

Production Model Based on 5S to Increase Productivity in an SME in the Garment Sector

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Abstract

The 5S methodology comprises a set of activities that seek to improve productivity and optimize processes in an organized, orderly and clean manner. The objective of this research was to improve the productivity of an SME in the textile industry through the evaluation and implementation of the aforementioned methodology. The company's main problem was identified as the lack of a routine of stock control, cleaning, and order activities in the warehouse area, generating loss of fabrics due to poor conditioning and lack of information on stored stock. For the development of this study, we worked with the phases of design, implementation, and validation, using control cards, training, and a schedule of activities to improve stock control and productivity. As a result, a 20% increase in productivity was obtained in the reduction of dispatch times. The implementation of the 5S demonstrates the positive effect of this methodology in the category studied and highlights the high transferability value of this lean tool.

Keywords

5S methodology, productivity, warehouse area, textile, stocks, lean manufacturing.

1. Introduction

According to Diario Gestión (2018), around 80% of companies in Peru have a family-based origin and contribute approximately 40% to the country's GDP. Many of these businesses, however, lack the necessary knowledge or overlook the importance of having well-structured logistics processes in their different areas—something essential for achieving the levels of productivity and profitability they aim for. Within this context, the supply chain plays a key role by ensuring coordination among all logistical components, allowing for a smoother flow of both products and information. This, in turn, leads to reduced production costs and greater customer satisfaction (Ballou 2004).

Warehouse management has become a fundamental part of this chain. A lack of control in this area can have a direct impact on key operations such as purchasing and sales, and may also lead to problems with inventory, product obsolescence, and traceability. As Poirier and Reiter (1996) point out, managing warehouses effectively is a critical process that allows businesses to make better use of their resources and available storage space, taking into account

the size and characteristics of the products involved. In recent years, the introduction of Lean methodology in logistics processes has gained relevance thanks to its focus on continuous improvement. Lean encourages the elimination of everything that does not add value and promotes doing more with less—less time, less effort, and fewer resources. One of its most widely used tools is the 5S method, which helps companies standardize their processes and develop consistent work routines.

As noted by Manzano and Gisbert (2016), the 5S approach can be particularly useful in small and medium-sized enterprises (SMEs), where it supports the creation of clean, organized workspaces and helps eliminate waste that doesn't contribute to the final product. In doing so, it also strengthens the long-term sustainability of the business by fostering a mindset geared toward constant improvement. The main goal of the 5S methodology is to bring order to the workplace and make it last over time. This not only improves working conditions but also enhances employee performance and the overall work atmosphere—factors that ultimately lead to better product quality and higher productivity (Hernández 2016).

The name "5S" comes from five Japanese words that summarize the core principles of the method: 1) Seiri (Sort) – to separate what's necessary from what's not and remove what's no longer needed to free up space. 2) Seiton (Set in Order) – to organize the necessary items so they are easy to locate and access when needed. 3) Seiso (Shine) – to keep the workplace clean and cultivate a sense of pride and care for the environment. 4) Seiketsu (Standardize) – to turn order and cleanliness into habits by creating clear standards and routines. 5) Shitsuke (Sustain) – to maintain discipline and commitment, so good practices become part of the culture rather than a one-time effort.

1.1 Objectives

This study aims to design and implement the 5S methodology to assess whether its application contributes to increased productivity in a microenterprise within the garment sector. The intervention is based on the identification of deficiencies in space management, such as the absence of inventory control routines, lack of order and cleanliness, and limited organization of daily activities.

2. Literature Review

2.1 5S in Inventory Management

Moreno and Diego (2019) conducted a quantitative research study with a correlational, explanatory, and descriptive approach, in which they highlighted the lack of timely information regarding inventory management. This deficiency affected the ability of companies belonging to the APLIPAT association to take advantage of seasonal sales. The objective of the research was to plan, improve, and adequately manage the processes of inventory and storage within the company. As a result, the association acknowledged the importance of logistics in distribution and internal systems, as well as its impact on stock control logistics in various bookstores and stationery stores in the area. This motivated them to implement the 5S methodology with the aim of improving their services efficiently and effectively.

Cejas and Garrido (2017), in turn, aimed to analyze the effectiveness of inventory management using statistical/mathematical models in companies located in Riobamba Canton, Ecuador, to better plan the administration of their products. The results showed that effective inventory management in SMEs increased the company's revenues and assets.

Likewise, Távara and Villanueva (2021) carried out a study involving a continuous improvement plan using the 5S methodology to optimize warehouse management in the company under study. This was a descriptive, non-experimental, cross-sectional study in which the origin of the problems was identified using a sample of 30 warehouse workers. Based on the results obtained, the authors concluded that the warehouse area did not apply the proposed 5S methodology plan, with a compliance level of only 36.67%, which was below the established productivity benchmarks.

2.2 5s in Productivity Improvement

Another relevant study is that of Lamprea and Carreño (2015), who evaluated the effectiveness of the 5S methodology in manufacturing companies. Their approach began with a visual diagnosis, followed by the use of tools such as surveys, case studies, and performance metrics to assess the current situation of the selected case. The findings revealed a positive correlation between the use of the 5S methodology and key operational factors, including quality, productivity, and occupational safety. Notably, the implementation of 5S led to an increase in productivity indicators, highlighting its practical benefits in industrial settings.

Similarly, Marmolejo and Mejía (2016) carried out a study focused on improvement processes within a garment manufacturing company in Bogotá, Colombia. The company faced challenges such as production delays, visual pollution, and financial losses due to poor control over the final product. The main goal of the study was to design and implement a continuous improvement action plan using lean manufacturing tool. This descriptive and observational research included interviews with operators and data collection efforts. Based on their findings, the authors concluded that the company lacked a solid organizational culture, and workers had not received adequate training to perform their tasks effectively—factors that had a direct impact on productivity. The implementation of the improvement plan resulted in a reduction in production time and, consequently, significant cost savings for the company.

In the same vein, Tinoco and Moscoso (2016) conducted a study on the application of the 5S methodology to improve the perception of quality culture in small textile manufacturing businesses located in the Northern Cone of Lima. This applied and experimental research relied on observation, data gathering, and surveys to measure the level of quality culture within the company, using a sample of 12 SME employees. The results showed that applying the 5S methodology not only enhanced the quality of the products but also improved the physical and mental well-being of workers, along with the order and cleanliness of their workspaces.

3. Methods

This article presents a case study based on a company in the textile and apparel sector, in which a combination of methods was used for analysis. The proposed model aims to improve productivity in the company's warehouse area and is structured into three development phases: diagnosis of the problem, intervention, and implementation of the intervention, as shown in Figure 1.

Firstly, a diagnosis of the company's current situation was conducted to address the problem through analysis, following these steps: indicator analysis (to visualize the company's current performance), identification of the main problem using the CTQ tree tool (which helped identify the problem based on customer requirements), IER matrix (which facilitated prioritizing the issue to focus on), and the Ishikawa diagram (which helped identify the root causes). Problems such as lack of inventory control, suboptimal product storage, deterioration of fabrics due to poor storage, and lack of stock information were identified.

Once the problems and their main causes had been identified, an investigation was carried out to find engineering solutions that could improve efficiency, with the goal of enhancing productivity indicators in the area. Therefore, the implementation of the 5S methodology was considered appropriate, as it would facilitate understanding and engagement among workers due to the clarity and simplicity of its principles, contributing to fostering a culture of continuous improvement, encouraging participation, and ensuring adherence to the proposed activities. Finally, the last phase aims to measure the level of improvement after the tool's implementation and to compare the results obtained with those from the initial diagnosis. Considering the above, Figure 1 illustrates the proposed model and its development.

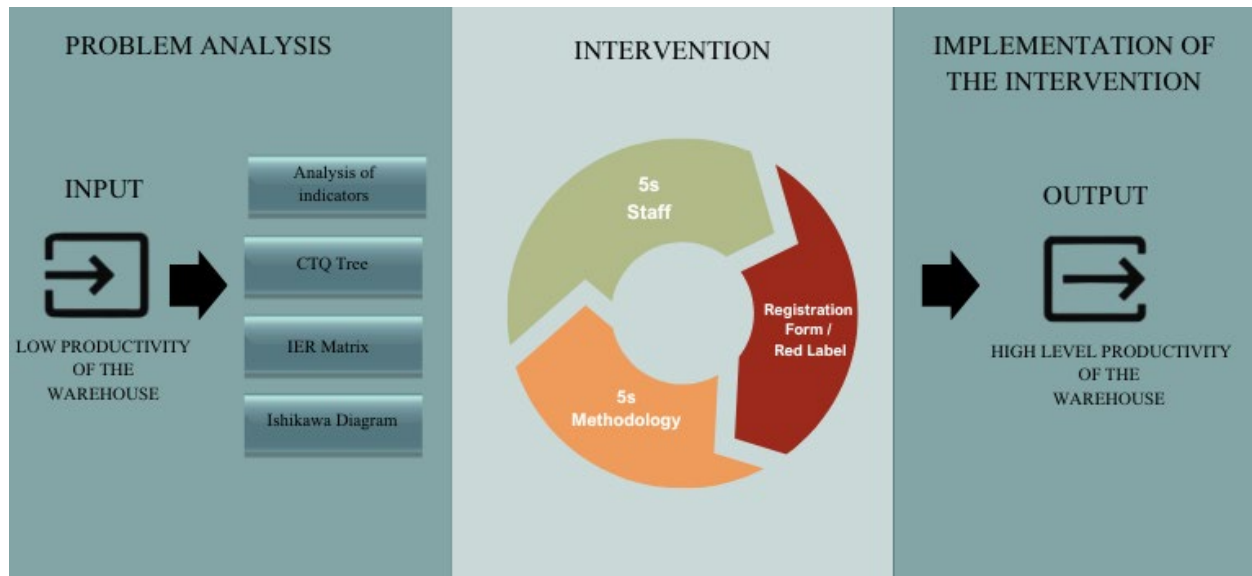


Figure 1. Proposed model

4. Data Collection

Data for this research were gathered through the collection and analysis of information from various bibliographic sources such as articles, books, and reports, aiming to carry out a comprehensive evaluation. Additionally, to gain deeper insight into the company's situation, tools like surveys and interviews were employed, allowing for a better understanding of its processes and identifying areas of improvement. Figure 1 shows the process that was followed for the results of this investigation.

The first step was data collection. Several visits were made to gain more detailed view of the company. In addition, surveys and key indicator helped to have a better view about the initial status of the company and try to understand the processes of the workers. Subsequently, an Ishikawa diagram was performed to identify the main problems and reasons. The, those causes were analyzed and asked if them were related to the order fulfillment. The second step was implementation. The 5S method first audit was made, and assessments of the process time, efficiency, and layout were taken to identify the improvements. With this information, the 5S methodology was implemented. Then, we teach and train staff about the new process that will help them on their daily work.

The third step was validation. The 5S method second audit was made. There were assessments of the new process post implementation and evaluate the indicator to see if we were having improvements. Afterwards, the new process got standardized and trace key indicators to measure every so often the efficiency.

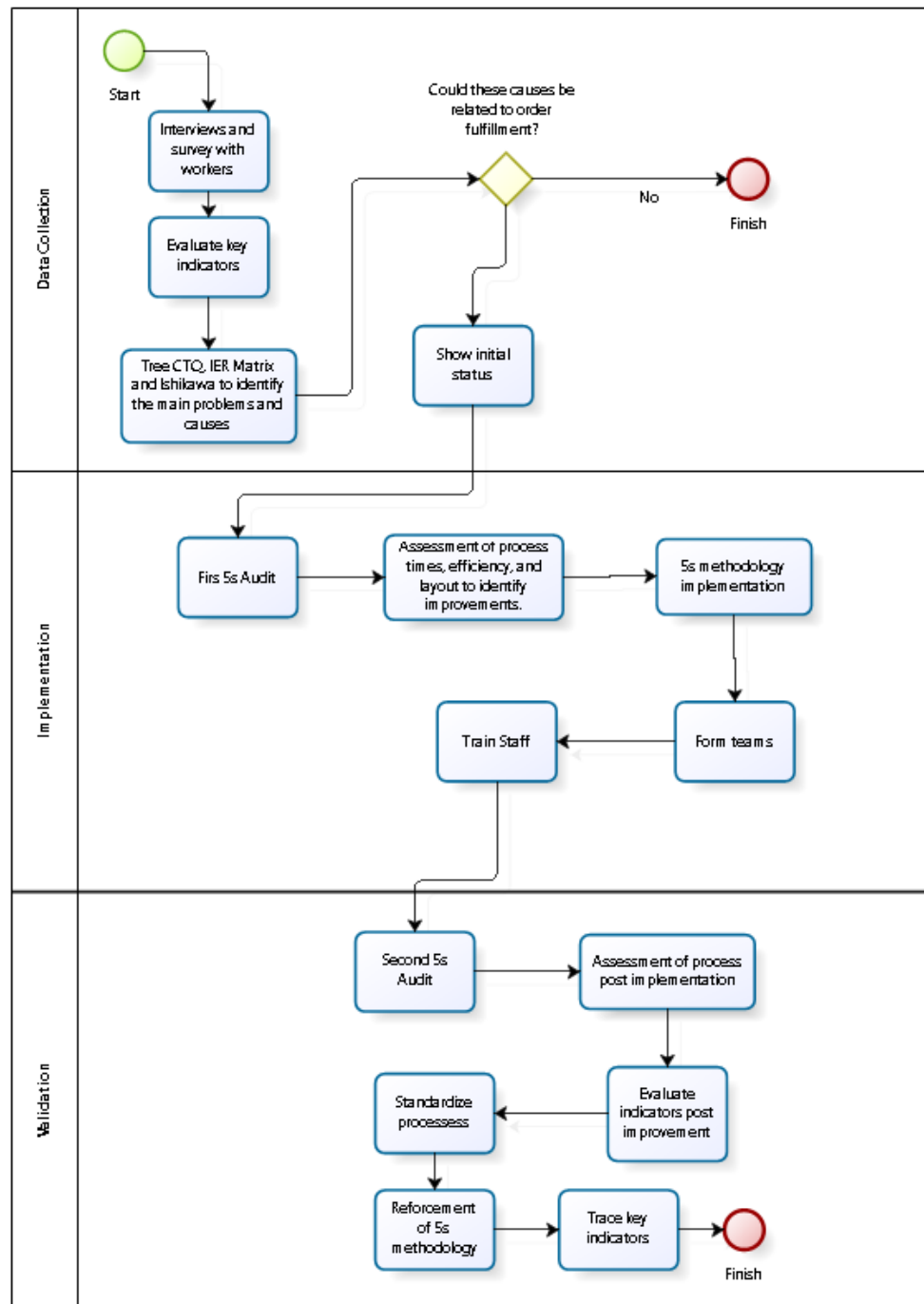


Figure 2. Diagram of results

4.1. Implementation of 5S Methodology, Form 5S staff and Ongoing staff development

In this phase, the selected tool is implemented through experimentation and pilot testing within the company. The organization faces an inventory management issue in the warehouse area, primarily caused by a lack of control, poor storage practices (such as inadequate classification), and suboptimal warehouse conditioning. These factors lead to low order fulfillment rates and extended response times in order processing. As a result, the company experiences lost sales and diminished customer service quality, which in turn generate customer dissatisfaction and a negative overall experience.

For the 5S tool, an internal audit was conducted to assess the company's current state and identify potential areas for improvement. In the initial phase, unnecessary items were identified and categorized using 5S tags, which specified the appropriate actions to be taken for each object. In this case, the classification was divided into two categories: fabrics and materials.

Regarding the tags used for fabric management, key aspects were recorded, such as the date of the last movement or sale, available yardage, physical condition of the material, and the presence of defects such as manufacturing faults, mold, or deterioration. Corrective actions were suggested accordingly, which included washing in the case of minor dirt, or disposal when the damage was severe or pest infestation was detected. If only part of the fabric was compromised, cutting the affected section was considered to maximize material usage. Finally, a decision was made on whether the fabric should be sold, liquidated due to obsolescence, or relocated to a special area if it was a delicate textile requiring additional protection.

For other materials (such as ties, buttons, cufflinks, and other accessories), a similar classification system was applied, although variables such as color and yardage were excluded. The overall objective of this activity was to identify the truly necessary items in the warehouse, distinguishing them from those that needed to be discarded, repaired, or cleaned. In the second phase, corresponding to the implementation of the second S (Seiton), the previously categorized useful or value-generating products were organized. A specific space was assigned to each type of material, facilitating their location and reducing search times. In addition, clear and appropriate signage was implemented to allow for quick identification of each area.

The third stage (Seiso) consisted of a thorough cleaning of the warehouse. The main sources of dirt, such as dust and the presence of insects, which contributed to the deterioration of fabrics, were identified. As a corrective measure, cleaning products and insecticides were acquired, and a detailed schedule was developed specifying the cleaning tasks, their frequency, and the personnel assigned. Each cleaning log listed the necessary supplies to prevent the overuse of materials. Task assignments were carried out randomly and rotated periodically to encourage equitable staff participation in the improvement process.

In the fourth stage (Seiketsu), a control system was established to ensure the sustained implementation of the first three S's. Monthly meetings were organized to present progress, evaluate results, and gather suggestions from the work team. A team composed of representatives from various departments—referred to as the "5S Team"—was created to oversee compliance with the proposed controls. Finally, in the fifth stage (Shitsuke), discipline was promoted as the foundation for consolidating the achieved improvements. Continuous training processes were carried out with the objective of strengthening and optimizing staff performance. Likewise, a recognition system was implemented to reward employees who demonstrated commitment to the methodology, and systematic records of material inflows and outflows were established. Below are the results for the initial state of the warehouse area. To assess productivity levels, a sample was created based on weekly production, calculating an average of the units processed over a 7-week period. Efficiency, effectiveness, and productivity indicators were used throughout the analysis, and improvements in each indicator were recorded each time we applied the 5S methodology.

- Effectiveness level (%): $\frac{315}{450} * 100\% = 70\%$
- Efficiency level (%): $\frac{11}{22} * 100\% = 50\%$
- Productivity level (%): $70\% * 50\% = 35\%$

5. Results and Discussion

As a result of the analysis, it was identified that the primary root causes contributing to excess inventory are the lack of order and cleanliness, the presence of unclassified products, and inefficient warehouse distribution. Considering these findings, the 5S methodology is proposed as an innovative solution to mitigate the main issue. Additionally, key performance indicators—such as productivity, efficiency, and effectiveness—are established to evaluate the impact of the implementation. Initially, following the application of the first "S" (utilization of tags for inventory classification), the following results were obtained:

Table 1. Total products classified in the observations

Observation No.	Necessary products	Total products	Classified products
1	90	98	92%
2	95	115	83%
3	129	140	92%
4	185	204	91%
Total	499	557	90%

It is observed that 90% of the inventory in the warehouse was classified as necessary products, while 10% were identified as unnecessary and should be reorganized or removed as they do not add value. After implementing the second S (schedule), compliance with it was evaluated, and the following results were obtained:

Table 2. Evaluation cleaning schedule

Observation No.	Cleaning completed	Scheduled Cleaning	Fulfillment percentage
1	2	3	67%
2	1	3	33%
3	1	4	25%
Total	4	10	40%

The table shows that only 40% of the cleaning schedule was fulfilled. It is noted that workers are not very receptive to the changes being implemented. Regarding the fourth S, maintaining the implementation of the first three S's requires continuous monitoring. To support this, short meetings were held in which progress, achievements, and difficulties encountered during the implementation of the methodology were discussed. It is recommended that these meetings be scheduled twice a week.

Finally, the fifth S (sustaining the initiatives over the long term) requires instilling discipline in employees so that they can continue applying the 5S methodology without the need for constant supervision. To achieve this, incentives such as "Employee of the Month" were proposed, recognizing individuals for their achievements and good performance. Additionally, employees should be encouraged to return reusable products to their original place and always keep the storage area clear. Workers should also be trained to record product inflows and outflows to keep track of inventory levels and avoid overstocking. Finally, through discipline, all participants were educated to commit to achieving the objectives previously set through self-discipline and personal responsibility, obtaining a final result after a final audit of 75%.

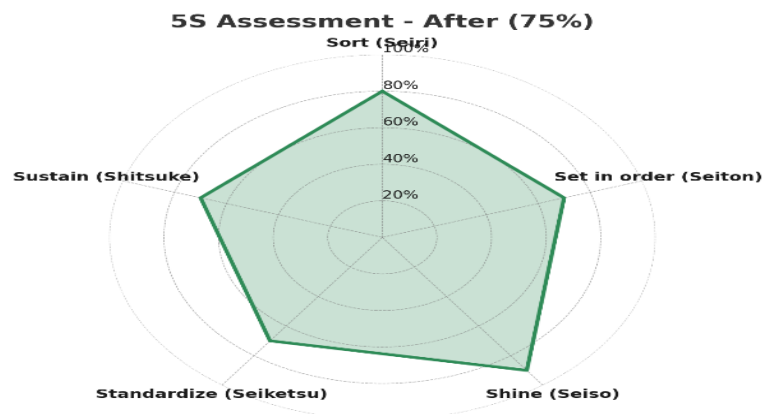


Figure 3. Assessment of the 5's after upgrade

5.1 Numerical Results

The indicators below are reported following the pilot test, with the order fulfillment level calculated as an average of the demand met and unmet over the seven-week duration of the pilot.

- Effectiveness level (%): $\frac{355}{416} * 100\% = 88.46\%$
- Efficiency level (%): $\frac{23}{26} * 100\% = 85.34\%$
- Productivity level (%): $88\% * 85\% = 75.5\%$

5.2 Graphical Results

The following visual results were obtained during the intervention:

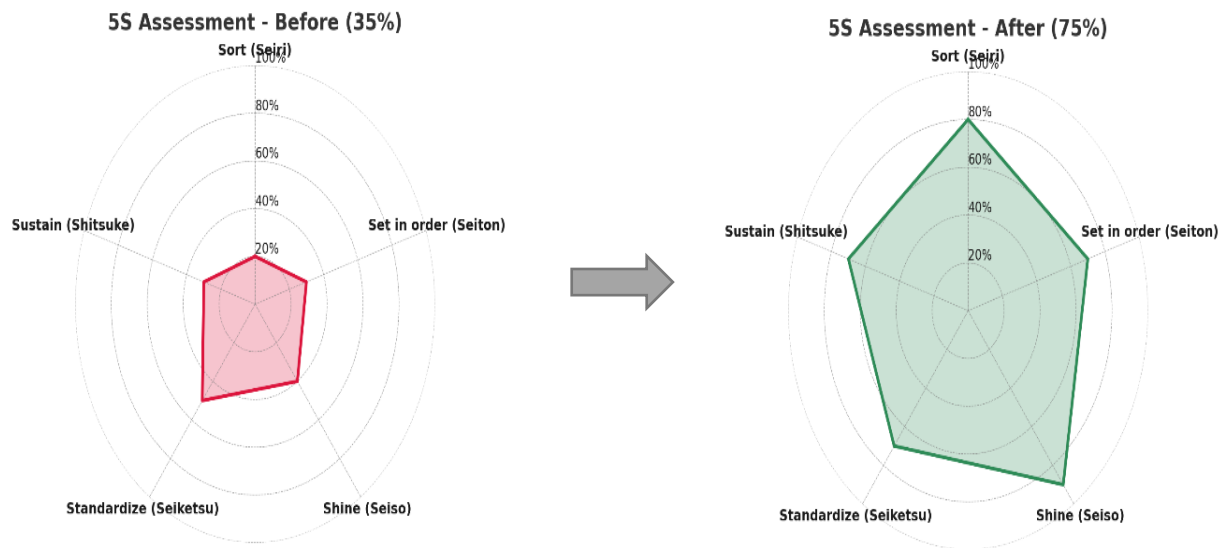


Figure 4. 5S audit before and after comparison

Table 3. Week-by-week implementation indicators

Weeks	Requested dispatches	Total scheduled time (min)	Dispatched executions	Total time used (min)	Efficiency	Effectiveness	Productivity
1	22	315	11	450	50%	70%	35%
2	19	290	10	342	52.63%	84.8%	44.63%
3	20	300	11	400	55%	75%	41.25%
4	17	255	10	320	58.82%	79.69%	46.88%
5	19	285	13	342	68.42%	83.33%	57.02%
6	25	375	20	450	80%	83.33%	66.67%
7	26	355	23	416	88.46%	85.34%	75.49%

5.3 Proposed Improvements

The improvement proposal is evaluated using performance indicators. An increase in productivity is observed each week, indicating progress in the warehouse area. Excess inventory was reduced, which in turn decreased the loss of fabrics and other items that were deteriorating due to lack of cleanliness and the unknown location of materials. With the improvement in performance indicators, the standard times for locating merchandise and delivering the requested items during order processing were reduced. Additionally, the work environment improved, as employees now carry

out their activities in clean and organized spaces and are recognized when they consistently follow the 5S methodology with discipline.

5.4 Validation

The methodological proposal was evaluated over a period of seven weeks. During this time, data was collected because of the implementation of the 5S methodology within the company.

Table 4. Comparison of indicators between scenarios

Indicator	Initial Situation	Improved Situation (7th week)
Effectiveness	38%	74%
Efficiency	31%	76%
Productivity	35%	75%
Inventory Turnover Ratio	40%	70%

Based on the results obtained, the achievement of the study's general objective is evident, as reflected in the improvement of the analyzed indicators. Furthermore, an additional margin for improvement was identified, suggesting that continued implementation of the model could lead to sustained long-term benefits.

6. Conclusion

The warehouse productivity of the company increased following the implementation of the 5S methodology, as did efficiency and effectiveness. In the first week, productivity was calculated at 35%, and after implementing the changes, it increased by 40%, reaching a 75% improvement by the end of the seventh week of implementation. These results are like success cases, as improvements were evident in processes, organizational culture, and the quality of the final product. Likewise, other proposals from the EIR matrix were indirectly implemented, such as cleanliness and order through the application of the third "S." The time spent searching for materials also decreased, as an organized environment allowed workers to find fabrics more quickly and prevented them from getting lost. External factors, such as the lack of commitment and responsibility from workers during the early stages of implementation, reaffirm that people are resistant to change and struggle to adopt new behaviors. However, with the right techniques, it was possible for them to internalize the 5S methodology into the organizational culture for continued application.

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