCA como proposta para uma gestão escolar eficiente. *Revista de Gestão e Avaliação Educacional*, 1(1), 1. <https://doi.org/10.5902/2318133836102>
- Torres, Karla, & Lamenta, Paola (2015). LA GESTIÓN DEL CONOCIMIENTO Y LOS SISTEMAS DE INFORMACIÓN EN LAS ORGANIZACIONES. *Negotium*, 11(32),3-20. <https://www.redalyc.org/articulo.oa?id=782/78246590001>
- Torres, R., & Fernández, J. (2020). La política económica española y el COVID-19. [En revisión] https://www.funcas.es/wp-content/uploads/Migracion/Articulos/FUNCAS_CIE/275art02.pdf
- Tüser, I., and Hoskova, Sarka. (2020). Emergency Management in Resolving an Emergency Situation: J. *Risk Financial Management*, 13(11), 262; <https://doi.org/10.3390/rjfm13110262>

- V. V. Khadilkar, A. V. Khadilkar, T. J. Cole, S. A. Chiplonkar & Deepa Pandit (2011) Overweight and obesity prevalence and body mass index trends in Indian children, *International Journal of Pediatric Obesity*, 6:sup3, e216-224, DOI: [10.3109/17477166.2010.541463](https://doi.org/10.3109/17477166.2010.541463)
- World Bank. 2020. *Global Economic Prospects*, June 2020. Washington, DC: World Bank. DOI: 10.1596/978-1-4648-1553-9. License: Creative Commons Attribution CC BY 3.0 IGO.
- Zajkowski, R., & Domańska, A. (2019). Differences in perception of regional pro-entrepreneurial policy: does obtaining support change a prospect? *Oeconomia Copernicana*, 10(2), 359–384. <https://doi.org/10.24136/oc.2019.018>

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APPENDIX

Personnel Data (The data presented here is divided into operational and indirect personnel)

DEPARTAMENT	2013	2014	2015	2016	2017	2018	2019	2020	ACTUAL
OPERATIONAL STAFF	123	126	132	173	229	183	178	184	184
INCREMENT	5%	2%	5%	31%	32%	-20%	-3%	3%	
DEPARTAMENT	2013	2014	2015	2016	2017	2018	2019	2020	ACTUAL
INDIRECT PERSONNEL	66	70	76	85	92	115	109	105	105
	s/APL	s/APL	s/APL	s/APL	s/APL	c/APL	c/APL	c/APL	
INCREMENT	3%	6%	9%	12%	8%	25%	-5%	-4%	105
TOTAL	189	196	208	258	321	298	287	289	289
ACUMULATED	3.8%	3.7%	6.1%	24.0%	24.4%	-7.2%	-3.7%	0.7%	

Inventory Data (The data corresponds to the periods from January to October full months in order not to affect the outcome of the study)

SUBJECT	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	ANUAL AVERAGE
NATIONAL RAW MATERIALS	90%	96%	95%	102%	107%	117%	113%	116%	106%	88%	93%
IMPORTED RAW MATERIALS	95%	86%	83%	75%	85%	93%	93%	106%	101%	89%	84%
MATERIALS IN PROGRESS	99%	108%	105%	114%	128%	114%	121%	115%	120%	93%	102%
NATIONAL FINAL PRODUCTS	154%	159%	145%	187%	224%	256%	268%	289%	230%	185%	190%
IMPORTED FINAL PRODUCTS	54%	55%	62%	75%	74%	87%	119%	157%	167%	172%	98%
MANUFACTURED FINAL PRODUCTS	69%	61%	81%	98%	96%	127%	108%	105%	91%	93%	83%
Total ==>	83%	86%	89%	97%	102%	112%	116%	124%	117%	103%	103%

Sales Data (The percentages were obtained by dividing the 2020 sales by the 2019 sales. The figures are expressed as percentages.)

MONTH	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	AVERAGE
SALES	91%	90%	101%	85%	97%	98%	106%	77%	133%	126%	100.4%

*The data used at this study are in percentage not in amounts due to the company confidentiality.