Universidad de Lima

Facultad de Ingeniería

Carrera de Ingeniería Industrial

LOGISTICS MANAGEMENT MODEL TO REDUCE NON-CONFORMING ORDERS THROUGH LEAN WAREHOUSE AND JIT: A CASE OF STUDY IN TEXTILE SMEs IN PERU

Tesis para optar el Título Profesional de Ingeniero Industrial

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Lima – Perú

Setiembre de 2023

Logistics Management Model to reduce non-conforming orders through Lean Warehouse and JIT: A case of study in textile SMEs in Peru

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The textile sector has a large share in the Peruvian manufacturing industry, dominated by SMEs. However, the segment has been facing a slowdown in growth, intensified by the partial inoperability of commercial enterprises. Under this scenario, there is a need to improve its competitiveness by optimizing the material supply process, as this is the stage that generates a large number of non-conforming orders and delays in the entry of production. Therefore, an optimize model using Just-In-Time and Lean Warehouse has been proposed to reduce backorders, shorten delivery times and minimize the input of defective materials. Along with 5S methodology to organize the warehouse and supplier assessment, ensured a long lasting solution. After the simulation made by the software Arena with the proposed model, it was possible to reduce the number of non-optimal orders by 55% and increase process efficiency by 5.97% by reducing procurement lead time. Furthermore, it represents a reduction in the purchasing cost of 40.55%.

CCS CONCEPTS • Supply chain • Non-conforming orders • Textile manufacturing

Additional Keywords and Phrases: Lean Warehouse, Just-in-Time, 5S, Small and Medium Enterprises, Procurement

ACM Reference Format:

Dhara Huamani-Lara, Jose Coronel-Vasquez, Alberto Flores-Perez, Martin Collao-Diaz and Juan Quiroz-Flores. 2022. Improvement Model to reduce non-conforming orders through Lean Warehouse and JIT: A case of study in textile SMEs in Peru. *In 2022 The 3rd International Conference on Industrial Engineering and Industrial Management (IEIM 2021), January 12–14, 2022, Barcelona, Spain*

1 INTRODUCTION

The textile industry represents a 30.6% share of Peru's income [1] and is one of the primary segments in the manufacturing industry. However, it has had a decrease in sales due to the reduction of retail trade. As of 2019, 99.9% of the companies in the apparel sector represent small and medium enterprises. Given this situation, it is necessary to find tools to maintain fluidity in the supply chain. That is why[2] mentions that the application of Just-in-Time would allow us to synchronize the operations of the supply chain. The research emphasizes the first links in the chain, focusing on the supply of materials and is directly related to the administration of warehouses, thereby seeking to optimize supply management in the textile sector.

The main problem of the case study is the large amount of non-conforming materials supplied in the company, which arises from an incorrect selection of suppliers, deficient quality controls, and mistakes due to the poor classification and organization of materials, causing material costs to increase by 45% [3]. Therefore, the supply must be efficient to compete and improve productivity from the process input [4]. Hence, the use of the well-known Lean methodology is proposed, which requires appropriate techniques to measure, quantify, validate and analyze its planning and implementation [5], with Lean Manufacturing as the protagonist in production processes [6]. However, for supply processes, the number of case studies is limited [7], which is why many companies do not choose to seek improvements in this area.

The company chosen for this case of study was a textile SME that represents qualitatively and quantitatively the sector. This allows us to measure the impact on the economic retribution and costs incurred by inappropriate supply management. The research aims to optimize this supply management through an improved model based mainly on Lean Warehouse and JIT. Successful cases of applying the different Lean techniques guarantee improvements in process efficiency, resulting in cost reduction [8]. Although there are scientific articles that implement Lean tools to improve supply problems, the innovation of the article lies in the implementation of Lean Warehouse and Just-in-Time simultaneously, adding 5S tools. Furthermore, the application of a supplier assessment to support the new methodology implemented in the company.

2 STATE OF ART

2.1 Lean Warehouse

This methodology covers the entire supply and picking process [7], which is part of the logistics costs, reaching 50% and 60% of the total costs [9]. This process is very important because it is the input of the supply chain and production plan. In addition, indicators and parameters must be set in order to have subsequent diagnosis, analysis and implementation of improvements [10]. Lean Warehouse aims to be able to eliminate these waste and downtimes in the supply process, in order to achieve greater efficiency [11].

The different studies referring to the supply chain management show that its implementation achieves improvements in time efficiency, productivity and quality [12], applying 5S to be able to improve that last aspect. To be able to talk about 5S, it is important to identify what each S means: Select, sort, clean, standardize and maintain. The aim of this tool is to be able to eliminate any kind of waste. In addition, when talking about Lean Warehouse and 5S you have an efficiency increase in warehouse operations by at least 40% [13].

Finally, it was possible to increase warehouse productivity by 3.95 times and reduce the time spent searching for material by 66.12% [14]. Similarly, the tool was able to reduce incidences that stop the Flow of the chain by 26.2% and increase the rotation of materials by 0.95 times [3].

2.2 Just in Time

Its main objective is to able to have everything at the exact time to avoid extra costs [15]. However, the implementation should be consistent and long-term in order to achieve the expected results [16]. Its implementation helps the production process not to be affected by delays in material orders, achieving optimal production [17]. In terms of benefits, it is a low-cost methodology that allows flexible provisioning and production, as well as flexible delivery times [16], through the capacity for cooperation and information exchange between the members of the supply chain [2].

The objective of this implementation was to improve the quality of the products, through the standardization and implementation of quality controls [15] with very favorable results, reducing up to 85% of delays due to lack of materials [16]. In addition, its application also had positive results within the textile industry, helping to standardize processes and improving the quality of materials [17].

2.3 Lean Warehouse y JIT

There are authors who implemented Lean Warehouse and JIT in their research to optimize provisioning management. With their application they sought improvements in the supply chain management that allows to measure, quantify, analyze and validate what is proposed, as well as to reduce costs and improve productivity [5]. In 1999 Gunasekaran model, Lean Warehouse, was implemented with Lean thoughts, which included JIT, obtaining the highest effectiveness coefficient for tool 5S with 0.97 above a monitoring of storage and supply activities through KPI’s [18].

In addition, there are studies that say that using JIT together with any Lean Warehouse tool can reduce costs and increase efficiency, as well as better supply management [19]. Both methodologies achieve higher productivity in the supply process by 47%, as well as an increase in compliance of 30-35% in orders served, and a decrease of 18% in total orders placed [20]. Finally, the implementation of 5S by Lean Warehouse Will optimize the cycle times and processes in the warehouse [21].

3 PROPOSED MODEL

This proposal combines the Just-in-Time and Lean Warehouse methodologies with 5S tools to optimize the management of the materials supplied to the warehouse to contribute to the textile sector, based on other successful cases. In addition, it considers a supplier assessment that helped with both of the problems previously mentioned. Both strategies, supporters of innovation and process improvement, aim to increase competitiveness and profitability by streamlining processes, improving supply cycle times [3], and reducing non-conformities in the entry of materials.

The research started with a diagnosis to analyze the current situation of the sector and to evaluate if the company is related to the problems commonly present. After a literature review, the tools that can contribute the most value to obtain better results were selected. This model will be given in four phases, including a phase 0, from the selection of suppliers to storage, recommending indicators.

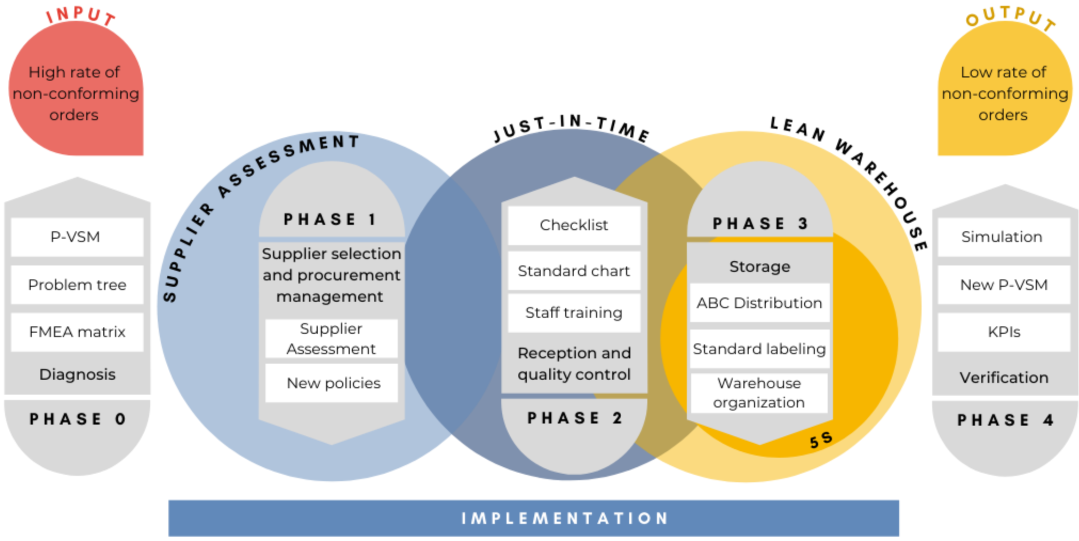

Figure 1: Proposed improvement model

The strategies and tools proposed in this improvement model are supported by an intensive literature review. Likewise, the selected case of studies has applied similar techniques with positive outcomes for the problems presented, which are shown below. Furthermore, the table also highlights the approached innovation of this article due to the combination of different methodologies.

Table 3: Comparison table of the proposal components vs State of art

Components	Reference	Unqualified suppliers	Inefficient procurement process	Reception and quality control	Storage
Makinde et al. (2020)	[22]	Supplier assessment			
Jing et al. (2020)	[9]	Procurement Management	Procurement Management		
Yang et al. (2021)	[2]		Just-in-Time Purchasing	Just-in-Time Procurement	
Altamirano et al. (2020)	[13]			Just-in-Time + 5S + Kanban + Heijunka	
Buonamico et al. (2017)	[24]	Just-in-Time		Lean Warehouse + 5S + Visual Management	Lean Warehouse + 5S + Visual Management

Components	Reference	Unqualified suppliers	Inefficient procurement process	Reception and quality control	Storage
Neyra et al. (2019)	[14]				5S Hybrid (5S + Inventory Management)
Prasetyawan et al. (2020)	[10]				Lean Warehouse
Proposal		Supplier assessment (based in JIT)	Just-in-Time Purchasing	JIT + Lean Warehouse	Lean Warehouse + 5S

3.1 Phase 0: Diagnosis

The diagnostic phase allows establishing the company's problems by analyzing historical purchasing data, production plans, process times, among others, to compare them with the industry average. A Procurement Value Stream Mapping (P-VSM) was elaborated utilizing flow diagrams to identify dead times within the supply [9]. Likewise, a FEMEA matrix was used to identify potential problems and eliminate risks.

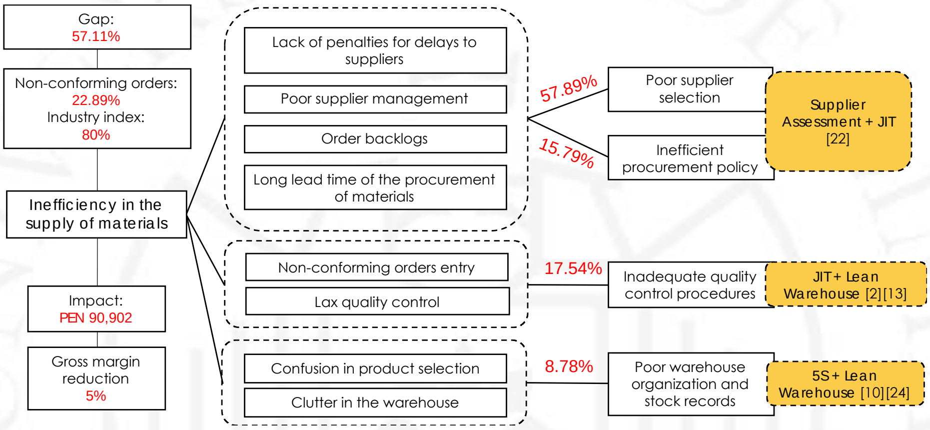

Figure 2: Problem tree

3.2 Phase 1: Supplier selection and procurement management

The purpose of the first phase is to achieve an efficient purchasing process and to develop a fluent relationship with the suppliers. It began with the communication of the philosophies and new Lean strategies to the employees and suppliers since success depends on the internalization of the methodology as an organizational change. To keep a high capacity of adaptation, a Supplier Assessment was executed, an evaluation that selects the best suppliers to hire or maintain [22] using a matrix.

Next, a Warehouse Management System (WMS) was implemented to ensure continuous communication between suppliers and the company, following the principles of Just-in-Time Procurement. In this way, suppliers will anticipate the company's needs, reducing delivery times and avoiding possible stock-outs.

3.3 Phase 2: Reception and quality control

The previously mentioned WMS seeks to improve the reception of materials, allowing the company to know the status of its orders in advance. This benefits with the opportunity to take action in case of an inconvenience or delay in the delivery. On the other hand, the Lean Warehouse methodology aims to reduce the entry of non-optimal orders through better quality control. Moreover, the implementation of more thorough quality control before the reception of the material, with tools such as standard parameter tables and checklists for order verification. This phase also includes training and coaching for the employees, whose knowledge is evaluated through small exams at the end of every session.

3.4 Phase 3: Storage

Phase three focused on Lean Warehouse with 5S, starting with training and divulgence of the methodology and new internal policies. The aim is to restructure the environment and create agility in the processes. The first stage started with the selection and elimination of unnecessary elements in the warehouse. Such made the space appear more spacious and less crowded. Then the inventory was organized using the ABC analysis to speed up picking improved the distribution of the pallets. After that, periodic cleaning is scheduled to maintain the order generated previously. Standardization will be done in the labeling of the materials to avoid confusion at the picking moment. Finally, monthly reviews were implemented to evaluate the effectiveness of the strategy's performance.

3.5 Phase 4: Verification

The last phase used simulation software called Arena to verify that the proposed model achieves improvements in terms of reducing non-conforming materials and lower lead times in the procurement. Along with the simulation was made a new P-VSM after decreasing some of the waiting times between processes and shortening the periods of activities because it did not generate value. Finally, the proposed indicators are measured, analyzed, and compared between both scenarios.

Table 1: Indicators

Indicator	Formula	Use
Delayed units (%)	$\frac{\text{Delayed units}}{Total\ units} x100$	Units that didn't arrive on time.
Lost units (%)	$\frac{\text{Lost units}}{Total\ units} x100$	Additional units to what was purchased in the orders.
Incorrect units (%)	$\frac{\text{Incorrect units}}{Total\ units} x100$	Units that have passed quality control but are defective.
Defective units (%)	$\frac{\text{Defective units}}{Total\ units} x100$	Units that did not pass quality control.
Supply lead time (%)	$\frac{Cycle\ time - Dead\ time}{Cycle\ time} x100$	The time taken by the cycle to perform the activities.
Rate of non-conforming orders (%)	$\frac{Non-conforming\ units}{Total\ units} x100$	All orders that submitted any of the above-mentioned non-conformities.

4 VALIDATION

4.1 Initial Diagnosis

The main problem identified in this study was the inefficient management of materials procurement, mostly because of the poor supplier selection and the lack of purchasing policies. It also showed that the company has inadequate quality control procedures, which leads to the entry of non-conforming materials into the warehouse, resulting in additional costs to compensate for the losses. Finally, founded there was poor organization and registration of materials in stock, which confuses at the time of picking, increasing the lead time of procurement and generating waste.

4.2 Validation Design and Comparison with the Initial Diagnosis

The validation of the new materials procurement model is in the following stages. First, we start with the information collected from each activity to identify the lead time and deviations. After a data-cleaning, the values were introduced into the Arena simulation software to verify if the proposed engineering tools have a positive impact on the results.

On the other hand, the next component allows shortening the delivery by reducing the time of the procurement order approval process, by updating the purchasing policy, and organizing the approvals hierarchically. It also helps to minimize the number of delayed units by selecting the top three most suitable suppliers out of a total of 8, which directly influences transportation times.

Continuing with component 3, once the materials arrive at the warehouse they go through quality control which follows JIT strategies and other tools such as an order checklist and a parameterized database of the weight of each material. This tool reduces the number of defective orders entering the factory.

The implementation of Lean Warehouse with 5S was expected to minimize the number of missing or inaccurate units that delay production. Also, this stage aims to maintain the warehouse in optimal condition, clean and organized, as well as to continue to use the standardized labeling of incoming materials.

In conclusion, an improvement can be observed in all the proposed indicators, highlighting the significant reduction in the number of non-conforming orders, which achieved 25%, approaching the industry index.

Table 2: Results of the simulation of the initial model and the proposed model

Indicator	Initial Situation	Improvement Situation
Delayed units (%)	77.42%	23.15%
Lost units (%)	12.90%	11.11%
Incorrect units (%)	4.52%	2.78%
Defective units (%)	7.10%	4.63%
Supply lead time (%)	64.13%	70.10%
Rate of non-conforming orders (%)	80%	25%

4.3 Improvement-Proposal Simulation

The simulation performed in Arena software considered a confidence level of 95% and an average error range of 10% for the optimal sample size of the activities. The same values were used to find the number of replications needed for the initial model and the improved model, which turned out to be 124 and 121 replications respectively. Moreover, the Input Analyzer tool was used to find the distribution of each activity of the procurement process. These distributions were mainly Uniform and Normal.

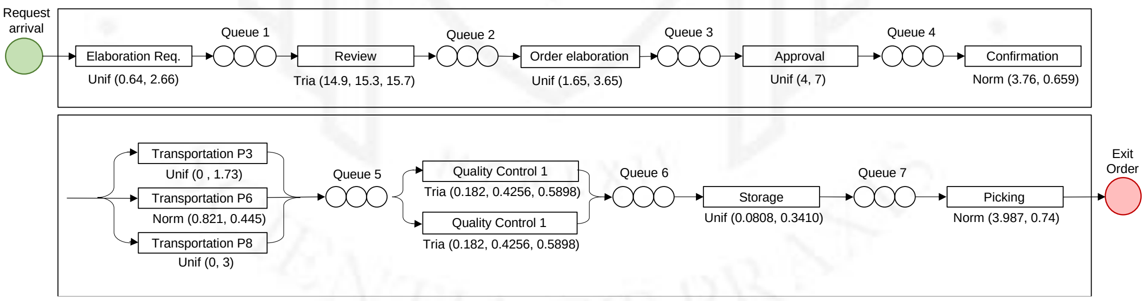

Figure 3: General View of the Process Model Proposed

5 DISCUSSION

The proposed model focuses on the logistics area, which seeks to optimize the supply management of the chosen textile company. These improvements were achieved with the implementation of Lean Warehouse and Just in Time methodologies in the supply process, which comes from the entry of the required plan until the picking of materials. Table 4 shows the results of simulating the current situation and the improved one that includes the suggestions mentioned above in the research.

Table 4: Comparison between scenarios according to the proposed objectives

	Objectives					
Situation	Delayed units	Lost units	Incorrect units	Defective units	Supply lead time	Rate of non-conforming orders
E0	77.42%	12.90%	4.52%	7.10%	64.13%	80%
E1	23.15%	11.11%	2.78%	4.63%	70.10%	25%
Variation	-54.27%	-1.79%	-1.74%	-2.47%	5.97%	-55%

From de the results of Table 4, a comparative analysis was made between both scenarios. All indicators show a percentage decrease, except for indicator five, supply lead time, which has increased from 64.13% to 70.10% compared to those waiting times that do not generate value for the process, similar to that proposed by [9], which reduced cycle time by 94.4% and consequently reduced dead times. The indicator of not optimal orders, which is a result of the first four indicators, decreased noticeably from 80% to 25%, achieving a reduction in the costs of materials of 40.55%, as well as diminution of penalties for shipments at the wrong time to customers. According to [23] the percentage of optimal orders of the textile industry is 80%, being a single difference of 5% relative to the proposal of improvement for the diverse factors that presents each company

It is important to note the change of the indicator of late orders, the most influential in the earlier mentioned indicator, decreases from 77.42% to 23.15% by the purchase policies established with the three suppliers selected as the best evaluated and most valuable to the company in the eight suppliers' rating matrix. So, all these indicators improved due to a correct selection of suppliers, improved reception and quality control of incoming units, and more efficient picking for better distribution and organization of materials for storage and subsequent use. This implementation required commitment and responsibility from the company and the collaborators involved. Employees were trained to implement the proposed model to achieve short and long-term benefits.

6 CONCLUSION

The research demonstrates that through the Lean Warehouse and Just-in-Time improvement model it is feasible to optimize the supply management in the textile industry. Considering that an optimal order has three axes, quality, quantity, and time, the proposal benefits each of them.

By using JIT and supplier assessment, it was possible to reduce the non-conforming orders entering the warehouse. The evaluation helped pick the most suitable suppliers for the company's new needs reduced delays in the delivery of orders due to the identification of suppliers that constantly failed to meet the promised delivery times. The reduction was enhanced through training, fluid communication, and new purchasing policies, which contain penalties for late delivery.

On the other hand, the utilization of Lean Warehouse, 5S, and a more detailed quality control minimizes the entry of incorrect or defective orders. The integration of the techniques previously mentioned achieved a reduction of 57.11% of the non-conforming units, representing 25% of the total. Furthermore, increased the revenue of the company, almost reaching the industry index level of 20%. In addition, greater efficiency was achieved in the processes, reducing the waiting time between activities by 2.9 days or 5.97%.

REFERENCE

[1] D. C. Bonett, A. S. Aguilar, L. Montoya Sánchez, M. C. Maza, and M. B. Rosado, "Informe Técnico Produción Nacional," Mar. 2021. Accessed: Sep. 17, 2021. [Online]. Available: www.inei.gob.pe.

[2] J. Yang, H. Xie, G. Yu, and M. Liu, "Achieving a just–in–time supply chain: The role of supply chain intelligence," *Int. J. Prod. Econ.*, vol. 231, 2021, doi: 10.1016/j.ijpe.2020.107878.

[3] M. Ramirez-Mitma, J. Rojas-Garcia, C. Torres-Sifuentes, and C. Raymundo, "A Strategic Lean Procurement Model Based on Supplier Approval to Reduce Unplanned Downtime in a Textile Small and Medium-Sized Enterprises," in *Smart Innovation, Systems and Technologies*, Oct.

2021, vol. 201, pp. 401–410, doi: 10.1007/978-3-030-57548-9_37.

[4] A. Zuluaga-Mazo, J. A. Cano-Arenas, and M. Montoya-Peláez, “Gestión logística en el sector textil-confección en Colombia: retos y oportunidades de mejora para la competitividad,” *Clío América*, vol. 12, no. 23, p. 98, Jul. 2018, doi: 10.21676/23897848.2621.

[5] A. Abideen and F. B. Mohamad, “Improving the performance of a Malaysian pharmaceutical warehouse supply chain by integrating value stream mapping and discrete event simulation,” *J. Model. Manag.*, vol. 16, no. 1, 2020, doi: 10.1108/JM2-07-2019-0159.

[6] S. Cuellar-Valer, A. Gongora-Vilca, E. Altamirano-Flores, and D. Aderhold, “Application of Lean Manufacturing in a Peruvian Clothing Company to Reduce the Amount of Non-conforming Products,” in *Advances in Intelligent Systems and Computing*, vol. 1253 AISC, 2021, pp. 481–487.

[7] Y. Prasetyawan and N. G. Ibrahim, “Warehouse Improvement Evaluation using Lean Warehousing Approach and Linear Programming,” in *IOP Conference Series: Materials Science and Engineering*, 2020, vol. 847, no. 1, doi: 10.1088/1757-899X/847/1/012033.

[8] P. Manfredsson, “Textile management enabled by lean thinking: a case study of textile SMEs,” *Prod. Plan. Control*, vol. 27, no. 7–8, pp. 1–9, Apr. 2016, doi: 10.1080/09537287.2016.1165299.

[9] S. Jing, K. Hou, J. Yan, Z. P. Ho, and L. Han, “Investigating the effect of value stream mapping on procurement effectiveness: a case study,” *J. Intell. Manuf.*, vol. 32, no. 4, pp. 935–946, Apr. 2021, doi: 10.1007/s10845-020-01594-x.

[10] Y. Prasetyawan, A. K. Simanjuntak, N. Rifqy, and L. Auliya, “Implementation of lean warehousing to improve warehouse performance of plastic packaging company,” in *IOP Conference Series: Materials Science and Engineering*, 2020, vol. 852, no. 1, doi: 10.1088/1757-899X/852/1/012101.

[11] K. A. Bonilla-Ramirez, P. Marcos-Palacios, J. C. Quiroz-Flores, E. D. Ramos-Palomino, and J. C. Alvarez-Merino, “Implementation of Lean Warehousing to Reduce the Level of Returns in a Distribution Company,” in *IEEE International Conference on Industrial Engineering and Engineering Management*, Dec. 2019, pp. 886–890, doi: 10.1109/IEEM44572.2019.8978755.

[12] E. Oey and M. Nofrimurti, “Lean implementation in traditional distributor warehouse - a case study in an FMCG company in Indonesia,” *Int. J. Process Manag. Benchmarking*, vol. 8, no. 1, 2018, doi: 10.1504/IJPMB.2018.088654.

[13] H. de la Cruz, E. Altamirano, and C. del Carpio, “Lean model to reduce picking time delays through Heijunka, Kanban, 5S and JIT in the construction sector,” doi: 10.18687/LACCEI2020.1.1.92.

[14] J. Neyra, J. Muñoz, J. Eyzaguirre, and C. Raymundo, “5S hybrid management model for increasing productivity in a textile company in Lima,” in *Advances in Intelligent Systems and Computing*, 2020, vol. 1018, pp. 975–981, doi: 10.1007/978-3-030-25629-6_151.

[15] S. Liu and H. Zhao, “Just-in-Time Purchasing and Its Application in Manufacturing Enterprises,” in *Advances in Intelligent Systems and Computing*, Nov. 2021, vol. 1185, pp. 198–202, doi: 10.1007/978-981-15-5887-0_29.

[16] S. C. Mukwakungu, E. M. Bakama, M. M. Bolipombo, and C. Mbohwa, “An Application of Just-in-time as a Strategy for Competitive Advantage: The Case of a Non-alcoholic Company in South Africa,” in *IEEE International Conference on Industrial Engineering and Engineering Management*, 2019, vol. 2019-Decem, pp. 690–694, doi: 10.1109/IEEM.2018.8607757.

[17] S. Cuellar-Valer, A. Gongora-Vilca, E. Altamirano-Flores, and D. Aderhold, “Application of lean manufacturing in a peruvian clothing company to reduce the amount of non-conforming products,” in *Advances in Intelligent Systems and Computing*, 2021, vol. 1253 AISC, pp. 481–487, doi: 10.1007/978-3-030-55307-4_73.

[18] C. M. Pereira, R. Anholon, I. S. Rampasso, O. L. G. Quelhas, W. Leal Filho, and L. A. Santa-Eulalia, “Evaluation of lean practices in warehouses: an analysis of Brazilian reality,” *Int. J. Product. Perform. Manag.*, vol. 70, no. 1, Feb. 2020, doi: 10.1108/IJPPM-01-2019-0034.

[19] D. V Lomotko, H. O. Prymachenko, O. V Kovalova, O. V Shkurenko, and Y. I. Hryhorova, “Use of modern logistics technologies in terms of saving resources,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 1021, Jan. 2021, doi: 10.1088/1757-899X/1021/1/012041.

[20] H. de la Cruz, E. Altamirano, and C. del Carpio, “Lean model to reduce picking time delays through Heijunka, Kanban, 5S and JIT in the construction sector,” *Proc. LACCEI Int. Multi-conference Eng. Educ. Technol.*, 2020, doi: 10.18687/LACCEI2020.1.1.92.

[21] J. S. Randhawa and I. S. Ahuja, “Examining the role of 5S practices as a facilitator of business excellence in manufacturing organizations,” *Meas. Bus. Excell.*, vol. 21, no. 2, May 2017, doi: 10.1108/MBE-09-2016-0047.

[22] O. Makinde, R. Selepe, T. Munyai, and K. Ramdass, “Development of a supplier assessment form for an electronic product manufacturing organisation,” in *Procedia Manufacturing*, 2020, vol. 43, pp. 743–750, doi: 10.1016/j.promfg.2020.02.109.

[23] H. Portales-Zevallos, J. Yalan-Curo, J. Sotelo-Raffo, and E. Ramos-Palomino, “SOP impact on inventory management in a Peruvian textile company,” Oct. 2019, doi: 10.1109/CONIITI48476.2019.8960897.

[24] B. Nicolas, Laurent Muller, and M. Camargo, “A new fuzzy logic-based metric to measure lean warehousing performance,” *Supply Chain Forum*, vol. 18, no. 2, pp. 96-11, Feb. 2017, doi: 10.1080/16258312.2017.1293466.

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