Commercial model to optimize supply chains in local markets

Modelo mercantil para optimizar cadenas de suministro en mercados locales

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Abstract

Today, inventory management is a highly studied and interesting topic to optimize the cost of managing them. Traditional inventory models generally tend to block inventory optimization, but the more the years have passed, the concept of "supply chain" has been implemented, where the satisfaction of the needs of the final customer is achieved through material flows, information and financial, which are established from the original suppliers to the last consumer, requiring a certain level of cooperation and integration between the participants in the chain. That is why through the present the design of a sustainable model to optimize supply chains in local businesses in Jerez, Zacatecas is investigated, proposed, and exposed.In this paper, the optimization of inventories is studied, creating an effective model that combines the traditional with the current and that reflects the advantages of this approach in the total inventory costs in the chain, that is, the optimization.

Resumen

Hoy en día la administración de inventarios es un tema muy estudiado e interesante para optimizar el costo de la gestión de estos. Los modelos de inventario tradicionales generalmente suelen trabar la optimización de inventarios , pero entre más han pasado los años se ha implementado el concepto de "cadena de suministro", donde la satisfacción de las necesidades del cliente final se logra mediante los flujos material, de información y financiero, que se establecen desde los proveedores originales hasta el último consumidor, requiriendo esto de un determinado nivel de cooperación e integración entre los participantes en la cadena. Es por ello que a través del presente se indaga, plantea y expone el diseño de un modelo sostenible para optimizar cadenas de suministro en los negocios locales de Jerez, Zacatecas. En este trabajo se estudia la optimización de los inventarios creando un modelo eficaz que combine lo tradicional con lo actual y que se reflejen las ventajas de este enfoque en los costos totales de inventario en la cadena es decir la optimización.

Supply chain, Optimization, Business

Cadena de suministros, Optimización, Negocios

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Introduction

In recent years the growth of global trade has evolved greatly and with it the competition, as well as the need to find ways to avoid being displaced by another business offering the same product.

Today, offering the best product at the best price and using information technology is essential. Although it is true that for many businesses it is difficult or even impossible to confront this phenomenon, since information is unknown, there is a lack of training or resources to achieve it, this is why the initiative to investigate and come up with a proposal that is useful to the companies in the municipality under study arises; not forgetting that this research can contribute to businesses in other geographical areas.

In general terms, we will talk about the supply chain in the businesses of the municipality of Jerez, Zacatecas, which will be our population and will be stratified by business sectors for their analysis. We know that there are different sectors and they all have different characteristics, but the most important characteristics that relate to these sectors are "selling" and "satisfying the needs of the client". A supply chain is considered a fundamental unit for business competitiveness, as it integrates and exchanges information, technology, coordination, collaboration and management that together will carry out the process of transformation and distribution of raw materials to the final customer.

This paper develops the general objective of the research that aims to propose a business model to optimise supply chains in local markets, in addition to the specific objectives, hypotheses, research framework, justification, statistical analysis, as well as the method by which the hypothesis will be tested, followed by conclusions and additional comments.

Finally, apart from testing the hypothesis and to
complement and support the research, a model will be proposed to optimise supply chains in businesses in the municipality of Jerez, Zac., attending to their most common needs and problems in order to strengthen their internal and external processes, which could be useful in other contexts.

Evolution of the supply chain concept

Frederick Taylor (1911), the founder of industrial engineering, who wrote The Principles of Scientific Management, focused on improving the manual loading process in his work.

The mechanisation of pallet lifts was the focus of logistics research around 1940 and 1950 to obtain more storage and distribution space (Aguila, 2015).

The concept of unit load and the use of pallets became popular, extending in 1950 to transport management through the use of intermodal containers, bringing together ships, trains and trucks to transport them. This set the stage for the globalisation of the supply chain (Aguila, 2015).

As mentioned by ASCM Mexico (2023) in the late 1970s when Keith Olivier was working with clients such as Heineken and Philips, he first developed his vision to break down the functional silos that separated production, marketing, distribution, sales and finance, to generate a reduction in inventory and a simultaneous improvement in customer service and called it Supply Chain.

It took time to take hold and remain in the business lexicon, but by the mid-1990s a large number of publications on the subject began to appear and it became a regular term in some officials' job titles (Jacoby, 2009).

According to Lambert (1996), supply chain management (SCM) was originally introduced by consultants in the early 1980s and has subsequently gained much attention (LaLonde, 1998).

Since the early 1990s, scholars have attempted to structure it (Stevens, 1989) and have conducted an extensive retrospective review of the literature and research on it.

Finally, Mentzer (2001) defines a Supply Chain as: the set of three or more entities (organisations or individuals) directly involved in the downstream and upstream flows of products, services, finance and information from the primary source of production to the final customer.

To make the above more concrete, we must consider that the "Supply Chain" is not limited to manufacturing companies, but has expanded to include both "tangible products" and "intangible services" that reach the consumer and require inputs of products and services.

With this in mind, several definitions or thoughts that various authors have on the concept are given below:

The supply chain is defined as the set of practical activities that are repetitive throughout the product flow channel through which raw materials are transformed into finished products and value is added to the customer. That is why, to manage the processes of the supply chain, one must take into account internal and external aspects that are in charge of planning and managing the information flows of all the actors where the money and products that take place within the company infers (Ballou, 2004).

The supply chain is a network of connected and interdependent organisations that work together cooperatively to control, manage and improve the flow of either materials or information from suppliers to end users (Santander, 2014).

However, it is also of interest to define the concept of "optimisation" in such a way that it is established concretely what we are referring to and how it is related to the supply chain. According to Westreicher (2020), optimisation is the action of developing an activity as efficiently as possible, with the least amount of resources and the least possible time; in other words, optimisation means carrying out a task in the best possible way, which can be applied to different fields such as business administration, economics and IT.

Nowadays, organisations are in a constant search for alternatives that allow them to find solutions to the ever-increasing challenges they face in a highly competitive environment. There are many problems to face, globalisation and technological advances are some of them.

Problem description

The description of a problem determines that its presentation goes from the general to the specific. For this reason, our approach to the subject to be developed is presented below through a questionnaire:

How to optimise supply chains in local markets?

In order to give more context to our approach, Cooke (1997) mentions that the supply chain is the coordination and integration of all activities associated with the movement of goods, from raw materials to the end user, to create a sustainable competitive advantage. This includes systems management, sourcing, production scheduling, order processing, inventory management, transportation, warehousing and customer service.

Objectives

The objectives are of great importance for the research, since they constitute the guide, the path along which the research is going to go, erroneous formulations of the aforementioned would lead us irremediably to failure.

According to Monje Álvarez, C. (2011), the research objectives define the degree of knowledge to be achieved, guide the research process and determine the path to be followed to achieve it.

The formulation of the objectives is essential for the success of a research project. The following is the general objective: To create a business model to optimise supply chains in local markets.

When establishing a general objective in automatic we must establish specific objectives that will help us to achieve the general objective, these must be precise, evaluable and feasible, in the case of the topic presented they are stated in the following way: To identify the main problems and needs of supply chains in local markets; to classify businesses into micro, small and medium enterprises; to identify the most common errors in business supply chains; to create a hierarchical system of the basic essential elements that the business must have in order to operate responsibly and comply with all the activities and responsibilities of the business.

Hypothesis

A hypothesis is an idea that may or may not be true, based on prior information. Its value lies in its ability to establish further relationships between facts and explain why they occur, for this research the following is proposed:

H_0 = A well-established business model is not the means to an end for optimising a supply chain in local markets.

H_1 = A well-established business model is the ideal means to an end to optimise a supply chain in local markets.

Variable	Tipo de variable	Constitutive Definition	Operational Definition
1) Commercial Model	Independent	It is a simplified representation of business logic and is basically what a business offers its customers from how it reaches them, how it relates to them and how the company makes and makes money.	It is considered that a commercial model could be measured qualitatively and quantitatively. It is considered that it depends on the methodology to be used.
2) Supply chain	Dependiente	A supply or supply chain is a set of elements that allow companies to have the necessary organization to carry out the development of a product or service and for it to meet the main objective, which is to satisfy the needs of the end customer.	This variable is quantitative since the elements that will be studied are accounting such as level of customer satisfaction, suppliers, cost comparisons, prices, profits, income, etc.

Table 1 Definition of variables
Source: Own elaboration

Justification

Nowadays, in the globalized market, businesses are forced to generate new ideas to enter the environment and obtain a competitive advantage. Due to this, the interest of companies is focused on good and correct management of the supply chain, creating value for the business and the customer, focusing primarily on satisfying customer needs. That is why when analyzing the various situations that the world is going through and the constant changes mainly in the market, it was considered that currently "selling" is the essential activity that moves and maintains the world.

After what has been mentioned, we can realize that this research is relevant, since currently due to the changing demands and needs of the client, as well as the competition, it is essential to create a commercial model that allows and guides us to carry out those activities associated with the movement. of goods from the supply of raw materials to the final consumer. This includes selection, purchasing, production scheduling, order processing, inventory control, transportation, storage and customer service. But, the most important thing is that it also includes the information systems required to monitor all these activities, but in a practical and efficient way that allows us to optimize processes and expenses.

The contributions that will be made can help local businesses to organize themselves in a better way and generate better profits, to be more specific when following a commercial model and, as already mentioned, profits will be maximized, costs, times, freight expenses will decrease, and expenses will increase. customers, customer loyalty with the product will be created, and a status to remain in the market.

Methodology

The objective of this section is to describe the procedure developed during the investigation. In the demographic framework, our population is located in the municipality of Jerez de García Salinas, specifically they are companies of any type and size that are dedicated to commerce that therefore need to acquire inputs and that is where a model is applied for the management of these and called "Supply Chain". The following table is shown below, showing the companies taken into account as population, as well as the number of each of them and their category.

Activity	Amount
Construction	12
Manufacturing industries	468
Wholesale trade	72
Retail trade	1438
Total:	1990 comercios

Table 2 Activities of the municipality contemplated as population
Source: INEGI (2020)

Analyzing and adapting to the objectives of this research, the survey with a Likert measurement scale was selected as a means of collecting information in which the opinion of the topic to be investigated was obtained through a probabilistic sample, since as a population it was considered to all businesses in the municipality in general and from there a stratified sample was taken, that is, the population was divided into different business sectors.

The formula applied to determine the research sample is the following:

$$n = \frac{N.Z\alpha^2.P.q}{d^2.(N-1)+Z\alpha^2.P.q}$$

Where each element is expressed as follows in the table:

Date	Value
N	Value to be determined (sample)
N	1990 shops
$Z\alpha^2$	95% equivalent to 1.96
P	0.5
Q	0.5
D	0.05

Table 3 Data to calculate the sample
Source: Own elaboration

Substituting these values, the sample obtained is 322. Likewise, to reduce the number of the sample, the sample sample is calculated, that is, now our population will be the result obtained previously, resulting in 175 businesses to which the instrument was applied. designed to collect the necessary information and be able to draw conclusions, since it should be emphasized that for it to be a representative sample it must be more than 100 people, which is verified if said factor is met.

In the case of this research, we chose use the "Cronbach's alpha" indicator, which is defined as the indicator that gives us a measure of the internal consistency of the items that make up a scale. If this measure is high, we assume that we have evidence of the homogeneity of the scale, i.e., that the items are "pointing" in the same direction and was developed by J.L. Cronbach in 1951.

According to Oviedo, C. & Campos-Arias, A. (2005) it is an index used to measure the internal consistency reliability of a scale, i.e. to assess the extent to which the items of an instrument are correlated. In other words, Cronbach's alpha is the average of the correlations between the items that make up an instrument.

Validity within research indicates whether a study is able to draw conclusions that are in accordance with statistical and scientific laws (Kalla, 2010).

Tristan López (2008) refers to the fact that, in an article published in 1975, Lawshe proposes a model for determining a quantitative index for the content validity of an objective instrument. In the case of the present research, a content evaluation panel made up of specialists was organised, as suggested by the model. In the case of the designed instrument, a reliability coefficient of 0.74447824 was obtained.

Subsequently, the data obtained were statistically analysed by means of measures of central tendency (mean, median and mode) and measures of variability (standard deviation and variance), providing the following results:

EXTENT	Value
Arithmetic average	3.53
Median	4
Fashion	5

Table 4 *Values of measures of central tendency in research*
Source: Own elaboration

Muestra total	Valor máximo	Valor mínimo	∑ de la muestra	μ	σ^2
175	5	1	10507	3.53	2.04	92.71

Table 5 Variability measures from a general research perspective
Source: Own elaboration

The correlation established between the variables considered, the classification of the variables was examined according to the measurement scale used based on different calculations carried out. Keeping in mind that the variables in the research are the constructs, properties or characteristics that acquire various values, the variables X and Y were analyzed, separating from the 17 items what corresponds to each of them, this to know how they behave around to another, to know if they can be merged and thus verify the hypothesis, therefore, meet the objectives set at the beginning of this research

| Independent variable	Dependent variable Y (supply chain)
(commercial model)	I. Do you know what a supply chain is and what it consists of?
VII. Does your business have the phases established by the administrative process? (Planning, organization, direction and control)	II. You consider it important to supply inputs or raw materials to produce your product or sell as appropriate wholesale.
X. The business has a periodic cost and profit analysis of its product.	III. Is the number of suppliers you currently have greater than 10?
XI. Within its sales process, it offers the customer the confidence or way to express their like or dislike regarding what they have purchased.	IV. Your suppliers who supply you with merchandise are internal (municipality).
XII. It considers that it uses the most viable and appropriate way to distribute and offer its product to the customer.	V. Have you ever performed a cost analysis with a provider outside of your state?
XIII. Do problems constantly arise in your company regarding product quality problems, price distribution, among other factors?	SAW. Do you consider that the location of a supplier intervenes in the cost of the product, as well as the time to have it where it is required?
XIV. Do you consider the infrastructure and technology you use in your company to be a key factor in attracting customers?	VIII. Are your input purchases retail?
	IX. Do you think that buying in wholesale would reduce your costs and therefore the cost of the product?
	XV. Do you consider the adequate supply of inputs vital for the company?
	XVI. Suppose you regularly lack raw materials to produce your product or offer your service, do you think you could lose the customer?

Table 6 Classification of variables X and Y
Source: Own elaboration

It can be examined in the previous table that our variable On the other hand, the variable Y made up of 10 items gives us data about the supply chain of the businesses surveyed.

In addition, the correlation analysis between variables was carried out, resulting in a moderate correlation.

Regression Statistics	
Multiple correlation coefficient	**0.566613166**
Determination coefficient R^2	0.32105048
Adjusted R^2	0.317125916
Typical error	0.505337267
Observations	175

Table 7 Regression statistics and correlation of variables,
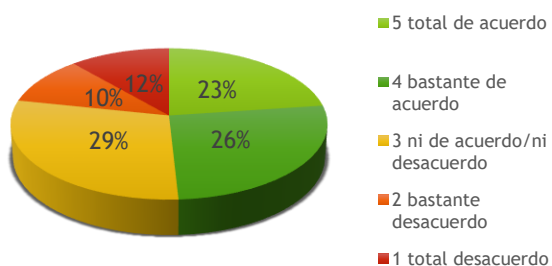*Source: Own elaboration*
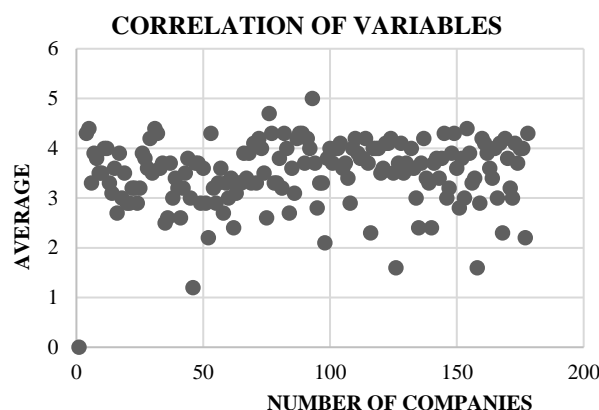
Graphic 1 Correlation of analyzed variables
Source: Own elaboration

In turn, in the case of verifying the hypothesis or hypotheses and as mentioned by Hernández Sampieri (2014) they are the precise guides towards the research problem or phenomenon being studied, the CH-Square distribution method was considered. since this statistical test is used in the analysis of two or more groups and two or more variables.

Results

Bearing in mind that the independent variable in this research refers to the "Commercial Model", seven reagents focused on said variable were proposed in the developed instrument that gathered the information that is required to be known, therefore through the results obtained from the main questions we can analyze through graphs its behavior in our researched population, as well as what it contributed and how it impacts the study. Considering for each question a Likert scale where 5 = totally agree, 4 = somewhat agree, 3 = neither agree/nor disagree, 2 = quite disagree and 1 = totally disagree..

Graphic 2 Question VII "Apply the phases of the administrative process",
Source: Own elaboration

As can be seen in the graph presented, the majority of us find that the businesses in the municipality of Jerez are unaware of the administrative process that every economic entity must have, regardless of size, essential for proper functioning, although it can be seen that 23% actually counts on it and is considered to be really undertaking correctly.
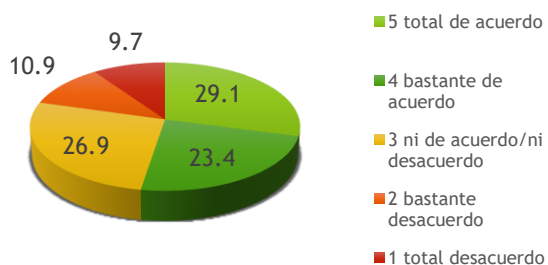
Graphic 3 Question X "Periodic cost and profit analysis"
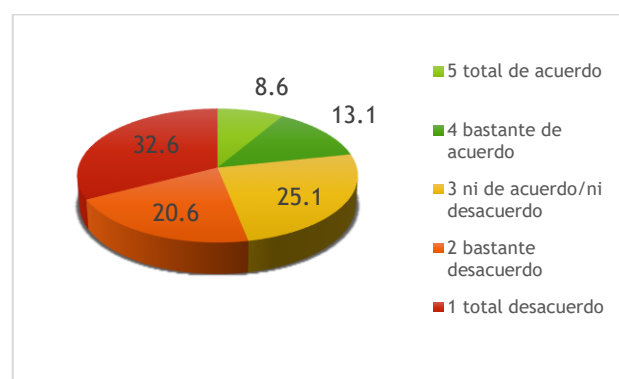*Source: Own elaboration*

It is obtained that 29% of the companies surveyed do record and analyze costs and profits in the activity carried out.
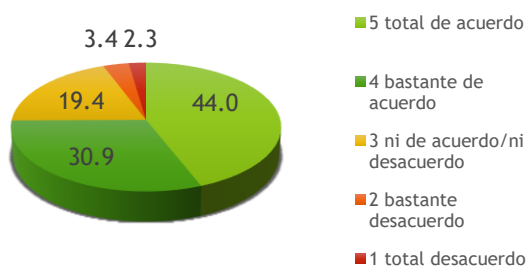
Graphic 4 Question XI "Express your feelings during the care process"
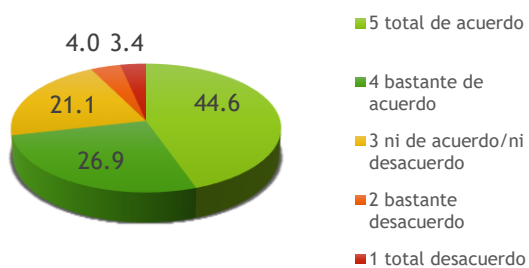*Source: Own elaboration*

Customer feedback will always help determine whether they are satisfied or not, and detect areas where you can work to improve. Chopra and Meindl (2008) state that "A supply chain is made up of all those parties involved directly or indirectly in satisfying a customer request."

The reagent shows that approximately 44% of those surveyed offer the opportunity and adequate way for the customer to express their feelings about their consumption in the establishment, which allows the company to receive feedback on the customer's experience and is also important to help to discover information that was not known.

Graphic 5 Question XIII "Problems arise in the company regarding product quality, price, distribution"
Source: Own elaboration

Problems will always be present in business, but they can become areas for improvement, an excess of problems in an entity is a risk for it, in the same way a company without problems is impossible, which is why this reagent indicates that 25% of the investigated sample presents problems related to various aspects mentioned, so this indicates that it is necessary to have a well-established commercial model, because Sierra, Moreno and Silva (2015) point out that a distribution channel is the set of organizational participants that execute all the functions necessary to achieve the arrival of a product to the final buyer, and as such due importance must be given to this aspect.

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Graphic 6 Question XVII "Agree that the company's activity requires a commercial model"
Source: Own elaboration

A commercial model is a prior step to the business plan and answers questions related to the objectives, the public and the generation of value in order to optimize its supply chain and is important because it allows you to establish the foundations of your venture, therefore the 44.6% of respondents say they completely agree that it should be an indispensable part of a business.

For an investigation to reach the approval of its hypothesis, we know that its variables must be related and work hand in hand with each other. In this case, we know that the dependent variable is the one whose value depends on the value adopted by the independent variable. , and within the designed instrument, ten reagents were formulated that encompass said variable, which explain the results of the most important questions in the following illustrations.
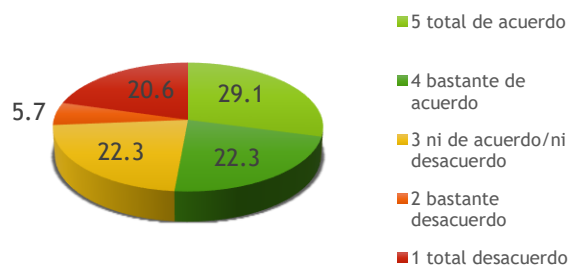

Graphic 7 Question I "Do you know what a supply chain is and what it consists of?"
Source: Own elaboration

Pulido (2014) indicates that the supply chain is a link that is responsible for providing the necessary inputs to satisfy production needs (raw materials and materials), taking care of supplier delivery times and levels. input inventory.

51% of those surveyed know the term or have heard of it, even so, there is an area of opportunity to reinforce this topic.
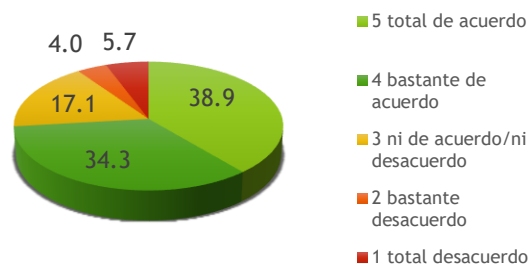
Graphic 8 Question VI "The location of a supplier influences the cost and delivery time of a product"
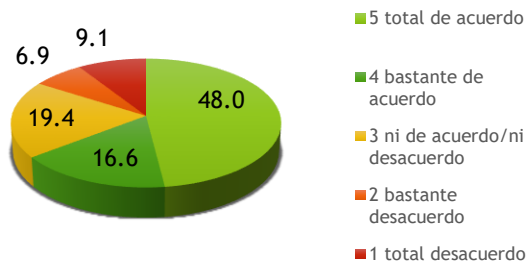*Own elaboration*

In this reagent it can be analyzed that the location of the suppliers really is a factor that the producer finds important, since it can help reduce transportation costs or use raw materials in better conditions and also in the end, a better price can be offered. price to the final consumer, 39% in this reagent consider this aspect very important, since as Vargas (2023) mentions, starting in 2021 the supply chain crisis caused by COVID 19 is reflected in exports, then a more punctual and close interaction between company-supplier becomes necessary.
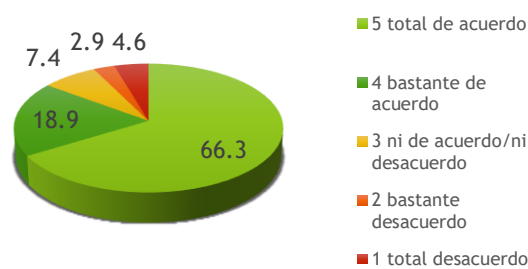
Graphic 9 Question XV "Do you consider the adequate supply of inputs vital for the company*"*
Own elaboration

Of the total number of respondents, 66% agree that the supply chain must be executed to guarantee customer satisfaction and the success of the company, thus ensuring the delivery of the right quantity and product at the time. prompt.

Graphic 10 Question XVI "Do you consider the adequate supply of inputs vital for the company"
Source: Own elaboration

Loyalty to a brand or business will always be a constant struggle between the customer and the company since the company must work daily to offer the best product with the best service so that the consumer needs to constantly purchase it as long as the product always remains in stock. the same and does not go beyond the standards or guidelines.

For this reason, in this question, 48% of those interviewed confirm that when a brand stops supplying a product or lacks it, customers leave and do not consume in that place again.

Hypothesis testing

Hypothesis testing is considered one of the most important sections of research since it is the statistical procedure that allows us to decide whether the results of a research are the product of random or real effects.

That is, through this test businesses can make data-based decisions and solve problems, and it will also help avoid high costs in experimental efforts by using existing data.

As stated in previous chapters, the Chi-square (x^2) or Chi-square test was chosen to demonstrate whether the proposed hypothesis is accepted or rejected since with this test we obtain the divergence between the distribution of the data and an expected distribution. or selected hypothetical.

Category (# ítem)	Fo (Observed Frequency)	Fe (Expected Frequency)	Development		Result
1	3.33	3.53	-0.21	0.04	
2	4.25	3.53	0.72	0.52	
3	2.87	3.53	-0.66	0.44	
4	2.45	3.53	-1.09	1.18	
5	3.32	3.53	-0.21	0.04	
6	3.97	3.53	0.43	0.19	
7	3.39	3.53	-0.14	0.02	
8	2.46	3.53	-1.07	1.15	1.9198629
9	4.29	3.53	0.75	0.57	
10	3.49	3.53	-0.04	0.00	
11	3.96	3.53	0.43	0.18	
12	3.8	3.53	0.27	0.07	
13	2.45	3.53	-1.09	1.18	
14	3.66	3.53	0.13	0.02	
15	4.40	3.53	0.87	0.75	
16	3.91	3.53	0.38	0.14	
17	4.06	3.53	0.53	0.28	
Total:	**60.04**	**60.04**	**6.78**		

Table 7 Data for hypothesis testing
Source: Own elaboration

In the previous table we can analyze that the calculation carried out to verify the hypothesis is developed, as well as the data used, first, the sum of all the observed frequencies minus the expected frequencies was carried out and each result was squared, then the figure obtained It is divided by the expected frequency and returns the result. An important fact to mention is the level of significance, which was taken as 0.05 as well as the degrees of freedom were calculated with: 17-1= 16, so our critical value is 26.2962, which means that if our result exceeds this value the hypothesis would be rejected, otherwise if it is within it it is accepted, therefore, we can see in the graph what the result was, as well as the behavior of our hypothesis:
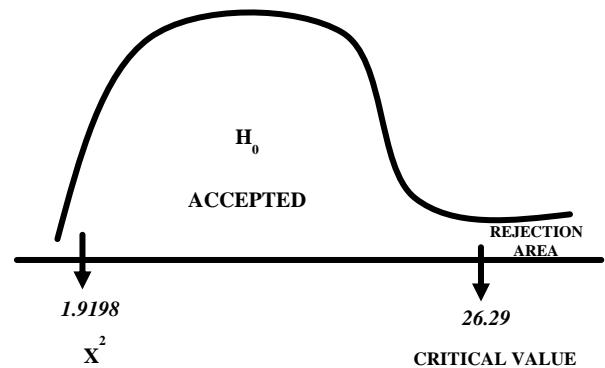
Graphic 11 Hypothesis testing
Source: Own elaboration

It is concluded that since X2 is within the acceptance area then our hypothesis H0 is accepted.

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Conclusions

Through this research it was determined that there is a moderate correlation between the variables analyzed and that the commercial model is a function of the supply chain, therefore:

A well-established business model is the ideal means to optimize a supply chain in local markets.

The comparison between observed and expected frequencies, together with the calculation of divergences, provided a solid basis for making informed decisions. With a significance level set at 0.05 and 16 degrees of freedom, a critical value of 26.2962 was obtained, which served as a reference to determine the acceptance or rejection of the hypothesis.

Coinciding with what was expressed by Manrique et al (2019) that the correct management of the supply chain, without a doubt, will favor the quality of the goods or services, optimize the distribution channels and adapt the points of sale to the needs and customer expectations.

Ultimately, this study demonstrates the importance of hypothesis testing as a valuable tool for data-driven decision making in research and management.

That is, through this test, businesses can make data-based decisions and solve problems, and it will also help avoid high costs in experimental efforts by using existing data.

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