Inventory Method of Intelligent Logistics Warehouse Based on Artificial Intelligence

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Abstract. The development of modern society is inseparable from the support of the logistics industry, especially now that China's e-commerce is more and more developed, the role of the logistics industry is becoming more and more important. With the continuous development of AI (Artificial Intelligence) technology, more and more changes have taken place in the traditional inventory method of intelligent logistics warehouse. The application of AI technology in modern logistics will improve industrial efficiency, reduce costs and promote the long-term development of enterprises. Traditional warehouse inventory efficiency is relatively low, pipeline technology and embedded technology these two methods have been more and more not adapt to the development of the times, which forces us to find a more intelligent method to replace the current traditional inventory method. This paper selects two logistics companies as the experimental research object, in order to study the effect of the combination of AI technology and intelligent logistics warehouse inventory method. The experiment shows that the employees of a logistics company are satisfied with the new inventory method on the whole, and 83.3% of them are satisfied and very satisfied, while the proportion of B company is only 43.3%.

Keywords: Artificial Intelligence, Intelligent Logistics, Warehouse Goods, Inventory Methods

1. Introduction
At present, China's economy is developing rapidly and the logistics demand is very strong, which further promotes the development of logistics industry. But the traditional logistics business cannot meet the needs of modern society, especially the current logistics continues to explode, which leads to more and more warehouse goods [1]. The traditional intelligent logistics warehouse inventory method cannot adapt to the changes of the new situation [2]. Therefore, we should find a better way to optimize and upgrade the current inventory method, and the emergence of AI technology, then we have pointed out the direction of search.

With the development of society and science and technology, AI technology is also developing and innovating. With the passage of time, AI technology has been paid more and more attention. The application of AI technology in various fields not only promotes the realization of automation and intelligent control, but also promotes the development of various industries in society. Xie Hong, Shao
Xinhai and Li Huiqin believe that we should further analyze the development process and direction of AI technology, explore the application of AI technology in related fields, so as to maximize the role of AI and create more contributions to the society [5]. In the world today, with the development of modern logistics, the introduction of intelligent logistics has solved the problems in logistics distribution to a large extent. Intelligent logistics warehouse is to use various advanced technologies to realize the automatic identification of goods in the storage system, obtain useful information, improve the storage system, and play an important role in the storage and distribution functions of goods. Yang Wenbo, Li Ping, Wang Zhixin believes that intelligent logistics system provides great convenience to staff in logistics industry, and also plays an important role in the progress of the times [6]. Because of the complexity and diversification of many orders, the improvement of inventory method of warehouse has become the focus of many logistics industry people. Many relevant professionals are trying to study a more advanced logistics inventory method [7-8]. In the logistics industry, contracts are usually small quantities, but due to the high characteristics of products, orders often change according to the needs of customers. Therefore, the order synchronization must be ensured to support production [9]. The inefficiency and inaccuracy of picking process in warehouse will have a negative impact on the target order, which requires upgrading and optimizing the current working methods, thus improving the production efficiency, picking accuracy and accuracy [10].

At present, the logistics industry in China develops rapidly and the market is increasing greatly. The intelligent logistics storage system is developing towards socialization and function. With the diversification of product types and personalized requirements, modern storage system not only has various goods, different forms and services, but also can intelligently identify goods, thus helping warehouse staff to quickly and accurately count goods and improve inventory efficiency [11]. The application of AI technology to the inventory method of intelligent logistics warehouse can further upgrade the inventory method of optimizing warehouse, greatly improve the efficiency and accuracy of goods counting [12].

2. Method

2.1 AI

AI technology is a challenging subject. People engaged in this work must have computer knowledge, and have an understanding of computer technology, philosophy and psychology. It is actually a branch of computer science. Its essence is to explore the essence of intelligence by using computer methods, so as to design and manufacture a machine similar to human intelligence. This is a very comprehensive science, which is based on machine learning, computer and other fields. And one of its main goals is to input intelligence into the machine, so that the machine can complete complex tasks, such as some tasks needed by human thinking. The impact of AI is diverse, the most important of which is the impact on science, economy and society.

2.2 Intelligent Logistics

Intelligent logistics is an intelligent system, which mainly has the ability of thinking, perception, learning and debate, and then judges and solves some practical problems by integrating intelligent technology, so that the logistics system can imitate human intelligence. The main characteristics of the future development of intelligent logistics are: intelligence, integration and hierarchy. In the process of logistics, a lot of intelligent operations and decisions are made. Logistics management is the core of transportation integration. In the whole logistics work, it is mainly divided into four links: transportation, storage, packaging, loading and unloading. The development of intelligent logistics will put more emphasis on the concept of customer-centered, which will make the production process flexible to adapt to the changes of consumer demand, so as to bring better logistics experience to consumers. The development of intelligent logistics will promote the development of the whole logistics industry, so as to promote the development of regional economy, optimize the allocation of global resources and realize global economic integration.
2.3 Intelligent Logistics and Warehouse Storage System
The intelligent logistics and storage system is an intelligent system composed of three-dimensional shelves, rail tunnel stacker, in and out of warehouse conveying system, information recognition system, automatic control system, computer monitoring system, computer management system and other auxiliary equipment. The system is designed with the integrated logistics concept of flow. Through the application of advanced control, bus, communication and information technology, it coordinates the actions of all kinds of equipment and realizes the automatic warehousing operation. Intelligent logistics and warehousing system is an important part of the rapid development of intelligent manufacturing industry 4.0, it has many advantages, such as saving land, reducing labor intensity, avoiding goods damage or loss, eliminating errors, providing the level of warehouse automation and management, improving the quality of management and operation personnel, reducing storage and transportation losses, effectively reducing the backlog of working capital, and providing logistics efficiency.

2.4 Warehouse Inventory
Warehouse inventory is to record the inventory of goods in the warehouse, which is one of the most important work in warehouse management, and it is also an important step in storage management. The main purpose of warehouse inventory is to ensure the accuracy of inventory quantity by accurately counting the quantity of goods, so as to provide accurate information data for various decisions and analysis. Warehouse inventory is also an effective means to test the management level of warehouse management personnel. Generally speaking, the more level of warehouse management personnel, the more accurate and faster the inventory data. Warehouse counting can be classified by counting time, content and function. General warehouse management personnel are in accordance with the time point to carry out inventory. One of the most common way of inventory is periodic inventory. Regular inventory refers to the warehouse inventory personnel generally in accordance with a fixed point in time to carry out goods inventory. Usually, this time interval can be divided by day, month, quarter and year, and the specific time span depends on the specific situation of each company.

2.5 Some Algorithm Formulas Involved in Inventory of Goods in Intelligent Logistics Warehouse
When we apply AI technology to the inventory method of goods in intelligent logistics warehouse, and determine the efficiency of this new method and people's satisfaction with this method, we often involve some new algorithms, such as PLA - PRF algorithm and correlation algorithm:

$$\frac{dN}{dt} = rN \left( \frac{k - N}{k} \right)$$

(1)

$$N = \frac{k}{1 + e^{-rt}}$$

(2)

$$r(X, Y) = \frac{Cov(X, Y)}{\sqrt{Var(X)Var(Y)}}$$

(3)

3. Experiment
3.1 Research Object
We choose a and B logistics companies as the experimental research objects, and then study the efficiency of their warehouses to check the goods. Company a combines AI technology with intelligent logistics inventory method, while company B still adopts the conventional cargo counting method. Then we interviewed warehouse staff of two companies randomly to investigate their evaluation of the methods used in inventory of goods in their warehouses.
3.2 Research Steps
We investigated the efficiency of the two companies' inventory of goods for a year, and then recorded the results. We selected 150 employees working in the warehouse in two logistics companies, and then asked them about their attitude towards the current inventory method of warehouse goods.

4. Discussion

4.1 Work Efficiency of Goods Inventory in Two Intelligent Logistics Warehouses
According to the data obtained by the experiment, we divide the two logistics companies into four groups of experimental data by quarter, and record the work efficiency of the goods in one year. These four groups are recorded as the first, second, third and fourth of the quarter respectively. The final experimental data results are as follows:

| Table 1. Work efficiency of inventory in two intelligent logistics warehouses |
|--------------------------|-----------------|-----------------|-----------------|-----------------|
| Company A                | Quarter one     | Quarter two     | Quarter three   | Quarter four    |
| Company B                | Quarter one     | Quarter two     | Quarter three   | Quarter four    |
| 78%                      | 83%             | 88%             | 92%             |
| 58%                      | 69%             | 63%             | 70%             |

![Figure 1. Work efficiency of inventory in two intelligent logistics warehouses](image)

From the chart above, the efficiency of company a has been increasing, and its efficiency has increased rapidly from 78% in the first quarter to 92% in the fourth quarter. In this short period, the efficiency has increased by 14 percentage points. And in this year's time, the efficiency ratio of company a has been maintaining this upward trend. However, the efficiency ratio of company B is relatively low, and it is unstable in the fluctuation of the whole. For example, the working efficiency of company B in the first quarter is 58%, and that in the second quarter is 69%, but by the third quarter, the efficiency of inventory goods in warehouse has fallen to 63%, while the working efficiency of company B in the fourth quarter has become 70%. Therefore, the work efficiency of company B is not very ideal and stable. Compared with company a, the work of warehouse inventory of company B is relatively low and floating.

4.2 Satisfaction Survey Results of Employees in Two Warehouses
We selected 150 warehouse workers in two logistics companies, and then interviewed them, and then investigated their satisfaction with the current warehouse inventory method adopted by the company.
By observing Table 2 and Figure 2, we can see that most of the employees in company a are satisfied, of which 88 are satisfied and 40 are very satisfied. The number of the two together reaches 85.3% of the total number of the interviewees, while the number of the people who are not concerned and dissatisfied is 15 and 7 respectively, and the total number of the two accounts for only 14.7%. The overall praise rate of company B is not high, among which 50 people are satisfied and 15 people are very satisfied. The combined proportion of the two is only 43.3%, 40 people are indifferent and 45 people are dissatisfied, which accounts for one third of the total number. Therefore, we can see from the above experimental data that the new inventory method brought by AI technology is worthy of affirmation, and people praise it more on the whole.

5. Conclusions
The pace of economic globalization is gradually accelerating. China's logistics industry should also comply with the trend of the times and participate in the competition of the global logistics industry. Under the new opportunities and challenges, we should continue to adopt advanced management technology and information technology, conform to the development of modern logistics, and constantly innovate to improve the level of AI and information technology. With the innovation of new technologies, logistics enterprises gradually evolve from labor-intensive industry to intelligent industry, solve the work problems of employees, optimize the distribution links of logistics companies, improve logistics efficiency, and bring better logistics experience to consumers, so as to improve the core competitiveness of logistics companies. The application of AI technology in the inventory of goods in intelligent logistics warehouse promotes the development of logistics industry to a more intelligent direction, so as to further promote the prosperity of logistics industry.

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