



A Study of Enterprise Warehouse Management Based on Intelligent Logistics

Pang Ying*

International Business School, Henan University, Zhengzhou, Henan, People's Republic of China, 450000

*PangYing03@henu.edu.cn

Abstract. As a new logistics model, smart logistics is being adopted by more and more enterprises for its high efficiency, intelligence and safety features. Based on extensive literature, this paper summarizes and analyzes the importance of warehouse management for enterprises, the definition and significance of smart logistics, the development of warehouse management in the context of smart logistics and the challenges faced by enterprises. It aims to help logistics enterprises improve the efficiency of warehouse management and achieve lean management and sustainable development. It is found that the application of smart logistics technology can make the enterprise warehouse management more fine and low cost, provide accurate service to consumers, and thus improve competitiveness. Therefore, it is relevant to study enterprise warehouse management in the context of smart logistics.

Keywords: Intelligent Logistics, Warehouse Management, Logistics Management, Internet of Things Technology

1 Introduction

In the era of "Industry 4.0", logistics-related companies are applying emerging technologies such as blockchain, cloud computing, Internet of Things and intelligent logistics equipment to logistics warehousing, transportation and distribution. Intelligent logistics is being adopted by more and more enterprises for its high efficiency, intelligence and safety. Warehouse management is an inevitable part of the logistics process, which is related to the cost, efficiency and service quality of enterprises. The application of intelligent logistics technology can realize lean management of warehouse management, help enterprises better respond to market changes and competitive pressures, and achieve an efficient, safe, energy-saving and environmentally friendly logistics operation mode.

2 The Importance of Warehouse Management to Enterprises

The warehouse is traditionally considered as a place where inventory is stored or stored and is an important part of the supply chain. Warehouse management refers to the effective control of inventory and ensuring the integrity of goods, which is the basis for activities such as manufacturing, logistics and transportation ^[1]. Warehouse management not only affects a company's financial situation, but also determines its long-term stability in a competitive market. Good warehouse management cannot be achieved without accurate inventory management. According to Narkhede and Rajhans, the performance of any organization is directly related to and influenced by the amount of inventory ^[2]. If the supplier's inventory is insufficient, then the opportunity to trade products will be reduced. Inadequate material inventories of manufacturers will lead to production termination and delays, which will increase costs such as transportation costs and order cancellations, thus increasing operational costs and reducing business profitability. Companies can save money and increase profits by managing warehouse materials efficiently and reducing unnecessary inventory inputs. Therefore, it is critical to make the best ordering, production and distribution decisions while minimizing waste. In addition, optimal warehouse management can improve business service levels and customer satisfaction. Good warehouse management practices can help companies increase operational efficiency and improve order fulfillment and delivery times, thereby meeting customer needs in a timely manner and improving service quality ^[3]. Therefore, companies should focus on warehouse management to meet customer needs and remain competitive.

3 The Concept and Significance of Intelligent Logistics

There is no single clear definition of smart logistics in academia. The development of the Internet of Things and Big Data has led to flexible, scalable and intelligent logistics processes, hence the term "smart logistics" ^[4]. According to other scholars, smart logistics refers to the use of computer technology and smart devices that enable all aspects of logistics to be intelligently sensed and learned ^[5].

Currently, smart logistics is at the center of many research and development projects aimed at tracking, monitoring, and predicting the progress of logistics solutions. Increasingly, new technological interventions have led to the emergence of smart warehouse management, smart transportation, digital twins, etc ^[6]. Smart logistics integrates existing technologies such as the Internet of Things, sensor networks and big data to achieve scientific supervision of dynamic information in logistics and transportation ^[7], automating, visualizing, controlling, intelligent and networking the supply chain, and significantly improving the efficiency of resource scheduling and utilization ^[8].

4 Intelligent Logistics and Enterprise Warehouse Management

Intelligent logistics is dedicated to real-time tracking of material flow, inventory and transportation management to meet changing demands while avoiding waste, reducing costs and saving time. Warehousing, an inevitable part of the logistics process for logistics companies, is associated with cost, efficiency and service quality. Today's warehousing is also evolving towards information and intelligence. More and more research is studying information and intelligence in warehousing. boysen, Briskorn and Emde^[9] studied order queuing in warehouses and summarized its impact on the number of lane openings and picking workload. weidinger, boysen and Briskorn optimized shelf assignment in robotic warehouses and shelf locations, and based on characteristics of Kiva warehouses and investigated scheduling rules^[10]. Tian and Wang used a panel dataset of companies to empirically analyze that IT capabilities have a positive impact on inventory strategy, inventory operations, and a negative impact on out-of-stock levels^[11]. The findings suggest that the importance of smart warehousing becomes more prominent as labor costs rise. The impact of smart logistics in the management of corporate warehousing is becoming more and more widespread, and the need to apply smart logistics to the management of corporate warehousing is increasing. In addition, enterprises are facing new challenges in the context of smart logistics.

4.1 The Positive Influence of Intelligent Logistics on Enterprise Warehouse Management

In recent years, the application of smart logistics technology in warehouse management has become increasingly important. It applies high-end technologies and concepts such as big data, Internet of Things and cloud storage to enterprise warehouse management, including the layout and design of warehouse systems, high-quality inventory management and efficient warehouse operations, which greatly reduces labor costs. It was found that most foreign companies have better warehouse management and they have established effective information networks with manufacturing companies, material managers and material demanders to share, network and intelligently manage warehouse information^[12]. A study by Smitha and Aslekarv found that the application of smart logistics led to significant improvements in inventory accuracy and cost efficiency^[13]. Ahmadi et al. studied the impact of smart logistics on inventory management in terms of perishable items. The authors found that temperature and humidity sensors and blockchain, can help companies to achieve better inventory visibility and control, thus reducing waste and improving product quality^[14]. Mahesh et al. showed that technologies such as big data analytics and cloud computing can help companies reduce inventory risk by improving demand forecasting and optimizing warehouse replenishment strategies^[15]. Finally, a study by Tripicchio et al. examined the impact of smart logistics on warehouse management performance^[16]. The use of robots can help companies achieve higher levels of supply chain flexibility and efficiency.

4.2 Intelligent Logistics in Warehouse Management

In the context of intelligent logistics, the process of enterprise warehouse management involves various applications of technologies such as Internet of Things, artificial intelligence, big data, cloud computing, and sensors. First, RFID technology can be used for inbound and outbound management to identify, locate, and track items, and improve the speed and accuracy of goods inbound and outbound^[17]. An example is Wal-Mart's RFID project. Using IoT technology can monitor the quantity and location of goods on the shelves through sensors and upload the data to the cloud for real-time monitoring and positioning of goods^[18]. Managers are able to perform operations such as warehouse movement through applications on smart devices. When picking goods, orders can be rationally placed and allocated using artificial intelligence algorithms and big data technologies. For large e-commerce companies with a wide variety of goods in stock, it is important to effectively use storage space and improve picking efficiency. In addition, intelligent logistics can realize inventory counting in unmanned warehouses. Artificial intelligence technology is used to reduce inventory time and cost and improve accuracy and efficiency^[19]. For example, Amazon acquired the robotics program of Kiva Systems, Inc. to use robots to sort and move goods. Alibaba and Jingdong have also successively applied handling and sorting robots in warehouse to achieve intelligent development of logistics^[20]. Smart warehousing is popular because of its flexible structure, compact storage space, high throughput, and short response time. Finally, cloud computing and big data technologies provide data analysis and decision support for warehouse inventory management, helping enterprises optimize management processes, improve efficiency and profitability, and establish a more efficient and intelligent logistics model.

4.3 Potential Issues of Enterprise Warehouse Management in the Context of Intelligent Logistics

Technological advances have allowed artificial intelligence to replace tedious and repetitive manual labor. However, it also brings many problems. First, it deepens users' concerns about the security of personal information^[21]. For example, many small Internet companies use virtual currencies to purchase basic consumer data. Although collecting and analyzing data can help companies create better products to attract consumers, there are problems such as privacy violations. Second, from the perspective of business managers, the popularity of smart logistics has put many SMEs in a difficult situation, facing financial difficulties and lack of technology. The small size of enterprises lacks sufficient funds to develop, build and innovate intelligent logistics systems. In order to adapt to the development of science and technology, companies need to invest additional funds, pilot projects, and personnel training, which will further widen the gap between SMEs and large enterprises. Finally, the current logistics industry lacks a unified, complete and standardized public information platform, making it difficult to form a scale effect. The development of the intelligent logistics industry requires the integration of the supply chain, but at present the intelligent logistics has not established a unified information standard, and the phenomenon of information silos prevails,

which hinders the connection and sharing of data [22]. Relevant government policies have also not been upgraded with the progress of the logistics industry, which makes the development of intelligent logistics greatly restricted.

4.4 Recommendations

Logistics enterprises should strengthen the research and application of Internet of Things, artificial intelligence, big data, cloud computing, sensors and other technologies to improve the intelligence level of logistics process. At the same time, enterprises should fulfill their social responsibility and apply them correctly and reasonably. Secondly, intelligent logistics service providers should vigorously promote technological innovation and research and development, introduce more intelligent and personalized logistics solutions, and attract more logistics enterprises and warehouse management companies to use intelligent logistics services through reasonable pricing and various service models. In addition, the government should introduce relevant incentive policies to encourage enterprises to strengthen technology research and development and promotion to promote the development and application of intelligent logistics industry. Establish a super logistics enterprise alliance system based on big data and cloud computing technology, and establish a unified and perfect intelligent logistics model. Finally, enterprises should increase the recruitment of professional talents, improve the training and introduction of technical R&D and application talents, and strengthen the talent reserve and technical consulting services in the field of intelligent logistics.

5 Conclusion

To sum up, the development of intelligent logistics has a profound impact on enterprise warehouse management. Applying intelligent logistics technologies such as IoT, cloud computing, and big data to warehouses can help enterprises improve the accuracy of inventory management, increase the efficiency and flexibility of supply chain operations, and thus achieve maximum customer satisfaction at the lowest possible cost. However, successful implementation requires effective collaboration between supply chain partners and the integration of smart logistics technologies into existing warehouse management systems. In addition, the development of smart logistics is not yet complete and not widely used. Therefore, the construction of smart logistics still requires the joint efforts of many parties in society. However, with the development of technology and the continuous updating of enterprise needs, the continuous improvement of intelligent logistics system is worth looking forward to. In the future, intelligent logistics will have more application scenarios and promote the development of logistics industry in the direction of diversification and intelligence.

References

1. Gonzalez, AM, Figueredo, FEJ & Osorio, E de la CG 2022, 'Warehouse Management, an Effective Tool for Decision Making', *Opuntia Brava*, vol. 14, no. 3, pp. 225–236.

2. Narkhede, G & Rajhans, N 2022, 'An integrated approach to redesign warehouse management strategies for achieving sustainable development of small and medium-sized enterprises: Insights from an empirical study in India', *Business Strategy and Development*, vol. 5, no. 4, pp. 308–321.
3. Schlapp, J, Fleischmann, M & Sonntag, D 2022, 'Warehouse timing: How to serve a stochastic season', *Production & Operations Management*, vol. 31, no. 7.
4. Douaioui, K, Fri, M, Mabrouk, C & Semma, EA 2018, 'The interaction between industry 4.0 and smart logistics: Concepts and perspectives', *2018 International Colloquium on Logistics and Supply Chain Management, LOGISTIQUA 2018*.
5. Han, J 2020, 'Research on the Application of Big Data Technology in Intelligent Logistics', *Economic Research Guide*, vol. 2, no. 36, pp. 36–37.
6. Niloofar, J, Mohammad, A & Hao, Y 2022, 'Moving from Industry 4.0 to Industry 5.0: What Are the Implications for Smart Logistics?', *Logistics*, vol. 6, no. 26.
7. Konstantakopoulos, GD, Gayialis, SP & Kechagias, EP 2022, 'Vehicle routing problem and related algorithms for logistics distribution: a literature review and classification', *Operational Research*, vol. 22, no. 3, pp. 2033–2062.
8. Jabeur, N, Al-Belushi, T, Mbarki, M & Gharrad, H 2017, 'Toward Leveraging Smart Logistics Collaboration with a Multi-Agent System Based Solution', *Procedia Computer Science*, vol. 109, pp. 672–679.
9. Boysen, N, Briskorn, D & Emde, S 2017, 'Parts-to-picker based order processing in a rack-moving mobile robots environment', *European Journal of Operational Research*, vol. 262, no. 2, pp. 550–562.
10. Weidinger, F, Boysen, N & Briskorn, D 2018, 'Storage assignment with rack-moving mobile robots in KIVA warehouses', *Transportation Science*, vol. 52, no. 6.
11. Tian, X & Wang, H 2022, 'Impact of IT Capability on Warehouse Management: An Empirical Study', *Procedia Computer Science*, vol. 199, pp. 142–148.
12. McFarlane, D, Giannikas, V & Lu, W 2016, 'Intelligent logistics: Involving the customer', *Computers in Industry*, vol. 81, pp. 105–115.
13. Smitha & Aslekar, A 2022, 'IoT in Warehouse Management', 2022 International Conference on Decision Aid Sciences and Applications (DASA), Decision Aid Sciences and Applications (DASA), 2022 International Conference on, pp. 1045–1050.
14. Ahmadi, E, Mosadegh, H, Maihami, R, Ghalekhondabi, I, Sun, M & Süer, GA 2022, 'Intelligent warehouse management approaches for perishable pharmaceutical products in a healthcare supply chain', *Computers & Operations Research*.
15. Mahesh, P, Tiwari, A, Gupta, N & Karri, R 2021, 'A Survey of Cybersecurity of Digital Manufacturing', *Proceedings of the IEEE*, vol. 109, no. 4, pp. 495–516.
16. Tripicchio, P, Unetti, M, D'Avella, S, Buffi, A, Motroni, A, Bernardini, F & Nepa, P 2022, 'A Synthetic Aperture UHF RFID Localization Method by Phase Unwrapping and Hyperbolic Intersection', vol. 19, no. 2, pp. 933–945.
17. Khanh, QV, Hoai, NV, Manh, LD, Le, AN & Jeon, G 2022, 'Wireless Communication Technologies for IoT in 5G: Vision, Applications, and Challenges', *Wireless Communications and Mobile Computing*, vol. 2022.
18. Fanti, MP, Ukovich, W & Uzsoy, R 2016, 'Guest Editorial: Special Section on Emerging Advances in Logistics Systems: Integrating Remote Sensing, IT, and Autonomy', *IEEE Transactions on Automation Science and Engineering*, vol. 13, no.4.
19. Smitha & Aslekar, A 2022, 'IoT in Warehouse Management', 2022 International Conference on Decision Aid Sciences and Applications (DASA), Decision Aid Sciences and Applications (DASA), 2022 International Conference on, pp. 1045–1050.

20. Zou, B, De Koster, R & Xu, X 2018, 'Operating policies in robotic compact storage and retrieval systems', *Transportation Science*, vol. 52, no. 4, pp. 788–811.
21. Fu, Y & Zhu, J 2019, 'Operation Mechanisms for Intelligent Logistics System: A Blockchain Perspective', *IEEE Access, Access, IEEE*, vol. 7, pp. 144202–144213.
22. Qi, Y & Wang, C 2020, 'Research on the Problems and Countermeasures of Intelligent Logistics System in China', *2020 International Conference on Computer Information and Big Data Applications (CIBDA)*, pp. 116–119.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

