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Optimization of the Placement of Fast-Moving Category Goods with the Pareto Analysis Method at PT XYZ Jakarta

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ABSTRACT

Objective: *PT XYZ Jakarta is a technology-based logistics company that provides end-to-end logistics solutions for business operators. One of the warehouses managed by PT XYZ stores a variety of client products with different movement characteristics, including fast-moving items. The main issue identified in the warehouse operations is inefficiency in the picking activity, which is caused by the randomized storage system that does not consider item demand frequency or the distance to the packing area. This condition results in increased picking time and the potential for daily distribution backlogs. This study aims to optimize the storage layout for fast-moving items by applying the Pareto method and the Time Motion Study approach to improve the efficiency of picking activities at PT XYZ Jakarta's warehouse.* ***Method:*** *A descriptive qualitative method was employed in this research, with data collected through participatory observation, interviews, and documentation. The Pareto method was used to identify category A SKUs with high picking frequency, while the Time Motion Study was applied to measure and compare picking times between the existing layout and the proposed layout.* ***Results:*** *The findings show that the existing layout results in an average picking time of 5.12 minutes per SKU, whereas the proposed layout reduces the time to 3.7 minutes per SKU. This indicates an improvement in picking efficiency of approximately 41.8%, with productivity increasing from 12 to 17 SKUs per hour. Placing fast-moving items closer to the packing area has proven effective in reducing picker travel time and optimizing overall warehouse operational workflows.* ***Novelty:*** *The novelty of this study lies in the application of the Pareto method and the Time Motion Study approach to optimize the storage layout of fast-moving items in a warehouse, leading to a significant improvement in picking efficiency and overall warehouse operations. This method provides a systematic approach to addressing inefficiencies in warehouse management, with practical implications for logistics companies.*

INTRODUCTION

In the era of globalization and digitalization, the logistics industry faces increasingly complex challenges, especially in warehouse management. Efficiency in warehouse layout is a key factor to win the competition, reduce costs, increase productivity, and improve service quality. The need for speed, accuracy, and flexibility in order fulfillment makes warehouse management an important element in the modern supply chain [1].

As logistics needs increase, many companies struggle to meet demand due to limited resources and inefficient storage systems. To overcome this, many manufacturing companies work with third-party logistics (3PL) companies to handle logistics activities such as storage, distribution, and product management. Effective warehouse management can have a direct impact on overall logistics cost efficiency.

One of the main challenges is the handling of fast-moving category goods, which are goods with a high frequency of demand. A non-optimal layout can lead to long

picking times, increased operator travel distances, and order queues. Therefore, a systematic approach is needed to optimize the layout and picking process of these items [2].

Two effective methods to improve efficiency are Pareto Analysis and Time Motion Study. Pareto Analysis is used to identify the 20% of items that account for 80% of picking activities, so that they can be prioritized for placement in easily accessible areas. Meanwhile, time motion study is useful for analyzing inefficient activities and rearranging work processes to make them more effective.

Previous research from Tsao & Lu shows that applying the Pareto method can reduce picking time by 30% and reduce error rates [3]. Faster picking times also increase customer satisfaction as orders can be processed and shipped faster.

PT XYZ is a digital technology-based logistics company that provides end-to-end solutions for businesses. Currently, PT XYZ is facing the problem of high picking time, averaging 4 minutes per item, exceeding company standards. The main cause is the non-optimal warehouse layout and random storage system. Some fast-moving items are stored far from the packing area, causing delays and backlogs.

Data shows a backlog of 87,176 orders/SKU over the past three months, indicating inefficiencies in the operational process. This problem mainly affects certain clients. Based on these conditions, this research will discuss the optimization of the placement of fast-moving category goods using the Pareto Analysis method at PT XYZ Jakarta.

RESEARCH METHOD

This research uses a descriptive qualitative approach based on the interpretive philosophy paradigm to explore natural object conditions, where the researcher acts as the main instrument. The research focus is directed at optimizing the layout of fast-moving category goods and picking activities at PT XYZ, by considering the supporting and inhibiting factors of the process. The research was conducted at PT XYZ located in Pasar Minggu, South Jakarta. The phenomenon studied is related to the efficiency of layout and picking activities using the Pareto method and Time Motion Study. Data sources in this study include primary data from interviews and direct observation, as well as secondary data from company documents and archives. Informants were selected purposively, consisting of various levels of positions such as managers, supervisors, and operational staff who understand warehouse processes. The researcher, as the main instrument, was assisted by documentation, interviews, and observation tools. Data collection techniques were carried out through observation, interviews, and documentation to obtain an in-depth description of the picking process and warehouse arrangement. Data analysis followed the stages of Miles and Huberman: data collection, data reduction, data presentation, and conclusion drawing/verification. To ensure data validity, triangulation of sources and techniques was used by comparing information from various informants and different data collection techniques. This approach aims to obtain a comprehensive and valid understanding of the conditions under study [4], [5], [6], [7], [8].

RESULTS AND DISCUSSION

Optimization of the Placement of Fast-Moving Category Goods with Pareto Analysis

Optimization of the placement of fast-moving category items in the PT XYZ warehouse is carried out using the Pareto method. This method is based on the 80/20 principle, where 20% of the total items account for 80% of the picking activity. By applying Pareto analysis to outbound data for March to May 2024, taken from the WMS system, SKU classification is carried out based on the frequency of orders from each client. Clients with the highest contribution to picking activities such as TAN, PKKI, and HQSC are categorized in class A. The data also shows that the TAN client has 76 SKUs with 12 SKUs classified as category A (fast-moving), 19 category B (middle-moving), and 45 category C (slow-moving). By identifying SKUs based on their contribution to picking activities, the company can reorganize the location of goods storage more strategically, placing category A SKUs closer to the packing area to improve warehouse operational efficiency. This approach allows for more optimal utilization of space and resources in logistics management [9].

Placement of Fast-Moving Category Goods

This research continues with the storage optimization stage for category A SKUs (fast-moving) through the rearrangement of PT XYZ's warehouse layout. The main objective of this arrangement is to improve the efficiency of the picking process by moving goods that often come out to a strategic location, which is closest to the CheckPack area. The method used is participatory observation by recording the flow of picker movement, distance traveled, and picking activity time both before and after relayout. Data was collected from category A SKUs belonging to the main clients (TAN, PKKI, and HQSC), which were previously placed randomly using a randomized storage system. The existing layout shows that the location on the 2nd floor has an impact on picking time, with an average time of 5.12 minutes per SKU or about 12 orders per hour. Based on the analysis results, a layout proposal was made by placing fast-moving goods near the CheckPack area, specifically in slots SV022, SV023, and SV024 on the 1st floor. This new layout succeeded in reducing the average picking time to 3.7 minutes per SKU, equivalent to 16 orders per hour. This increase in efficiency shows that placement based on high frequency is very effective in speeding up the picking process and reducing operator workload. This approach is reinforced by the Time and Motion Study method, as well as validation from internal interviews and previous studies that support the benefits of relayout in a logistics context.

Factors for Optimizing Layout and Picking Activities at PT XYZ Warehouse

The optimization of layout and picking activities in the PT XYZ warehouse is influenced by two main groups of factors:

1. Supporting Factors
   a. The use of an integrated Warehouse Management System (WMS) allows real-time monitoring of picking and placement of goods based on SKU classification.

b. Adequate warehouse infrastructure, such as efficient layout, use of appropriate material handling (forklift, reachtruck), and availability of racking support the effectiveness of the picking process.
c. An organized system helps evaluate picker performance and more precise labor allocation.

2. Inhibiting Factors
a. Lack of picker discipline in following the picking flow set by the system, as well as the tendency to take alternative paths that can trigger errors.
b. Difficulty in adapting the workforce to changes in layout or new storage systems, mainly due to limited understanding and visibility of item locations.
c. Other research from Taqwanura et al. corroborates that layout changes require HR readiness, including retraining and adaptation time [10].

Output Of Applied Research

The research entitled "Optimization of the Layout of Fast Moving Category Goods and Picking Activities with the Pareto Method and Time Motion Study at PT XYZ Jakarta" produces practical solutions in the form of improved storage layouts based on the classification of fast-moving SKUs and systematic picking activity analysis. The results showed that in the initial condition (existing), the average time required for picking activities reached 5.12 minutes per SKU, with the ability to complete about 12 SKUs per hour. After optimizing the layout using the Pareto and Time Motion Study methods, the average picking time decreased to 3.7 minutes per SKU, so that the number of SKUs that could be completed increased to 17 per hour. This change reflects an increase in the efficiency of picking activities by approximately 41.8%, or almost 50% when compared to previous conditions.

This efficiency improvement is achieved by placing category A (fast-moving) SKUs in a more strategic location and close to the CheckPack area, so that picker travel distance can be significantly reduced. Changes in storage locations are made for clients such as TAN, HQSC, and PKKI, which have high-value goods in the A classification. From the data obtained, the picking time for these clients ranges from 3.4 to 4 minutes per SKU, with a completion capacity of 15 to 18 SKUs per hour. This finding proves that an approach based on Pareto classification and Time and Motion analysis is not only able to improve efficiency but also provides tangible output in improving warehouse operational productivity, especially in the picking process [11], [12], [13], [14], [15].

CONCLUSION

Fundamental Finding : This study demonstrates that optimizing the warehouse layout and picking activities at PT XYZ Jakarta through the application of the Pareto method and Time Motion Study leads to a significant increase in operational efficiency. By identifying fast-moving SKUs (category A) that contribute to 80% of picking activity and relocating them closer to the CheckPack area, the average picking time was reduced from 5.12 to 3.7 minutes per SKU. This resulted in a productivity increase from 12 to 17 orders per hour, marking an efficiency improvement of approximately 41.8%.

Implication : The improvement was supported by a well-integrated Warehouse Management System (WMS), appropriate material handling equipment, and structured warehouse infrastructure. However, operational effectiveness was hindered by human factors, particularly picker discipline and adaptability to layout changes. Training and consistent communication regarding layout adjustments are essential to fully realize the benefits of the optimized layout. **Limitation :** This research was limited to a single observation period and focused on a specific category of fast-moving goods. The study primarily addressed warehouse layout and did not comprehensively analyze other operational variables such as inventory forecasting, storage volume constraints, or detailed zone-level classification. **Future Research :** Future studies are encouraged to extend the observation period and examine broader human resource issues, including compliance and behavioral adaptation to new systems. Further, researchers should explore more granular storage strategies, such as zone-based racking by SKU priority or product characteristics, and consider additional operational factors like demand forecasting, equipment capacity, and warehouse physical constraints to develop a more adaptive and scalable warehouse layout model.

REFERENCES

[1] Mediaocean, "The competitive advantage of operational efficiency," 2022.

[2] B. N. Siswanto and R. Fauzan, "OPTIMASI TATA LETAK PADA WAREHOUSE FINISHED GOODS PT. XYZ MENGGUNAKAN KEBIJAKAN CLASS BASED STORAGE DENGAN PENDEKATAN CORELAP," *Vol. 8, Issue 1*, 2022.

[3] Y.-C. Tsao and J.-C. Lu, "The application of Pareto principle in warehouse operation optimization," *J. Ind. Eng. Manag.*, 2012.

[4] J. A. Bashatah, "A Case Study Towards Sustainable and Smart Warehousing," *Appl. Sci.*, vol. 15, no. 20, p. 11186, 2025, doi: 10.3390/app152011186.

[5] V. Kapou and others, "An Innovative Layout Design and Storage Assignment Strategy for Manual Warehouse Order Picking Optimization," *Logistics*, vol. 6, no. 4, p. 83, 2022, doi: 10.3390/logistics6040083.

[6] D. Ueno, "The Optimization of Picking in Logistics Warehouses in Response to Disruptions and Layout Constraints," *Mathematics*, vol. 12, no. 16, p. 2580, 2024, doi: 10.3390/math12162580.

[7] Y. Zhou, Y. Xu, K. Xie, and J. Li, "Joint Optimization of Storage Allocation and Picking Efficiency for Fresh Products Using a Particle Swarm-Guided Hybrid Genetic Algorithm," *Mathematics*, vol. 13, no. 21, p. 3428, 2025, doi: 10.3390/math13213428.

[8] L. Zhou and others, "Performance Analysis of Picking Routing Strategies in Warehouse Operations," *Mathematics*, vol. 10, no. 17, p. 3149, 2022, doi: 10.3390/math10173149.

[9] M. A. Yerlikaya and F. Ar\ikan, "A Novel Framework for Production Planning and Class-Based Storage Location Assignment: Multi-Criteria Classification Approach," *Heliyon*, vol. 10, no. 18, p. e37351, 2024, doi: 10.1016/j.heliyon.2024.e37351.

[10] Y. C. W. Taqwanur Winursito, N. I. Qurratu'aini, A. Saputro, and Tranggono, "Penerapan Relayout Dengan Menggunakan Metode Class Based Storage di PT SMM," *WALUYO JATMIKO PROCEEDING*, vol. 16, no. 1, pp. 541–550, 2023, doi: 10.33005/wj.v16i1.78.

[11] V. Kapou, S. T. Ponis, G. Plakas, and E. Aretoulaki, "An Innovative Layout Design and Storage Assignment Method for Manual Order Picking with Respect to Ergonomic Criteria," *Logistics*, vol. 6, no. 4, p. 83, 2022, doi: 10.3390/logistics6040083.

[12] R. De Koster, T. Le-Duc, and K. J. Roodbergen, "Design and Control of Warehouse Order Picking: A Literature Review," *Eur. J. Oper. Res.*, vol. 182, no. 2, pp. 481–501, 2007, doi:

10.1016/j.ejor.2006.07.012.
[13] A. Silva, K. J. Roodbergen, L. C. Coelho, and M. Darvish, "Estimating Optimal ABC Zone Sizes in Manual Warehouses," *Int. J. Prod. Econ.*, vol. 252, p. 108579, 2022, doi: 10.1016/j.ijpe.2022.108579.
[14] M. Wang, R. Q. Zhang, and K. Fan, "Improving Order-picking Operation through Efficient Storage Location Assignment: A New Approach," *Comput. \& Ind. Eng.*, vol. 139, p. 106186, 2020, doi: 10.1016/j.cie.2019.106186.
[15] A. Y. Alqahtani and others, "Improving Order-picking Response Time at Retail Warehouse," *SN Appl. Sci.*, vol. 5, no. 14, p. 5953, 2023, doi: 10.1007/s42452-022-05230-6.

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