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Journal-International Economy

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Presentation of the Content

In the first article we present, *Administrative factors that affect customs clearance in an electronics manufacturing company in Ciudad Juárez, Chihuahua*, by Castro-Ramírez, Vianey Iliana, Portillo-Castillo, Víctor Manuel and Mejía-Hernández, Marisela, with adscription at the Universidad Tecnológica de Ciudad Juárez, as following article we present, *Study of the organizational behavior of the sales force in medium-sized companies through the comparative method*, by Pedraza-Huerta María de Lourdes, Morado-Huerta, Ma. Guadalupe, Márquez-Gónzalez, Olga and Valente, Verónica, with adscription at the Universidad Tecnológica de San Juan del Río, as following article we present, *Proposal for standardization in the warping process in textile manufacturing*, by Bahena-Medina, Lilia Araceli, Gómez-Vicario, Miguel Ángel, Reyes-Velázquez, Alejandro and Hernández-Jasso, Ana María, with adscription at the Universidad Politécnica del Estado de Morelos, , as last article we present, *Equity investment portfolio in renewable energy companies to influence the UN's 2030 agenda*, by Hernández-Escobedo, Quetzalcóatl, Rodríguez-García, Ernesto Raúl, Mendoza-González, Felipe and Rueda-Martínez, Fernando, with adscription at the Escuela Nacional de Estudios Superiores Unidad Juriquilla, UNAM and Universidad Veracruzana.

Content

Journal-International Economy 8[14]1-7: e10814107
Article

Administrative factors that affect customs clearance in an electronics manufacturing company in Ciudad Juárez, Chihuahua

Factores administrativos que inciden en el despacho aduanero en una empresa maquiladora del sector electrónico en Ciudad Juárez, Chihuahua

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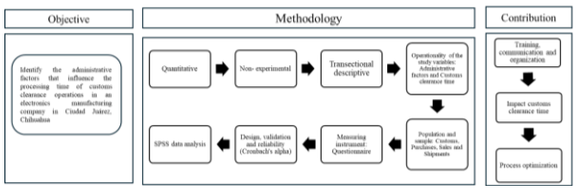
Abstract

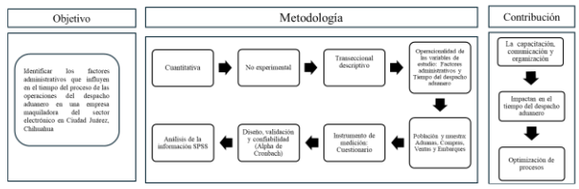
The objective of this research was to identify the administrative factors influencing customs clearance operations processing time in an electronics manufacturing company in Ciudad Juárez, Chihuahua. A quantitative methodology with a non-experimental, transactional, descriptive design was used. The study population consisted of personnel from the customs, purchasing, sales, and shipping departments. Data was collected through a survey using a validated questionnaire by experts, and the instrument's reliability was verified using Cronbach's Alpha coefficient. The questionnaire was administered to 19 employees considered in the study sample. The results show that there is a dependence between customs clearance time and administrative factors: training, communication, and organization.



Customs clearance, Maquiladora, Import

Resumen

El objetivo de esta investigación fue identificar los factores administrativos que influyen en el tiempo del proceso de las operaciones del despacho aduanero en una empresa maquiladora del sector electrónico en Ciudad Juárez, Chihuahua. Se utilizó una metodología cuantitativa, de diseño no experimental transeccional descriptivo. Se consideró como población de estudio al personal de los departamentos de aduanas, compras, ventas y embarques. Para recolectar la información se utilizó el método de encuesta, a través del diseño de un cuestionario validado por expertos, y la confiabilidad del instrumento fue comprobada a través del coeficiente Alfa de Cronbach. El cuestionario fue administrado a 19 empleados considerados en la muestra de este estudio. Los resultados obtenidos muestran que existe dependencia entre la variable tiempo del despacho aduanero y los factores administrativos: capacitación, comunicación y organización.



Despacho aduanero, Maquiladora, Importación

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Introduction

Ciudad Juarez is a border city belonging to the state of Chihuahua, Mexico; due to its strategic location close to the United States of America, it attracts foreign investment through the establishment of companies belonging to the maquiladora export industry sector. These companies import raw materials and manufacture the product in Mexico and then export it to different countries, so international logistics and supply are key elements of success for these companies (Blanco, García, Avelar, Maldonado and Canales, 2015).

Maquiladora export companies depend to a large extent on supply chain processes: the supply of raw materials from suppliers, the logistics used, import processes, internal logistics systems during the production process, distribution procedures for the finished product and logistics in export processes (Sánchez and Ravelo, 2010).

According to Soin (2004) there are internal and external elements that impact the fluidity of the supply chain. In maquila companies, some of the internal factors that affect the operation of the supply chain are: logistics in the handling and movement of products and services, customer relationship management, information systems and technology used; flexibility to organisational changes, decision making and organisational factors, such as employee performance, skills and behaviour.

In terms of external factors affecting the supply chain, it is mainly the customs clearance, which is the mandatory act for all those involved in trade. However, customs clearance and all the formalities that are part of it become daunting processes (Lenin and Zamora, 2015).

Therefore, it is essential that customs and companies optimise the trade process to provide security in the markets and thus ensure the timely delivery of goods, resulting in reduced costs in international trade (Lenin and Zamora, 2015).

Efficiency in the customs processes of maquila companies is a fundamental factor in their operation, which is why it is important for them to have various strategies and tools that allow them to optimise their customs activities and achieve a more fluid and agile international trade.

Customs clearance is composed of the set of formalities and actions that are carried out at the time of entry and exit of goods from one country to another, through the different types of traffic, land, rail, sea and air. Customs regimes play a fundamental role in the customs law, generating the process of operations before customs, complying with the transmission of the corresponding information through an electronic customs system (Cámara de Diputados del H. Congreso de la Union, 2024).

An administrative process is made up of activities, sequenced, repetitive and connected to each other in a systematised manner, the correct execution of which has the same purpose. In the work environment, processes have always existed as the most natural way to organise work, however, in order to correctly identify the correct steps to follow according to the process to be carried out, it is necessary to delimit the limits based on their function, assign responsibilities and identify the elements and interactions to make a successful process possible.

Nowadays, the task of producing efficiently while avoiding delays in the delivery of the finished product has become essential for companies that wish to remain in a competitive commercial market linked to elementary factors for survival, such as quick responses, quality and delivery times are paramount. Thus, business processes have become a crucial factor for manufacturing companies seeking to cope with international trade (Arango, Campuzano, and Zapata, 2015).

Internally, organisations have been influenced by several factors, which have resulted in providing time and resources for new work routines, which are based on teamwork, cooperation and observation; to achieve this, it is necessary to invest in the necessary tools to help accomplish these tasks, such as the application of new technologies, constant training and coaching of employees, and investing in knowledge.

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Training and communication become key tools for the functioning of the operations and activities of the maquila industries (Beltrán and Cabiativa, 2008).

Based on the above, we proceeded with the analysis of the customs clearance process of a maquiladora company in the electronics sector located in Ciudad Juárez, Chihuahua.

Customs operations in the maquiladora company considered in this research project tend to be affected by the speed and fluidity of customs clearance processes, causing stoppages in operations, delays in the delivery of finished products, increased costs due to overtime and reprimands to customs personnel due to the slow crossing of some goods.

The clearance times present delays in each daily export and import operation to be carried out, which causes fewer commercial operations per day, increases the wait for the arrival of raw materials and customer dissatisfaction due to late deliveries.

The general objective of this research was to identify the administrative factors that influence the process time of customs clearance operations in the maquiladora industry of the electronics sector in Ciudad Juárez, Chihuahua.

The identification of the administrative factors that influence the process time of customs clearance operations will allow companies to optimise their processes by eliminating bottlenecks, strengthening weak points and reducing the time of operations, which will allow them to increase their productivity and efficiency.

Methodology

The nature of the research was quantitative, non-experimental, descriptive, cross-sectional design.

The study was conducted in the following functional areas of the company: customs, purchasing, sales and shipping, of a manufacturing company belonging to the maquiladora sector, in Ciudad Juárez, Chihuahua. The study population consisted of 19 employees belonging to the aforementioned areas (table 1).

Box 1

Table 1
Staff by areas participating in the study

Department	Employees
Customs	4
Sales	3
Purchasing	7
Shipments	5
Total	**19**

Source: Own elaboration

The sample was obtained according to the population involved and the formula for finite populations was used, generating a result of 18.75 people. To collect the information, the survey method was used, through the design of a questionnaire, validating the content of the research instrument through the technique of expert judgement in the areas involved (Galicia, Balderrama and Navarro, 2017). According to table 2, it integrates the elements of coherence, clarity and impartiality of the instrument, suggesting the adjustment of some questions which were identified and improved for validation.

Box 2

Table 2
Expert validation

Expert	Coherence		Clarity		Impartiality	
	YES	NO	YES	NO	YES	NO
1	X		X			X
2	X		X		X	X
3	X		X			X
4		X	X		X	
5	X		X			X

Source: Own elaboration

The validity of the questionnaire was tested under Cronbach's Alpha coefficient which is a tool that takes values between 0 and 1. The closer to 1, the greater the veracity of the instrument used (Darren & Mallery, 2003).

The designed measurement instrument obtained a reliability of 0.923 in the Cronbach's Alpha range, which is an excellent acceptance criterion according to table 3.

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Box 3

Table 3
Cronbach's Alpha Reliability

Cronbach's Alpha	No. of Items	No. of participants
.923	16	19

Source: Own elaboration

The questionnaire consisted of 16 questions, distributed in 3 dimensions corresponding to the study variables. For the answers to each question, a Likert scale was used with values from lowest to highest, where 1 has a scale of never and 5 is very frequently. The questionnaire was physically administered to the 19 employees considered in the sample of this study.

The operationalisation of variables is a process of separation and observation of the variable into its components, which allows it to be measured (Morán & Alvarado, 2010). Accordingly, Table 4 is presented, in which the components of the selected variables are developed.

Box 4

Table 4
Variables and dimensions

Variable	Dimension	Ítems
Independent: Administrative factors	Training Communication Organisation	1, 8, 9, 16, 2, 7, 10, 15, 3, 6, 11, 14,
Dependent: Customs clearance time	Import time	4, 5, 12, 13

Source: Own elaboration

In addition, a checklist was designed to record the activities and times in minutes of the operations carried out in the customs, purchasing, sales and shipping areas of the company studied.

The information collected was analysed using SPSS statistical software.

Results

The results obtained for the objective of this research are presented below.

Objective

To identify the administrative factors that influence the process time of customs clearance operations in a maquiladora company in the electronics sector in Ciudad Juárez, Chihuahua.

Hypothesis

Ho: Administrative factors do not influence the time of the customs clearance process in the maquiladora industry of the electronics sector in Ciudad Juárez, Chihuahua.

Ha: Administrative factors do influence the time of the customs clearance process in the maquiladora industry of the electronics sector in Ciudad Juarez, Chihuahua.

The analysis of the information collected, carried out using Chi-square and contingency tables, identified the following as the main administrative factors that influence the processing time of customs clearance operations: training, communication, and organisation.

The results for each of the factors identified are presented below.

Training

Table 5 presents the result of the Chi-Square test to identify whether there is a dependence between customs clearance time and training.

Box 5

Table 5
Chi-square test training dimension

Value		df	Asvmp Sig (2-sided)
Pearson Chi-Square	15.354	3	.002
es Likelihood Ratio	19.585	3	.000
Linear-by-Linear Association	11.558	1	.001
N of Valid Cases	19		

Source: Own elaboration

The relationship is dictated by Pearson's correlation coefficient (rho), and according to the result obtained, there is indeed a dependence between the training dimension and the customs clearance time variable, since the ^{c2} as shown in table 3 with a value of 15.354 is greater than the critical value of 7.815 and a p-value = 0.002.

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Training in companies seeks to ensure that employees obtain and develop the skills necessary for the position they hold. It is deeply rooted in the organisation's systems, the lack of which can affect the daily operations of the maquiladora, so it must provide teaching, learning and tools that allow the skills of employees to flow and thus achieve the intended goals of the position (Parra and Rodriguez, 2015).

Communication

Table 6 shows the result of the Chi-Square test to identify whether there is dependence between the variable customs clearance time and the communication dimension. When calculating the Chi-Square test, according to the result obtained, it was determined that there is dependence between the variable customs clearance time and the communication dimension, since the c^2 calculated in Table 17 with a value of 12.436 is greater than the critical value of 7.815 and a p-value = 0.002.

Box 6

Table 6
Chi-square test communication dimension

	Value	df	Asvmp Sig (2-sided)
Pearson Chi-Square	12.436	2	.002
es Likelihood Ratio	15.856	2	.000
Linear-by-Linear Association	9.659	1	.002
N of Valid Cases	19		

Source: Own elaboration

The result obtained coincides with De Castro (2014), with regard to the continuous affectation in the internal operations of the companies due to the lack of communication.

Organisation

When performing the Chi-squared test to identify whether there is dependence between the customs clearance variable and the organisation dimension, according to the data collected, the result obtained showed that there is dependence. Table 7 shows that the c^2 had a value of 15.308, higher than the critical value of 5.991 and a p-value of 0.000.

Box 7

Table 7
Chi-square test organisational dimension

	Value	df	Asvmp Sig (2-sided)
Pearson Chi-Square	15.308	2	.000
es Likelihood Ratio	19.362	2	.000
Linear-by-Linear Association	12.117	1	.000
N of Valid Cases	19		

Source: Own elaboration

According to the results obtained, there is dependence between the customs clearance time variable and the administrative factors: training, communication and organisation, therefore, Ho: Administrative factors do not influence the customs clearance process time in the maquiladora industry of the electronics sector in Ciudad Juárez, Chihuahua with a significance level of 0.05 is rejected.

Conclusions

The optimisation of the activities involved in the customs clearance of local companies is a matter of great concern. This operation plays a crucial role, as this process allows the legal entry or exit of goods through customs, complying with the regulations and standards determined.

The internal operations between the departments of a maquiladora company require an effective analysis to identify areas of opportunity and improvement, in order to reduce the time of the internal process. The present study identified different organisational factors influencing the process and time mentioned above, within which several elements were detected and sized in three categories, training, organisation and communication.

A DAT 2024 measurement instrument was developed with a total of 16 questions with which the perception and ideals of the different departments involved in clearance, customs, purchasing, sales and shipping were evaluated. The questions were sized as independent variables of the three categories mentioned above, and the time of customs clearance was integrated as a dependent variable.

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The instrument was analysed with the statistical programme SPSS 21 for Windows; the results were measured with the Chi-square statistical test, which was used to determine if there is significant dependence between the administrative factors, training, organisation and communication and the time of the internal customs clearance process of the maquiladora company.

The results obtained for the training variable, the ^{c2} calculated with a value of 15.354 was higher than the critical value of 7.815 and a p-value = 0.00. On the other hand, the result obtained for the communication variable, the ^{c2} calculated with a value of 12.436 was higher than the critical value of 7.815 and a p-value = 0.002.

Finally, the result obtained for the organisation variable calculated with a value of 15.308 was higher than the critical value of 5.991 and a p-value = 0.000.

According to the above results, following up on the hypotheses stated, the null hypothesis was rejected, which states: Administrative factors do not influence the time of the customs clearance process in the maquiladora industry of the electronics sector in Ciudad Juárez, Chihuahua with a significance level of 0.05.

The data obtained allow us to establish an improvement plan in the different departments in which the proposal to measure the times of each operation will be generated, to establish the necessary improvements and changes and to determine statistically whether the improvements implemented will generate a significant change in the time of the customs clearance process in the maquiladora industry of the electronics sector in Ciudad Juárez, Chihuahua.

The product obtained once the changes, improvements and the measurement of departmental process times have been implemented will generate another data analysis and statistical tests to determine whether the recommendations and approach generated in this study will improve the time efficiency of customs clearance in the maquiladora industry of the electronics sector in Ciudad Juárez, Chihuahua.

Declarations

Conflict of interest

The authors declare that they have no conflicts of interest. They have no known competing financial interests or personal relationships that might have appeared to influence the article reported in this paper.

Authors' contribution

Castro Ramírez, Vianey Iliana: Contributed the idea of the research project, the approach, methodology, data collection and analysis, results and conclusions.

Portillo Castillo, Víctor Manuel: Contributed to the research approach, methodology, results and conclusions.

Mejía Hernández, Marisela: Contributed to the research approach and methodology.

Availability of data and materials

The data obtained and the instruments used for the collection of information in this research are available upon request to the authors.

Funding

This research was carried out without funding from any institution or body.

Abbreviations

DAT	Customs clearance time

References

Background

Blanco Fernández, J., García Alcaraz, J. L., Avelar Sosa, L., Maldonado Macías, A. A., y Canales Valdivieso, I. (2015). La logística internacional y su impacto en la eficiencia de la cadena de suministro en maquiladoras de Ciudad Juárez. Cultura Científica Y Tecnológica, (49).

Cámara de Diputados del H. Congreso de la Union. (2024). Ley Aduanera. Cámara de Diputados. Mexico.

ISSN: 2524-2032
RENIECYT-CONAHCYT: 1702902

Fernández de Velasco, J. (2014). Gestion Por Procesos. Madrid: ESIC Editorial.

Lenin, J., & Zamora, A. (2015). Competitividad de la administración de las aduanas en el marco del comercio internacional. Contaduría y administración, 205-228.

Sánchez, S., y Ravelo, P. (2010). Cultura obrera en las maquiladoras de Ciudad Juárez en tiempos catastróficos. *El Cotidiano*, 19-25.

Soin, S. (2004). Critical success factors in supply chain management at high technology companies. University of Southern Queensland.

Basics

Arango, M., Campuzano, L., y Zapata, J. (2015). Mejoramiento de procesos de manufactura utilizando Kanban. Revista Ingenierías Universidad de Medellín, 221-233

Beltran, S., y Cabiativa, J. (2008). Análisis de la influencia de los factores comunicación y capacitación en el clima y la cultura organizacional de la empresa. Universidad De La Salle.

Darren , G., y Mallery, P. (2003). SPSS for Windows Step by Step: A Simple Guide and Reference, 11.0 Update. Universidad de Michigan: Allyn and Bacon.

Galicia, L., Balderrama, J., y Navarro, R. (2017). Validez de contenido por juicio de expertos: propuesta de una herramienta virtual. Universidad de Guadalajara. Apertura, 42-53.

Morán, G., y Alvarado, D. (2010). *Métodos de investigación.* México: PEARSON EDUCACIÓN.

Support

De Castro, A. (2014). Comunicación organizacional. Técnicas y estrategias. Universidad del Norte.

Parra, C., y Rodríguez, F. (2015). La capacitación y su efecto en la calidad dentro de las organizaciones. Revista de Investigación Desarrollo e Innovación. 131-143.

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Castro-Ramírez, Vianey Iliana, Portillo-Castillo, Víctor Manuel and Mejía-Hernández, Marisela. [2024]. Administrative factors that affect customs clearance in an electronics manufacturing company in Ciudad Juárez, Chihuahua. Journal-International Economy. 8[14]-1-7: e10814107.
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Article

Study of the organizational behavior of the sales force in medium-sized companies through the comparative method

Estudio del comportamiento organizativo de la fuerza de ventas en medianas empresas a través del método comparativo

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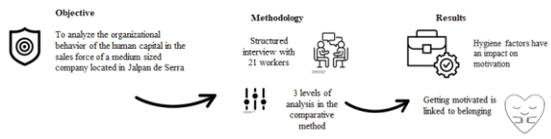
Abstract

The study focuses on the organizational behavior of a medium-sized company in the Sierra Gorda of Querétaro, emphasizing the performance of the sales department in relation to various variables. The analysis is comparative and considers different levels and job categories within the sales department, facilitating the understanding of performance. The results were obtained from 21 structured interviews in two job categories. At the individual level, age was found to be a differential variable between general assistants and salespeople, with the latter being more experienced. Additionally, a decrease in physical abilities was observed in both groups. At the group level, there is a perception of a good work environment regarding personal relationships, where personal interaction influences the evaluation of leaders..



Behavior, teamwork and motivation

Resumen

El estudio se centra en el comportamiento organizacional de una mediana empresa en la Sierra Gorda de Querétaro, enfocándose en el desempeño del área de ventas en relación con diversas variables. El análisis es comparativo y considera diferentes niveles y categorías de puestos dentro del área de ventas, facilitando la comprensión del desempeño. Los resultados se obtuvieron a partir de 21 entrevistas estructuradas en dos categorías de puestos. A nivel individual, se encontró que la edad es una variable diferencial entre ayudantes generales y vendedores, siendo estos últimos más experimentados. Además, se observó una disminución en las habilidades físicas en ambos grupos. A nivel grupal, se percibe un buen clima laboral en cuanto a las relaciones personales, donde la interacción personal influye en la evaluación de los líderes.

Comportamiento, trabajo en equipo, motivación

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Introduction

The importance of the current study is derived from its focus on organizational behavior at a medium-sized business in Queretaro's Sierra Gorda region and its analysis of the performance of the company's sales force in response to variables affecting organizational behavior.

The analysis was carried out at a comparative level, taking as a point of departure the acceptance of each of the variables, distributed by level of analysis and job classifications within the sales department. This allows for a greater analysis and a deeper understanding of employee job performance.

Results are derived from the application of 21 structured interviews among two different job classifications.

Analyzing results at the level of the individual, age represents a differential variable between general assistants and salespeople. General assistants tend to have accumulated more work experience and have been promoted to their position. Moreover, physical ability appears to be diminished among the general assistants of both groups.

Regarding personal relationship, at the group level there exists the perception of a positive work environment. Relevant to this study, the quality of personal interactions among employees plays a role in the evaluation of a good or bad leader.

The added value of this study's analysis resides in its ability to identify the set of variables needed to create a model of motivation for sales departments with an average of a high school education. Considering the organizational aspect, the current level of economic remuneration for the work is perceived positively. Extrinsic factors play an important role in perceived motivation. For example, companies providing adequate uniforms for increased efficiency and exercise programs for to improve the physical condition of the workers as part of the organization's benefits.

The sections of this document are distributed in the following manner: a literature review of the fundamental theories from basic authors such as Chiavenato and the characterization of organizational behavior and its associated variables, followed by an explanation of the study's methodology and a demonstration of the model of analysis used along with the composition of the levels of analysis, and ending with a presentation of the results through comparative tables organized by position and, in the case of joint work, also organized by the dynamic of the sellers.

Literature review

In the current economic context, companies confront diverse challenges that threaten their place in the market: changes in consumer preferences, immediate access to products and services through digital mediums and the newly available variety of payment options.

It is thus indispensable to develop strategies that adapt to the so called "new normal," for which an analysis of organizational and sales strengths is a watershed in the decision making process.

The industry, in any of its sectors, can be considered a living entity - constantly evolving and totally tied with not only the behavior of the members of the organization but also the market and its waves of new desires and needs.

Companies achieve success in their markets by virtue of human capital, the most fundamental unit of the company. This is to say that the most valuable and important asset of any organization are its people. Through them, sales are converted into an indicator of success within the company.

Linking these two concepts, the salesforces, according to León (2013) , is the entire workforce whose objective and principal function is to respond to consumer demands by offering products and/or services that are seen as beneficial and attractive for both the company and the counterpart.

In this way, it is possible to address the objectives of the salesforce. Even if it is easy to identify sales as the central axis, this concept goes much farther. It can be understood as the connecting buyers and sellers.

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Given that the interests of both must be mediated, the salesforce serves as a representative of the company to consumers at the moment of communicating information from a catalog of products or services. At the same time, the salesforce also provides the company feedback about the needs and interests of the consumers.

Independent of the more corporate implications, there also exists a classification of the sales team that is more oriented towards achieving institutional goals. Hernández and Duana (2021) describe the relevant characteristics of the structure of a sales team according to geographic area, product, and function (when the activities are specialized)

It is not only relevant to mention how resources are organized but rather the type of sales force to employ as well, Suárez (2019) , as the digital journal *Marketing Insider Review* mentions:

- Human sales force; refers to the people that conform the team, sellers, supervisors, and executives.
- Material sales force; focuses on the tools and new technologies to market products.
- Internal sales forces; the human capital of this team belongs to the company which consequently provides the company with a greater control of it

The importance of the sales forces becomes clearer when considering that the common ground between organizations of all types is achieving goals through proper resource management in the area of sales.

In this context, the current study focuses on conducting an analysis of human capital through a study of organizational behavior within the sales department of the company being analyzed.

Human capital is the capital of people, talents, and competencies (abilities). It is the capacity to act in diverse situations to produce both tangible and intangible assets. It is not enough for an organization to simply employ individuals, an adequate organizational structure as well as a democratic and innovative culture are also necessary. Chiavenato (2011).

Being directly related to human individuals, working with human capital presents significant challenges as it encompasses emotions, idiosyncrasies, and additional, difficult to measure aspects outside of the organization's control. Nevertheless, no organization can achieve success if not for its people; this is the importance of human capital.

As a result of changes in social stimuli over the last few years, previous definitions of human capital have evolved and created the need to dig deeper into a detailed perspective.

According to Gallego y Naranjo (2021) human capital is a combination of assimilated elements brought together by intangibles. They pose that a majority of jobs have considered four or five of the seven components: values, attitudes, aptitudes, capacities, competencies, knowledge, abilities, experience, learning, and others.

Finally, it is critical to establish a definition of organizational behavior as it serves as the link between human capital and a sales force.

Alles (2017), in the book "Comportamiento organizacional: cómo lograr un cambio cultural a través de la gestión por competencias" describes organizational behavior as everything related to the people in the organizational environment: from the organization's most high ranking members to its most entry-level positions, individual actors and group actors, individuals seen from their own perspective to individuals as viewed by their bosses or other executives, the problems or conflicts and the virtuous circles of growth and development.

Currently many companies are betting on a strategy that provides workers with labor conditions that allow them to develop their maximum potential, and consequently increase productivity – an outcome reflected in the achievement of company objectives.

As support for this idea, Chiavenato (2022) , describes a few characteristics of organizational behavior:

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- It is an applied discipline related to the practices that, through the management of personnel, help individuals attain high levels of achievement and foster a mutual understanding for both parties.

- Hypothesis and generalizations regarding the dynamic of behavior within the organization that are empirically verified.

- Findings are complemented by behavioral studies from distinct scientific perspectives and areas of study.

When discussing behavior, an immediate link is formed between the ways in which a person or group of people act, but this depends on a number of variables that are influenced by the development and personal aspirations of staff members. There is then a need for studies whose objective can synthesize the following:

- Systematically describe how people behave in a determined variety of circumstances.

- Understand why individuals act in the ways they do.

- Predict future behavior.

- Control, to the degree possible, and obtain or achieve certain expected behaviors among individuals in the workplace, for example, in productive material.

- Wield the organizational culture to resolve any identified problems or to align individuals with organizational strategies (Alles, 2017).

A point to consider is how the size of an organization affects what type of study should be conducted. Larger companies generally encourage more standardized behaviors. PyMES, on the other hand, have often barely developed an institutional mission or vision statement - creating confusion among employees as to the expectations of the company as well as difficulty for analysts searching to improve the human capital.

The organization being studied corresponds to the small and medium-sized company category, and it can be assumed that organizational behavior will conform to similarly sized companies. Nevertheless, there is no specific model for this sector, Jiménez et al., (2021) suggests fusing the two models of organizational behavior to better analyze the organizational behavior or small and medium-sized companies.

Jiménez et al., (2021) proposes establishing as independent variables those at the organizational, group, and individual level. As a dependent variable, all of these influence the efficiency of the organization - considering for example productivity and absenteeism. On the other hand, and as a second option, they propose the value in considering a model oriented towards innovation within the market and as an organization.

Methodology

Objective

Analyze the organizational behavior of human capital within the sales force of a medium-sized company in the municipality of Jalpan de Serra.

Model analysis

Figure 1, structure of the organizational analysis by levels, shows how the organizational analysis was structured. Corresponding variables are grouped in each box.

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Box 1

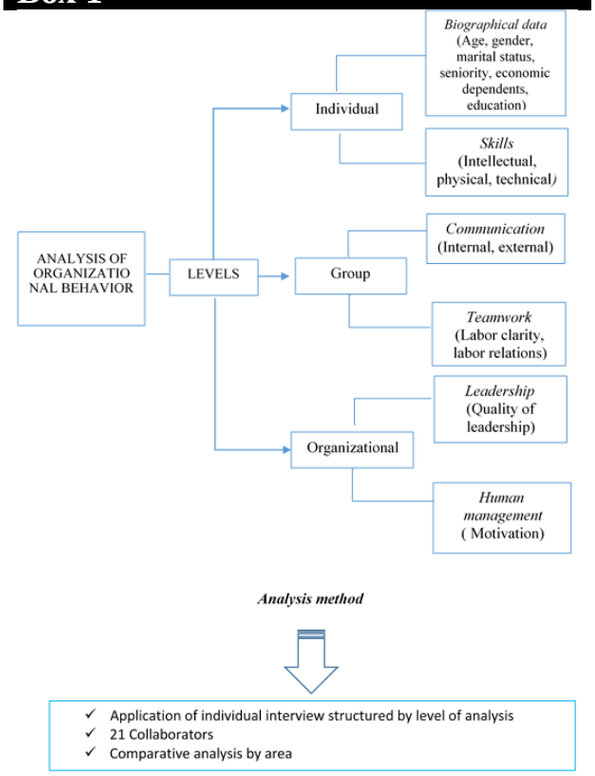

Figure 1
Organizational analysis by levels
Source: Own elaboration

Definition of the variables

Individual variables

Biographic/Personal Characteristics

According to Bartolo (2018) , within organizational behavior, biographic information is an unmodifiable yet important factor that determines the employee profile and must be considered. It is then relevant for the company to have knowledge of the personal characteristics of their collaborators as a way of knowing what they are capable of doing and learning, basing their analysis on experience accumulated throughout the employee's life. Relevant criteria include age, origin, level of educational attainment, gender, and marital status. These characteristics influence the individuals' behavior within the organization and form part of the primary data to obtain.

Abilities

It is of vital importance that the company is aware of the skills of its personnel when they join the organization, in order to identify their appropriate area of work or if they meet the requirements to be part of the available vacancy.

In addition to being important also to know based on what you already know what would be easier to learn within the organization, based on the theory that human capital can be classified according to their education, i.e. what they have already learned academically throughout their lives and training refers to the knowledge acquired during their stay in the organization, among which we find physical, intellectual and technical skills. (Chiavenato, 2009).

Workgroup variables

Communication

Communication is an indispensable element within any process that you want to carry out with one or more people.

Communication contributes to company development in addition to provoking changes in the staff: motivating them and encouraging them to develop professional relationships understanding that the work team, is one of the company's audiences. (Alves, 2023).

Teamwork

Every company lays out a variety of shared objectives with the hopes of meeting them by delegating activities to teams that bring together diverse individuals who work towards the fulfillment of company objectives. According to Gómez and Acosta (2003) it is this focus on results that differentiates and team and work group.

Variable at the level of the organization

Leadership

Leadership is directly related to the capacity to influence others, and in this case orient them toward meeting the objectives of the company (Becerra, 2010).

Human Management

Human management within companies is a broad and important field, but in this case, it will serve specifically as a lens to understand how satisfied or dissatisfied employees are with the payment they receive from the company for achieving their respective sales targets (Jara et al, 2018).

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The comparative method

Grounded in the arguments of Steward (2024) the qualitative and quantitative analysis focuses on identifying patterns using a limited number of cases and treating them as configurations of attributes or conditions. In this way, the qualitative researchers can determine what conditions produce certain results, allowing for both a detailed and general understanding. This method simplifies complex data while maintaining the depth of each case while at the same time differentiating the relationship between conditions and results.

Having defined the variables, it is necessary to add that the method of analysis is comparative. In this case, the purpose of a comparative analysis is to produce a horizontal analysis by level within which each variable can be analyzed under the criteria of homogeneity, as mentioned in Tonon de Toscano (2011) – it being the identity of class that legitimizes the comparison.

The definition of the variables, by establishing their attributes and properties, allows for systematic analysis.

Results

Regarding the collection of data, the researchers were able to apply the instrument to 21 of the 23 individuals who make up the sales force. Ten of the individuals interviewed are sales people and the remaining 11 are general assistants. From this distinction of job category, the comparative aspect of the study was derived. By basing the analysis on the previously mentioned variables from the methodology section, the study attempts to present the perspective of employees according to job title taking from information that was obtained during the application of the instrument.

Individual variables

A comparative table of the biographical data of the sales force is presented below.

Box 2

Table 1

Comparative table of the biographical characteristics of the sales force

Biographic/Personal Characteristics		
Analysis criteria	**Salespeople**	**General Assistant**
Age	Currently, the sales position ranges in age from 25 to 52 years old.	The age range of the general assistant position is from 19 years old to 55 years old.
Marital status	Married and common-law marriage	The predominant marital statuses in the position of general assistant are: common-law marriage and single.
Seniority in the position	Considering that one of the criteria to become an agency salesperson is to have previously worked in the company as a general assistant, the seniority range of salespeople currently goes from 2 years to 23 years.	Since it is the main position that most seeks to recruit personnel and does not require prior work experience, the age range for this position currently goes from 19 to 55 years old. However, it recruits personnel with a minimum age of 18 years old.
Financial dependents	Taking into account the marital status of the salespersons, they reported having between 2 and 6 financial dependents.	As for the helpers, they have up to a maximum of 4 people as economic dependents. In this case, it is noteworthy that most of the young people are single and make financial contributions to their households, but they do not cover all of their expenses.
Educational level	With respect to this criterion, it is not an indispensable requirement in the sales force positions, given that, in the case of salespeople, they must have previous experience in the company with the intention of identifying products and the territories included in their route, in terms of the activities they perform as salespeople, the company itself is responsible for training them, in this case with respect to the management of the sales system, which is why the upper secondary level is the predominant level of schooling in the group of salespeople. group of salespeople.	With respect to general assistants, the predominant level of schooling among young people is high school, while among adults who are also general assistants, high school is the most common. It is noteworthy, however, that only one of the general assistants has a higher technical degree.

Source: Own elaboration

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Following is a comparative table the presents the abilities variable.

Box 3

Table 2

Comparative table of the variable: skills

Skills		
Analysis criteria	**Salespeople**	**General Assistant**
Intellectual Skills	In light of the enumeration of the intellectual skills that can be applied and potentially developed in a professional setting, sales professionals have identified that they possess these abilities. Conversely, they have also highlighted the presence of additional skills, including oral expression and the capacity to swiftly and effectively address cognitive challenges.	With regard to the general assistants, it is notable that only those with greater tenure in the role are aware that they have acquired the competencies enumerated. Those with less than six years of seniority, however, believe that they have not yet developed all of these skills.
Physical skills	The salespeople concurred that their abilities had enhanced when they were initially employed as assistants. Nevertheless, at the present time, they corroborate that their physical capabilities have diminished.	According to the information obtained, the general assistants confirm that their physical abilities have improved as a result of their work activities. However, employees with more than 10 years of seniority, which would be adults, mentioned that their skills such as physical endurance have decreased.
Technical Skills	Regarding technical skills, the instrument applied to the salespeople highlights that most of them developed their technical skills based on their own experience and were only trained in the use and management of the sales system.	With respect to the assistants, it is noteworthy that there is a greater response regarding the way in which they have acquired the technical skills. Some mentioned that they acquired them at school, since they have a high school level. Others mention that they have not yet developed some of the skills and, on the other hand, others recognize that they have acquired them through training, since the senior assistants have passed on their knowledge to the newcomers.

Source: Own elaboration

Workgroup

Next is a comparative table for the communication variable and its respective criteria at the group level.

Box 4

Table 3

Comparative table of the communication variable and its respective criteria at workgroup level

Communication		
Analysis criteria	**Salespeople**	**General Assistant**
Internal Communication	This point is of vital importance for the company and the fulfillment of its objectives, specifically the sales goals, since these are divided among the 10 routes, with meetings scheduled at least twice a week to review results. According to the salespeople, they receive the corresponding information via WhatsApp and provide feedback on their results at the meetings.	As for the assistants, information about the goals and their process is made known to them through the meetings. However, they mention that sometimes there is no immediate response to their requests, such as requesting vacation time.
External Communication	In terms of external communication, the salespeople are satisfied with the tasks involved, however, they feel that this could be improved by supplementing their uniforms and changing their work units.	Like the salespeople, the assistants are satisfied with performing these tasks, but they would like their work uniform to be more complete.

Source: Own elaboration

The following is a comparison table of the Teamwork variable. In this case, the comparison was made between two sales groups that are part of the organization's sales force.

Box 5

Table 4

Comparative table for the teamwork variable

Teamwork		
Analysis criteria	**"Centellas"**	**"Infieles"**
Work Clarity	The sales group of the "centellas" is aware of their role in the company: to sell. However, they mention the need to change their work equipment (cell phones and printers), as they are constantly failing. They know who to contact depending on the nature of the problem at hand.	Similarly, the group is aware of their role within the company. They have mentioned that their vehicles are in poor condition and have suggested general maintenance or replacement. In the absence of a sales supervisor, this group communicates only with the manager.
Labor Relations	With regard to working relationships, in this case each of the five routes that comprise the group agrees that the working relationship is based on trust and mutual respect, and that they are able to fulfill their tasks as a team, distributing their activities among themselves.	As for labor relations within the work teams, they are treated with respect. However, in some of the routes, colleagues do not do their part to improve work efficiency. However, other comments mention that they manage to organize themselves very well and distribute the work fairly due to the current lack of personnel in the company.

Source: Own elaboration

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Variable at the level of the organization

The following is a comparative table of the leadership variable at the organizational level.

Box 6

Table 5

Comparative table of the leadership variable at the organizational level.

Leadership		
Analysis criteria	**Salesperson**	**General Assistant**
Quality of leadership	In the case of the salespeople, their leaders are the supervisor and the agency manager; however, one of the sales groups (unfaithful) does not currently have a supervisor, which is why the manager assumes that role. Regarding the leadership exercised by the "centellas" supervisor, the salespeople qualify it as good and excellence. They also mention that he is a person who supports and helps the route whenever necessary, in addition to motivating them and informing them of their results. On the other hand, the "infieles" group recognizes that the manager does a good job as a supervisor, but that it is necessary for them to have a supervisor specifically for their group, since, they say, it could improve the company's situation, given the fact that the manager has a lot of work to do. Regarding the agency manager's leadership, the salespeople rate it as very good and excellent, and add that he is very patient with them when it comes to giving them indications about their sales goals and that he motivates them to meet them.	From what the salespeople mentioned, the general assistants rate the leadership of their supervisors as good and fair. They argue that the supervisor does not interact much with them, only with the salespeople. As for the agency manager's leadership, they rate it equally as very good and excellent, and mention that he is a very patient person with them.

Source: Own elaboration

Finally, the last comparative table, corresponding to the human management variable at the organizational level, is presented:

Box 7

Table 6

Comparative table of the human management variable

Human management		
Analysis criteria	**Salesperson**	**General Assistant**
Motivación	The salespeople mention that the type of motivation the company uses is to let them know the salary they could earn if the route meets their goals.	The general assistants mentioned the same motivation strategy, noting that the only type of motivation they receive is salary and bonuses.

Source: Own elaboration

Conclusions

Men account for the entirety of the salesforce studied in this investigation, and majority of them are from the Sierra Gorda region. In regards to their physical conditions, personnel had mentioned that if their uniforms were made of a higher quality fabric, it would be more comfortable for them to work. In this way, we found that hygiene factors are fundamental are critical for producing higher performance. Moreover, monetary compensation alone is not sufficient as a singular factor of motivation. This situation emphasizes the importance of good working conditions to achieve adequate performance, Madero (2020)

It should be added to the findings that organizational behavior encompasses motivational factors relating physical activity and interaction between colaborators. Physical activity that contributes to feelings of to an informal group, but that also determines satisfaction within work space. For this reason, company sponsered wellbeing programs have been created and are responsible for offering health plans with the objective being to increase productivity and reduce absenteeism Del Callejo Bañales (2018).

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Communication among the sales people is considerably effective as information arrives through two means. In reference to sales targets, the general assistants mention that communication is only effective between the sales person and manager – which is to say that the supervisor is not in regular contact with them – only at company meetings.

The personnel of the sales department all agree that responses to leave requests is slow; nevertheless, they are conscious of the fact that this is caused by lack of staff.

Another important commonality shared among the sales force through internal communication is that the personnel report that they would only leave the company for better pay. In external communications made by company personnel, they report being generally satisfied with their work, and they would only ask to replace the current material of their uniforms and that additionally they be provided withshoes and glasses (we will return to hygiene factors in the workplace).

People who have been in a position for a long time have a personal assessment of their technical and cognitive ability to perform processes within their company. This is therefore related by Ha (2024) mentions: performance is linked to the company's productivity.

In respect to the two different teams, job clarity between the two groups is not proportional due to the fact that one of the groups lacks a sales supervisor to orient them as they should. This could be an indicator of the results of each group.

Regarding the leadership of the supervisor of the “centellas” group, the general assistants consider that he does not manage to motivate them; on the contrary, he demands good results because he does not communicate sufficiently with them. However, they recognize and appreciate the support he provides to the routes when they have too much work. The group of “infieles” is grateful for the manager's role as supervisor, but requests that one be assigned to them.

Therefore, the relationship between groups and work teams is differentiated, in principle, by the nicknames used, “Centellas” and “Infieles”, in terms of the characteristics of the work team. From this perspective, by adding characteristics such as values and task effectiveness, a team presence is generated, which means higher productivity (Gómez and Mújica, 2003).

Finally, human development facilitated by the company, and towards which this case is directed, was identified as a significant area of improvement.

Declarations

Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence in this chapter.

Author contribution

Pedraza Huerta, María de Lourdes. Research development.

Morado Huerta, Ma. Guadalupe. Technical responsible for the research and general structuring of the article.

Márquez González, Olga. Theoretical basis
Valente, Verónica. Translation of the document

Availability of data and materials

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DOI: https://doi.org/10.35429/JIEC.2024.8.14.1.10

References

Antecedents

Chiavenato, I. (2011). Administración de recursos humanos. Mc Graw Hill.

Basics

Alles, M. (2017). Comportamiento organizacional segunda edición: cómo lograr un cambio cultural a través de la gestión por competencias. GRANICA.

Chiavenato, I. (2009). Comportamiento organizacional, la dinámica del éxito en las organizaciones. Mc Graw Hill.

Supports

Alves, O. F. (2023). Comunicación Empresarial y Desarrollo de Equipos. En O. F. Alves, Comportamiento organizacional (pág. 48). Freitas Bastos Editorial.

Bartolo Ramos, J. L. (2018). Características biográficas y el desempeño laboral de los trabajadores administrativos de la municipalidad distrital de Uchiza. Tesis para optar el título de licenciado en administración: Características biográficas y el desempeño laboral de los trabajadores administrativos de la municipalidad distrital de Uchiza. Tingo María, Perú: Universidad Nacional Agraría de la Selva.

Becerra, G. (2010). El liderazgo y su rol en las organizaciones transcomplejas. Visión gerencial (1), 30-42.

Chiavenato, I. (2009). Las personas en las organizaciones, microperspectiva del CO. En I. Chiavenato, Comportamiento Organizacional. La dinámica del éxito en las organizaciones (págs. 190-211). México: McGrawHill.

Gallego, C., & Naranjo, C. (2021). El capital humano de la empresa: Una propuesta de medición.

Gómez Mújica, A., & Acosta Rodríguez, H. (2003). Acerca del trabajo en grupos o equipos. ACIMED, 11(6).

Jara Martínez, A., Asmat Vega, N., Nancy, A. P., y Medina Guzmán, J. (2018). Gestión del talento humano como factor de mejoramiento de la gestión pública y desempeño laboral. Revista Venezolana de Gerencia, 23(83), 740-760

Jiménez, W., Silva, I., & Gallardo, W. (2021). Organización de la fuerza de ventas. Boletín Científico de las Ciencias Económico Administrativas del ICEA, 10(19), 40-42.

Suárez, P. (2019). La fuerza de ventas en la empresa; qué es, tipos y funciones.

Tonon de Toscano, G. (2011). La utilización del método comparativo en estudios cualitativos en ciencia política y ciencias sociales: diseño y desarrollo de una tesis doctoral. Kairos. Revista de temas sociales (27).

Differences

Stewart, L. (2024). atlas.ti.

Discussion

Del Callejo Bañales, M. (Diciembre de 2018). Satisfacción laboral: Estudio comparativo previo y posterior a la actividad física en HL de Tijuana, BC. Tesis para obtener el grado de Maestro en Administración: Satisfacción laboral: Estudio comparativo previo y posterior a la actividad física en HL de Tijuana, BC. Tijuana, Baja California, México.

Ha, K. V., Nguyen, A.T & Nguyen, T.T. N. (2024). Exploring the influence of transformational leadership on salesperson job performance: The mediating roles of self-efficacy and creativity Vietnamese smes. International Journal of Professional Business Review, 9(3).

Hernández, Mendoza, S., & Duana, Ávila, D. (2021). Organización de la fuerza de ventas. 10(19).

León Valbuena, I. (2013). Fuerza de ventas determinante de la competitividad empresarial. Revista de Ciencias Sociales, XIX(2), 379-389.

Madero Gómez, S. (2020). Factores de la teoría de Herzberg y el impacto de los incentivos en la satisfacción de los trabajadores. Acta Universitaria, 29.

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RENIECYT-CONAHCYT: 1702902

Pedraza-Huerta María de Lourdes, Morado-Huerta, Ma. Guadalupe, Márquez-Gónzalez, Olga and Valente, Verónica. [2024]. Study of the organizational behavior of the sales force in medium-sized companies through the comparative method. Journal-International Economy. 8[14]-1-10: e20814110. DOI: https://doi.org/10.35429/JIEC.2024.8.14.1.10

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Article

Proposal for standardization in the warping process in textile manufacturing

Propuesta de normalización en el proceso de urdido en la fabricación de textiles

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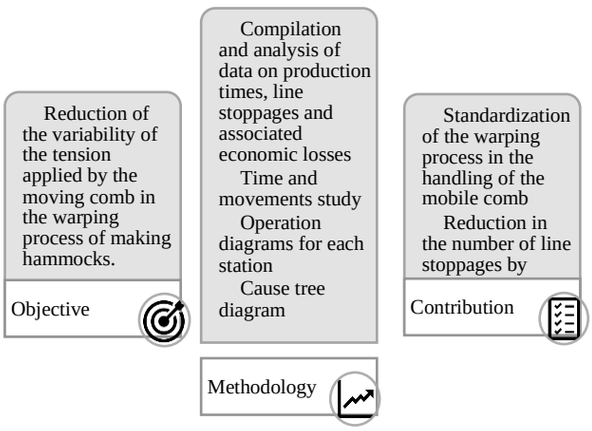
Abstract

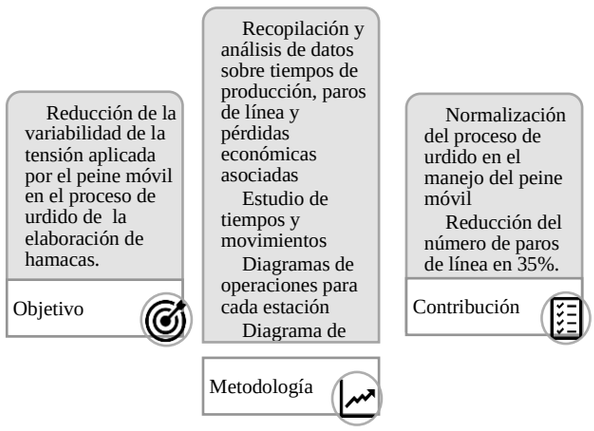
In a textile company focused on producing hammocks, the Warping Process presented line stoppages in its weavers related to the variability of the tension applied by the moving comb. This variability was identified as the main cause of reel defects, which account for 84% of line stoppages. It was found that 72% were caused by differences in the voltage with which they were made. To address the problem raised, a detailed analysis of line stoppages caused by defects in the reels and their impact on production was carried out. The methodology included the collection and analysis of data on production times, line stoppages and associated economic losses. Time and motion study techniques were implemented to identify the warping stations with the highest number of defects and operations diagrams were developed for each station.



Warping, Standardization, Textile process

Resumen

En una empresa textil enfocada en producir hamacas, el Proceso de Urdido presentó paros de línea en sus tejedoras relacionados con la variabilidad de la tensión aplicada por el peine móvil. Esta variabilidad fue identificada como causa principal de los defectos en los carretes, los cuales, representan el 84% de los paros de línea. Se encontró que el 72% eran provocados por diferencias de tensión con la que fueron elaborados. Para abordar la problemática planteada, se realizó un análisis detallado de los paros de línea causados por defectos en los carretes y su impacto en la producción. La metodología incluyó la recopilación y análisis de datos sobre los tiempos de producción, los paros de línea y las pérdidas económicas asociadas. Se implementaron técnicas de estudio de tiempos y movimientos para identificar las estaciones de urdido con mayor cantidad de defectos y se desarrollaron diagramas de operaciones para cada estación.



Urdido, Normalización, Proceso textil

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Introduction

The Warping Process is a fundamental stage in the Textile Industry, especially in the production of high quality fabrics. Standardization and normalization of production processes are essential to minimize variability and improve operational efficiency (Juran, 1999). In the context of warping, the tension applied by the moving reed is a critical factor that directly influences the quality of the final product and the efficiency of weaving machines (Smith & Miller, 2018).

In the textile industry, specifically in the production of hammocks, the Warping Process presents a number of challenges related to the variability of the tension applied by the moving reed (Dantzig, 2010). This variability has been identified as the main cause of reel defects, which account for 84% of line stoppages in weaving machines (Foster, 2017).

To address the issue raised, a detailed analysis of line stoppages caused by spool defects and their impact on production was performed (McGregor, 2021). The methodology included the collection and analysis of data on production times, line stoppages and associated economic losses (Murphy & Wood, 2016). Time and motion study techniques were implemented to identify the warping stations with the highest number of defects and operations diagrams were developed for each station (Hopp & Spearman, 2000). Arroyo and Ruiz (2018) point out that detailed analysis of line interruptions and identification of critical points in the process are essential to implement effective improvements and reduce downtime.

The historical data was reviewed, and it was found that during the period January-August 2022, 134 were caused by defects in the spools produced in the warping stations, which represents 84.8% of all those recorded.

An analysis of the defective spools was carried out, and it was found that 72% of the defects were caused by differences in the tension at which they were produced.

The Warping Process of each station was studied in detail, taking measurements of the height of the mobile reed with which it is worked and its distance from the spools that are filled with yarn, with the objective of finding the angle worked for each station, since this influences the final tension of the spools.

Also, the methodology used in the 4 warping stations for the handling of the mobile reed was analyzed, as well as the factors that influence the tension provided by the mobile reed, which are the initial conditions of the process.

With the data obtained from the study and analysis of all the warping stations, the normalization proposal was developed, matching in the other stations the working angle of the mobile reed, the initial conditions and methodology of the process of Station A, which is the one that showed the best performance in the period January-August 2022. Visual aids were developed for the operators to facilitate the new working conditions.

The proposal could be implemented as a pilot test in two stations for one month, in Station A and D, while in Station C only 8 reels were tested.

To analyze the results, the number of line stoppages recorded in the month of October (current method) was compared with those of November (proposed method) of the same year, based on stations A and D where the tests of the standardization proposal were carried out. In the month of October there were 45 line stoppages due to defective reels, while in the month of November there were only 29. This represents an improvement of 16 reels, which is 35.55 %.

A comparison was made of reels warped without the proposal, with those that were developed with it, where inspections were carried out.

A comparison was made between the reels developed without the proposal and those developed with it, where visual and hardness inspections were carried out, finding the latter with greater resistance to touch and blows, uniformity and number of turns within the specification limits.

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The company frequently fails to meet the daily production requirements due to line stoppages in the weaving machines. 84% of the line stoppages are due to the fact that the weaving machines are not working properly. Eighty-four percent of the line stoppages of the weaving machines are due to reel defects, the main reason being reel variability (Figure 1).

The Warping Process presents variability in most of its stages, which causes differences in yarn tension and yarn turns on the spools. The yarn tension is determined by the mobile reed, which is configured at a certain height and distance from the warping machine's rotation axis.

a) A line stoppage during the Weaving Process to adjust the thickness of the spools lasts an average of 2 to 3 hours.

b) For each hour of stoppage, 10 hammocks are lost.

c) For every hour of machine downtime, $1266.2 in finished product is lost.

Background

Standardization and Normalization

Standardization refers to the implementation of consistent procedures to ensure uniformity in production processes (ISO, 2015). Standardization in the manufacturing industry, and specifically in the textile industry, has proven to be an effective strategy to reduce variability and improve the quality of the final product (Shingo, 1989). According to Deming (1986), variability is the main enemy of quality, and its reduction should be a priority in any continuous improvement effort. Aguilar (2015) stresses the importance of process standardization to ensure quality and efficiency in textile production, highlighting that a systematic approach to standardization can lead to significant improvements in production.

Methodology and Improvement Tools

The methodology used to address variability in the Warping Process includes the study of times and movements, which is crucial to identify inefficiencies and areas for improvement (Gilbreth & Gilbreth, 1917; Niebel & Freivalds, 2008).

The implementation of visual aids and standardization of moving comb handling are key interventions to ensure that operators follow uniform procedures (Liker, 2004). Alarcón and García (2013) point out that the use of visual tools in quality management facilitates understanding and adherence to standardized processes, which reduces errors and increases operational efficiency.

Importance of Tension in the Warping Process

Yarn tension during the warping process is a fundamental parameter that affects the quality of the reel and, ultimately, the final fabric (Berkstresser & Sando, 1993). Variability in tension can cause defects that lead to line stoppages, negatively impacting productivity and production costs (Harrington, 1991). Previous studies have shown that tension optimization can significantly reduce defects and improve operational efficiency (Marsh, 2001). Cabrera and Hernandez (2017) emphasize that precise tension control is essential to maintain yarn integrity during warping and avoid problems in later stages of the textile process.

Time and Motion Analysis

Time and motion analysis is a technique used to study the time required to complete a task and the movements involved in its execution (Niebel & Freivalds, 2008). This analysis is fundamental for process standardization, as it allows identifying and eliminating unnecessary movements, thus reducing production time and improving efficiency (Monden, 1993). Gómez and Sánchez (2016) highlight that the application of the study of times and movements in the Textile Industry can result in a remarkable improvement in productivity and in the reduction of cycle times.

Methodology

Study area

Based on the problems raised, we proceeded to a more detailed analysis of the line stoppages caused by defects in the spools and how this affects the company. Table 1 shows the times obtained per machine for the production of a hammock and the machines assigned to each station.

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With the data shown, the average time taken by the machines for the production of a hammock was obtained (6 min.). The recording of the line stoppages of the machines in the logbook made it possible to trace the warping stations with the greatest number of defects. For this purpose, the number of stoppages per machine in the mentioned time span was first investigated (Figure 1).

Box 1

Table 1
Allocation of machines per station and average times

Average times per station			
Station	Assigned machines	Production time per hammock (min)	Average time (min)
A	M14	5.40	5.83
	M15	6.50	
	M16	6.50	
	M19	5.25	
	M20	5.50	
B	M9	6.00	6.61
	M10	6.09	
	M12	7.40	
	M17	5.38	
	M18	8.20	
C	M5	5.23	5.13
	M6	5.07	
	M7	5.38	
	M8	3.20	
	M11	6.79	
D	M1	6.00	6.25
	M2	5.40	
	M3	8.53	
	M4	7.17	
	M13	4.42	
	M21	6.32	
	M22	5.89	
		Average time =	6.005

Box 2

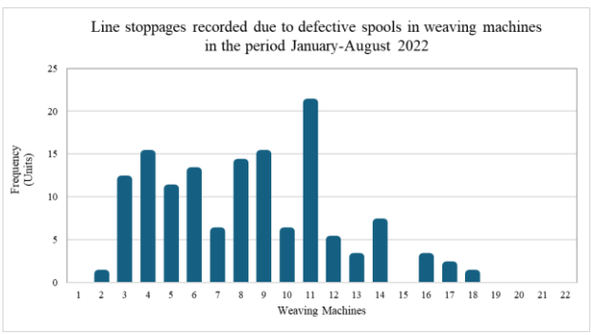

Figure 1
Line stoppages per warping station

After this, the relationship between the warping stations and the weaving machines was investigated. Each station is assigned a certain number of machines to which the finished reels are supplied (Figure 2).

It was identified that Station A is the one with the least number of defects in the mentioned period of time; on the other hand, Station C is the one with the highest number of defects in its reels.

Box 3

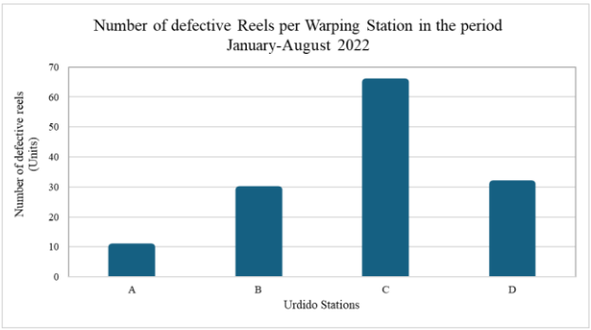

Figure 2
Number of defective spools per warping station

These two stations were analyzed to identify the differences in the process, and what activities contribute to these defects. Once the number of reel nonconformities at each station was quantified, the sources of these nonconformities were tracked more specifically. An Ishikawa diagram was made for the general search of the factors influencing the reel problems (Figure 3).

Box 4

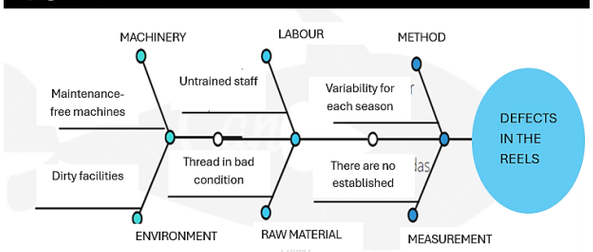

Figure 3
Identification of causes of defective reels

To quantify these causes, the historical data recorded in the logs were again identified, resulting in the following information shown in Figure 4.

To obtain the percentages of the causes that were not in the logbook, the number of occurrences of these causes in the preparation of the reels was identified.

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Box 5

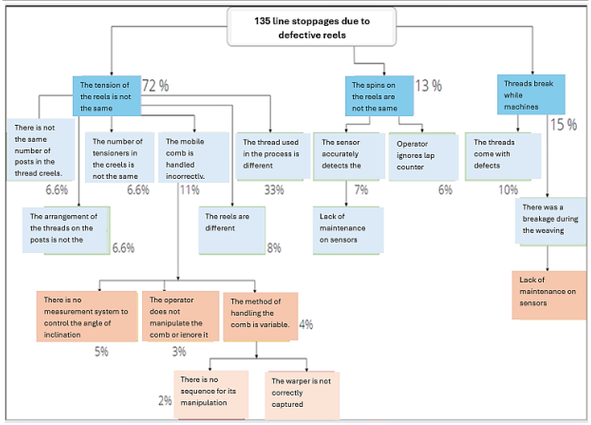

Figure 4
Tree diagram of causes of line stoppages due to defective reels

As can be seen in the tree of causes diagram, the variability between the spools produced in the warping stations is due to the fact that there is no methodology for the whole process, since each of these stations presents significant differences between their work sequence, the initial conditions to start operating, the yarn handling and the lack of measurements and parameters to control the mobile reed.

Thus, it was proposed to establish a sequence for the manipulation of the mobile comb within the Warping Process, which represents 2% of the problem of line stoppages.

Measurement and study of times and movements for each warping station

During the observation of the Warping Process, it was found that for the filling of the reels, a similar opening range (angle) must always be maintained between the reel cylinder and the mobile comb. Different measurements were taken of the diameter of the cylinders of each reel model, since, being from different suppliers, it varies, so the initial conditions for filling the reels should be different. The distance between the floor and the axis of rotation of the reels (A). The distance between the floor and the surface of the moving reel (B). The distance between the axis of rotation of the reels and the movable comb (C). With these measurements, the initial angle can be accurately obtained by means of the Pythagorean Theorem, as well as, its modification during yarn filling, since the latter will cause the diameter of the spool cylinder to increase (Figure 5). The value of the angle α was calculated by the formula:

$$\alpha = Arc\ tan\left(\frac{opposite\ leg}{adjacent\ leg}\right) \quad [1]$$

Box 6

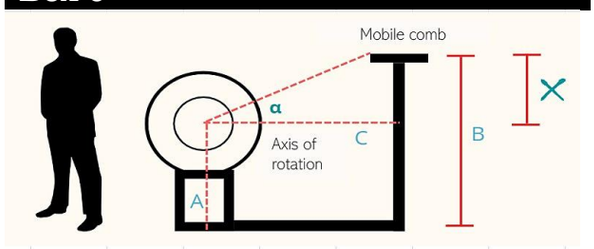

Figure 5
Measurements required to establish angles

The measurements obtained from each warping station based on the above information are shown in Table 2.

Box 7

Table 2
Measurements per station

Measurements between mobile comb and reels per station (cm)				
Station	A	B	C	D
height A	76	58	58.5	78
height B	107	103.5	114	97
length C	63	37	30	32
angle α	26°	50°	62°	37°

Measurements of warping station reels

For Warping Station A, 3 types of reels were measured (Table 3).

Box 8

Table 3
Reel measurements

Reel model (measurements in cm)	height	cap width	*cylinder diameter*
A1	51.1	70.76	*27.0*
A2	49.6	76.0	*28.5*
A3	51.1	70.0	*28.0*
B1	72.0	76.0	*28.0*
C1	103.4	53.5	*26.5*
C2	103.2	76.0	*28.5*
C3	104	53.0	*26.7*
D1	50.3	53.2	*16.7*
D2	50.3	54.0	*18.0*
D3	50.4	53.5	*17.3*
D4	50.0	53.3	*17.0*
D5	50.8	53.1	*17.5*

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Time and motion study

Based on the data obtained from the graph shown in Figure 2, it was necessary to analyze in depth the Warping Process in each station, for this purpose, diagrams of process operations were used (Annexes 1, 2, 3, and 4) in order to know the sequence of operations performed to compare them with the most efficient station, with the objective of seeking to assimilate them to this one and thus standardize the same sequence for all the stations, taking into account the initial conditions which are the measurements obtained from the reels.

The study of the process operation diagrams of each station allowed to identify the existing differences in the methodologies for the warping of the reels, among which is the manipulation of the mobile reed; to understand how the different operations of the process, the parts of the creel and the machine affect the final tension of the reels by means of the reed. To determine the variability of the spools, control diagrams were made by taking samples of 10 random spools per station, where the exact number of turns of yarn with which the spools were filled was recorded (Figures 6, 7, 8 and 9).

Box 9

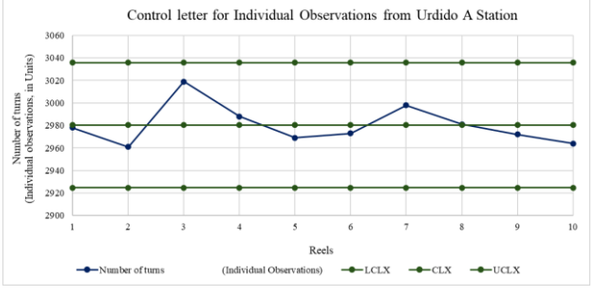

Figure 6
Control letter for Individual Observations from Urdido A Station

Box 10

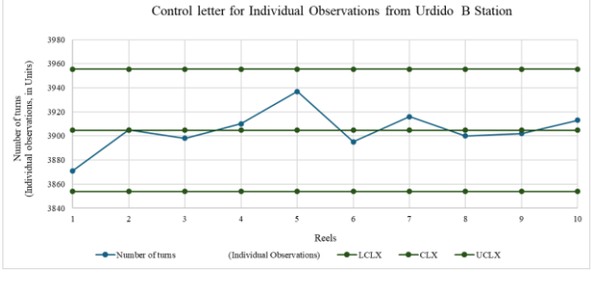

Figure 7
Control letter for Individual Observations from Urdido B Station

Box 11

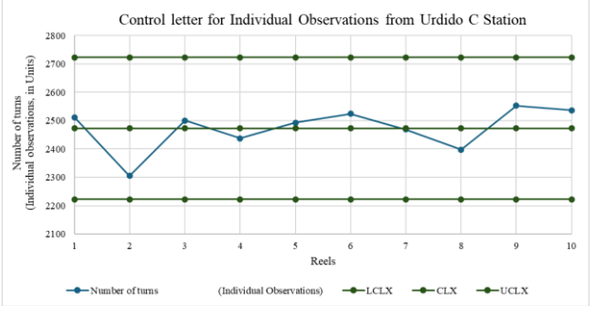

Figure 8
Control letter for Individual Observations from Urdido C Station

Box 12

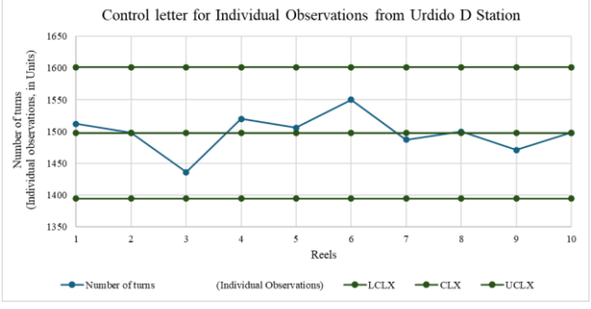

Figure 9
Control letter for Individual Observations from Urdido D Station

The data and graphs obtained show the variation of tension that exists between each elaborated reel (through the number of yarn turns), this due to the differences in the whole Warping Process, as well as in the manipulation of the mobile reed. The standard deviations with respect to the number of turns on the spools at each station (Aσ=18.52, Bσ=16.94, Cσ=83.43, Dσ=34.48), show the variability of the Warping Process. The number of yarn turns of the spools of Stations B and C did not reach the specification limits of the process.

During the observation of the spooling process, it was found that the spools that commonly fall outside the specification limits, or that present a very large difference in the number of turns, are the result of the following causes: a) yarn breakage in the creel during the Warping Process, b) warping machine stop to make yarn bobbin change, c) warping machine stop to make creel inspections, or bobbin filling, d) warping machine stop because the operator performs other activities such as going to the restroom, rest, unloading of yarns from the supplying trucks, e) ignoring the warping machine lap counter.

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f) filling bobbins with a very large angle between the bobbin and the mobile reed, g) changing the tensioning devices and thread positioning between the posts during the warping process.

Proposal for standardization of the methodology used for the handling of the moving comb

Based on the analysis of the measurements and the study of times and movements, a proposal was developed to condition the Warping Stations B, C and D to the measurements and sequence used by Station A, which is the one that had the best performance during the period January-August 2022.

The angles formed between the reel and the mobile comb of each station were previously shown, therefore, the angle from Warping Station A to the others (B, C and D) is sought to be replicated, changing the heights and distances of the other stations shown in Figure 5. Figure 10 shows the angle sought to be replicated:

Box 13

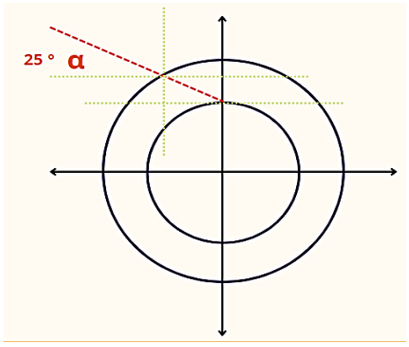

Figure 10
Side view of the angle formed by the thread (red line) between the reel and the mobile comb

This triangle (Figure 11) is placed on the bobbin to check the yarn position. When the yarn comes out of the green zone, the height of the movable reel must be readjusted. This helps to be able to make reel height changes regardless of the type of reel being assembled, plus the check is quick and without time delay and physical effort.

Box 14

Figure 11
Visual aid, reference triangle for checking the angle

For the case of the standardization of the methodology, in addition to the comparison made between the diagrams of process operations of each station, the average number of operations performed that cause the difference in yarn turns during the Filling Process was recorded (Table 4), so that new, more detailed and precise diagrams could be made.

Box 15

Table 4
Analysis of warping stations

Analysis results of warping stations				
Operations performed during the warping process	Stations (average in min)			
	A	B	C	D
Machine stoppages due to warped reel	2	4	5	3
Thread spools changed by warping reel	7	9	11	5
Stops for reel inspection	1	2	5	3
Ties of threads broken by warped reel.	2	3	4	2
Changes of tensioners per warped reel	0	2	6	0
Reel fill time	19	45	70	16

With all this information, the proposal was made with the changes in the process and the modified operation diagrams were made (Annexes 5, 6, 7 and 8).

In each diagram, an inspection was implemented in the thinning process to check that the same number of tensioners was used in each creel thread guide; if there were differences, there could be tension variations between the threads, which would cause deformities in the spools.

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Also, according to the data obtained in Table 3, specific machine stops were programmed to perform yarn spool changes, creel and spool inspections, and to verify that the angle is correct with the visual aids, with the objective of reducing the number of stops during the filling of yarn on the spools, in addition to allowing each operator to better manage the yarn spool changes.

With the restructured information for each warping station, the visual aid for the programmed stops was generated, which in addition to the yarn bobbin changes, are also helpful to verify that the angle is within the specifications with the visual aid of the triangle. The reason for reducing the number of stops of the warping machines during the filling of the bobbins is due to the fact that the machines do not have mechanisms or braking systems to stop the bobbins quickly, so that when the stop button is pressed, the speed of the motor (the one that turns the bobbin) gradually decreases. The same situation occurs when the machine is turned on again, and this causes the tension to vary too much with respect to the reels that had no or minimal stops during filling.

When the machine is stopped, the yarns also lose the tension they maintained on the moving reel during the process.

Implementation of the method standardization proposal

The current situation and the detailed proposal were explained to the warpers of the four stations and to the supervisor of the production area; they were provided with the guide triangles with training on their use to maintain the proper angle of inclination formed between the mounted reel and the mobile reed.

Likewise, visual aids were implemented, which are personalized guides per station where the programmed stops are specified and how to use the guide piece to adjust the angle, and at what times these actions should be applied.

The modification of the mobile comb, the programmed stops, fixing the same number of tensioners and the same pattern of yarn arrangement through the poles (initial conditions of the creel process), was only implemented for one month in Warping Station D, since the operator of that station works with smaller reels, which facilitates fixing the problems in less time. At Station A, the tilt angle was left as it had already been working in the period January-August 2022, that is, an angle of 25°, which is the same as the one proposed to be implemented at the other stations. Regarding the initial conditions (tensors and thread pattern through the poles), a review of their compliance was made to further improve the process, since on multiple occasions differences were detected in these points.

Station C was traced as the most problematic in terms of defective spools, for which reason, it was sought to work hard on it. It was authorized to work with 8 reels with the proposal developed.

For these reels, the reed was adjusted to an angle of 25° and the initial conditions indicated in the process operation diagram were sought to be equalized in order to proceed with the reel warping.

The spools that were worked on Station C were labeled for tracking on the weaving machines, with the objective of validating the implementation of the proposal. The labeling of these reels facilitated that, in case of a line stoppage, it could be registered if it was a reel elaborated with the new conditions, besides having a record of the number of turns taken out. No modifications were made at Station B because it was necessary to first validate the tests carried out at Station C, in addition to observing the results of the improvements implemented at Stations A and D.

Results

The development of the standardization proposal of the methodology used for the management of the mobile comb did not have any complications, being completed and implemented for its analysis, considering the multiple factors that influence through the comb. In the stations where it was feasible to study the implementation of the proposal, new control charts were obtained (Figures 12 and 13).

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Box 16

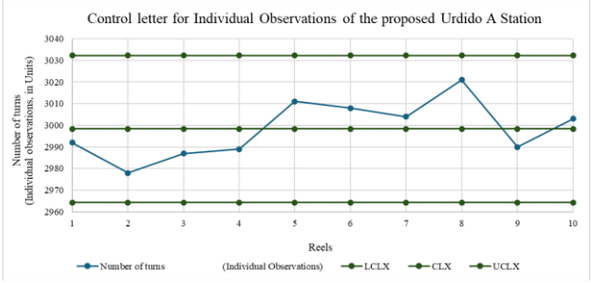

Figure 12
Control letter for Individual Observations of the proposed Urdido A Station

Box 17

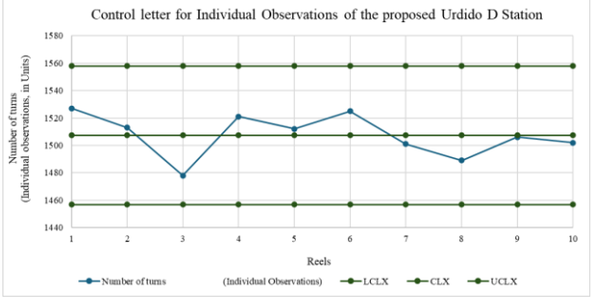

Figure 13
Control letter for Individual Observations of the proposed Urdido D Station

It can be observed that after the implementation of the standardization proposal of the methodology used for the manipulation of the mobile reel in the Warping Process of Stations A and D, it was mainly achieved that the reels of Station A did not go out of the control limits for the number of yarn turns, however, there is still variation between each reel. For Station D, it was possible to decrease the variation (Table 5) of the spools, reducing to only one outside the control limits. The differences in variability between the yarn spools in both stations is due to factors that cannot be controlled during the process such as: a) yarn breakage during filling of the spools, b) defective yarn with variability in its hardness, c) yarn tangling during the process.

Box 18

Table 5
Standard deviations by warping station

Station	Standard Deviation
A (No proposal)	18,52
B (No proposal)	16,94
C (No proposal)	83,43
D (No proposal)	34,48
A (With proposal)	11,33
D (With proposal)	16,84

To track the results of the proposal implemented in the weaving machines, the logs were reviewed, where it was found that in October, without the standardization proposal, there were 45 line stoppages due to defective spools, while in November there were a total of 29 line stoppages for the same cause. The difference between the two months is 16 stoppages, which represents a 35.55% improvement (Figure 14).

Box 19

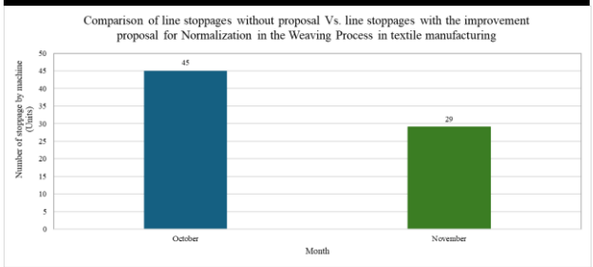

Figure 14
Comparison of line stoppages without proposal Vs. line stoppages with the improvement proposal for Normalization in the Weaving Process in textile manufacturing

Also, the results of the eight reels produced at Station C with the standardization proposal implemented were tracked, thus obtaining the data shown in Table 6.

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Box 20

Table 6
Monitoring of the reels prepared with the standardization proposal for station C.

Monitoring of reels made with the proposal at station C		
Model	Type of load	Line stoppages
C1-moka	rear	0
C1-moka	rear	0
C2-moka	front	0
C2-moka	front	0
C3-picaflor	rear	0
C3-picaflor	rear	0
C1-dinastía	front	0
C1-dinastía	front	0

There were no line stoppages with these reels. Finally, a visual and tactile inspection was carried out to compare reels produced without the standardization proposal with those produced with it. It was observed that the reels produced with the new method were more uniform, with resistance to touch and blows, and the yarn had greater compression.

Conclusions

Standardizing the handling of the moving reed in the warping process reduced the variability of the reels and consequently reduced line stoppages on the weaving machines. This not only improved operational efficiency, but also reduced the economic losses associated with line stoppages.

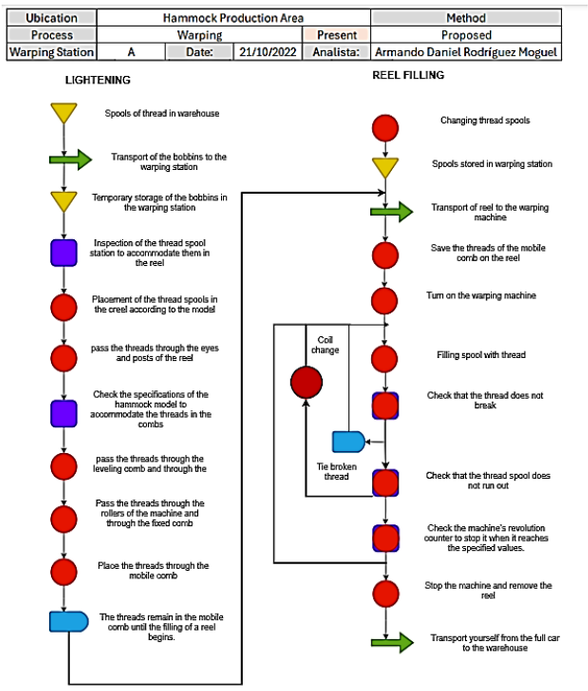
The results obtained in our study confirm Berkstresser & Sando, Harrington, Marsh, Cabrera and Hernandez who mention that it is crucial to emphasize that precise tension control is fundamental to preserve yarn integrity during warping and to prevent complications in the later stages of the textile process.

On the other hand, the analysis and study tools support the results obtained in this study.

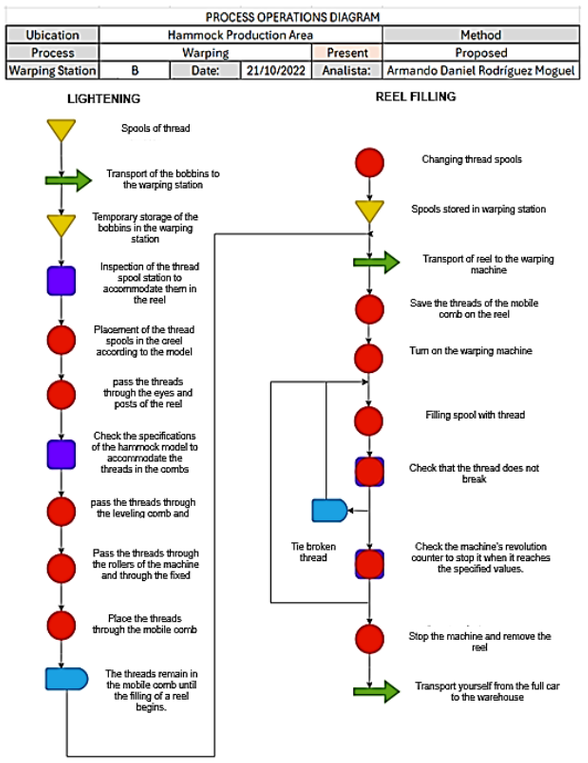
Finally, in times where competitiveness yields differentiating elements, adjustments in processes can make a difference, in relation to costs, expenses and other inputs, since increases in sales depend on other areas of knowledge.

Annexes

Annex 1 Diagram of process operations of station A with the current method.



Annex 2. Diagram of process operations of station B with the current method



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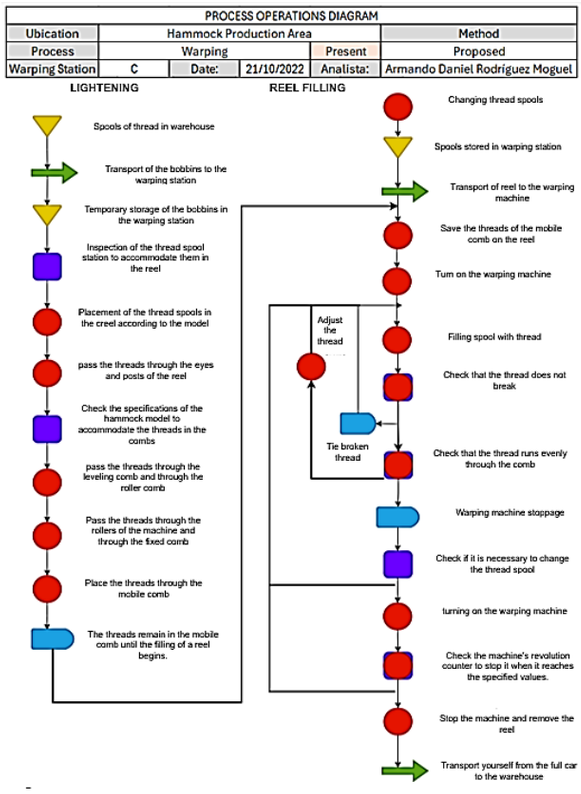
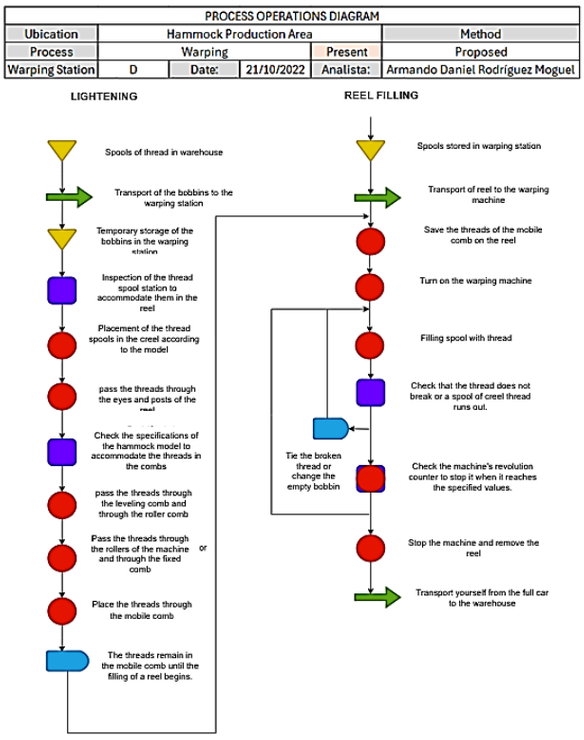
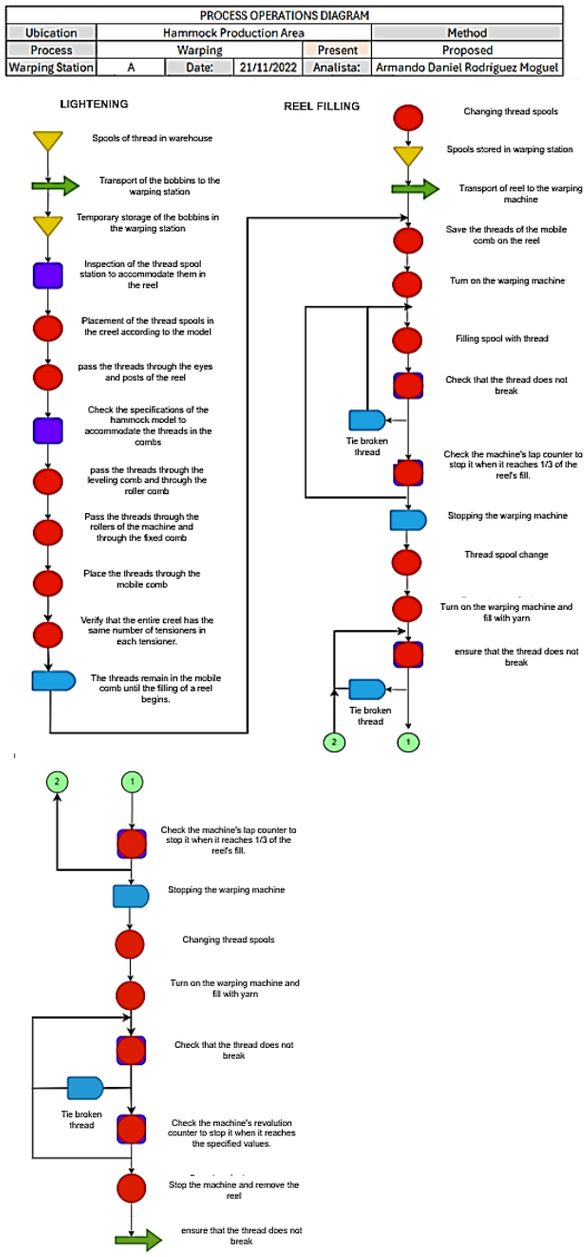
Annex 3. Diagram of process operations of station C with the current method.



Annex 4. Diagram of process operations of station D with the current method



Annex 5. Diagram of process operations of station A with the proposed method.



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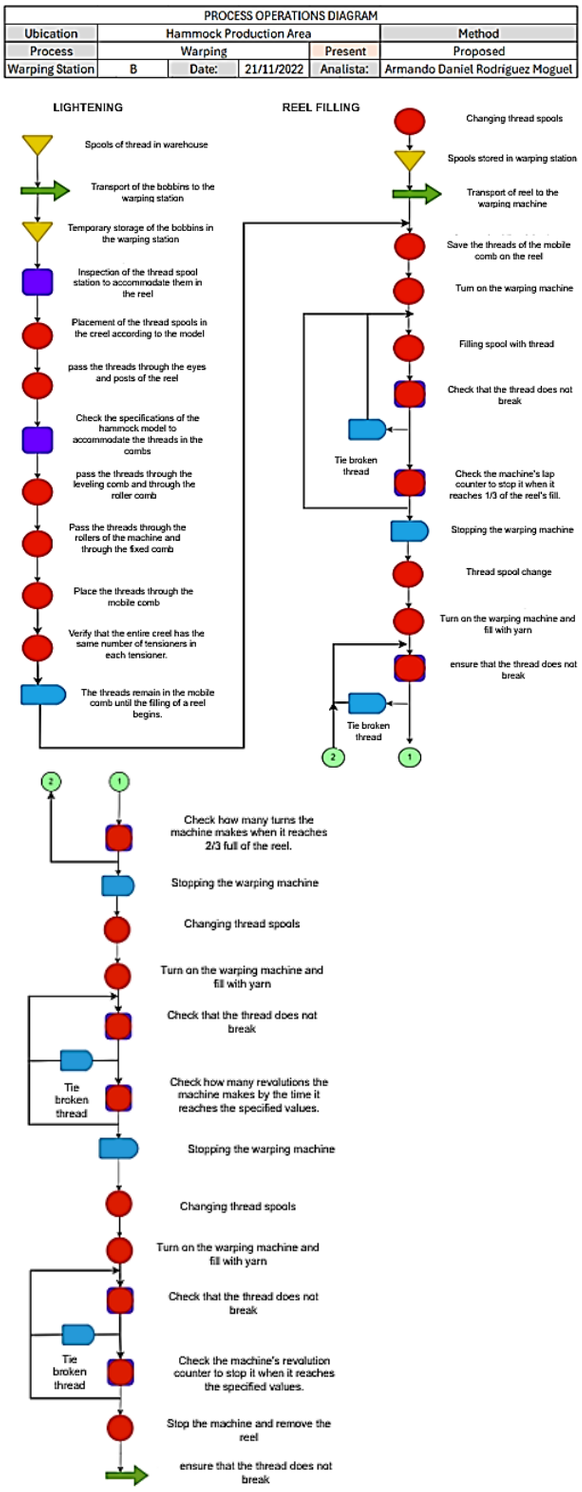
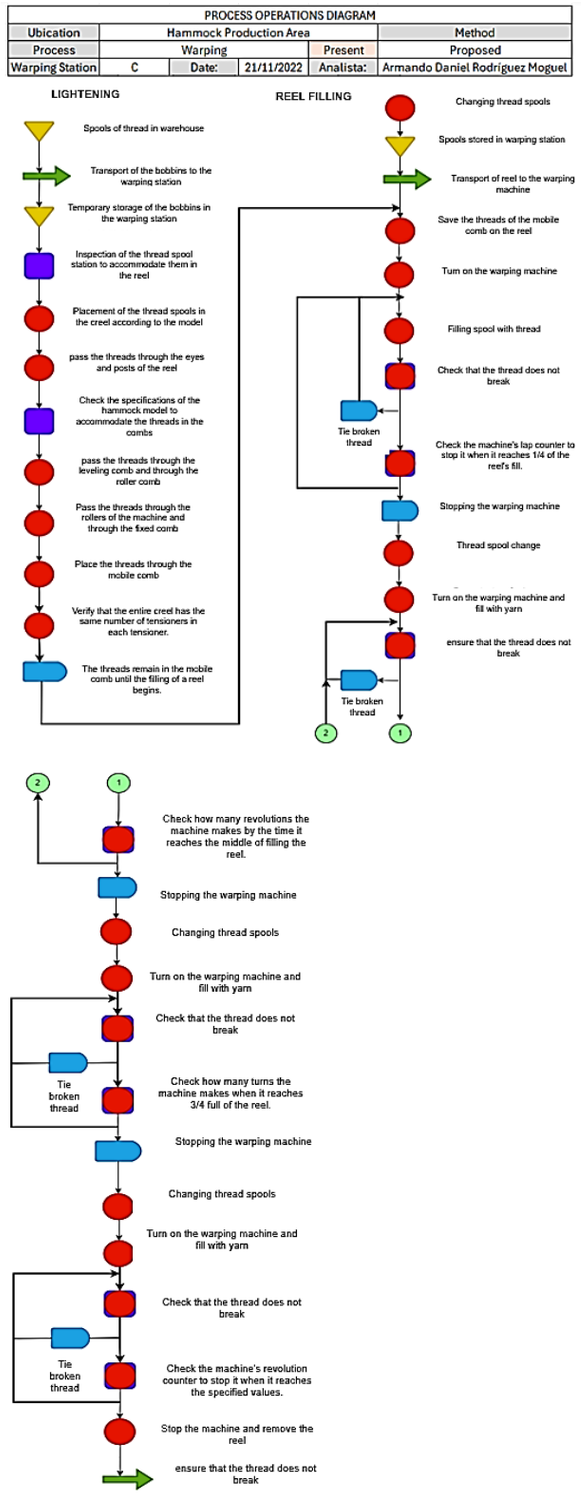
Annex 6. Diagram of process operations of station B with the proposed method.



Annex 7. Diagram of process operations of station C with the proposed method.



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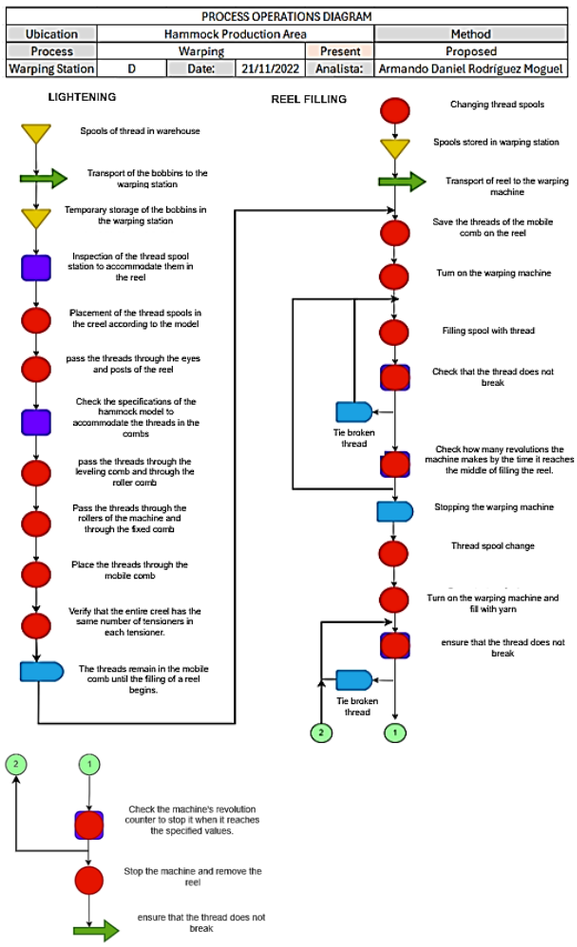
Annex 8. Diagram of process operations of station D with the proposed method.



Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Authors' Contribution

The contribution of each researcher in each of the points developed in this research, was defined based on:

Bahena-Medina, Lilia Araceli: Contributed to the project idea, research method and technique. She carried out the data analysis and systematization of results, as well as writing the article.

Gómez-Vicario, Miguel Angel: Contributed to the analysis and design of the current and proposed process diagrams, as well as the tests and measurements carried out to obtain the angle. On the other hand, he supported the writing of the article.

Reyes-Velázquez, Alejandro: Contributed to the research, as well as to the search and analysis of the sources that correspond to the theoretical underpinning of the research. He also participated in the writing of the article and its translation and editing in the English language.

Hernández-Jasso, Ana María: worked on the application of the field instrument, data collection and systematization of the results, data analysis with Descriptive Statistics, as well as, with Statistical Process Control. Also, she worked on writing the article.

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References

Basics

Aguilar, F. J. (2015). Manual de procesos textiles. Editorial UPC.

Alarcón, R., & García, L. (2013). Gestión de la calidad en la industria textil. Editorial Reverté.

Arroyo, P., & Ruiz, M. (2018). Optimización de procesos industriales. Editorial Paraninfo

Berkstresser, G. A., & Sando, D. (1993). Textile Process Control. Textile Institute.

Cabrera, J., & Hernández, L. (2017). Producción textil: Procesos y técnicas. Editorial Síntesis.

Dantzig, G. B. (2010). Linear Programming and Extensions. Princeton University Press

Deming, W. E. (1986). Out of the Crisis. MIT Press.

Foster, S. T. (2017). Managing Quality: Integrating the Supply Chain (6th ed.). Pearson.

Gilbreth, F. B., & Gilbreth, L. M. (1917). Applied Motion Study. Sturgis & Walton Company.

Gómez, M. J., & Sánchez, E. (2016). Optimización de procesos industriales. Alfaomega Grupo Editor.

ISSN: 2524-2032
RENIECYT-CONAHCYT: 1702902

Harrington, H. J. (1991). Business Process Improvement: The Breakthrough Strategy for Total Quality, Productivity, and Competitiveness. McGraw-Hill.

Hopp, W. J., & Spearman, M. L. (2000). Factory Physics (2nd ed.). McGraw-Hill.

Juran, J. M. (1999). Juran's Quality Handbook (5th ed.). McGraw-Hill.

Marsh, G. (2001). Textile Progress. Textile Institute.

McGregor, D. (2021). The Human Side of Enterprise (Annotated ed.). McGraw-Hill.

Monden, Y. (1993). Toyota Production System: An Integrated Approach to Just-In-Time (2nd ed.). Engineering & Management Press.

Murphy, G. B., & Wood, D. J. (2016). Operations Management (3rd ed.). McGraw-Hill Education.

Niebel, B. W., & Freivalds, A. (2008). Methods, Standards, and Work Design (12th ed.). McGraw-Hill.

Supports

ISO. (2015). ISO 9001:2015 Quality Management Systems. International Organization for Standardization.

Liker, J. K. (2004). The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. McGraw-Hill.

Shingo, S. (1989). A Study of the Toyota Production System: From an Industrial Engineering Viewpoint. Productivity Press.

Differences

Smith, H. E., & Miller, T. G. (2018). Textile Manufacturing: Processes, Materials, and Applications. CRC Press.

ISSN: 2524-2032
RENIECYT-CONAHCYT: 1702902

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Article

Equity investment portfolio in renewable energy companies to influence the UN's 2030 agenda

Portafolio de inversión en acciones de compañías energéticas renovables para incidir en la agenda 2030 de la ONU

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Abstract

Companies need more and more financing, in particular energy companies can be a good instrument to generate a higher return by investing in their shares and to collaborate so that these companies have income from the purchase of their shares. In this work 5 companies related to the topic of renewable energies were considered, these are: Iberdrola, Gamesa, Vestas, General Electric (GE), and Brookfield Renewable Partners L.P. (BEP), this portfolio will be analyzed following the Markowitz model. The results yield a weighting in the distribution of money when invested in this way: 55% to Iberdrola shares, 20% to Gamesa, 2% to Vestas, 0% to GE, and 23% to BEP. It was found that the stocks with the highest risk are Vestas, and the lowest risk are Iberdrola. These results could motivate investment in this type of companies and the result would be to have more economically sound companies and thus meet the Sustainable Development Goals of the United Nations (UN).

Company	Country	Cotization	Currency	Year
Iberdrola S.A. (IBE.MC)	Spain	MEDIQON Group	EUR	5
Siemens Gamesa Renewable Energy, S.A. (SGRE.MC)	Spain	MEDIQON Group	EUR	5
Vestas Wind Systems A/S (VWS.CO)	Denmark	Copenhagen Real Time Price	DKK	5
General Electric Company (GE)	United States	NYSE - Nasdaq Real Time Price	USD	5
Brookfield Renewable Partners L.P. (BEP)	Bermuda	NYSE - Nasdaq Real Time Price	USD	5

	Iberdrola	Gamesa	Vestas	GE	BEP
Yield (%)	0.042%	0.065%	0.284%	-0.032%	0.077%

Portfolio, Risk, Investment, Companies, Renewable Energy

Resumen

Las empresas necesitan de financiamiento cada vez mayor, en particular las empresas energéticas pueden ser un buen instrumento para generar un mayor rendimiento al invertir en sus acciones y así también en colaborar para que estas empresas tengan ingresos por compra de sus acciones. En este trabajo se consideraron 5 empresas relacionadas con el tema de las energías renovables, estas son: Iberdrola, Gamesa, Vestas, General Electric (GE), y Brookfield Renewable Partners L.P. (BEP), este portafolio se analizará siguiendo el modelo de Markowitz. Los resultados arrojan una ponderación en la distribución del dinero cuando se invierte de esta forma: 55% a las acciones de Iberdrola, 20% a Gamesa, 2% a Vestas, 0% a GE, y 23% a BEP. Se comprobó que las acciones con más riesgos son la de la compañía Vestas, y la de menor riesgo la de Iberdrola. Estos resultados podrían motivar a la inversión en este tipo de empresas y el resultado sería contar con empresas económicamente más sólidas y así enfrentar los Objetivos de Desarrollo Sostenible de la Organización de las Naciones Unidas (ONU).

Empresa	País	Índice de cotización	Moneda	Años
Iberdrola S.A. (IBE.MC)	España	MEDIQON Group	EUR	5
Siemens Gamesa Renewable Energy, S.A. (SGRE.MC)	España	MEDIQON Group	EUR	5
Vestas Wind Systems A/S (VWS.CO)	Dinamarca	Copenhagen Real Time Price	DKK	5
General Electric Company (GE)	Estados Unidos de América	NYSE - Nasdaq Real Time Price	USD	5
Brookfield Renewable Partners L.P. (BEP)	Bermuda	NYSE - Nasdaq Real Time Price	USD	5

	Iberdrola	Gamesa	Vestas	GE	BEP
Rendimiento (%)	0.042%	0.065%	0.284%	-0.032%	0.077%

Portafolio, Riesgo, Inversión, Empresas, Energías renovables

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Introduction

Wind energy, together with photovoltaic solar energy, has been the one that has increased its exploitation the most and its prices have decreased (IEA - International Energy Agency, 2022), so this renewable energy has become attractive both for energy generation and for investments (Aquila et al., 2020). In Mexico, it is possible to invest in a portfolio of financial assets in Mexico or abroad through various forms of financing from multiple banks.

Investment processes are considered as economic activities for electricity companies, and are closely related to the structure of power generation (Zhang et al., 2022). Therefore, scientific investment decision-making is essential to ensure economic benefit through the share value of these power companies.

It can be said that compared to fossil energy companies, the value performance of renewable energy companies is more vulnerable to various constraints such as grid interconnection, availability of the renewable resource, government restrictions, among others. The performance of fossil companies may be more stable (Odeh et al., 2018).

The premise of portfolio optimisation is to measure the value of investment and changes in that value given a single power generation technology, where the technology is affected by different uncertain factors. First, after the full opening of an electricity market, the price of electricity will change based on supply and demand; changes in the price of coal, natural gas and other energy will also cause fluctuations in the cost of fuel.

Secondly, due to differences in weather, region and climate, there are intermittent changes in wind power, light energy and other renewable energies, and electricity production is unstable. This can lead to vibrations in the electricity grid after connection to the grid. Thirdly, the rapid expansion of installed capacity and increased investment in research and development (R&D) facilitates technological breakthroughs and the continued reduction of costs associated with renewable energy from renewables. However, the concrete path to such cost reductions remains uncertain.

The objective of investment portfolios is to improve the return on investment (Davis & Owens, 2003), for this the Markowitz portfolio model is employed, as done by Xu et al., (Xu et al., 2022), where they optimised an investment portfolio with energy companies that are subject to power dispatch effects; or the one done by (Bai et al., 2019), who introduced a portfolio allocation approach to improve the performance of these portfolios of renewable energy stocks in China by taking uncertainty into account in the portfolio optimisation process.

Few researches have linked these investment portfolios to the United Nations (UN) Agenda 2030 Sustainable Development Goals, as Wang et al. did, (Wang et al., 2020) where they linked the investments to China's sustainable development goals and found an economic benefit in the investments. In this paper we present a methodological proposal to optimise an investment portfolio with energy companies that have branches towards renewable energy using the Markowitz model and show how that performance impacts positively on the UN Sustainable Development Goals.

Material and method

Companies

Stock market data of 5 companies listed on different stock exchanges in the world are used, these data were obtained from the financial website yahoo finance (Yahoo Finance - Stock Market Live, Quotes, Business & Finance News, 2022), 5 years of daily data with closing prices of the shares are used, i.e. 1248 data per share are available. Table 1 presents the information on the companies' shares.

Box 1

Table 1
Investment portfolio shares

Company	Country	Index	currency	Years
Iberdrola S.A., (IBE.MC)	Spain	MEDIQON Group	EUR	5
Siemens Gamesa Renewable Energy, S.A. (SGRE.MC)	Spain	MEDIQON Group	EUR	5
Vestas Wind Systems A/S (VWS.CO)	Denmark	Copenhagen Real Time Price	DKK	5
General Electric Company (GE)	United States	NYSE - Nasdaq Real Time Price	USD	5
Brookfield Renewable Partners L.P. (BEP)	Bermuda	NYSE - Nasdaq Real Time Price	USD	5

Source: Own elaboration.

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Hernandez-Escobedo, Quetzalcoatl, Rodríguez-García, Ernesto Raúl, Mendoza-González, Felipe and Rueda-Martínez, Fernando. [2024]. Equity investment portfolio in renewable energy companies to influence the UN's 2030 agenda. Journal-International Economy. 8[14]-1-5: e40814105. https://doi.org/10.35429/JIEC.2024.8.14.1.5

As shown in table 1 not all companies are quoted in the same currency, therefore all prices are converted to US dollars (USD) to have a reference currency, with respect to the exchange rate, these were carried out on 14 September 2022 with the following values, for euros (EUR) 1 EUR = 1 USD, and for Danish kroner (DKK) 1 DKK = 0.13 USD (SIE - Foreign Exchange Market, 2022).

Markowitz model

The Markowitz portfolio model is widely used because it minimises the variance and covariance of a portfolio, i.e. it reduces risk and maximises investor returns. According to Montgomery (Montgomery, 2005) the portfolio return can be expressed with the following parameters.

$$R_i = \frac{\sum_{t=1}^{T} R_{it}}{T} \quad (1)$$

where R_i is the return on instrument i; R_{it} is the return earned on instrument i in period t; and T is the number of periods under analysis..

Measure of portfolio risk

The measure of dispersion that is calculated by averaging the sums obtained is known as the variance and can be expressed as equation 2.

$$\sigma^2 = \frac{\sum_{t=1}^{T}(R_{it}-R_i)^2}{T-1} \quad (2)$$

where σ^2 is the sample variance.

The return is calculated for each share, the average returns per share are shown in table 2.

Results

Box 2

Table 2
Average stock returns

	Iberdrola	Gamesa	Vestas	GE	BEP
Yield (R_i)	0.042%	0.065%	0.284%	-0.032%	0.077%

Source: Own elaboration.

As can be seen in table 2 there is only one negative return which belongs to the company General Electric, this could modify the overall performance of the portfolio, on the contrary, the company Vestas is the one that presents the best performance, and the other three, Iberdrola, Gamesa, and BEP present positive returns.

To develop the Markowitz model it is necessary to calculate the standard deviation and the variance, table 3 shows the standard deviation of each of the shares.

Box 3

Table 3
Standard deviation of actions

	Iberdrola	Gamesa	Vestas	GE	BEP
Standard deviation (σ)	1.46%	2.73%	7.69%	2.74%	1.90%

Source: Own elaboration.

The highest standard deviation within the portfolio is that of the company Vestas 7.69%, it is clarified that the units are percentages as they were calculated on the performance of these units. The lowest standard deviation is in the performance of the company Iberdrola. With these results it can be deduced that investing in Vestas carries a higher risk than investing in Iberdrola.

A variance-covariance matrix or Markowitz model is obtained, table 4 shows the results obtained.

Box 4

Table 4
Modelo Markowitz

	Iberdrola	*Gamesa*	*Vestas*	*GE*	*BEP*
Iberdrola	1	0.38	-0.0059	-0.096	-0.091
Gamesa	0.38	1	6.7E-05	-0.0521	-0.0374
Vestas	-0.0059	6.7E-05	1	-0.0009	0.00756
GE	-0.096	-0.0521	-0.0009	1	0.0161
BEP	-0.091	-0.0374	0.00756	0.0161	1

Source: Own elaboration.

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Table 4 shows the variance and covariance between the stocks in the portfolio, the diagonal of the matrix is equal to 1 as it represents the variance between the same company, and as the covariance indicates the relationship between two variables it can be seen that Iberdrola has a negative relationship between Vestas, GE, and BEP, while Gamesa has a positive relationship with Vestas and Iberdrola, GE, and BEP, while Gamesa has a positive relationship with Vestas and Iberdrola, Vestas only has a positive relationship with Gamesa and BEP, General Electric (GE) only has a positive behaviour with BEP, and finally BEP has a positive relationship with Vestas and GE.

The result of the portfolio is presented in table 5.

Box 5

Table 5
Equity investment weighting

	Iberdrola	Gamesa	Vestas	GE	BEP
Investment	55%	20%	2%	0%	23%

Source: Own elaboration.

The investment weighting in a portfolio containing only companies involved in renewable energy can be seen in table 5, the model showed 0% investment for GE, 2% for Vestas, 20% for Gamesa, 23% for BEP, and 55% for Iberdrola, i.e. the lowest risk stock is Iberdrola and the model considered this variable to develop the portfolio.

Conclusions

It can be said that companies are financed in different ways, one of them is to place their shares in Stock Exchanges, in this work 5 shares of companies related to renewable energies are analysed, in order to check how to build an investment portfolio, the companies are Iberdrola, Gamesa, General Electric, Vestas, and Brookfield Renewable Partners L. P. (BEP). P. (BEP), it was found that the shares with the highest return are Vestas with 0.284% and the company with the lowest return is General Electric with -0.032%, in terms of risk, i.e. its standard deviation, the one that varies the most is Vestas with 7.69% and the most stable of the 5 shares is Iberdrola.

The Markowitz model uses these two variables in addition to a variance-covariance matrix to determine the best investment weighting. The result of this weighting is that the investment money in the portfolio will be distributed as follows: 55% to Iberdrola shares, 20% to Gamesa, 2% to Vestas, 0% to GE, and 23% to BEP.

Contributing authors

Hernandez-Escobedo Quetzalcoatl: I contributed to the idea of the project and the development of the research.

Rodríguez-García Ernesto Raúl: I contributed to the idea of the project and to the development of the research.

Mendoza-González Felipe: I contributed to the idea of the project and the development of the research.

Rueda-Martínez Fernando: I contributed to the idea of the project and to the development of the research.

Availability of data and materials

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References

Background

Aquila, G., de Queiroz, A. R., Balestrassi, P. P., Rotella Junior, P., Rocha, L. C. S., Pamplona, E. O., & Nakamura, W. T. (2020). Wind energy investments facing uncertainties in the Brazilian electricity spot market: A real options approach.Sustainable Energy Technologies and Assessments, 42, 100876.

Bai, L., Liu, Y., Wang, Q., & Chen, C. (2019). Improving portfolio performance of renewable energy stocks using robust portfolio approach: Evidence from China. Physica A: Statistical Mechanics and its Applications, 533, 122059.

Davis, G. A., & Owens, B. (2003). Optimizing the level of renewable electric R&D expenditures using real options analysis. Energy Policy, 31(15), 1589-1608.

IEA – International Energy Agency. (s. f.). IEA. Recuperado 12 de septiembre de 2022, de https://www.iea.org

Montgomery, R. (2005). Probabilidad y estadistica aplicadas a la ingeniería (WILEY). Limusa Wiley.

Support

Odeh, R. P., Watts, D., & Negrete-Pincetic, M. (2018). Portfolio applications in electricity markets review: Private investor and manager perspective trends. Renewable and Sustainable Energy Reviews, 81, 192-204.

SIE - Mercado cambiario. (s. f.). Recuperado 14 de septiembre de 2022, de

Wang, H., Su, B., Mu, H., Li, N., Gui, S., Duan, Y., Jiang, B., & Kong, X. (2020). Optimal way to achieve renewable portfolio standard policy goals from the electricity generation, transmission, and trading perspectives in southern China. Energy Policy, 139, 111319. https://doi.org/10.1016/j.enpol.2020.111319

Xu, D., Bai, Z., Jin, X., Yang, X., Chen, S., & Zhou, M. (2022). A mean-variance portfolio optimization approach for high-renewable energy hub. Applied Energy, 325, 119888. https://doi.org/10.1016/j.apenergy.2022.119888

Yahoo Finance—Stock Market Live, Quotes, Business & Finance News. (s. f.).

Zhang, M., Tang, Y., Liu, L., & Zhou, D. (2022). Optimal investment portfolio strategies for power enterprises under multi-policy scenarios of renewable energy. Renewable and Sustainable Energy Reviews, 154, 111879. https://doi.org/10.1016/j.rser.2021.111879.

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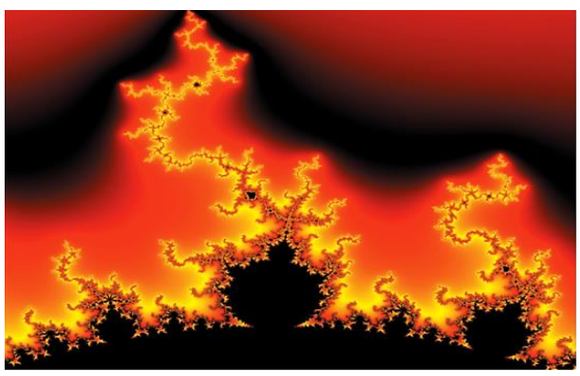

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