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Influence of the Logistics Management System on the Productivity of Call Centers

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Abstract*– This research determines how the implementation of a logistics management system enhances the productivity of Majorel SP Solutions SA, Lima 2023. The study is applied, featuring a non-correlational and cross-sectional design. The population under study encompasses all interactions handled by employees, ranging from warehouse staff to high-level administration. The diagnostic phase identified the main reasons behind returns, which include late deliveries, defective products, products nearing expiration, and incorrect orders. These issues stem from inadequate order planning and inefficient route planning. Furthermore, critical areas in logistics management requiring attention were highlighted, such as order distribution and storage. The proposed solutions include the implementation of the proposed logistics management processes, the application of the 5S methodology, and the ABC classification of products based on sales. Additionally, the inventory management model based on the Periodic Review model (Model P) and the redistribution of layout using the Systematic Layout Planning (SLP) method and Guerchet method were detailed. The conclusions reveal a significant increase in efficacy by 10.8%, efficiency by 28.6%, and productivity rose to 89.0%. The positive impact on overall efficiency is supported by a p-value of 0.032. In summary, the implementation of a logistics management system significantly improves the productivity of Majorel SP Solutions SA, Lima 2023.

Keywords-- *Logistics, Systematic Layout Planning, Inventory Management, Guerchet method.*

I. INTRODUCTION

Low productivity in business operations represents a significant global challenge, negatively impacting economic progress and the competitiveness of countries [1]. According to the International Labour Organization (ILO), 45% of companies worldwide face difficulties in improving their productivity, limiting their ability to compete in an increasingly demanding and dynamic market. In this context, the implementation of logistics management systems emerges as a potentially effective solution to enhance organizational efficiency and performance. However, the lack of widespread adoption of these systems is concerning. In Latin America, the challenges related to the implementation of logistics management systems are even more pronounced. The region faces significant problems in terms of efficiency and competitiveness [2].

The Inter-American Development Bank noted that labor productivity in Latin America is only a quarter of that in the United States and Europe [3]. The lack of investment in technology and training is a major obstacle, as Latin American and Caribbean countries, on average, invest 0.6% of their GDP in research and development, compared to the 2%-3% invested by other countries such as Germany, the United States, and Japan [4]. This situation creates a significant technological gap and a lower adoption of quality management systems through weighted selection.

The importance of conducting research on the implementation of logistics management systems lies in the need to identify best practices and provide evidence-based recommendations to overcome current challenges. In Chile, many companies face excessive product storage issues when demand is uncertain, highlighting the need for effective control and balance between anticipated demand and available inventory [5]. In Mexico, the lack of an efficient inventory and warehouse control system leads to incorrect decisions and a lack of transparency in available information, negatively affecting business competitiveness [6]. Furthermore, in Peru, distribution companies face a notable lack of access to adequate financing, representing a substantial obstacle to the effective implementation of logistics systems [7]. This research allowed for a comprehensive analysis of these problems and offered solutions based on previous studies and updated data.

According to Gómez and Muñoz [8], Ludwig Von Bertalanffy's general systems theory is fundamental for logistics integration, proposing a set of active systems that monitor the flow of physical information. This approach allows companies to achieve favorable results by forming an independent and well-organized network unit in aspects such as time, quantity, and quality. The applicability of logistics has experienced rapid and crucial development in Cuba across various industries, including the medical sector, where the management of procurement, storage, reception, and distribution of inventories is essential for improving efficiency [9]. In the pharmaceutical sector, logistics faces significant challenges to ensure optimal supply to the pharmaceutical areas of public health institutions [10] [11].

Business management includes customer satisfaction as one of its main objectives, where logistics plays a leading role by integrating it as a chain from suppliers to customers and viewing it as an entire system that must function harmoniously [12]. In this context, the term integration becomes more relevant, and it is a trend in organizations to integrate management systems to achieve superior results by giving managers a systemic vision that provides greater

effectiveness in decision-making [13]. Logistics management is an important component of the supply chain. A logistics system manages the flow of materials and information, as well as the efficient movement and storage of data, goods, and services [14].

A critical review of other research on the topic reveals that the implementation of logistics management systems has been studied in various industries and contexts. Bin et al. [15] presented a modified version of the EOQ model for inventory management in micro, small, and medium-sized enterprises (MSMEs) in Malaysia, demonstrating significant improvements in inventory control and space availability. Castrejón et al. [16] addressed inefficient inventory management in a hardware company in Zacatecas, proposing an ABC model to improve internal control and system supervision. In Erazo's research, an inventory management model was developed for the supply chain of a cleaning and pharmaceutical company, using a probabilistic periodic review model with dynamic demand [17]. These reviews provide a solid foundation for the development of a logistics management system at Majorel SP Solutions SA.

The research aims to determine how the implementation of a logistics management system can improve the productivity of Majorel SP Solutions SA in Lima in 2023. This objective is broken down into several specific objectives, such as conducting a comprehensive analysis of the state of the art and the conceptual framework related to the identified problem, diagnosing the problem through the collection and evaluation of relevant data, proposing concrete and feasible improvements, implementing the selected tools, and validating the effectiveness of the proposed improvement. The research seeks to offer a comprehensive and evidence-based solution to the productivity and efficiency challenges faced by the company, thereby contributing to its competitiveness and sustained growth in the market.

II. METHOD

The method employed in this research was designed to determine how the implementation of a logistics management system can improve productivity at Majorel SP Solutions SA, located in Lima, during the year 2023. This methodological approach encompassed various phases including data collection, analysis, and implementation of improvements, as illustrated in Figure 1, all with the aim of evaluating the impact of logistics management on productivity.

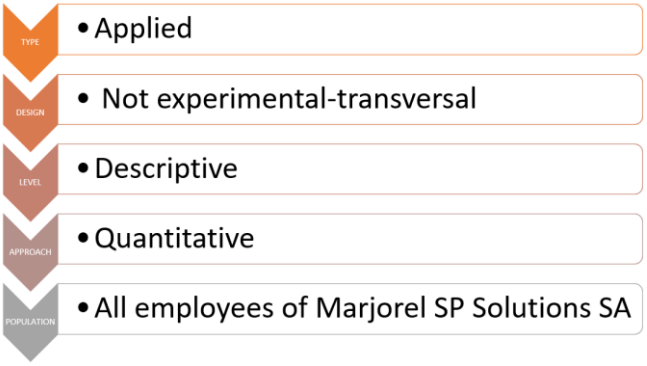


Figure 1. *Research methodology*

The main data collection technique was documentary analysis. This technique allowed for the review of previous records and historical data of the company to obtain pertinent and accurate information [23]. The documentary analysis included the review of interaction reports and service records provided by the call center, focusing on identifying returns or incomplete services. To identify primary studies, various academic search engines such as Redalyc, Scielo, Google Scholar, and EBSCO were used. Keywords and search strategies included terms such as "logistics management," "business productivity," "inventory systems," "operational efficiency," and "continuous improvement." These keywords were combined with boolean operators to refine the results and ensure the relevance of the selected studies. The data collection procedure was structured in several phases as detailed in Figure 2.

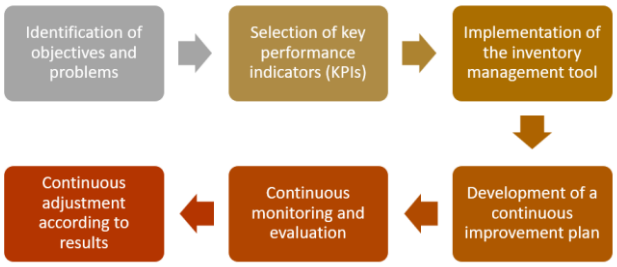


Figure 2. *Data collection procedure*

To ensure accurate and relevant data collection, a documentary analysis form was used, allowing for a structured review of historical information. The collected data were systematically organized in Excel to facilitate the creation of tables and graphs that represented trends and results related to response times and the budgeting process.

The systematization of the analysis process for the publications included in the review was carried out following a detailed and rigorous approach. Initially, an exhaustive search was conducted in the aforementioned search engines using the defined keywords. Subsequently, the most relevant studies were selected based on predefined inclusion and exclusion criteria, such as thematic relevance, recency of publication, and methodological quality. Each study was

evaluated and categorized according to its contribution to the researched topic, ensuring a comprehensive and representative coverage of the existing literature. This methodological approach allowed for obtaining reliable and relevant results, contributing to a better understanding of how logistics management can improve productivity at Majorel SP Solutions SA, and offering a solid foundation for future research and practical improvements in the company.

III. RESULTS

Diagnosing the identified problem through the collection and evaluation of relevant data using quantitative methods. Majorel is a global digital business services company that helps optimize the businesses of the world's top brands with advanced business services and digital technology. It has a multinational organizational structure with senior executives for strategic decisions and management teams for functional areas such as human resources, finance, technology, and operations. Majorel offers a wide range of outsourcing services, including:

Customer Service: Management of inquiries, problem resolution, and support via phone, online chat, and email.

Business Process Outsourcing (BPO): Data processing, *back-office services, and content moderation.*

Sales Management: Lead generation, sales, and support throughout the sales process.

Technology Services: Implementation and management of technological solutions such as CRM systems and automation tools.

Analysis of the Process to be Intervened: We will evaluate the capacity and stability of the distribution process.

Process Capacity: Delivery times of the processes vary significantly throughout the year, with some orders processed in 1 day and others in 15 days, without a clear monthly pattern. Most delivery times are clustered between 8 and 12 days, indicating a typical operation window. However, recurring delays highlight the need to improve specific areas of the process.

Potential Capacity: The company has established that orders should not take more than 7 days to be delivered, reflecting its commitment to efficiency and customer satisfaction. This 7-day parameter will be used as a reference to evaluate the process. Ideally, measurements should align with this nominal value or fall within the lower and upper specification limits. With the data from Table 1, the mean and standard deviation were calculated, key values for identifying areas for improvement and optimization opportunities in the delivery process.

Table 1

Sample average and standard deviation

Average	9.5
Standard Deviation	3.2

Note: With all this data we can replace in the formula

Tolerance = $+-\ 2\ days$.

$N\ =\ 7$ (Company policy)

$USL\ =\ 7+2\ =\ 9$ days, Upper Specification limit.

$LSL\ =\ 7-2\ =\ 5$ days, Lower Specification Limit.

Replacing in the formula:

$$\boldsymbol{C_P = \frac{USL - LSL}{6\sigma} = \frac{9-5}{6(3.2)} = 0.21}$$

The Process Capability (Cp) value is 0.21, indicating that the process is classified at level 4 according to Salvador Naya Fernández (2021). This suggests that the current process does not meet the desired standards, requiring immediate interventions to improve its efficiency.

Being at level 4 reflects deficiencies that can increase operational costs, cause customer dissatisfaction, and lead to market share loss. It is crucial to conduct a thorough review to identify and address root causes, thereby improving the process capability and strengthening the company's competitive position.

Actual Potential Capability (Cpk). For the Process Capability Index (Cp), which does not consider how well the process mean is centered within the specification limits, the formula is:

$$C_{pk} = Min\left[\frac{\mu - LSL}{3\sigma}, \frac{USL - \mu}{3\sigma}\right]$$

$N\ =\ 7$ (Company policy)

$USL\ =\ 7+2\ =\ 9$ days, Upper Specification Limit.

$LSL\ =\ 7-2\ =\ 5$ days, Lower Specification limit.

$\mu = 9.5$, mean obtained

Substituting:

$$C_{pk} = Min\left[\frac{9.5-5}{3(3.2)}, \frac{9-9.5}{3(3.2)}\right] = -0.06$$

The registered Cpk index is -0.06. A satisfactory Cpk should be greater than 1.25, and a value less than 1 indicates that the process does not meet specifications. The negative Cpk value emphasizes the urgent need to implement significant improvements.

Process Stability. Process stability will be assessed using a control chart. Control limits are established based on the data from Table 2.

$\bar{p} = 0.474$, average defect fraction

$z\ =\ 3$, number of standard deviations for 99.7% confidence

$s_p = 0.1$, standard deviation

$UCL = \bar{p} + zs_p = 0.744$, Upper Control Limit

$LCL = \bar{p} - zs_p = 0.174$, Lower Control Limit

The Cp value of 0.21 indicates limited capability to meet specifications, signifying that the process exhibits significant variability relative to the specified limits. Furthermore, the Cpk value of -0.06 demonstrates that the process is not centered and yields outcomes outside the specified ranges. Addressing these shortcomings is critical, necessitating operational adjustments to align with company standards and mitigate potential negative impacts on customer satisfaction and profitability.

Root Cause Analysis. A comprehensive analysis was conducted to identify the root causes of returns in the company, reviewing 285 returned orders from the past year. This analysis revealed that 47.37% of returns are due to late deliveries, indicating logistical and time management issues. A further 33.68% of returns result from defective orders, highlighting the need to improve packaging and transportation. Other issues include nearing expiration products (11.23%) and incorrect orders (7.72%), underscoring the necessity for enhanced inventory management and dispatch accuracy. Over 80% of returns are concentrated in these first two causes, suggesting that addressing them could significantly reduce returns.

The root cause analysis details sub-causes, identifying lack of order planning (23.36%), inefficient route planning (15.94%), and inadequate staff training (14.49%) as major factors contributing to low productivity. Other issues include over-stacking due to improper storage (13.77%) and insufficient warehouse space allocation (10.87%). Additionally, inadequate protection during transport and improper product handling exacerbate these situations.

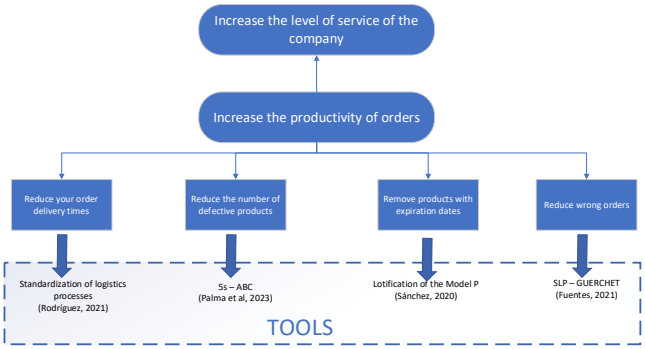


Figure 3. *Objective tree*

Development of Tools to Mitigate/Eliminate Root Causes

Diagnosis and Proposal

Sort (Seiri): Eliminate unnecessary items from the warehouse. Set in Order (Seiton): Place useful items in specific locations for easy access. Shine (Seiso): Maintain a clean workspace and identify sources of dirt. Standardize (Seiketsu): Sustain the gains from the previous 3S with norms and policies. Sustain (Shitsuke): Create habits of improvement and establish norms among workers.

Implementation Results. Upon applying the checklist, the following results were obtained according to the evolution of the implementation of the 5S improvement methodology.

Table 2

Score summary before and after 5s implementation

5S	Before Points	After Points
Sort (Seiri)	15	60
classify (Seiton)	27	67
Clean (Seiso)	87	93
Standardize (Seiketsu)	0	73
Discipline (Shitsuke)	13	67
TOTAL	35%	90%

ABC Classification of Products

Products classified based on their turnover and sales:
Class A: 13 products, accounting for 78.8% of sales.
Class B: 4 products, accounting for 14.2% of sales.
Class C: 3 products, accounting for 7.0% of sales.

Inventory management model

Using the Periodic Review Model (Model P):
Class A: Inventory reviewed weekly.
Class B: Inventory reviewed every 2 weeks.
Class C: Inventory reviewed monthly.

Table 3 details the order quantity (Q), reorder point indicating when to reorder, and safety stock for each product.

Table 3

Quantity per product to order

Product type	Articles	Annual demand (unid/año)	T (días)	L (días)	σ (t+l)	Q	Reorder point	Safety stock
A	CP00019	755	6	8	6.15	44	19	10
A	CP00015	628	6	8	6.15	38	16	8
B	CP00008	602	13	8	7.54	53	15	8
B	CP00011	554	13	8	7.54	50	14	7
C	CP00005	498	26	8	9.59	70	13	6
C	CP00007	389	26	8	9.59	58	10	5

Layout Redistribution. The layout was reorganized using the Guerchet and SLP methodologies: Total required area: 2,672.1 m², Available area: 2,995 m².

Results of Simulation of Tools in the Company. Regarding the process flow of Majorel SP Solutions SA, logistic management planning was conducted from order arrival to order delivery. Out of 938 incoming orders, 914 orders were successfully delivered, while 47 orders were not delivered.

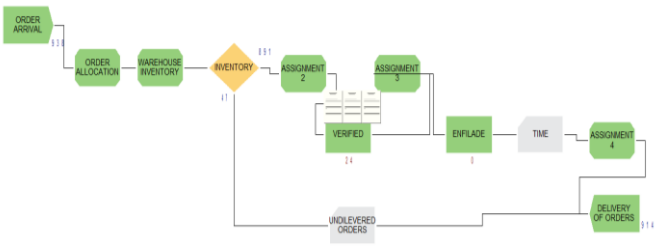


Figure 4. *Simulation model of logistics management in ARENA software*

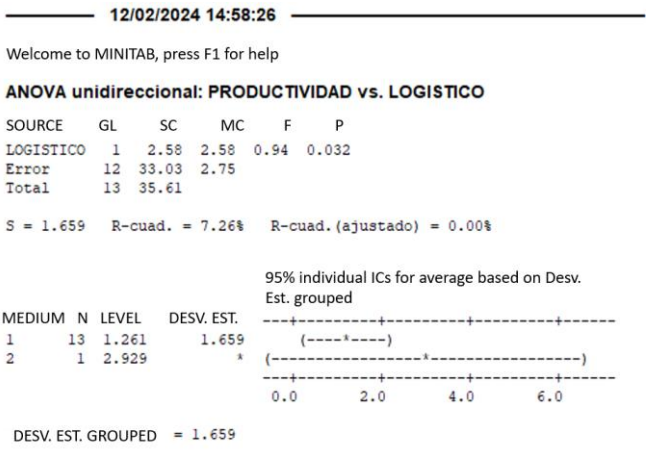
In the comparative dashboard of indicators, it is observed that with the simulation of the proposals, effectiveness has increased by 10.8%, efficiency has risen by 28.6%, thereby boosting productivity to an index of 89.0%, marking a 34.7% increase. Additionally, stockouts decreased by 12.8%, pending picking reduced by 2.6%, and order returns decreased by 8.2%, achieving a service level of 97.4%.

Table 4

Benchmarking of the indicators board

Indicator	Current value	Value with simulation	Difference
Efficiency	86.6%	97.4%	10.8%
Efficacy	62.7%	91.3%	28.6%
Productivity	54.3%	89.0%	34.7%
Stock break	15.4%	2.6%	-12.8%
Picking pending	3.3%	0.6%	-2.6%
Orders returned	10.1%	1.9%	-8.2%
Service level	87.6%	97.4%	9.8%

Hypothesis Testing Verification. Hypothesis testing was conducted using Minitab software, yielding a p-value of 0.032, which is less than the significance level (0.05). Therefore, the null hypothesis is rejected, and the alternative hypothesis is accepted: Implementing a logistics management system significantly improves the productivity of Majorel SP Solutions SA, Lima 2023.



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12/02/2024 14:58:26

Welcome to MINITAB, press F1 for help

ANOVA unidireccional: PRODUCTIVIDAD vs. LOGISTICO

SOURCE      GL     SC     MC     F      P
LOGISTICO    1   2.58   2.58  0.94  0.032
Error       12  33.03   2.75
Total       13  35.61

S = 1.659   R-cuad. = 7.26%   R-cuad.(ajustado) = 0.00%

                                  95% individual ICs for average based on Desv.
                                  Est. grouped
MEDIUM  N  LEVEL    DESV. EST.    ---+---------+---------+---------+------
1      13  1.261         1.659        (----*----)
2       1  2.929             *   (-----------------*-----------------)
                                  ---+---------+---------+---------+------
                                   0.0       2.0       4.0       6.0

DESV. EST. GROUPED   = 1.659
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Figure 5. *Hypothesis test with Minitab software*

IV. CONCLUSIONS

The implementation of a logistics management system at Majorel SP Solutions SA, Lima 2023, has significantly improved productivity. The analysis of the state of the art and a thorough diagnosis of 285 returned orders identified the main causes of returns: late deliveries, defective products, nearing expiration, and incorrect orders. Proposed solutions included the 5S methodology, ABC classification of products, and an inventory management model based on the periodic review model P, along with layout redistribution using SLP and Guerchet methods. Simulation with ARENA software showed improvements in effectiveness (10.8%), efficiency (28.6%), and overall productivity (34.7%), alongside reductions in stockouts (12.8%), pending picking orders (2.6%), and returns (8.2%), achieving a service level of 97.4%. Economic viability was confirmed with a NPV of 30,425.05 soles, an IRR of 43.7%, and a Benefit-Cost Ratio of 1.99. Validation using Minitab software, with a p-value of 0.032, corroborated that the implementation significantly enhances productivity.

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