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RINOE Journal-Industrial Organization

Definition of the Journal

Scientific Objectives

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Market structure, business strategy and market functioning, Objectives, organization and behavior of the company, Non-profit organizations and public enterprises, Politics of defense of the competition, Regulation and industrial politics, Sectorial studies: Manufactures, Sectorial studies: Primary products and construction, Sectorial studies: Services, Sectorial studies: Transport and basic supplies.

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Monopolization strategies, Oligopoly and Other imperfect markets, Transactional relationships, Contracts and reputation, Information and Product quality, Industrial Organization and Macroeconomics, Macroeconomic industrial structure; Firm objectives, Organization, and Behavior: business objectives of the Firm, Firm organization and Market structure, Vertical Integration, Organization of Production, Firm Size and Performance; Nonprofit organizations and Public Enterprise: Nonprofit institutions, Public enterprises, Boundaries of public and private enterprise, Privatization, Contracting Out; Antitrust policy: Monopolization, Horizontal anticompetitive practices, Vertical restraints, Resale PRICE maintenance, Quantity Discounts, Legal Monopolies and Regulation or Deregulation, Antitrust policy and public enterprise, Nonprofit Institutions, and Professional Organizations; Regulation and industrial policy, Economics of regulation, Industrial policy, Sectoral planning methods; Industry studies: manufacturing, Metals and Metal products, Cement, Glass, Ceramics, Automobiles, Other transportation equipment, Microelectronics, Computers, Communications equipment, Other Machinery, Business equipment, Armaments, Chemicals, Rubber, Drugs, Biotechnology, Food, Beverages, Cosmetics, Tobacco, Other Consumer Nondurables, Appliances, Other consumer durables; Industry studies: Primary products and construction, Mining, Extraction, and Refining: Hydrocarbon fuels, Other nonrenewable resources, Forest products, Construction; Industry studies: Services, Retail and wholesale trade, Warehousing, Entertainment, Media, Sports, Gambling, Recreation, Tourism, Personal and professional services, Real estate services, Information and internet services, Computer software; Industry studies: Transportation and utilities, Transportation, Railroads and Other surface transportation, Air transportation, Electric utilities, Gas Utilities, Pipelines, Water utilities, Telecommunications, Utilities, Government policy with diverse approaches and perspectives, That contribute to the diffusion of the development of Science Technology and Innovation that allow the arguments related to the decision making and influence in the formulation of international policies in the Field of Social Sciences. The editorial horizon of RINOE® extends beyond the academy and integrates other segments of research and analysis outside the scope, as long as they meet the requirements of rigorous argumentative and scientific, as well as addressing issues of general and current interest of the International Scientific Society.

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Presentation of Content

In the first article we present, *Analysis of automation in manufacturing processes, inventory control and sales in micro, small and medium-sized companies of Acámbaro, Gto.*, by BARRERA-FIGUEROA, Mayra Verónica, RODRÍGUEZ-RODRÍGUEZ, Graciela and UGALDE-ZAMUDIO Giovanni, with ascription in the Universidad Tecnológica de León, as following article we present, *Management of micro and small businesses directed by women in Huejutla de Reyes, Hidalgo*, by HERRERO, Laura, ESPINOSA, Abraham, ROMERO, Carmina and RIVERA, Claudia, with ascription in the Universidad Tecnológica de la Huasteca Hidalguense, as following article we present, *The importance of emotional capital in organizations*, by GUTIÉRREZ-OCAMPO, Verónica, DELGADO-REYES, Sergio Carlos and SILVA-DÍAZ, Virginia, with affiliation at the Universidad Tecnológica de Izúcar de Matamoros, as last article we present, *Effective application of the APQP quality tool in Pull Back Car toy assembly processes*, by BONES-MARTINEZ, Rosalia, SOTO-LEYVA, Yasmin and SANTOS-OSORIO, Arturo, with secondment in the Instituto Tecnológico Superior de Huauchinango.

Content

Article	Page
Analysis of automation in manufacturing processes, inventory control and sales in micro, small and medium-sized companies of Acámbaro, Gto. BARRERA-FIGUEROA, Mayra Verónica, RODRÍGUEZ-RODRÍGUEZ, Graciela and UGALDE-ZAMUDIO Giovanni <i>Universidad Tecnológica de León</i>	1-11
Management of micro and small businesses directed by women in Huejutla de Reyes, Hidalgo HERRERO, Laura, ESPINOSA, Abraham, ROMERO, Carmina and RIVERA, Claudia <i>Universidad Tecnológica de la Huasteca Hidalguense</i>	12-18
The importance of emotional capital in organizations GUTIÉRREZ-OCAMPO, Verónica, DELGADO-REYES, Sergio Carlos and SILVA-DÍAZ, Virginia <i>Universidad Tecnológica de Izúcar de Matamoros</i>	19-23
Effective application of the APQP quality tool in Pull Back Car toy assembly processes BONES-MARTINEZ, Rosalia, SOTO-LEYVA, Yasmin and SANTOS-OSORIO, Arturo <i>Instituto Tecnológico Superior de Huauchinango</i>	24-31

Analysis of automation in manufacturing processes, inventory control and sales in micro, small and medium-sized companies of Acámbaro, Gto.

Análisis de automatización en procesos de fabricación, control de inventarios y ventas en micro, pequeñas y medianas empresas de Acámbaro, Gto.

BARRERA-H K I W G T Q C . " O c { t c " X g t »-RODRÍGUEZ, Graciela and UGALDE-ZAMUDIO Giovanni

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Abstract

The development of products destined to cover specific needs plays an important role when it is possible to have feedback, in terms of functionality, on the part of the final user for the consolidation of the product. Seeking such consolidation and identifying opportunities for improvement, in this paper a redesign was made based on specific criteria to align the manufacturing to mass production. The following premises were raised: 1) validation of the de-sign proposal; 2) comparative and operational analysis; 3) geometry optimization for weight and production cost reduction. This paper proposes a new design of the drawbar body of a tractor (case study) and the theoretical framework is established taking the bases of the concurrent engineering to define and characterize the final architecture configuration. Is reported the methodology used for the development of this research and the results obtained by finite element analysis for architecture optimization. Finally, are presented the defined strategies for aligning manufacturing to production.

Redesign, Characterization, Optimization

Resumen

The objectives of this work are decisive to obtain an up-to-date and reliable status regarding the use of automation in micro, small and medium-sized enterprises (MPYMES), and thus to seek a direct relationship in terms of the use of automated elements either in the production process, inventories and / or sales; in addition to how this can influence your competitiveness. The method used was the statistician, from a finite universe sample. The approach to the analysis of research results was quantitative with a descriptive scope, by which it was possible to examine how much of Acámbaro's MYPIMES, Gto. make use of automation in the aforementioned processes. The sample is obtained from the city of Acámbaro, Gto., selected place as a case study. With the results obtained, it helps to determine various factors that impact the chosen control sector; a certain part makes use of automation in some of the areas of interest, others mention ignoring the terms, and others show great interest in optimizing your business. Based on the information, various improvement recommendations are made.

Company, Automation, Process

Citation: BARRERA-FIGUEROA, Mayra Verónica, RODRÍGUEZ-RODRÍGUEZ, Graciela and UGALDE-ZAMUDIO Giovanni. Analysis of automation in manufacturing processes, inventory control and sales in micro, small and medium-sized companies of Acámbaro, Gto. RINOE Journal-Industrial Organization. 2020. 4-7:1-11.

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Ä " T g u g c t e j g t " e q p v t k d w v k p i " h k t u v " c w v j q t 0

Introduction

It is a reality that the use of current technology can be a fundamental part of the performance of any activity, even more so, in an environment as competitive as the productive sector; technology should be considered as indispensable and not as optional. By implementing current technology, and focusing on the automation section, it is possible to optimize the activities carried out, which leads to an increase in the effectiveness and efficiency of the procedures.

To obtain reliable information on the use and impact of automation in micro, small and medium-sized enterprises (MPYMES), an analysis is carried out in the city of Acámbaro, Gto., Which is characterized by having a large commercial sector in this category. Based on the fact that both the manufacturing processes, inventory control and product marketing should not implement obsolete methodologies, it is necessary to know how the three mentioned areas are currently, and if the commercial activity in the area has been adapted to the new technological circumstances in which it is immersed.

It is considered that the use and knowledge of automation is a priority to ensure the good positioning of any company, so it seeks to determine the status of automation implemented by micro, small and medium-sized companies.

The information in this article is approached in such a way that it is part of the description of the methodology implemented for the research, subsequently the data analysis is carried out, and based on them, the results obtained are determined; as well as deductions and improvement considerations.

Method description

The development of this research was based on a statistical method, using a finite universe sample in the town of Acámbaro, Gto. applied in micro, small and medium enterprises; under a confidence level of 95%, with a margin of error of the sample of 5%.

The focus of the analysis of the research results was quantitative with a descriptive scope, to identify characteristics of the Acambarenses population with the relationship to the aforementioned, it was based on the contribution of Namakforoosh (2005), who said that the research is used descriptive "to calculate the portion in a specific population that have certain characteristics" (p. 91), because the city of Acámbaro was considered, under the aforementioned variables, in addition to describing the status of micro, small and medium enterprises of this city, in relation to automation in manufacturing processes, in inventory control and in the sales process.

For data collection, a survey was used as an instrument because it is carried out on all interviewees with the same questions, in the same order, and in a similar social situation (Vidal Díaz, 2001, p. 13), it was applied face to face with the interviewees, which consisted of 18 questioners, with specific items focused on responding to the research questions posed. The research was based on the scientific method, which according to Castán (2014) is a systematic research process that consists of interdependent parts. The stages that make up the scientific method are: 1) definition of the problem, 2) formulation of hypotheses (deductive reasoning), 3) collection and analysis of data, 4) confirmation or rejection of hypotheses, 5) results, 6) conclusions (p. 5).

Methodology to be developed

Theoretical framework

The city of Acámbaro, was founded on September 19, 1526, is located in the Southeast region of the state of Guanajuato, has a territorial extension of 877.43 square kilometers, which represents 2.85% of the total surface of the state (Encyclopedia of municipalities and delegations of Mexico, nd), speaking of economic entities in Acámbaro there are 5,694 of these, of which 5,669 are micro and small companies.

INEGI (2009) mentions that micro, small and medium-sized enterprises (MPYMES) have great importance in the economy and in employment at the national and regional level, both in industrialized countries and in those with less development.

MPYMES companies represent the segment of the economy that contributes the largest number of economic units and employed personnel worldwide; hence the relevance of this type of companies and the need to strengthen their performance by having a fundamental impact on the global behavior of economies.

Speaking specifically, the microenterprise is the smallest productive unit of the business structure, in terms of the scale of fixed assets, sales and number of employees, that carries out production, trade or service activities k p " t w t c n " q t " w t d c p " c t employment unit with no more than 10 employees, whereas a small company employs between 11 and 50 people; and a medium-sized company employs between 51 and 100 people (Lizarazo Beltrán, 2009, p. 15), in the same way Ramírez (2006) mentions that the SME is f g h k p g f " c u " ò c p { " w p k v " carried out by natural or legal persons, in business, agricultural, industrial, commercial or service activities, either in rural or urban areas; It also adds that the medium-sized company has a plant of workers between 51 and 200 people, while the small company has between 11 and 50 workers (p. 10-13).

Now, addressing the term automation that "is the action by which activities carried out by an operator, in a production process, are transferred or transferred to a machine, which is governed by equipment that can be wired or programmed electronic" (Solbes i Mozó, 2014, p. 13), likewise Iborra, Dasí, Dolz and Ferrer (2014) say that automation is the result of the incorporation of information technologies into manufacturing (p. 336); On the other hand, in the article entitled Manufacturing and organization, they cite the Strategic Plan of the National Program for Industrial Technological Development and Quality, 2000-2010, which addresses that automation is considered as the management of information in companies for decision-making in real time, incorporates computer science and automated control for the autonomous and optimal execution of processes designed according to engineering criteria and in line with the plans of the business management (Cordoba Nieto, 2006), instead Palomares and Mertg p u " * 3 ; ; 3 + " u v c v g " v j phenomenon that involves the work process itself and the market.

It is not only a process of transformation of human work, by substituting man for machine, but also the appearance of new needs in society, which are reflected in market demand.

There are different levels of automation according to García (2005), these can be analyzed depending on the level it produces: a) Level 1. Elementary, b) Level 2. Simple machines, d) Level 3. Process, c) Integrated management level (p. 23); Sánchez and Pizarro (2010) state that there are four levels: Level 1. Manual operation, Level 2. Semi-automatic, Level 3. Automatic, Level 4. Computerized. On the other hand, automating also brings with it a series of advantages, on the website Grup MCR (2016), they mention some, among them are that optimal levels of quality are achieved, cost savings, production time, personnel safety, improvement of data flow, competitive advantage, however, they also mention disadvantages and this is that specialized personnel are required, on the other hand for Mungaray and Lagarda (1990), the new type of industrial technology although it replaces skilled and specialized workers, creates in turn, new types of training and jobs such as programmers, security guards, operators and regulators, this being an advantage (p. 85).

Parallel to the above, Katz and Calatayud (2019) mention that automation and robotization facilitate the implementation of decisions without the need for human intervention, this brings benefits which are huge gains in time, agility and risk management between the elements key to the supply chain. The application of the technologies of the fourth industrial revolution, 4.0, this is characterized by a high level of interconnection between the physical and digital fields (page 13), combined to the above, Sánchez (2008), contributes that an integrated program relates the functions of product development, manufacturing supply and planning within the company, the resulting process must be a network of activities that must be managed simultaneously (p. 101).

Speaking of the commercial area, there are three large areas for contact susceptible to automation according to García (2001), these are: Customer service, marketing processes and automation of the sales force (p. 130).

Sales force automation (connecting salespeople to headquarters from remote computing connections) is perhaps the main force behind changing sales organizations today, it has freed salespeople from daily visits, and that results in more time with clients (Sánchez Gómez, 2008, p. 118).

Problem Statement

Companies increasingly seek to optimize resources and increase their productivity, in many aspects within themselves, such as in the production process, in the way they control supplies and in the way of marketing their products and / or services, everything in favor of increasing efficiency and improving delivery times; For the aforementioned, the question arises of knowing how the small and medium-sized companies of Acámbaro, Gto., are in the automation of manufacturing processes as well as identifying difficulties that are faced in it; in the same way, to know the state in which they are in the automation processes in the inventory control and automation in the sales area processes.

Research questions

In order to give an order to what we wanted to analyze, the following research questions were formulated:

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- J q 0 " V j g " e q o r c p k g u " k p " C e ^ a o F q " j c x g " c p " c w v q o c v k u w r r n k g u 0

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J 3 0 " O c m k p i " r w t e j c u g u w r r n k g t u . " e c t t { k p i f k u w v t k k q d p " c p c n { u k u " c v g e j p q n q i { . " k u " p q v " y C e ^ a o d c t q . " I v q " t g e q o c

Research justification

It is convenient to carry out the research because the data that this yields can be for the use of the same companies surveyed and thus, have a broader vision of how they can improve, in addition to being new information that is helpful to the general population; consequently, it will have a social relevance with the utility of Acámbaro Gto., so that future businesses implement automation processes, since this can have many benefits as mentioned by García (2005) who says that the advantages of automation are: producing a constant quantity, supplying necessary quantities at the precise moment, increasing productivity and increasing job's security (p. 21). t q . " I v q 0 . "

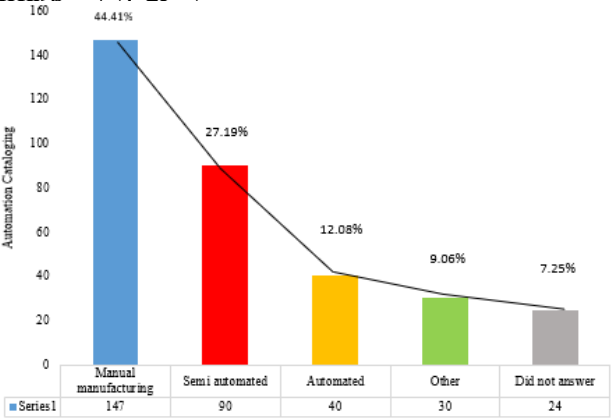
This research has theoretical value, because it will be possible to know the behavior of the automation processes in the production process, in the supply control process and in the commercial or sales process, of the companies in the area.

The analysis of "quantitative results with descriptive scope"

The analysis of the results was carried out through the Design of Survey Analysis program (DYANE, 2005), in which a database was integrated, which was able to produce graphs expressing basic descriptive statistics.

Analysis results

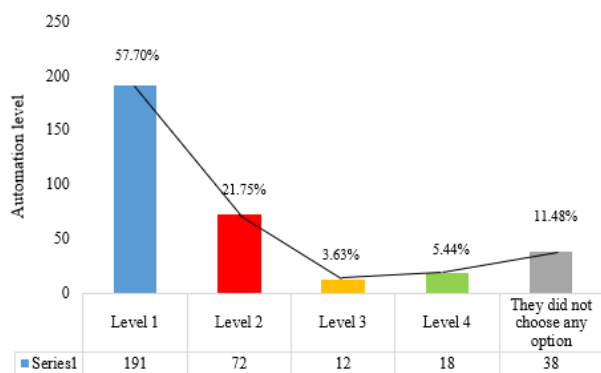
How they categorize their companies in a general way, referring to automation



Graphic 1 Automation in general
Source: Own source

In Graphic 1, it can be seen that 44.41% of the population of micro, small and medium companies classify their organization as manual manufacturing, on the other hand 27.19% consider it as semi automated, on the other hand 12.08% think they are automated Likewise, 9.06% said another option, these were where they mentioned that it was artisanal, commercial, services and even that it does not apply; finally, 7.25% abstained from issuing a response.

- How do companies in Acámbaro, Gto consider the level of automation:



Graphic 2 Automation level

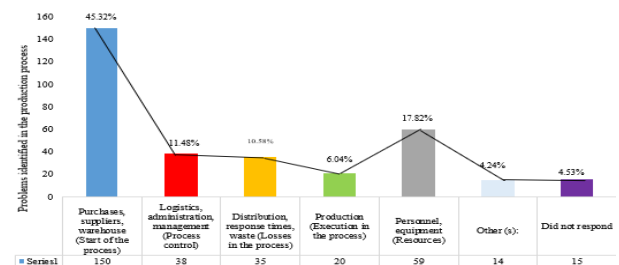
Source: Own source

To carry out Graphic 2, options were provided to the micro, small and medium enterprises of Acámbaro, Gto; The options that were given to the respondents were considered, these were:

- a) Ng x g n v " w a p a " h h " f g x k e g u . " u g p u q t u . "
- b) Ng x g n " q 4 o < " v u p p . O p e j k p g K p v g t h c e g " * k p v g t c e v k p p + . " E q p v t q n n g t u . " K o o g f k q r g t c v q t u 0
- c) Ng x g n " 5 < " G p g t i { " e q p v t q n n g t u . " K o o g f k q r g t c v q t u 0
- d) Ng x g n " 6 q ' b u k p t v g " n n k i g p c f l w u v c d n g . " c f c r v c d f k h h g t g p v " e q p f k / g f k i q p u v g e j p q n q i { " * e q p p g e v o c p c i g o g p v . " w u g " q h " c w i o g p m k f { t g ' c f k i k v k | r t q e g u u g u " c p f " f t k x g t u

Once the options are contextualized, it can be seen that 57.50% of the companies consider they are at level 1 (Turn-on-off devices, sensors, alerts, alarms), on the other hand it is observed that 11.48% did not choose any option However, 21.75% mention they are at level 2 (Automation, Human-Machine Interface (interaction), SCADA (Supervision, Control and Data acquisition), Programmable Controllers, digital systems packages); Likewise, 5.44% say they are at level 4 (Smart Company (intelligent), self-adjustable, adaptable according to different conditions, use of cutting-edge technology (connectivity, information management, use of virtual and / or augmented reality), digitization , business processes and online drivers); Finally 3.63% say they have a level 3 (Energy control systems, Active controllers, Immediate responses, IT operators).

- Problems identified by the companies Acámbaro, Gto regarding the manufacturing process of the product and / or service:

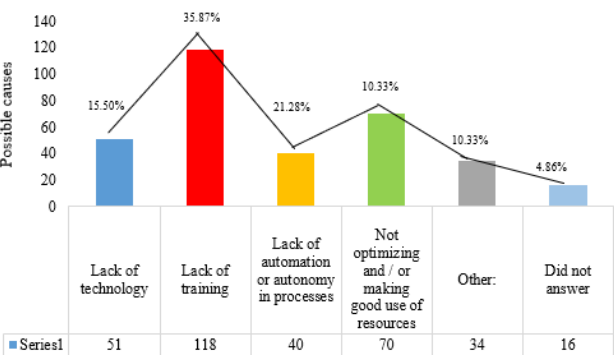


Graphic 3 Problems identified in the production process

Source: Own source

In Graphic 3 it can be observed that 45.32% of the micro, small and medium companies of Acámbaro, Gto; they present problems in the purchasing, supplier and warehouse area, that is to say, at the beginning of the process; On the other hand, 17.82% have faults with their personnel and equipment, specifically with human and technical resources; In addition to the above, 11.48% mentioned that their problems are in the area of logistics, administration and management, that is, in the control of the process; On the other hand, 10.58% expressed having difficulties in distribution, response times, waste, which means that there are losses in the process; However, 6.04% mentioned that the problem is in the production area, emphasizing the execution of the process; It is worth mentioning that 4.53% abstained from answering; Finally, 4.24% selected the other option, where they mentioned a delay with customers, a decline in the markets and simply stated that they had no problem.

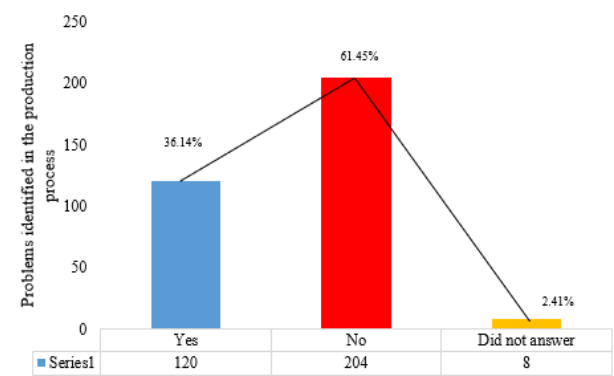
- What are the problems identified above?



Graphic 4 Possible causes of problems identified in the process productive
Source: Own source

In Graphic 4, the causes of the problems identified in graphic 3 are shown, where 35.87% of the micro, small and medium-sized enterprises of Acámbaro, Gto; state that the possible causes of the problems identified are the lack of training for staff, on the other hand 21.28% said that the causes are due to the lack of automation or autonomy in the processes, however 15.50% of the companies mentioned that the problems are due to the lack of technology, on the other hand 10.33% said that it was due to not optimizing resources well and / or making good use of them; finally with 4.86% the companies that did not respond are shown.

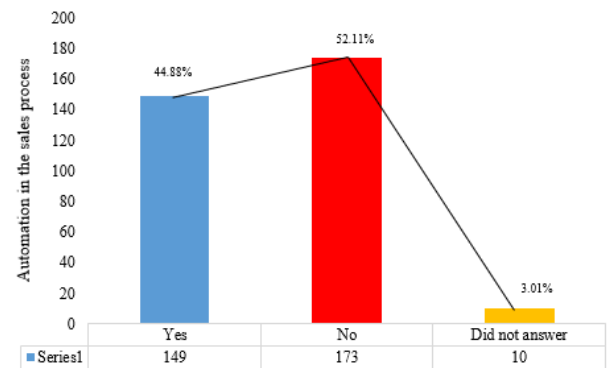
- Automation process in the control of supplies of the companies of Acámbaro, Gto:



Graphic 5 Problems identified in the production process
Source: Own source

To the businessmen of the Acámbaro, Gto sample; They were asked if they had an automated process for the control of supplies, therefore in graph 5 it is shown that 61.45% expressed not having an automated process for that area, likewise 36.14% said they did have an automated process for control of supplies; finally 2.41% did not provide an answer.

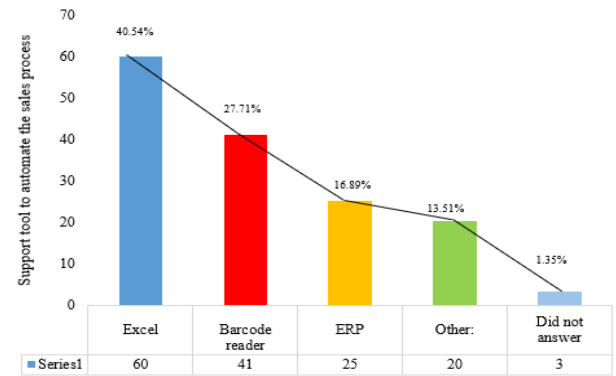
- Automation process in the sales area of the companies of Acámbaro, Gto:



Graphic 6 Automation in the sales process
Source: Own source

In Graphic 6 the results are shown focused on whether in the companies of Acámbaro, Gto; They have automation processes in the sales area, where 52.11% said they did not have, on the other hand 44.88% mentioned whether to have a process, finally 3.01 did not respond.

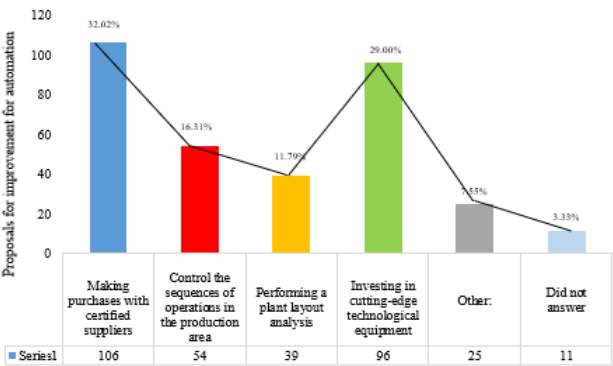
- Support tool to automate the sales process of companies in Acámbaro, Gto:



Graphic 7 Support tool to automate the sales process
Source: Own source

Graphic 7 shows the results of the opinion of 44.88% of the micro, small and medium enterprises of Acámbaro, Gto; who said yes to have an automation process, who were questioned which tool they used to automate their processes, where, with 40.54% mentioned that they use the Excel tool, instead 27.71% said they use a barcode reader On the other hand, 16.89% said they use the ERP system, likewise 13.51% said another, in which Sicar, Point of Sale System, Aspel, Private system, Smartphone classification of clients, Atenea, real estate CRM, Ciber Planet System stand out , SAP system, cash register. Finally, 1.25% is appreciated, which represents the companies that did not respond.

- Recommendations of the companies of Acámbaro, Gto., To achieve global automation in their businesses:



Graphic 8 Proposals for improvement for automation
Source: Own source

In Graphic 8 it can be seen that 32.02% of the micro, small and medium enterprises of Acámbaro, Gto; They state that they can improve for automation by making purchases with qualified suppliers, however 29.00% think that they can improve by investing in cutting-edge technological equipment; on the other hand, 16.31% propose that they can improve by controlling the sequences of operations in the production area; Likewise, 11.79% express that they can improve if they carry out a plant distribution analysis; Similarly, 7.55% mentioned other options, these were that they must renew and modernize the business, constant and improved training, work on the responsibility of their positions, control the sales sequence, have new products, optimize times, not have suppliers Unique, you are not interested in having an automated company, having someone to control supplies, acquire new machines, seek government support, systematizing processes. Finally, 3.33% of the companies that did not answer the question are shown.

Analysis of the Hypotheses

An analysis of the hypotheses formulated at the beginning of the investigation is carried out, where the verification of them is shown below, based on the results:

- Ho. The companies of Acámbaro, Gto., Are considered with an automation in general of Manual Manufacturing.

H1. The companies of Acámbaro, Gto., Are not considered with an automation in general of Manual Manufacturing.

Based on the above, the null hypothesis is accepted, with a trend greater than 44.41%, the population of micro, small and medium-sized companies, classify their organization as manual manufacturing.

- Ho. The companies of Acámbaro, Gto., Are in a level 1 of automation: Turn-on-off devices, sensors, alerts, alarms.

H1: The companies of Acámbaro, Gto., Are not in a level 1 of automation: Turn-on-off devices, sensors, alerts, alarms.

Based on the above, the null hypothesis is accepted; since 57.50% of the surveyed companies consider they are in level 1 of automation (turn-on-off devices, sensors, alerts, alarms).

- Ho. The lack of automation, technology and training; are the main problems identified by the companies of Acámbaro, Gto. in the manufacturing process of products and / or services.

H1. The lack of automation, technology and training; they are not the main problems identified by the companies of Acámbaro, Gto. in the manufacturing process of products and / or services.

The null hypothesis is accepted because the companies mention having problems with technology and especially with training; since 35.87% of the micro, small and medium enterprises of Acámbaro, Gto .; state that the possible causes of the problems identified are the lack of staff training.

- Ho. The companies in Acámbaro, Gto., Do have an automation process to control supplies.

H1. The companies in Acámbaro, Gto., Do not have an automation process for controlling supplies.

According to the above, the alternative hypothesis is accepted, because 61.45% of the micro, small and medium-sized companies of the mentioned city expressed not having an automated process for the supply control process.

- Ho. The companies in Acámbaro, Gto., Do have an automation process in the sales process.

H1. The companies in Acámbaro, Gto., Do not have an automation process in the sales process.

Now, from the previous hypotheses, the alternative hypothesis is accepted because 61.45% of the micro, small and medium-sized companies in the mentioned city expressed not having an automated process for the sales process.

- Ho. The companies of Acámbaro, Gto., Do use a tool to automate their sales process.

H1. The companies of Acámbaro, Gto., Do not use any tool to automate their sales process.

Continuing with the hypothesis testing, from those shown above, the null hypothesis is accepted because of 44.88% of the companies in Acámbaro, Gto. ; They said yes to have a tool for the sales process represented with 40.54% say they use the Excel tool to automate their sales process, this being the biggest trend.

- Ho. Make purchases with certified suppliers, carry out a plant distribution analysis and invest in technology, is what the companies of Acámbaro, Gto.

H1. Making purchases with certified suppliers, conducting a plant distribution analysis and investing in technology, is not what the companies of Acámbaro, Gto recommend.

Finally, the last hypotheses raised are analyzed, where the null hypothesis is accepted, this derived from the results where a trend greater than 32.02% is obtained, which expresses that companies think that they can improve their automation by making purchases with qualified suppliers, in addition to the 7.55% that the study showed, mention was made of certain recommendations, such as the need to renew and modernize the business, constant and improved training, work on the responsibility of their positions, control the sales sequence, have new products, optimizing times, not having unique suppliers, they are not interested in having an automated company, having someone to control supplies, acquire new machines, seek government support and systematize processes.

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A special thanks to the Technological University of León, an institution that constantly supports the generation of research and technological developments, which meet defined needs, as well as always considering a favorable impact on educational programs.

We thank managers and all personnel involved in various committees related to investigation, since unconditional support and good will are essential to achieve the objectives that are set.

We express great gratitude to the micro, small and medium-sized companies in the city of Acámbaro, Gto., Which kindly agreed to participate in the research; for responding to all the questions raised, for sharing information and for opening its doors to maintain a relationship and commitment with the education sector.

Last but not least, we thank the Research department of the UTL, for being aware of various related activities and for their constant attention to the adequate monitoring of each of them.

Conclusions

It was relevant to discover that most companies classify their businesses as manual manufacturing, therefore, their priority is not that their processes be automated; In addition, more than half of the surveyed population are at level 1, where they only have turn-on-off devices, sensors, alerts, alarms; which means that they still do not have the technology to consider their businesses Smart.

On the other hand, since companies with manual manufacturing are in a greater tendency, they consider they lack training, in order to avoid problems that affect money.

Likewise, the companies of Acámbaro, Gto., Do not consider it relevant to have an automated process for the control of supplies, upon detecting through research that the highest percentage does not have an automated process for this function; followed by a smaller percentage amount, but quite a weight of those that do consider it important to have a process of this type for the control of raw materials, merchandise and inventories in general.

Parallel to the above, it was relevant that the micro, small and medium enterprises of Acámbaro, Gto; they still do not consider it important to automate their businesses, some are due to lack of knowledge of the term, in other cases, companies are traditionalists and show reluctance to change. On the other hand, in relation to automating the sales process, it was found that they do not have something to support it, however, of the percentage that said yes to do so, they showed that they do it through various softwares, to facilitate the process; An important finding was that a minimum percentage, located in the "other" answers, mentioned that they rely on a CRM, which according to its acronym in English Customer Relationship Management, is a business strategy that implies a change in the business model focused on the automated management of all points of contact with the client, whose objective is to attract, retain and make the client profitable by offering the same face through the centralized analysis of their data (García, 2001, p. 26).

Finally, it is concluded that the surveyed companies are not totally open to automation, as it highlights what was detected through the recommendations they make to achieve better automation, that they have no interest in having an automated company, having someone to take charge to keep control of supplies, acquire new machines, seek government support, systematizing processes; which serves to investigate in the future if it is because they do not know the benefits of automation in a process of this nature or it is because it does not adhere to their needs.

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Management of micro and small businesses directed by women in Huejutla de Reyes, Hidalgo

Gestión de las micro y pequeñas empresas dirigidas por mujeres en Huejutla de Reyes, Hidalgo

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Abstract

The objective of this research is to analyze the level of functionality of the management of micro and small companies directed by women, through evaluating their processes with a systemic approach, which is composed as inputs of the variables inputs of the process, system processes and system results. The study included a representative sample of 327 companies. The information was collected through an instrument that includes 109 items on a five-level Likert-type scale applied by 180 students, previously trained for the application, as well as for data capture on a digital platform. The validation of the information generated in these two activities was validated by the present authors. Specifically, the variable with the best performance is production-operation (process) with a value of 4.2, where it is reflected that companies focus on the quality of their products, taking care of delivery times, as well as satisfaction of customers. On the other hand, the variable scope in sales is the one that shows the largest area of opportunity with a value of 3.0, this has to do with the expansion of sales outside its local sphere.

Resumen

El objetivo de esta investigación es analizar el nivel de funcionalidad de la gestión de las micro y pequeñas empresas dirigidas por mujeres, mediante la valoración de sus procesos con enfoque sistémico, el cual se compone como entradas de las variables insumos del proceso, procesos del sistema y resultados del sistema. El estudio contempló una muestra representativa de 327 empresas. La recopilación de la información fue a través de un instrumento que contempla 109 ítems a una escala tipo Likert de cinco niveles aplicado por 180 estudiantes, previamente capacitados para la aplicación, así como para la captura de los datos en una plataforma digital. La validación de la información generada en estas dos actividades fue validada por los presentes autores. De forma específica se tiene que la variable con mejor desempeño es producción-operación (proceso) con un valor de 4.2, en donde se refleja que las empresas se enfocan a la calidad de sus productos, cuidando los tiempos de entrega, así como la satisfacción de los clientes. Por otra parte, la variable ámbito en ventas es la que muestra mayor área de oportunidad con un valor de 3.0, esta tiene que ver con la expansión de las ventas fuera de su esfera local.

Business, Women, Management

Empresas, Mujeres, Gestión

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Ä " T ghegcontributing first author.

Introduction

At present, the study of micro and small companies is a center of interest due to the relevance that they have for the Mexican economy, having an important participation in the contribution to the national GDP, as well as the generation of jobs. above, it is important to have an analysis that allows recognizing its strengths but above all the weaknesses of the elements that comprise it; in such a way that strategies can be generated to improve their performance.

An important figure within these organizations is the participation of women, since the figures indicate that when the number of employed women increases, the economy grows, also contributing to reduce the gap in gender equality, as referred to by the Organization of the United Nations (UN 2019), finding alternative benefits for the country such as the eradication of poverty, reducing exploitation and discrimination.

Therefore, there are currently various international agencies that promote actions that contribute to the empowerment of women by developing programs to promote the economic autonomy of women as well as show the contributions of women to the economy, as is the case of UN Women (UN 2019).

Specifically, in Mexico, the UN Women shows the legislative advances with related issues in areas such as: wage equality, social security, gender equality, among others. For its part, the National Institute of Women (Inmujeres) and the Ministry of Economy joint efforts to increase the economic opportunities of women who live or have experienced gender violence, as well as mothers of disappeared women and / or girls or victims of femicide, who are in a situation of vulnerability, to enable them to start a micro-business. (Inmujeres 2019).

Therefore, the development of this study is considered of interest, whose objective is to analyze the level of management functionality in the micro and small companies of Huejutla, led by women to generate statistical information that allows us to visualize the status they present in the input, process and output variables, in such a way that once the areas of opportunity are identified, strategies are proposed that allow them to achieve organizational success and consequently increase the country's economy.

Literature Review

García, García and Madrid (2012) in their research called Characterization of the behavior of SMEs according to the gender of the manager: an empirical study, in the Region of Murcia, Spain, found that companies that are run by women are mainly found in the service sector (44.6%), have a weak technological position (10.7%), are smaller (the average sales of women's companies is 1'194,373 euros, while men have an average of 4'547.886 euros), and are above all of a family nature (67.3%). In relation to performance, there is only a significant difference in the rational e j c t c e v g t k u v k e ø u " o g c u w t g stated that women present a lower performance than men. Likewise, it is concluded that there are many limitations for the entry and development of women within organizations; One of these is its social function and the obligations that it imposes on it and that affects the perceptions of its performance, which leads to working on a cultural change within organizations that is oriented to provide greater opportunities for development and growth to the woman within it.

For his part, Saavedra 2020 in his study La Competitividad en MiPyMEs directed by Women in Mexico City, mentions that 49% of the companies belong to the service sector, while 39% correspond to the commerce sector and only 12% are from the Industry sector, in terms of size, 92% correspond to micro companies, 7% are small companies and less than 1% correspond to medium-sized companies and 80% of companies are individuals or individuals, that is, they lack personality legal.

Regarding the characteristics, 60% of the businesswomen are over 40 years old, indicating that they have some work experience before starting a business, while 40% are under 40 years old, the same ones they undertake in order to balance their work with family responsibilities. Regarding the studies carried out, the bachelor's level predominates (36%) in the business area (46%). On the other hand, 52% are married or have a partner, while the rest are single (35%), and to a lesser extent they are divorced or widowed.

In this study it is concluded that the limitations of businesswomen are mainly due to insufficient business training and the fact that they are still responsible for the family and having the latter as a priority they are satisfied with the poor result and size of your company, constantly seeking the balance between both roles.

Marrugo (2016) in his study called "The access of women to decision-making positions in Colombian companies listed on the stock market" mentions that the industrial sector Colombia seems to be more receptive when it comes to placing women in the highest positions. However, even in the rest of the economic sectors there is greater resistance to this change in mentality, not only from men but also from women themselves. In this sense, one of the main problems to combat is ingrained gender stereotypes and traditionally institutionalized in the structures and culture of organizations, whether public or private.

Instrument

As a data collection instrument for the present research, that of a macro research published by the Latin American Business and Administration Network proposed by Posada, Aguilar and Peña (2020) which was previously validated (construct / reliability analysis), said The instrument measures the characteristics of the system of each micro and small company, from the perspective of a single person (the director or owner of the organization), who from his perspective valued the entry, process, exit and environment of his company. The instrument is structured by various sections, within which 105 items correspond to management strategies, divided in turn into: system inputs, market analysis, human resources, system processes, sales management, ISO 26000 matters and valuation environment, a section is included at the beginning to collect sociodemographic aspects.

Population and sampling.

The sample size was 361 companies, with which it was possible to obtain a confidence level of 95% and a maximum error of 5%. However, the application included 514 companies, of which it was taken for the analysis of this document 328 which are headed by women.

The collection of information was carried out through the training of 180 students for the application and for capturing the information on the platform. Once this information was collected, it was validated by the authors of this research. The criteria for the selection of the sample were: to be of a micro and small size (from 2 to 50 workers, according to the classification by size in Mexico), to be located in Huejutla de Reyes and to belong to some of the activities that the classification of economic activities of the National Institute of Statistics, Geography and Informatics of Mexico.

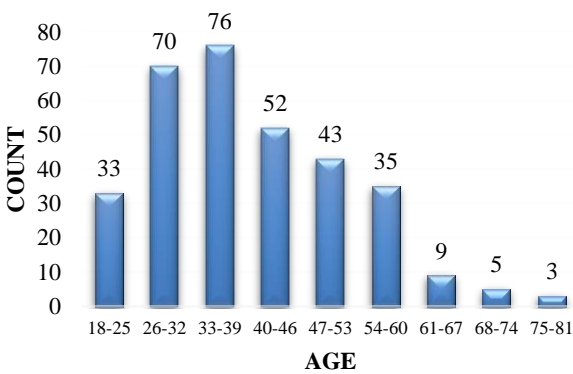
Design of the investigation

The design of the present study is of a cross-sectional type because the data collection was in a single time, it is also descriptive, as it aims to investigate the level of the variables of the population.

Results

Sociodemographic aspects

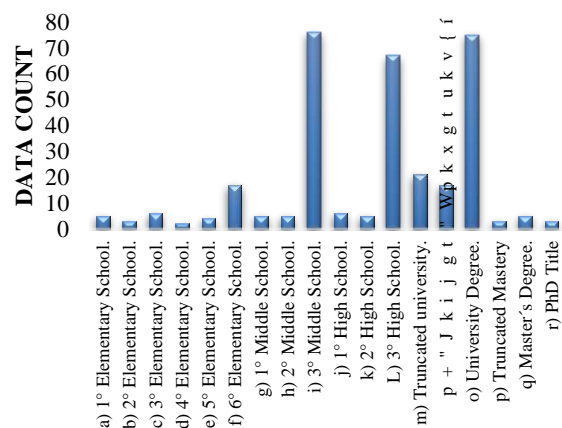
Regarding the sociodemographic aspects, it is observed that the age of the female directors is concentrated between 33 and 39 years of age, as shown in graph 1, a fact that when compared with the figures provided by the literature for Mexico City has a contrary behavior.



Graphic 1 Age of women
Source: Self made

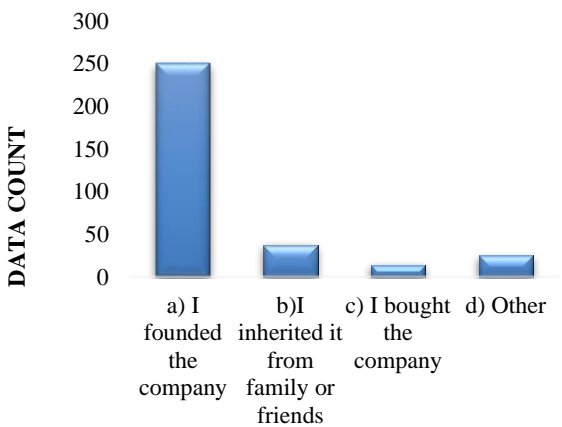
In terms of educational training, it was identified that there are three levels with high frequency that are: completed secondary school, completed undergraduate degree and completed high school, as can be seen in Graphic 2, these levels generally suggest that the majority (more than 50% of the population) has a medium and high level of education; situation that could benefit when considering that there are current tools implemented in companies achieving better management.

HERRERO, Laura, ESPINOSA, Abraham, ROMERO, Carmina and RIVERA, Claudia. Management of micro and small businesses directed by women in Huejutla de Reyes, Hidalgo. RINOE Journal-Industrial Organization. 2020



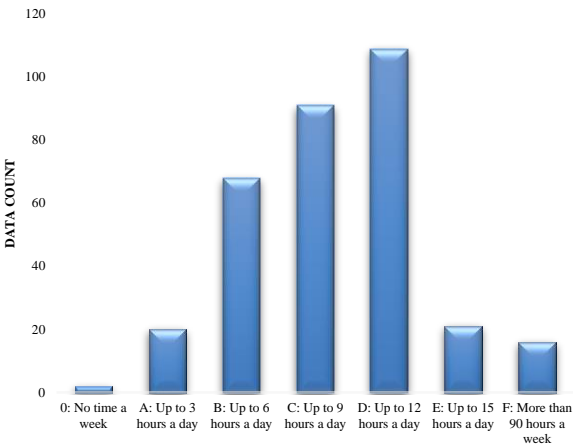
Graphic 2 Last year of studies
Source: Self made

Regarding the founding of companies, it can be seen in Graphic 3, that the majority of female managers are the ones who founded their business, demonstrating a significant level of entrepreneurship.



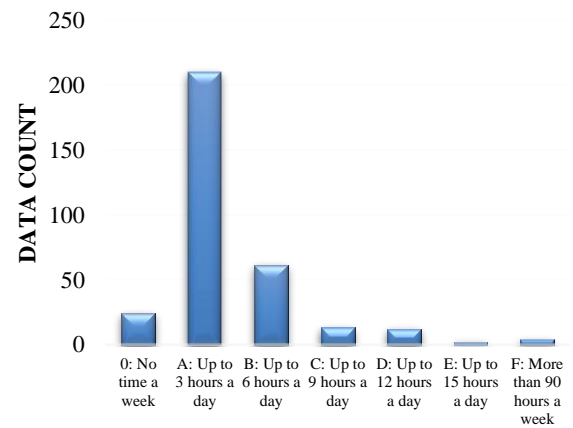
Graphic 3 How did you come to be the owner of this company?
Source: Self made

On the other hand, when analyzing the time, they invest in their businesses, a total of up to 12 hours was identified as the most frequent data, as shown in Graphic 4, the days greater than 15 hours a day are the ones with the lowest frequency.



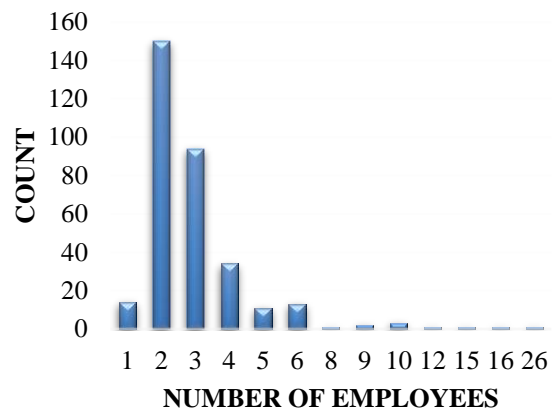
Graphic 4 How many hours a week do you dedicate to your company?
Source: Self made

Now, once the time spent working in your company has been analyzed, the hours devoted to household chores were analyzed. Here it is observed that the majority dedicate 3 hours; as shown in Graphic 5. The above is considered relevant for the analysis of the balance that women have between their work and family responsibilities.



Graphic 5 How many hours a week do you dedicate to housework?
Source: Self made

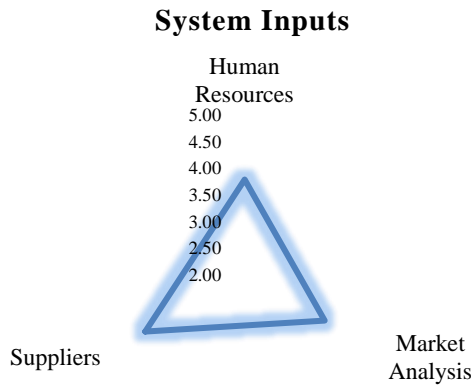
Finally, in terms of employability, it is observed in Graphic 6 that the companies run by women have mostly two employees, this shows their participation in the country's economy.



Graphic 6 Number of employees
Source: Self made

System analysis (Input-Process-Output)

With regard to system inputs, the areas of human resources, market analysis and suppliers are considered, according to what is shown in Graphic 7, it is observed that the strongest is suppliers, indicating that the most important thing for the directives is that their suppliers give them the best price, quality products, permanent supply and that they give timely follow-up to their complaints.

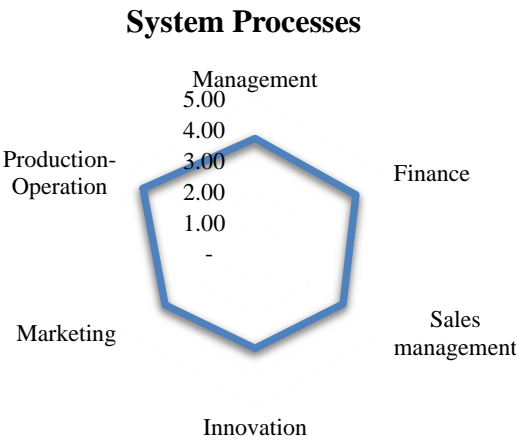


Graphic 7 System Inputs
Source: Self made

Regarding process variables, it was identified that the area with the greatest strength is that of production-operation. which denotes an occupation of the directives to reduce their costs, as well as in the delivery in time and form of their products.

The areas of Management and Finance present a high valuation also which shows a high interest in activities related to the investment of profits for the growth of their businesses, seeking financing to make their company work, establishing clear objectives, planning expenses, as well as sales so as not to lose money.

On the other hand, the variable with the lowest value in process is innovation, which reflects the lack of development-oriented work to innovate the way in which they sell their products or services, the inclusion of employees to propose changes in products, services or processes and the infrequency of offering new products or services generated by the suggestion of customers. (Graphic 8)

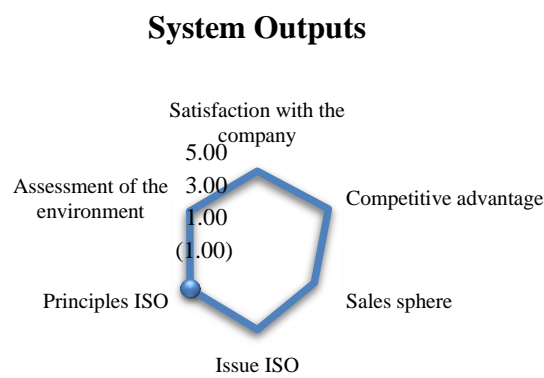


Graphic 8 System Processes
Source: Self made

Finally, in the analysis of the output or results of the system, the area with the highest value is that of competitive advantage (Graphic 9), where it is observed that female managers consider that clients choose their businesses for the good treatment they offer, because their product is the best in its category, because of the availability of your products and why they appreciate your brand.

In general, it can be seen that the areas of satisfaction with the company, environmental assessment and ISO principles maintain an acceptable behavior.

The lowest value area corresponds to the sales area where it is observed that the directives do not consider customers from their neighborhood, city, government, other population and even abroad to extend their sales.



Graphic 9 System Results
Source: Self made

Conclusions

The analysis of the companies run by women shows us a large participation of female founders of micro and small companies, which correspond mostly to the retail trade, the age they have is from 33 to 39 years with an educational level of high school, although the baccalaureate and undergraduate levels are presented with a significant representation, the above can support the implementation of a greater number of strategies included in their organizations. In terms of the balance between work and family, it was found that their effort is concentrated mostly in business, leaving little time dedicated to housework showing a family imbalance. The majority of employees were found to be 2 workers, leaving the possibility of analyzing whether the majority of them hire women, promoting labor equality.

Regarding the analysis of the system in the input variables, the strength of the directives in activities that have to do with their suppliers is observed, taking care that they have continuous supply of products or services, that they offer the best prices and follow up on their complaints. The foregoing can be translated (with its reservations) to the mentality focused on sales, since most of them are businesses dedicated to retail sales, having special concern for it in the relationship with their suppliers.

For the process variables, it is observed that the one of greatest interest is that of production-operation, repeating the efforts of the entrepreneurs to take care of costs, as well as the time and manner in the delivery of their products. It was found in the same way that the areas of management and finance are also high, it is considered that the latter may be due to the concern of entrepreneurs for the care of their money and for the regulation by the authority that is required today in day to every business and not necessarily as a measure that they visualize as a strategy to achieve better results, the foregoing subject to conducting a study for confirmation.

Finally, in the output variables, it is observed that competitive advantage is the one that presents the greatest value, which suggests that women entrepreneurs consider that customers like their products and that they appreciate their brand.

In general, the system of micro and small companies led by women shows a dynamism of traditional management, suggesting according to the results the implementation of a modern business management that allows them to compete in a globalized context.

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The importance of emotional capital in organizations

La importancia del capital emocional en las organizaciones

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Abstract

Within the organizations we work with the personnel in the different areas, who are the core part so that the Company can offer its products or services, in the course of work as human beings we face many problems with the personnel that we interact for not manage our emotions in our work and social environment, causing our environment to become chaos and affect the company or organization where we work. Through Emotional Capital, personal performance, communication and therefore the work environment cab be optimized. The staff will not fear being fired from their job but will fell part of it and will be motivated by working and this will reduce absenteeism and will be motivate by working, and this will reduce absenteeism and turnover. Another result is to increau g " r g q r -stegn, whichuwilln h g be reflected in their attitudes because they will have a positive trend. This will generate greater adaptability to the processes of change because fear and uncertainty will be managed. With this model you can also facilitate processes.

Resumen

Dentro de las organizaciones se trabaja con el personal en las diferentes áreas, quienes son la parte medular para que la empresa pueda ofrecer sus productos o servicios, en el transcurso del trabajo como seres humanos nos enfrentamos a muchos problemas con el personal que interactuamos por no saber manejar nuestras emociones en nuestro ámbito laboral y social, provocando que nuestro entorno se vuelva un caos y afectamos a la empresa u organización donde trabajamos. A través del Capital Emocional se puede optimizar el desempeño personal, la comunicación y por consiguiente el clima laboral. El personal no sentirá temor de ser despedido en su trabajo, sino que se sentirá parte de ella y se motivará trabajando y esto se logrará disminuir el ausentismo y la rotación. Otro resultado es aumentar la autoestima de las personas que se verá reflejado en sus actitudes porque tendrán una tendencia positiva. Esto generará una mayor adaptabilidad a los procesos de cambio, porque se sabrá manejar el miedo y la incertidumbre. Con este modelo se puede también facilitar procesos.

Emotional Capital, Leadership, Personal

Capital Emocional, Liderazgo, Personal

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Introduction

Organizations are currently experiencing a stage of many changes that are affected and within it, the personnel involved experience constant work stress due to not having financial and secure stability, which with it leads to an emotional imbalance to the person, because they do not, he knows how to control his emotions.

Many times, in companies they are concerned with achieving success and are determined to produce more and better in a world of much competition, and managers resort to all available means to meet their objectives, capital increase, productivity but they do not worry for the welfare of its workers, that there is a good, pleasant organizational climate, motivation of adequate human capital. It is important that those who manage constitute the most important factor that allows them to contribute to the achievement of business objectives and personal development accordingly.

The leader of the organization must be motivated and in harmony so that the company and its collaborators have a better performance in terms of the work they do, it is of the utmost importance to maintain a positive attitude within it, with which a good work environment, which leads to the entire work team working one hundred percent. Many employees feel very unmotivated and insecure, because they constantly do not have financial stability, this causes chaos in each of them and that there is not a good performance at work.

Therefore, it is recommended to have a pleasant environment within companies to ensure that motivation levels remain high. Simmons and Simmons (2000) indicate that emotional intelligence is the most important factor that can serve as an indicator of success in work relationships. A successful work environment is achieved by worrying that the collaborators have the Emotional Capital through the boss who is the source of inspiration and who must show that personal balance and then transmit it to his staff.

In this project to be developed, we will work with organizations and their collaborators, in some techniques and models that allow each of them to help in Emotional Capital, with the purpose that they can improve their control of emotions and contribute to the company for a harmonious balance.

An organizational diagnosis will be carried out to know the emotional state of how the companies where the sample will be applied are, and based on this, the appropriate techniques and models will be applied to the company.

The problem to be solved to reduce the level of stress in the organization and bring a better work environment.

The following sections will describe the techniques and models that will help organizations improve their productivity through emotional capital.

Methodology to be developed

From an organizational perspective, labor involvement constitutes a first-order practical reference in determining positive sustainable performance results.

The toxic environment in which a worker operates is harmful to their health. This prevailing labor condition in our country prevents it from being productive, since it confuses productivity with quantity.

The work environment where a worker operates is crucial to generate good results. If his functions are performed in a healthy and proactive environment, the possibilities of enhancing his creativity and innovation will be reflected in his performance and productivity. By understanding and applying this correlation, organizations and employees will benefit.

In an analysis of 38 countries carried out by the Organization for Economic Cooperation and Development (OECD), it revealed that Mexico and Costa Rica are the Latin American countries with the longest working hours in the world, a position that it shares with the rates of work stress.

For the World Health Organization (WHO), this syndrome known as Burnout or professional burnout, can already be considered a mental disorder.

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During the 72nd World Health Assembly, held on May 20 in Geneva, Switzerland, nations agreed that this new classification will come into effect on January 1, 2022.

A few weeks ago the Official Gazette of the Federation published Standard 035 of the Ministry of Labor and Social Welfare (STPS) to prevent and control psychosocial risk factors in organizations.

This classification, which will come into force in 2022, requires and obliges employers to make diagnoses, preventive actions in order to control conditions of harassment or workplace violence and other psychosocial risk factors, such as chronic stress.

Tools, techniques and models will be applied that will help the company staff as they are in their emotional state and later help them to maintain the balance and organizational climate.

The Salovey and Mayer Model will be applied, this model is also known as the four-phase model of emotional intelligence and Emotional Capital, which has "The ability to correctly identify and translate personal and other emotional signs and events, elaborating and producing processes of emotional direction, thought and behavior effectively and appropriately personal goals and the summarized as:

- K p v t c r g t u q p c n " t K p k g n i g p e g
- K p v g t r g t u q p c n " t K p k g n i g p e g

In this model it can be mentioned that there are mental processes such as:

- R g t e g r v k q p . " g x c n w c v k q p
- X c n w c v k r q r p t " g e t k " c v k q p " q h " g o q v k q p u " k p "
- G o q v k q p c n " t g i w n c v k q p " k p " q p g u g n h 0
- G o q v k q p c n " t g i w n c v k q p " k p " q p g u g n h 0
- W u g " q h " G o q v k q p c n " K p v g n n k i g p e g 0

In this model you will be supported by techniques and tools such as the Johari window, which will allow you to know yourself (Self-awareness), Emotional Control and management of work stress, learn to trust yourself, learn to empathize, learn to flow with others, learn to interact of the organization and entrepreneurship.

30% of samples will be made to the organization's staff, applying questionnaires and interviews to see the balance and control of their emotions, after repositioning the samples, the inferential statistics will be applied that show the graphs and histograms of the results, and based on to this, apply descriptive statistics, we will work on models such as Pearson's coefficient of variation and find how the control of emotions in the organization has been related.

Other quality tools that will be used, the Ishikawa tool, which will allow to know the causes that are generating the emotional imbalance in the organization, which must take into account the environment, the materials, the methods and processes that the company in its daily activity.

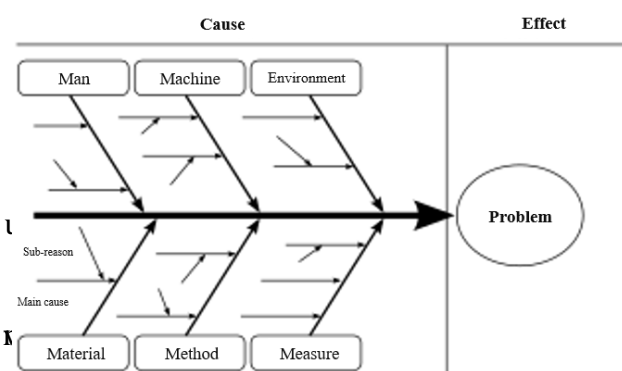


Figure 1 Ishikawa tool

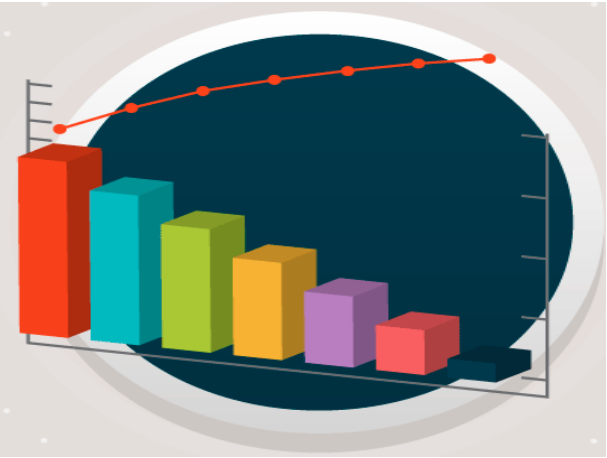
Survey sheets to find out how the organizational climate in the company is, the opinion on the salary, labor relationship with colleagues, machinery and equipment, adequate working conditions, no previous training and others; that will allow as another point to see the problems.

Opinion	No. Of Opinion s	No. of accumulate d opinions	Relative %	Accumulate d Relative %
Salary				
Work relationshi p with colleagues				
Machinery and equipment				
Adequate working conditions				
Training				
Others				
Total				

Table 1 Opinion survey

Pareto diagram to help make visible the real problems that are affecting the achievement of the company's objectives and reduce the losses that it has, this graph allows assigning an order of priorities for decision making, which are the most serious problems that are must solve first, applied to staff.

This Diagram will help identify the critical points of the company and the situations that most negatively impact the results. With this you can find identify the products and services that generate the most customer complaints, which products and services generate the most profits for the business, understand which employees have the highest productivity.



Graphic 1 Pareto Chart

Results

Organizations by working on their emotional capital, in those aspects that motivate people to go to workday after day. After all, emotional capital leads to better performance and higher productivity, it is the bond that holds people back in organizations beyond.

It increases people's self-esteem and their attitudes towards a positive trend, there is greater adaptability to change processes, because they will know how to handle fear and uncertainty.

It is possible to solve conflicts more easily and even prevent them, as well as solve problems and improve interpersonal relationships, which will allow a better integration of work teams.

Applying Emotional Capital within the organization will increase personal energy, motivation, clarity of mission in the company, commitment to objectives, which will help in an increase in personal satisfaction and productivity. in the same.

It is important that first the leader of the organization is convinced to apply Emotional Capital and see that he will have benefits in his organization by being in harmonious balance, which will be reflected in his company through his work team.

Annexes

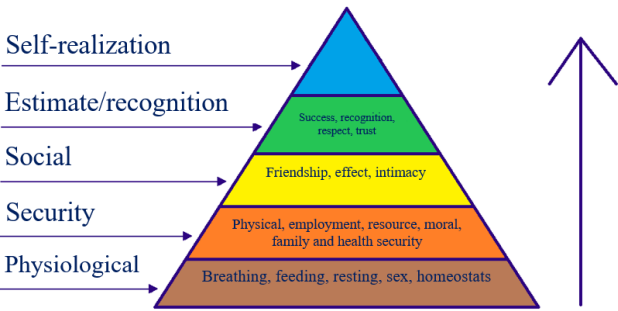


Figure 2 Maslow Pyramid

First phase: 0-21 years	Period of preparation or physical development - becoming of women and men
Second phase: 22-42 years	Period of expansion or of living being a woman and a man
Third phase: 43-65 and more	Period of realization and spiritual development of women and men

Table 2 Phases through which we will be humans

Conclusions

Talking about emotional capital refers to the importance of Human Security, since emotional capital implies living in harmony with oneself, that is, with the human being himself, in order to live with respect and enjoy the diversity of ways of life, of the planet and their ecosystems and everything that supports Human Security.

Emotional capital implies that each individual, in her own way, knows how to face what Human Security must support. Holistic security to achieve personal happiness, thus generating interpersonal relationships with their environment.

First of all, we must accept ourselves as we are, and we must be proud of who we are. Because being unique, that is why we will begin to work with the Johari Window tool that allows us to make that self-awareness, each one of us comes to this life with a task to perform and as the universal energy is supremely intelligent, each of us we have what it takes to do your job in this life.

These quality tools will allow us to see the state of the company and from there to seek emotional balance in it.

It will be applied to small companies in the influence area of the Atlixco and Izúcar de Matamoros valley, in addition to being possible with educational institutions.

The results that are expected to be achieved is that the company's personnel have a control management of their emotions, that there is a good organizational climate that favors the productivity of the company, within what is expected to be achieved is:

Increase staff productivity by 30%, which allows better performance in the company.

Draw at least 5 strategies that allow teamwork that help with emotional balance and camaraderie.

Give courses to at least 60% of personnel in Emotional Capital training in the different areas of the company to be more competitive.

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Effective application of the APQP quality tool in Pull Back Car toy assembly processes

Aplicación efectiva de la herramienta de calidad APQP, en procesos de ensamble de juguetes Pull Back Car

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Abstract

The current Mexican market for the production and assembly of toys (Pull back car) demands ever higher productivity, quality, cost and delivery rates, complying with defined production requirements, as the market is becoming larger and of course competitive. For their part, companies have the need to continually launch new models to stay competitive. The current procedure is based on project management through a recognized procedure in the sector, such as APQP (Advanced Product Quality Planning), based on the implementation of a series of key management tools for DNP. The research carried out characterized the current context of toys for the development of new parts in the local toy sector of the Meccano company, in the Huauchinango Puebla region. An operational model proposal is made for the Pull back car toy assemblers, in order to improve performance in the activities of the Meccano company.

Resumen

El mercado mexicano actual de producción y ensamble de juguetes (Pull back car) demandas índices de productividad, calidad, costo y entregas cada vez mayores, cumpliendo con requisitos de producción definidos, ya que el mercado cada vez se hace más grande y por supuesto competitivo. Por su parte, las empresas tienen la necesidad de lanzar continuamente nuevos modelos para mantenerse competitivas. El procedimiento actual se basa en la gestión de proyectos a través de un procedimiento reconocido en el sector, como el APQP (Planeación Avanzada de la Calidad del Producto), basado en la implementación de una serie de herramientas clave de gestión para el DNP. En la investigación realizada, se caracterizó el contexto actual de los juguetes de desarrollo de nuevas partes en el sector local de juguetes de la empresa Meccano, en la región de Huauchinango Puebla. Se realiza una propuesta de modelo operacional para las ensambladoras del juguete Pull back car, con el fin de mejorar el desempeño en las actividades de la empresa Meccano.

APQP, DNP, Control

APQP, DNP, Control

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Introduction

Over the years the design and development of new products has been a key element for the survival of any company in the market. Currently it is vital that the product meets the needs of the client, to ensure its acquisition again.

In the automotive industry the integration of any car model is very expensive and requires large investments usually; In addition, the market is very competitive, which is why it requires good quality in its products and it cannot afford to deliver defective products to its customers, since in various circumstances the products imply the requirement of zero defects against specifications, since its use involves the risk of human lives; Due to the aforementioned, the industries were forced to create a methodology with which they could ensure the quality of their products, it was then that the automotive industries, including FORD, DIME CHRYSLER, GMC (General Motors Company)¹, created a standard called QS-9000, with which they could observe the quality of the product, within this a section called APQP (Advanced Planning Quality Product) or Advanced Planning of Product Quality was generated, where this guide is carried out the development of a new product in this case automobiles.

The application of APQP has been shown to have high impact by expanding the ability of organizations to develop and produce products and systems that meet customer needs. Therefore, it could be profitable in small and medium-sized companies, without the need to seek the implementation of a QMS (Quality Management System) of the ISO-9001: 2000 type. It is obvious that we encourage work in the direction of SGC, but we urge to take better advantage of one of the quality technologies with the greatest impact.

The objective of this article is to present the most important aspects of advanced product quality planning, in relation to Pull back car assembly, as well as to show the results obtained in each of the phases of the APQP, analyzed.

The practical case has been structured as follows: In section one the description of the concepts of the APQP methodology is presented, in section 2 the essential elements for the development of APQP in the company where the study is applied are presented. and an analysis of the prevailing practices in terms of product quality planning, that is; where a market investigation will be carried out in order to know and evaluate the experience of the team and ending with a quality assurance plan, knowing the defects that exist in both the product and the process; and in this way ensure that, before delivering a product to the client for the first time, the correct methodology is followed and the necessary quality controls are established to provide a quality product, on time and at the lowest cost.

In section three, there are the results of the application, finally in the last sections are the conclusions and references, managing to highlight the positive points, exposing the conclusions of the project and the recommendations that could be functional for continuous improvement and support the supporting information used in the application.

Methodology to be developed

This section will present selected and important information that must be taken into account to develop the phases of the APQP methodology. Each phase is made up of a series of specific tasks.

Leaving aside the particularities of each company and project, and based on the APQP procedure, every automotive development project will follow a cascade planning (phase-gate process) similar to that represented in Figure 1 Diagram of advanced planning of the APQP product quality.

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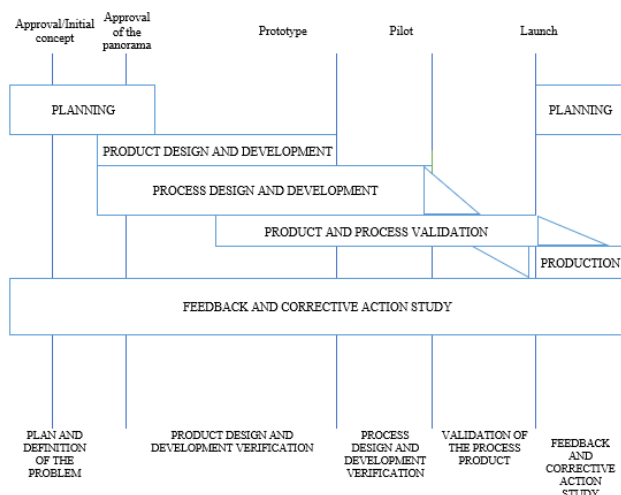


Figure 1 APQP Advanced Product Quality Planning Diagram

Source: Chrysler, et al., (2008)

Each of the APQP stages are described below, defined in the Reference Manual created by the AIAG (Automotive Industry Action Group), in order to determine the standards for automobile manufacturers and parts suppliers.

Stage I: Planning and definition of the program

In this study phase, the objective sought by the program is defined, which will allow planning. Taking into consideration that at this stage the customer's need is indicated with respect to the product to be manufactured. For this, all the relevant information regarding the product offer is gathered, this through meetings with the client.

In this way, a market research is carried out, which allows defining in quantitative data the need, acceptance and opinion of potential customers in relation to the product to offer.

Stage II: Product Design and Development

Once the client's need has been determined and quantified, this phase is directed to the development of the product, that is, to define its characteristics based on the established requirements and in this way carry out the designs and monitoring of the final product to be offered. CAD software will be used for the design of this, for the purposes of this study AutoCAD software was used, this being a software that adapts to the specifications that are sought with the project. In tune, evaluations are carried out to measure the conformity of the design with respect to the initial requirements.

Stage III: Design and development of the process

Defined the design of the final product, this stage aims to develop a manufacturing system to achieve quality products. The development of process flow diagrams is considered, as well as the inclusion of formats, Process FMEA, the creation of a pre-launch Control Plan, all of them aimed at finding the best conditions for the production of the selected design.

Stage IV: Product and process validation

A production control plan is carried out, which allows the evaluation of the process and the product. To do this, the application of operations research tools, such as: The Master Production Plan (MPS), Bill of Materials or Material Boom and the Material Requirement Plan (MRP).

Stage V: Feedback, evaluation and corrective actions

The objective is to evaluate the effectiveness of the product quality planning effort and analyze the manufacturing process when all common and special causes of variation are present.

Results

Below are the results obtained by each stage of implementation:

Stage I: Planning and definition of the program

In the first instance, a questionnaire is carried out that allows us to determine the attributes that people look for in a toy, so that it is considered as quality. The analysis of three of the questions with the greatest impact and importance in the study is indicated.

Emphasizing the main characteristics that the client looks for in a toy in order to acquire it, three alternatives are identified: the price, the popularity derived from its diffusion in the media, and also the educational component.

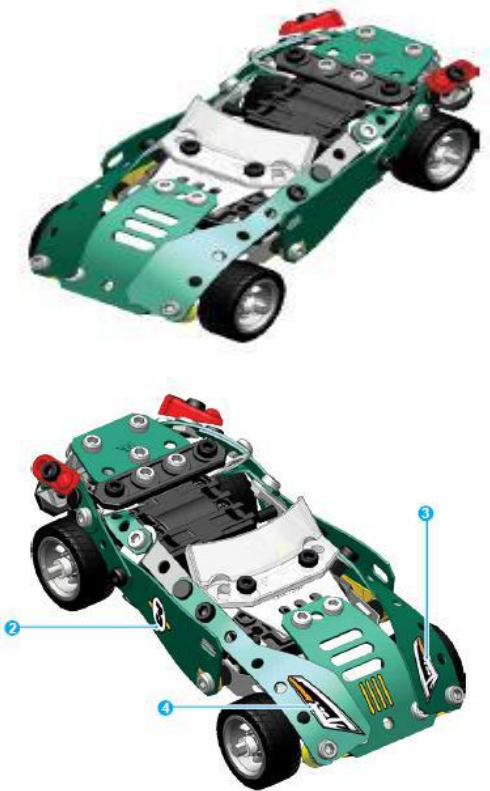


Figure 6 Final product made in CAD
Source: Own elaboration, (2020)

Stage III: Design and development of the process

Information is collected regarding the properties of the materials of each piece that makes up the final product. The quantity necessary for the assembly of the pieces is identified, as well as the duration in years. This in addition to the bill of materials (Figure 7 Preliminary bill of materials).

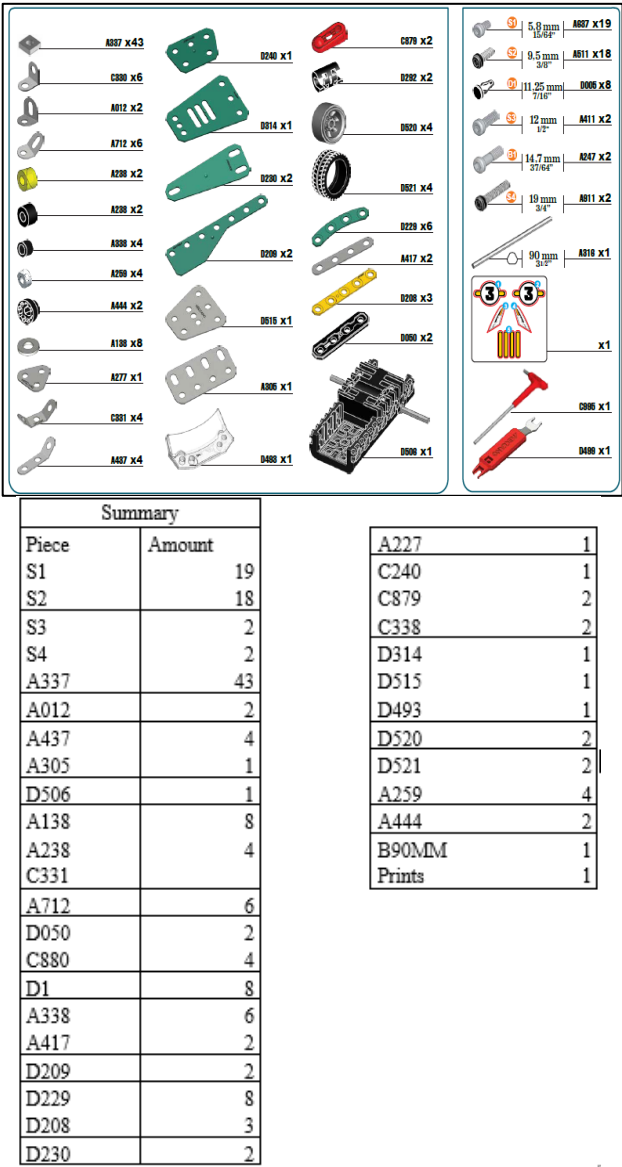


Figure 7 Preliminary Bill of Materials
Source: Own elaboration, (2020)

Knowing the whole process of the Pull Back Car assembly process allows us to optimize the preparation times. Therefore, in the first instance, the operations that make up this process are identified. This through a work study tool, the process flow diagram (Figure 8 Process flow diagram) as well as a format with visual aid for assembly operations (Figure 9 Component assembly operations format, with visual aid).

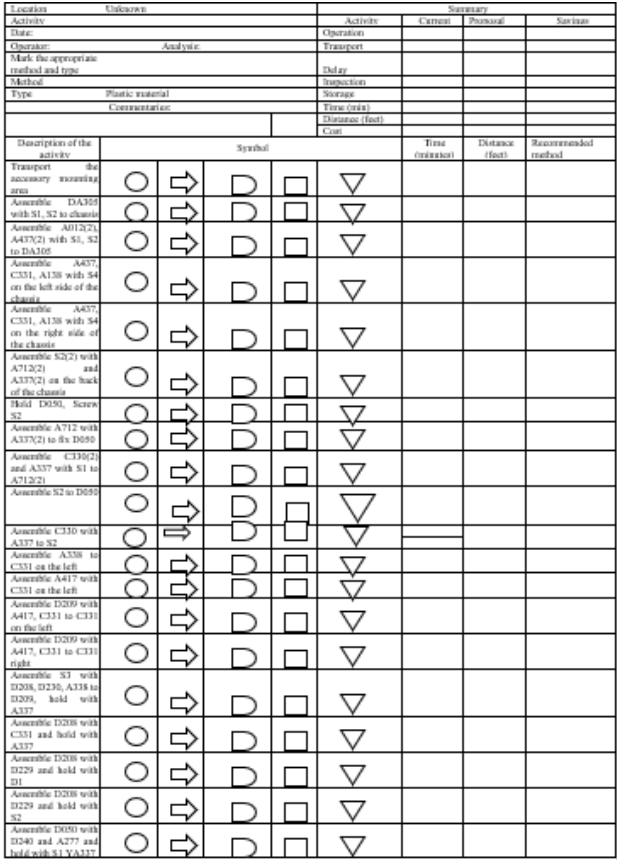


Figure 8 Process flow diagram
Source: Own elaboration, (2020)

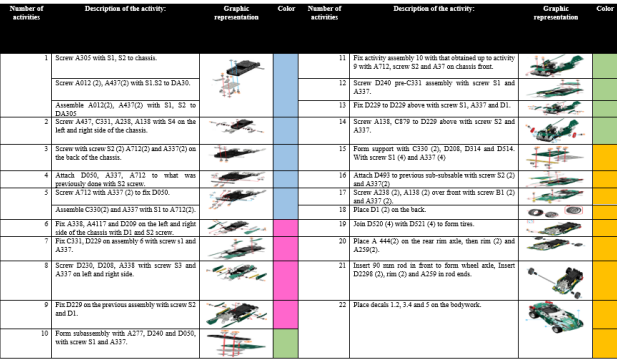


Figure 9 Component assembly operations format, with visual aid
Source: Own elaboration, (2020)

Stage IV: Product and process validation

For the validation of the Pull back car assembly process, a production program is established, consisting of the Master Production Plan and the Material Requirement Plan, these will allow to have control of both the production and the necessary materials.

Considering that the company has the capacity to produce 50 cars a day, it works six days a week, from Monday to Saturday with an 8-hour shift, and that cars are produced to order that usually arrive a week in advance; You can carry out the same Master Production Plan that will allow us to know the behavior of the delivery of orders. For its elaboration, a lot size of 50 units is established, with an initial inventory of 80. The results are reflected in Table 1 Master Production Plan.

WEEK	1	2	3	4	5	6	7	8	9	10	11	12
Inv.	80	30	10	20	40	10	40	40	0	30	30	40
Ped.	100	70	40	80	0	70	50	0	120	10	90	70
Plan P.	50	50	50	50	50	50	50	50	50	50	50	50
Inv. fi	30	10	20	40	10	40	40	0	30	30	40	20
MPS	1	1	2	2	1	2	1	1	3	2	2	1

Table 1 Production master plan
Source: Own elaboration, (2020)

Now, pointing out the importance of a complete production plan, the Material Requirement Planning analysis is also added (See Table 2 Material Requirements Plan), which will allow us to have control over the raw materials of the product that is offers the customer. It is programmed with lots of 50 units with issuance every 2 weeks. This gives a total inventory cost after 10 weeks of \$ 600, a production cost of \$ 430,000, labor with \$ 103,200. Resulting in a total of \$ 533,800.

Week	1	2	3	4	5	6	7	8	9	10
Pron.	1000	900	900	500	700	1000	700	500	600	500
Dem.	800	700	800	600	900	800	600	900	800	900
Inv. In	50	50	50	50	50	50	50	50	50	50
Inv. The end	50	50	50	50	50	50	50	50	50	50
Issue	20	18	18	12	18	20	14	18	16	18
MRP	1000	900	900	600	900	1000	900	900	800	900
Cost p / inv	60	60	60	60	60	60	60	60	60	60
Cost p / pro	50000	45000	45000	30000	45000	50000	35000	45000	40000	45000
Workforce	12000	10800	10800	72000	10800	12000	8400	10800	9600	20800

Table 2 Material Requirements Plan
Source: Own elaboration, (2020)

Specifying the importance of having a plan that encourages customer satisfaction, both with the specifications of the product, as well as the service offered in the sale. The use of formats is proposed, such as FMEA (See Annex 1 Figure 10 FMEA Format) and a pre-launch control plan (Annex 2 Figure 11 Pre-launch control plan), this focusing on the assembly process, such as the inclusion of a check list for the review of a quality system (Note Annex 3 Figure 12 Check list for the review of the quality system and complaint format).

Annexes

Annex 1

Artículo	Potential Fault Mode	Potential Failure Effect	SEVY	Cla	Potential Cause/Failure Mechanism	Ona	Current Prevention Design Control	Current Prevention Design Control	Det	RPN	Recommended Action	Responsibility and Objective Verification Date	Action Taken	SEVY	Ona	Det	RPN
A1	Loose pins	Disturbance in the operation	3	1	The separation between studs is greater than required	2	Simulation analysis	Competitive study	4	120	Destructive testing						
A2																	
A3																	
A4																	
A5	Assembling the parts is not possible	Accuracy of the final product	5	3	Flow design and perforation of attachment points	4	Simulation studies	Competitive study	3	180	Simulation validation						
A6																	
A7																	
A8																	
A9																	
A10																	
A11	Fractured	Sticky	4	4	Wrong material	3	Selection of materials according to standards: ASTM F963, NORM 222, BSA 2001	Destructive testing	3	80	Design experiments to compare different types of material and choose the most suitable						
A12																	
A13																	
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Figure 10 FMEA format

Source: Own elaboration, (2020)

Annex 2

PLAN DE CONTROL - CONTROL PLAN									
Revisión		Revisión				Revisión			
Control plan number: CP-001		Control Plan for: Toy Car Assembly Process				Revision date: 2020-12-31			
Control plan version: 1.0		Control Plan for: Toy Car Assembly Process				Control Plan for: Toy Car Assembly Process			
Control plan description: Toy Car Assembly Process		Control Plan for: Toy Car Assembly Process				Control Plan for: Toy Car Assembly Process			
Control plan objective: Toy Car Assembly Process		Control Plan for: Toy Car Assembly Process				Control Plan for: Toy Car Assembly Process			
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