



Implementation of Warehouse Management System Planning in Finished Goods Warehouse

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ABSTRACTS

Warehouses play an important role in the supply chain by serving as a link between producers and end consumers. Warehouses not only serve as a place to store goods, but also have other important functions. Operational efficiency and logistics control in finished goods warehouses are increasingly becoming an urgent need for companies in various industries. However, ineffective warehouse management can lead to negative impacts such as decreased profits and customer dissatisfaction. Therefore, efforts are needed to manage warehouses with good efficiency and structure. This article discusses the concept of Warehouse Management System (WMS) and finished goods warehouse management in an effort to improve operational efficiency and logistics control. Through a qualitative approach with data acquisition using literature review from various relevant sources, the relationship between the use of WMS and increased productivity in a company is examined. The results showed that there was a significant improvement in the performance of a company. The WMS is proven to increase the number of orders received and the company's operational efficiency. WMS aids inventory management with real-time stock data, preventing shortages or excesses. Successful implementation demands proper strategy, tech utilization, planning, system integration, and employee training. Thus, WMS implementation can bring about positive changes in warehouse operational efficiency, inventory optimization, and meeting customer needs.

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1. INTRODUCTION

Efficient warehouse management is vital for businesses in today's intricate and competitive industrial landscape. Nowadays, the warehouse acts as a competitive factor in any supply chain as it has a main role in linking all the partners in it (Hamdy et al., 2020). Warehouses are an integral part of any logistics system and supply chain management and have an important role as a link in the flow of materials or goods from producers to end consumers or customers (Susanto & Hasibuan, 2017). In the past, warehouses primarily served as static storage facilities for products awaiting distribution. However, the dynamics of consumer demands, e-commerce proliferation, and global supply chains have transformed warehouses into dynamic hubs that demand precision, speed, and adaptability.

Over the last decade, there has been continuous pressure for organizations to focus on the sustainability and accountability of a company's performance beyond the border of financial issues (Torabizadeh et al., 2020). Towards this end, companies have been striving to improve the efficiencies of their operations through improvements in the processes (Mahalik & Nambiar, 2010). On top of that, companies constantly need to anticipate and adjust to changing client needs and societal requirements. Hence, one could argue that the ability of organizations to renew their knowledge – in other words, knowledge innovation – is pivotal to achieving corporate excellence and competitive advantage (Rademakers, 2005). With the growing concern for modern competitiveness, companies today are now turning to implementing technology into their operations. One form of applying this concept of effectiveness can be found in finished goods warehouses. Finished goods warehouses, or warehouses in general, are currently implementing technology in their operational processes, either partially or completely. According to Statista (2019), the technology adoption rate in 2019 only reached eight percent but has the potential to increase to 45 percent by 2030. This shows that some industries are starting to realize the importance of effective management in the finished goods warehouse. As a result, profits may be affected, and customers may become dissatisfied, leading to other negative consequences. Therefore, there is a need to manage warehouses in an efficient and structured manner.

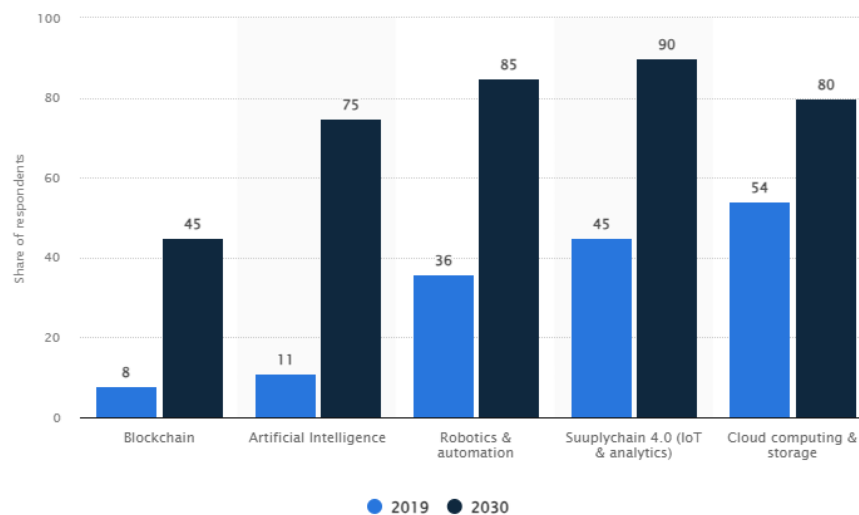


Figure 1. Technology adoption in warehouse automation worldwide in 2019 and 2030 (Source: <https://www.statista.com/>)

Based on the above background, WMS and its application in the context of warehouse management need to be explained in detail regarding the importance of understanding the topic in order to improve operational efficiency and logistics control in finished goods warehouses. A comprehensive understanding of the scope of warehouse management related to Warehouse Management System (WMS) and finished goods warehouse management is needed as a reference source that can help readers to understand the concepts, principles, and best practices in warehouse management. It is hoped that readers can gain understanding and apply this knowledge in their work environment.

2. THEORITICAL BASIS

2.1. Warehouse Management System

WMS is an information technology database used to support storage operations and increase warehouse productivity by coordinating integrated storage activities and keeping accurate inventory (Istiqomah et al., 2020). WMS acts as a system that organizes all warehousing activities in the supply chain, such as receiving stock, storing stock, and managing stock orders. The software helps to keep the check on the inventory, raw material, and shipment details and customers feedback (Ali et al., 2020). The use of WMS is becoming more frequent in this modern era. As warehouses and DCs become more automated and less reliant on human labor, and as that labor becomes harder to come by and more expensive, software that supports these operations is in high demand (McCrea, 2019). Based on a survey conducted by McCrea (2022), more than half (56%) of the companies surveyed use WMS, inventory management, etc. software; 30% use supply chain management and planning (SCP) software; and 26% currently use Transportation Management System (TMS). The urgency of using WMS in this modern age is driven by the need for businesses to improve their operational efficiency, reduce costs, and meet increasing customer expectations.

In the present day, Warehouse Management Systems (WMS) are extensively employed across various industries to optimize warehouse operations and enhance supply chain efficiency. The use of WMS has evolved to address modern business challenges and capitalize on technological advancements. The influence of WMS extends to the complex landscape of multi-channel retail, enabling businesses to effectively oversee inventory and orders across diverse sales platforms. WMS is pivotal in managing product returns proficiently, facilitating the reverse logistics process with clarity and efficacy. Integration with automation technologies enhances operational workflows, while data analytics tools embedded within modern WMS offer valuable insights for refining warehouse performance. Ensuring compliance, traceability, and real-time tracking of shipments, WMS caters to industries with rigorous regulatory requirements. Integration with other enterprise systems and a positive impact on customer experience further underline the contemporary significance of WMS. Their scalability and adaptability make WMS suitable for businesses of all scales and industries. As technological progress continues, the role of WMS is poised to evolve further, adapting to the evolving demands of a globally interconnected business environment.

2.2. Finished Goods Warehouse

A finished goods warehouse is a space designed to store products that have come off the production line and are ready to be sold or distributed (Mecalux.es, 2021). This warehouse is used to store products or goods that have been completed. This type of warehouse is usually located near production facilities or distribution centers, and it plays an important role in the supply chain management process.

Finished goods warehouses can be used for different types of purposes, including by manufacturers, wholesalers, and retailers. The specific requirements for a finished goods warehouse will depend on the nature of the products being stored and the needs of the business. The goods stored can vary, but in general, the goods stored in a finished goods warehouse, for example, are electronics, clothes, food, and goods that are ready to be shipped and used.

In today's business landscape, finished goods warehouses continue to hold significant importance across industries. These warehouses serve as pivotal hubs for manufacturers, wholesalers, and retailers, facilitating streamlined supply chain management and efficient distribution processes. Modern businesses rely on finished goods warehouses to effectively manage inventory, fulfill orders promptly, and adapt to fluctuating customer demands. By centralizing products ready for distribution, these warehouses enable companies to optimize inventory levels, meet customer expectations, and ensure timely order deliveries.

3. METHODS

The research methodology employed for this study is primarily qualitative in nature, adopting a systematic approach to gather valuable insights. The data acquisition process involves conducting an extensive literature review, drawing information from a diverse array of pertinent sources. The choice of a qualitative methodology stems from the objective of generating a conceptual framework and innovative ideas pertaining to the central theme of the study.

The sources used are articles, journals, books and publications relevant to the topic of discussion. Articles and journals were obtained from reputable sites such as Google Scholar, ResearchGate, Taylor and Francis, Emerald, ScienceDirect and other journal sites. The flowchart of the overall methodology of working on the article is shown as shown in the figure below.

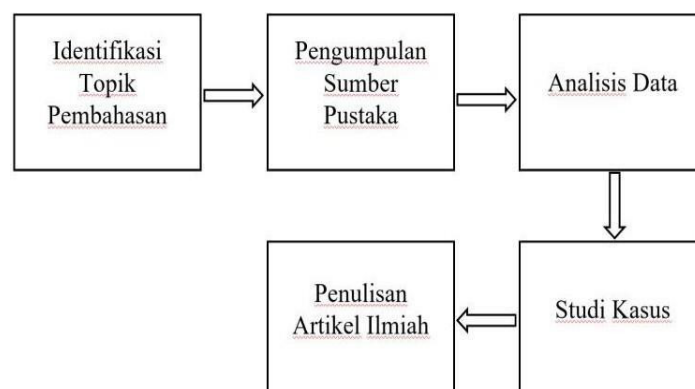


Figure 1. Methodology Flow

The research process begins by choosing a topic and defining the problem to be addressed. After clarifying the problem, the next step involves gathering relevant sources of information, like articles and studies. These sources are essential for analyzing data and studying real-world cases. Once all this information is collected, it's used to create a scientific article that presents the research findings and insights.

4. RESULTS AND DISCUSSION

Warehousing and material handling systems play a vital role in maintaining a smooth supply chain. The requirements of warehousing and handling operations have seen a significant increase in recent years, demanding more sophisticated and efficient solutions. Warehousing refers to activities related to inventory management within the warehouse area, including receipt of goods, handling of purchased goods, selection, collection, and activities related to sorting (Tomáš Kučera, 2017). WMS is applied to improve the effectiveness and management of warehousing with the aim of improving management decision-making and minimizing the amount of unnecessary inventory in the manufacturing process (Jiun-Yan Shiau and Ming-Chang Lee, 2010). An automated warehousing system provides easier organization, more efficient results, and reliability, compared to manual management in a finished goods warehouse.

4.1 Implementation of WMS in Finished Goods Warehouse

The application of technology in various fields has been integrated into warehouse management. Automation in the process can be improved by using robotics technology. The use of robots in material handling is done by incorporating radio frequency identification (RFID), which will be connected to computer programming by integrating tools such as material resource planning and enterprise resource planning to streamline material handling data management (M. Shashidharan et al., 2021). This planning software supports effective inventory management by performing replenishment on a precise schedule and maintaining optimal quantities in real-time. Using QR codes or barcodes along with wireless technology will provide additional benefits in the process. Maintaining accurate stock in the finished goods warehouse can be done by conducting regular physical counts of the products in the warehouse. This counting is done daily and on a regular basis. WMS is a solution to make the stock counting process easier and faster because, by using WMS, inventory data recorded in the SAP (System Applications Product) system can be automatically adjusted to the physical data of products in the warehouse (Andi Haslindah et al., 2017). SAP is an Enterprise Resources Planning-based software that functions to manage various daily activities in an organization or company. With the use of WMS, company is able to monitor and track product items, their quantity per pallet, the location of the product in the storage bin, and the batch of each product. This helps reduce human error and improve the accuracy of stock counts.

4.2 Advantages of WMS Implementation in a Finished Goods Warehouse

Implementing a WMS in a finished goods warehouse has many advantages. According to Nadya Amanda Istiqomah et al. (2020), WMS makes it possible to reduce errors in receiving goods and increase the speed of the process. In addition, WMS can automatically identify the storage location of goods, reduce errors in storing goods in the storage area, and minimize errors in determining the location and goods taken by the picker. The WMS can also increase the speed of pickers in picking goods, assist in recognizing shortages or excess quantities of goods, know the reliability and quality of goods to be shipped, and reduce human error in checking goods. In addition, the WMS also accelerates the delivery of information and report data obtained from the processes

of receiving, storing, order processing, outgoing inspection, loading, and stock take/opname. All this information is directly updated in the WMS, thus ensuring the accuracy of the data obtained.

Secondly, order fulfillment processes are streamlined as WMS optimizes order picking routes, ensuring quicker and error-free order processing, ultimately boosting customer satisfaction. Thirdly, the system optimizes space utilization by suggesting ideal item placement based on demand patterns, leading to efficient storage. Effective labor management is another benefit, as WMS aids in resource allocation and task assignment, granting real-time insights for strategic decisions. Moreover, real-time tracking and visibility into inventory levels and order statuses enable proactive issue resolution. By minimizing cycle times and errors, WMS accelerates throughputs and reduces returns. Additionally, compliance adherence and traceability improve due to accurate inventory records. Data generated by WMS empowers data-driven decision-making, while the system's scalability caters to business growth. Integration with other systems like ERP and TMS ensures seamless information flow. Despite initial costs, the long-term savings from error reduction, efficient labor utilization, optimized inventory management, and space usage make WMS implementation financially beneficial. In conclusion, adopting a WMS in a finished goods warehouse substantially enhances efficiency, inventory control, and customer satisfaction, necessitating careful planning and training for optimal results.

4.3 Challenges in WMS Implementation

As technology continues to evolve, WMS contributes to logistics and supply chain systems to help simplify their implementation. The logistics industry has experienced tremendous advances in technology in the past few decades. WMS makes a significant contribution in simplifying the implementation of logistics and supply chain systems, but there are several challenges that need to be overcome in the implementation process. According to Rafael de Assis and Juliana Keiko Sagawa (2018), one of the main challenges in the implementation process is predicting and overcoming the cultural shock that is bound to occur. The WMS system is complex because it requires standardizing and formalizing processes, reducing the use of informal and alternative records, and monitoring and tracking the overall movement of components. It also demonstrates the productivity of the people involved, directs tasks, and provides little decision autonomy for standardized operations. These new working practices have significantly changed the routine of logistics operators compared to the past.

The next challenge is system integration that can arise when connecting the WMS with existing systems to ensure smooth data flow and synchronization between systems. One of the challenges in WMS integration is ensuring effective integration between the WMS and the Customer Host system (Natesan Andiyappillai, 2020). During the integration process, technical challenges can arise in connecting different systems, mapping data correctly, and ensuring proper synchronization between the WMS and other external systems. This requires close cooperation between the technical teams involved in the implementation. To achieve this, an in-depth understanding of the business needs and capabilities of the Host system is required in order to select and implement a suitable integration. Careful evaluation of factors such as system requirements, product capabilities, flexibility and reliability is necessary to ensure seamless integration and real-time data delivery. Employees who have the responsibility of using the WMS must receive adequate training to operate the system with expertise. This challenge involves providing effective training and a comprehensive understanding of the features and functionality of

the WMS. It is important to ensure that employees are involved in the planning and development process of the system, so that they feel they have a significant role in the use of the WMS and can more easily accept necessary changes.

The challenges of WMS implementation in data security and protection are related to protecting the database and regulating software access. In this context, effective data protection measures need to be implemented to keep the database safe from internal and external threats (Chen Chen, et al., 2018). Care needs to be taken in designing and configuring WMS systems to meet high security standards, as well as conducting regular monitoring and updates to address security vulnerabilities that may arise over time. Integrating appropriate data protection measures into the design and operation of the system to maintain the confidentiality, integrity, and availability of the data stored in it is to protect the database with high security and regulate software access.

4.4 Case Study

La Ruche Logistique is a logistics company that has renovated its warehouse and has a 3,000 m² warehouse in Créancey, France, to meet the new demands of its customers (mostly e-commerce companies). La Ruche Logistique uses Easy WMS, a powerful and versatile software, to optimize their logistics processes. Easy WMS is able to efficiently control warehouses, whether they are manually operated with paper or radiofrequency devices, mixed warehouses, or large automated warehouses. With multi-owner, multi-site, and multi-language features, Easy WMS simplifies warehouse management, no matter how large or what type of warehouse is operated. The company managed to increase the number of daily processed orders from 150 to 500, consisting of more than 3,000 order lines that were distributed and shipped in a matter of hours. In other words, the company not only increased productivity but also work speed by using this WMS.



Figure 2. Easy WMS Mapping
(Source: <https://www.mecalux.com/>)

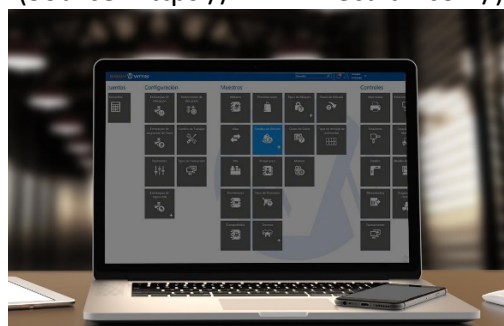


Figure 3. Easy WMS Dashboard
(Source: <https://www.mecalux.com/>)

The organization of operations and workers must also be taken into account when

improving item selection. Operators use radio frequency terminals to communicate in real-time with the WMS, receive orders, and confirm that they have been fulfilled. La Ruche Logistique has implemented Multi-Carrier Shipping, an Easy WMS module that manages the packaging and labeling process. In addition, the WMS can communicate with the shipping agents who distribute the orders. The program enables control of the number of packages so that transport agents know in advance how many boxes make up each order, printing of the necessary documents, both labels for carriers and delivery notes, as well as confirmation of tracking numbers that allow end customers to track shipments. According to Thomas LARGERON, who is the founder of La Ruche Logistique, thanks to the Multi-Carrier Shipping feature, Easy WMS can communicate directly with the carriers to notify them of orders to be distributed.

Table 1. Productivity Comparison of La Ruche Logistique Company

	Before	After	Improvement (%)
Number of SKUs	6000	12000	100
No. of packages received/day	100	200	100
No. of packages dispatched/day	50	150	200
No. orders prepared/day	150	500	233
Number of lines that make up the orders	1000	3000	200

The table above shows a comparison of the productivity of La Ruche Logistique before and after using WMS. The results show a significant improvement in the company's performance. Before using the WMS, the number of orders that could be processed daily was only around 150, but after implementing the system, the company managed to increase the number of orders processed to 500 per day. In addition, there was also an improvement in operational efficiency, with more than 3,000 order lines distributed and shipped within hours. The WMS enabled the company to face the rapid growth of e-commerce with more efficient operations and significantly improved productivity.

5. CONCLUSION

The implementation of a WMS in a finished goods warehouse provides significant benefits in increasing operational efficiency, optimizing inventory management, and improving customer service. WMS helps warehouse management processes become more structured and automated, enabling a reduction in the time and effort required to complete tasks such as item selection, storage, and shipping. In addition, WMS also assists in inventory management by providing accurate and real-time information on stock items, ensuring timely availability and avoiding shortages or excess inventory. Challenges in WMS implementation also need to be overcome with the right strategies and the use of relevant technologies. Successful implementation requires careful planning, including needs analysis, selection of appropriate software, and adequate training for employees. In addition, integration of the WMS with existing systems also needs to be considered to ensure smooth operations and compatibility. The implementation of a WMS can bring about positive changes in warehouse

operations, improve efficiency, optimize inventory, and better meet customer needs, given the right strategy and the use of relevant technology.

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