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Evaluation of the Effectiveness of Warehouse Management System (WMS) and Shuttle Cart Rack Orbiter Technology in Improving Warehouse Operational Performance: A Case Study at PT XYZ

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Abstract: The development of warehousing technology requires integrating management and automation systems, with continuous upgrades to enhance company performance. This research evaluates the effectiveness of the Warehouse Management System (WMS) and Shuttle Cart Rack Orbiter in improving warehouse operational performance at PT XYZ. Using a descriptive qualitative method with purposive sampling, data was obtained through in-depth interviews, direct observation, and documentation, then analyzed with NVivo software which produced tree map, cluster, and hierarchy chart visualizations. The results showed that WMS accelerated the inbound–outbound process by approximately 50%, improved stock data accuracy to above 95%, and reduced manual errors, while the Orbiter increased storage capacity by five times and reduced forklift usage by 40%. The obstacles faced include dirty sensors, batteries that drain quickly, and suboptimal utilization of WMS features. Companies need to optimize the auto putaway feature and interfacing system to speed up warehouse processes, improve accuracy, and reduce human error. In addition, routine maintenance of the Shuttle Cart Rack Orbiter and the addition of new units will support smooth operations, increase capacity, and improve efficiency, productivity, and customer satisfaction. The integration of WMS and Shuttle Cart Rack Orbiter has been proven to increase productivity and efficiency, with recommendations for evaluation, training, and routine maintenance. This study fills a gap in previous studies, which generally assessed the two separately without considering their combined impact on warehouse operational performance.
Keywords: *WMS, Shuttle Cart Rack Orbiter, Technology, Operational performance, Warehouse management, Evaluation*

Introduction

In this digital age, information technology plays a crucial role in improving efficiency and productivity across various industrial sectors, including logistics and warehousing. PT XYZ, as one of the largest logistics and cargo companies in Indonesia, continues to strive to adopt the latest technologies in order to strengthen its competitiveness and service quality. One of the technologies implemented is the Warehouse Management System (WMS), which helps manage and optimize warehousing processes digitally, from receiving and storing goods to shipping them. A Warehouse Management System (WMS) is commonly used software to help manufacturing, retail, and distribution companies track warehouse operations in real-time. By implementing a WMS, businesses can perform more effective data analysis to improve employee productivity. (Ririn Uke Saraswati and Amin Amin 2024).

As time went on and with increasing customer demand, Warehouse XYZ faced the challenge of limited storage space in its warehouse facility. With limited space capacity, PT XYZ took a strategic initiative by adopting advanced physical technology such as the Shuttle Cart Rack Orbiter, which can significantly contribute to storage space efficiency and order

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picking speed. This technology allows for automatic movement of pallets within a multi-level racking system designed for high-density storage. The combination of WMS and Shuttle Cart Rack Orbiter is believed to be capable of creating a more responsive, flexible, and automated warehousing system. However, there is a significant amount of manual labor in the current warehousing system. The situation within this warehousing system will lead to a high error rate and low efficiency. Failure of a simple warehousing system can disrupt important work, leading to high costs. Automated storage systems are more appropriate; not only can they reduce costs by avoiding errors, but they also improve efficiency. Therefore, automation technology is crucial for the development of sustainable storage systems. (Robotics and Lightcap 2017).

Although various studies have discussed the benefits of Warehouse Management Systems (WMS) in improving data accuracy, process efficiency, and the effectiveness of Shuttle Cart Rack Orbiters in optimizing storage capacity, most previous studies have investigated these two technologies separately. As a result, there is still a limited understanding of how the simultaneous integration of WMS and Shuttle Cart Rack Orbiters can impact the overall operational performance of warehouses. In the context of PT XYZ, which faces challenges of limited storage space while needing to accelerate the flow of goods, this combined analysis becomes highly relevant. By evaluating the synergy between digital management systems and automated storage technologies, this research not only addresses the gaps in the literature but also provides practical contributions to help companies achieve efficiency, productivity, and competitive advantage in the logistics industry.

Despite bringing various advantages, the implementation of WMS and Shuttle Cart Rack Orbiter also impacts warehouse operational performance, particularly in the warehouse working environment. Digital transformation can impact productivity levels, work efficiency, and employee satisfaction in carrying out daily responsibilities. Therefore, a comprehensive analysis and evaluation are needed to understand how the integration of these two technologies affects human resource performance at PT XYZ. By using WMS, all warehouse operational activities are expected to have high information quality, system performance, and service, which will ensure a reliable and efficient process. This research aims to examine the effectiveness evaluation of the Warehouse Management System and Shuttle Cart Rack Orbiter on warehouse operational performance, specifically at the PT XYZ inventory warehouse.

Literature Review

The development of warehouse technology requires companies to integrate digital management systems and physical automation to achieve operational efficiency. Warehouse Management Systems (WMS) have been extensively researched as a solution to improve data accuracy, speed up inbound-outbound processes, and reduce manual errors. Meanwhile, the Shuttle Cart Rack Orbiter is known to be effective in optimizing storage space utilization and reducing dependence on forklifts. However, most previous studies have only focused on one of these technologies, so the understanding of the combined impact of both on warehouse operational performance is still limited.

Warehouse Management System

A company's warehouse operational system is adjusted to the Standard Operating Procedure (SOP) as an effort to reduce the level of losses that the company may experience (Marpaung, Rahardjo, and Surya 2017). One of the operational standards with technological advances is a system known as the Warehouse Management System (WMS) which can be applied to manage various warehousing information in a company (I. Afif, Pratikto, and Y. Sumantri 2023). However, the application of WMS is still very much considered by companies established by new business people and old business people in order to continue to develop following

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technological developments (Putu, I gusti ayu, Nurcaya 2019). Warehouse Management System (WMS) is defined as database information technology designed to assist in carrying out warehouse operations to improve the efficiency and effectiveness of warehouse functions through coordination and integration of warehouse operations and archiving, updating, and maintaining warehouse transaction records. According to Andiyappillai (2019), Warehouse Management Systems are indispensable in facilitating the maximization of operational efficiency in different processes, eliminating waste, speeding up order turnaround time, providing real-time order status updates, increasing labor productivity, and managing warehouse space. WMS indicators, referring to Frazelle (2002) and Bartholdi & Hackman (2011) are: Inventory Accuracy, Order Picking Speed, Storage Utilization, and Process Automation Level.

With the implementation of Warehouse Management System, logistics companies, especially in warehousing such as PT XYZ can ensure the procurement of goods is carried out on time, and within budget, support warehouse operational performance, and reduce the potential for human error based on the data input process caused by incorrect input, forgetting to input or data errors. Overall, the synergy between the Warehouse Management System and warehouse operational performance has a positive impact on the company in terms of efficiency, cost management, and overall performance.

Technology Shuttle Cart Rack Orbiter

Warehousing and distribution facilities have grown in importance in the supply chain in recent years. In such facilities, large warehouses are used to collect and store different types of goods at a central location for delivery by truck to one or more locations, usually retail locations. Goods may be stored in the warehouse by pallet load or individually, and goods may be shipped on uniform pallets, mixed pallets, or otherwise. To maximize efficiency, goods are often stored in vertical rack-based systems, multiplying the amount of goods that can be stored in a given amount of area (Salichs and Tamayo 2017).

In addition, the automatic conveying cart can automatically run on the ground outside the rack facility along a certain path, which eliminates the conveying tools such as conveyors or unmanned conveying carts, or forklifts operated by workers to carry goods from the distant stock field to the rack facility and carry goods from the rack facility to the distant shipping field (Robotics and Lightcap 2017).

A shuttle system includes one or more shelves on which SKUs are stored, a shuttle frame positioned near the shelves, and one or more shuttles configured to service the shelves by walking along the shuttle frame. This shuttle system creates a robot-to-goods environment where the robotic shuttle automatically picks, places, and/or handles goods. The robot-to-goods environment created by these shuttle systems is a significant improvement over the traditional goods-to-person environment where humans handle the goods which can be labor intensive and quite costly. In these shuttle systems, multiple shuttles form a swarm with each operating in parallel to each other. Some or all of the shuttles in one variation have independent missions, and in another variation, some or all of the shuttles can coordinate their activities so as to cooperate with the freight handling mission (Patent 2022).

Operational Performance

Operational performance according to Sobandi and Kosasih (2014) can be interpreted as the suitability of the process and performance evaluation of the company's internal operations in terms of cost, customer service, delivery of goods to customers, quality, flexibility, and quality of the process of goods or services. Performance is something produced by a company in a certain period with reference to established standards (Prabowo and Jaya 2015).

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From this opinion, it can be concluded that operational performance is an effort to increase the effectiveness of work to get the results to be achieved.

According to Rahadi (2012: 48) in Candra DwiHardiana1 (2021), the level of operational performance in companies can be measured by flexibility through process flexibility, quality through product performance and delivery through on-time delivery. Meanwhile, according to Sutrisno (2019) in Windra (2021), operational performance is measured by indicators, namely: financial performance , sales performance, and customer satisfaction.

Research Methodology

Study describes the data collection methods, data sources, data analysis methods, and triangulation techniques used. Data were collected through indepth interviews, observations, and documentation. Interviews were conducted to obtain direct information from informants regarding the phenomenon under study, while observations were used to directly observe processes or activities in the field. Documentation served to complement the data with secondary information such as archives, records, or relevant official documents. The data sources consisted of primary and secondary data. Primary data were obtained directly from informants through interviews and observations, while secondary data came from documents, reports, archives, and supporting literature. Data analysis was carried out qualitatively with the assistance of NVivo software, through the stages of data reduction, data presentation, and drawing or verifying conclusions. The analysis process involved coding the data into categories or themes, followed by identifying patterns and relationships relevant to the research focus.

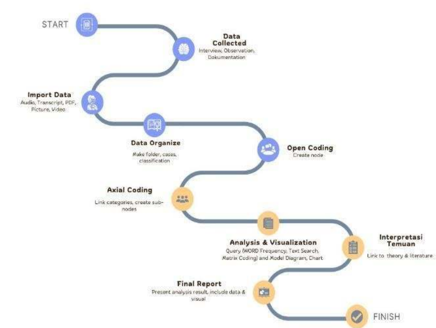

Fig. 1. Flowchart of the research method process or NVivo data analysis flow

In this study, the analysis focuses on two interconnected units: work processes and technology. The work process unit examines the operational workflows within PT XYZ's warehouse covering inbound, inventory control, and outbound activities and how these workflows transition from manual to automated through the adoption of the Warehouse Management System (WMS) and Shuttle Cart Rack Orbiter. The technology unit evaluates the functional performance, integration, and combined impact of these two systems on warehouse efficiency, accuracy, and space utilization. By analyzing both units together, the research captures not only the technical capabilities of the WMS and Orbiter but also their influence on daily operational procedures, workforce adaptation, and overall warehouse performance.

To ensure data validity, source triangulation and technique triangulation were applied. Source triangulation compared data obtained from different informants, while technique triangulation compared the results obtained from interviews, observations, and documentation. In qualitative research, findings or data can be declared valid if there is no difference between

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what the researcher reports and what actually happens to the object under study. The sharpness of the researcher's analysis in presenting data does not necessarily make the researcher's findings accurate data and have a high level of trust.

Determining informants carried out in this study is using Purposive Sampling technique, by selecting informants based on certain criteria, namely staff who really have a deep understanding and also have direct involvement with the WMS and Shuttle Cart Rack Orbiter which is being studied in the PT XYZ warehouse.

In this study, the informants are practitioners with in-depth knowledge and experience in implementing WMS and AI systems in warehouse operations, specifically at PT XYZ. The informants were selected based on their knowledge and understanding of the WMS system and the Shuttle Cart Rack Orbiter technology that has already been implemented. Researchers will conduct interviews to gather further information about the research subject. Researchers will conduct interviews to delve deeper with the aim of obtaining information related to the research object. For a case study, Creswell (2018) recommends no more than 4 or 5 cases in a single study and 20 to 30 interviews. For phenomenological studies, he recommends between 5 and 25 interviews with participants.

Tabel. 1. List of Participant

Participant	Gender	Year of experience	Position
Participant 1	Male	15-20 years	**HRD (Human Resource Development)**
Participant 2	Male	15-20 years	**Key Account Manager**
Participant 3	Male	More than 10 years	**Shuttle Cart Rack Orbiter Operator**
Participant 4	Male	8 years	**Operation Project Supervisor**
Participant 5	Male	8 years	**Orbiter Managing Staff**
Participant 6	Female	3 years	**IT Support 1**
Participant 7	Female	6 years	**IT Support 2**
Participant 8	Male	5 years	**Forklift Operator**
Participant 9	Male	15 years	**Warehouse Supervisor 1**
Participant 10	Male	10-11 years	**Warehouse Supervisor 2**
Participant 11	Male	15-20 years	**Warehouse Manager**

Results

The NVivo-based analysis of the research revealed that key factors influencing the effectiveness of WMS and Shuttle Cart Rack Orbiter implementation at PT XYZ are closely tied to both internal and external elements. Internally, system reliability, warehouse layout, automation versus manual processes, user competence, and project customization emerged as critical aspects. Externally, customer demands, operational scale, digitalization trends, and the need for cost efficiency played significant roles.

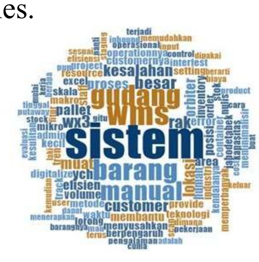

Fig. 2. Word Cloud Frequency

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Tree map results highlighted dominant themes such as “system,” “WMS,” “goods,” “warehouse,” “orbiter,” and “efficient,” reflecting the central focus on technology integration for operational improvement. The WMS was found to enhance real-time inventory control, accuracy, and workflow automation, while the Orbiter improved storage capacity and reduced forklift dependency.

Fig. 3. Tree maps. Evaluation of the Effectiveness of Warehouse Management System (WMS) and Shuttle Cart Rack Orbiter Technology in Improving Warehouse Operational Performance: Case Study at PT XYZ

The cluster analysis showed strong interconnections between WMS, Orbiter, efficiency, location, and goods, illustrating their complementary roles: WMS optimized picking, put-away, and location accuracy, while the Orbiter maximized deep lane storage and minimized aisle congestion. Together, they created a synergistic effect that reduced cycle time, improved storage capacity, and enhanced operational accuracy, though some challenges remained, such as stock data errors and partial reliance on manual processes, indicating a need for better system integration and user training.

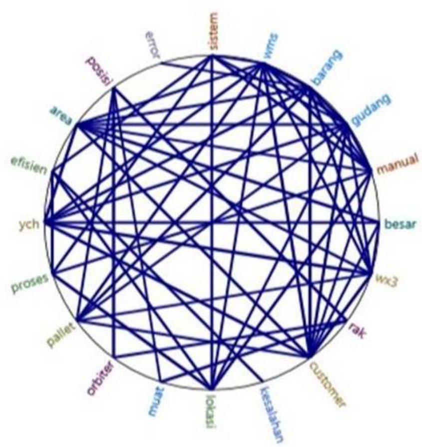

Fig. 4. Cluster analysis of Evaluation of the Effectiveness of Warehouse Management System (WMS) and Shuttle Cart Rack Orbiter Technology in Improving Warehouse Operational Performance: Case Study at PT XYZ

The interview results show that the combined implementation of WMS and Shuttle Cart Rack Orbiter at PT XYZ significantly improved efficiency, accuracy, and productivity in warehouse operations. WMS enabled real-time stock monitoring, automated reporting, reduced human error, and streamlined inbound–outbound workflows. The Orbiter accelerated storage and retrieval, enhanced space utilization, and improved safety by reducing forklift use in narrow aisles. Integration with barcode scanning further minimized manual input. Respondents noted faster KPI achievement, cost savings, and smoother processes. However, challenges included network disruptions, Orbiter sensor issues from dust or cobwebs, battery depletion, and the

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need for staff adaptation, which typically took about a month. Recommendations from informants emphasized routine maintenance, continuous training, feature optimization (example, auto-putaway, interfacing), and SOP development to handle system disruptions effectively.

Table 2. Comparison Before & After

Aspects	**Before Implementation (Manual / Old System)**	**After Implementation (WMS & Orbiter)**	**Impact**
Inbound & Outbound Process Speed	The process of recording and checking goods is done manually, taking a long time (on average 30-40 minutes per large transaction).	Automated process through WMS, time decreased to ±15-20 minutes.	Time efficiency increased by ±50%.
Stock Data Accuracy	There are often differences in stock data between records and physical data due to human error.	Stock is recorded in real-time in the WMS, input errors are significantly reduced.	Data accuracy > 95%.
Storage Capacity	Maximum of 2 racks per aisle with conventional systems.	Up to 10 racks per aisle with Orbiter's deep lane storage system.	Capacity increased ±5 times.
Forklift Usage	Forklifts are used intensively for placement and retrieval of goods, causing lane congestion.	Forklift movement is reduced as Orbiter manages the movement of goods within the rack.	Reduction in forklift usage by ±40%.
Picking & PutAway Errors	Item location errors are common, requiring additional time for correction.	WMS provides automatic location guidance, reducing errors significantly.	Error reduced by >70%.
Utilization of Technology Features	Lack of technology, relying mostly on human labor.	WMS and Orbiter are used, although some WMS features have not been optimized.	Potential efficiency can still be improved.
Technical constraints	There were no technological constraints due to the manual system, but time and labor were high.	Constraints such as Orbiter sensors getting dirty and batteries running out quickly.	Preventive maintenance and technical training are required.

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Discussion

The discussion highlights that implementing the Warehouse Management System (WMS) and Shuttle Cart Rack Orbiter at PT XYZ has delivered clear operational benefits, including faster processing, improved accuracy, higher storage capacity, and reduced forklift dependency. Before adoption, inbound and outbound recording was manual, taking 30–40 minutes per large transaction, often leading to stock discrepancies and location errors. After implementation, automated WMS processes cut transaction time by about 50%, increased stock data accuracy to over 95%, and reduced picking/putaway errors by more than 70%. The Orbiter's deep lane storage expanded capacity up to five times, decreased forklift usage by 40%, and allowed retrieval of slow-moving items without disrupting other pallets. These improvements align with warehouse management principles of efficiency, space optimization, and error reduction.

However, technical and operational challenges remain, such as unoptimized WMS features, sensor interference from dust and cobwebs, rapid battery depletion, and partial reliance on manual processes. These issues reflect a gap between the technology's full potential and its current utilization, in line with the Technology Acceptance Model (TAM) which emphasizes the importance of perceived ease of use and benefits for adoption. The discussion concludes that to maximize benefits, PT XYZ needs periodic performance evaluations, user training to optimize feature use, and preventive maintenance-particularly for Orbiter sensors and batterieswhile also expanding automation capabilities such as auto-putaway and full system interfacing with customer platforms. This combination of technological enhancement and human resource development is essential to sustain longterm efficiency gains.

Conclusion

The implementation of the Warehouse Management System (WMS) at PT XYZ has contributed greatly to improving warehouse operational performance, especially in large-scale projects. The system is able to speed up workflow, increase efficiency, and reduce errors through automated recording, monitoring of goods movement, and integrated work area management. The WMS process covers inbound, inventory control, and outbound, all of which are interconnected to ensure accurate stock data and smooth distribution. Although the results have been positive, there are still some features that require development and increased user competence so that the system can be fully utilized.

Shuttle Cart Rack Orbiter technology also plays an important role in maximizing space utilization and speeding up the warehouse work process. This technology can reduce the number of forklifts required, increase pallet storage capacity, and speed up the arrangement of goods. Challenges encountered include rapid battery depletion and sensor interference due to dust. However, overall the technology has been running optimally and has had a significant positive impact on warehouse productivity.

To address existing issues, companies need to strengthen employee capabilities through regular training and support this with the recruitment of experts so that the use of WMS and Shuttle Cart Rack Orbiter can run optimally. In addition, it is important to conduct regular system reviews to ensure suitability with operational needs, accompanied by routine maintenance of tools, sensors, and batteries. These efforts must also be accompanied by consistent warehouse cleanliness to create a neat, safe, and supportive working environment that facilitates operational efficiency. By taking these steps, companies can improve efficiency, reduce the risk of damage, and ensure long-term system reliability.

Overall, WMS and Shuttle Cart Rack Orbiter have successfully improved the speed, accuracy, and efficiency of PT XYZ's warehouse operations. What needs to be done in the future

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is to minimize errors, as well as conduct regular system development and maintenance to maintain and improve operational performance.

Implications

Implementing the Warehouse Management System (WMS) and Shuttle Cart Rack Orbiter at PT XYZ has had a major positive impact on warehouse operations, improving performance effectiveness, data transparency, space optimization, and cost savings. These technologies accelerate processes previously done manually, reduce errors, and enhance the accuracy of goods management while maximizing storage space usage.

However, success depends heavily on employee competence. Intensive training enables WMS operators to better manage inbound, inventory control, and outbound processes, while trained Orbiter operators can optimize equipment use, troubleshoot issues quickly, and perform proper maintenance. This leads to greater operational independence, less reliance on external technicians, and faster problem resolution.

Several recommendations can be implemented to support operational efficiency at PT XYZ. The company needs to expand the application of the auto put away feature across all projects so that goods can be placed automatically according to certain criteria, such as type, size, weight, stock rotation, and turnover rate. This step will speed up the storage process, reduce dependence on user experience, and reduce the risk of human error. In addition, the implementation of a comprehensive interfacing system is also important, given that some order data input processes are still done manually and are prone to errors. With interfacing, data input can run automatically, faster, more accurately, and reduce repetitive manual work. Both strategies will provide long-term benefits in the form of increased operational efficiency, optimized storage space, improved stock data accuracy, and support for direct integration between WMS and customer systems.

Operationally, the technologies help transform manual, error-prone processes into accurate and efficient workflows. Real-time monitoring further improves transparency, requiring consistent oversight and budget accountability. The passage concludes that companies must actively support this digital transformation by fostering an adaptive organizational culture, ensuring that the WMS and Orbiter deliver maximum added value to warehouse performance.

Theoretical Implications

This study contributes to the academic literature by offering an integrated evaluation of Warehouse Management System (WMS) and Shuttle Cart Rack Orbiter technologies, an approach rarely addressed in prior research. It extends the understanding of how software-based warehouse management tools and automated storage/retrieval systems can work synergistically to enhance operational efficiency, accuracy, and space utilization. The use of NVivo for qualitative analysis enriches methodological practices by visually mapping relationships between system features, human resource adaptation, and performance outcomes. The findings also provide empirical evidence from the Indonesian logistics sector, adding contextual insights to global warehouse technology adoption studies.

Partical Impilications

For the logistics and warehousing industry, the study offers clear operational strategies to maximize the benefits of WMS and Shuttle Cart Rack Orbiter. These include enhancing automation features such as auto-putaway, ensuring full system integration with other platforms, and implementing routine preventive maintenance to address sensor and battery issues. The research highlights the importance of intensive employee training to optimize

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system features and achieve independence in troubleshooting, ultimately reducing reliance on external technicians. By applying these recommendations, companies can improve speed, accuracy, and productivity while reducing operational costs and maximizing warehouse space usage.

Research limitations

This study provides a transparent and honest assessment of its limitations to allow readers to evaluate both its strengths and weaknesses. The research is limited to a single case study at PT XYZ, making the results highly contextspecific and potentially less applicable to different operational settings. It is also based on qualitative data from a relatively small pool of informants, which may restrict the diversity of viewpoints represented. Furthermore, the assessment reflects only a specific period after the implementation of the Warehouse Management System and Shuttle Cart Rack Orbiter, so it may not capture long-term impacts or evolving challenges. In addition, reliance on self-reported interview data introduces the possibility of bias or subjectivity. By acknowledging these limitations, this study encourages future researchers to broaden the scope, extend the observation period, and incorporate additional methods to strengthen the evidence base and advance knowledge in this field.

References

Frazelle, E. (2002). *Supply chain strategy: the logistics of supply chain management*. McGrraw Hill.Bartholdi, J. J., & Hackman, S. T. (2008). *Warehouse & Distribution Science:*

Dablanc, L., & Ross, C. (2012). Atlanta: a mega logistics center in the Piedmont Atlantic Megaregion (PAM). *Journal of transport geography*, *24*, 432-442.SOBANDI, Koesmawan A ; Sobarsa Kosasih.*Manajemen Operasi : Bagian Kedua / Koesmawan A. Sobandi* .2014

Rafli, M. (2022). Pengaruh tata letak, material handling equipment dan warehouse management system terhadap efektivitas pengelolaan gudang. *Jurnal Bisnis, Logistik Dan Supply Chain (BLOGCHAIN)*, *2*(2), 78-84.

Hardiana, C. D., & Setiawan, N. (2021). Pengaruh Supply Chain Management (SCM), Manajemen Kualitas dan Strategi Inovasi Terhadap Kinerja Operasional pada Perusahaan Manufaktur Di Kawasan Delta Silicon Cikarang. *Jurnal Ekonomi dan Bisnis*, *1*(2), 30-44.

Afif, I., & Sumantri, Y. (2023, October). Tinjauan Literatur Teknologi Identifikasi RFID dan QR-Code sebagai Alat Pendukung Aliran Informasi di Dunia Industri. In *Talenta Conference Series: Energy and Engineering (EE)* (Vol. 6, No. 1, pp. 505-512).

Marpaung, A. M., Rahardjo, B., & Surya, T. M. (2017). Pelatihan Penyusunan Neraca Dan Laba Rugi Di Koperasi Krotobond. *Jurnal Abdimas*, *1*(1), 27-30.

Atsauri, M. R., Mawengkang, H., & Efendi, S. JITE (Journal of Informatics and Telecommunication Engineering). *Telecommunication Engineering*, *7*(1), 30-42.

PRABOWO, H. (2015). *Pengaruh Sistem Informasi Akuntansi Manajemen, Strategi Dan Inovasi Terhadap Kinerja Operasional Perusahaan Manufaktur Dalam Memasuki Era Perdagangan Bebas* (Doctoral dissertation, UNIVERSITAS NEGER JAKARTA).

RIRIN, U. S., & AMIN, A. (2024). THE INFLUENCE OF IMPLEMENTATION WAREHOUSE MANAGEMENT SYSTEM AND COMPETENCE ON EMPLOYEE PERFORMANCE OF LOGISTICS AT PT. BUMIMULIA INDAH LESTARI CIKARANG. *DIGITAL INNOVATION: INTERNATIONAL JOURNAL OF MANAGEMENT Учредители: Asosiasi Riset Ilmu Manajemen dan Bisnis Indonesia*, *1*(4), 66-78.

Robotics, Play, and Christopher Lightcap. 2017. “(12) Patent Application Publication (10) Pub . No .: US 2017 / 0097 . 169 A1 Patent Application Publication.” 1(19).

ISSN: 2622-5778 (online)
Advances in Transportation and Logistics Research
http://proceedings.itltrisakti.ac.id/index.php/altr

Salichs, Rafael, and Carlos Tamayo. 2017. "(12) United States Patent." 2(12).
Windra, Windra. 2021. "Faktor-Faktor Yang Mempengaruhi Pencapaian Kinerja Operasional Di Cv Tunggal Jaya." *Performa* 5(5): 389–96.
Husnullail, M., & Jailani, M. S. (2024). Teknik pemeriksaan keabsahan data dalam riset ilmiah. *Jurnal Genta Mulia*, *15*(2), 70-78.