



Optimization of Enterprise Logistics Management Information System Based on Two-Dimensional Code Technology

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Abstract. As a part of enterprise management, LM (logistics management) has been paid more and more attention by enterprises. The LM information system implemented by two-dimensional bar code technology can realize the effective and quick understanding of the process realization and information statistics of the outbound and inbound products of the enterprise. The use of QR code technology has become an inevitable trend for the development of enterprise LM. How to optimize the LM management system to provide customers with abundant information resources and more convenient data processing methods has become a concern and research issue for enterprise decision makers and managers. Therefore, this article mainly studies the optimization of enterprise LM information system based on QR code technology. First, a comparative analysis of the current status of LM between China and other countries. The results show that the product turnover cycle of Chinese companies is longer than that of the United States and Japan, and the product turnover cycle of Chinese companies is 35 days. In some foreign developed countries, such as the United States, the average product turnover cycle of companies is 16 days. Secondly, after introducing the optimization process of the QR code technology applied to the LM information system, the effect of this technology is analyzed, and the results show that when the QR code technology is applied to the LM system, companies can quickly query customers and Product information, improve efficiency.

Keywords: QR code technology · Logistics management · System optimization · C/S structure

1 Introduction

The logistics information management system can improve the service quality of the enterprise, speed up the operation of the enterprise, and reduce the operating cost of the enterprise. All relevant departments of the enterprise must ensure and promote the rationality and smooth flow of logistics. With the advent of the Internet age, the development of new technologies has made the development of modern logistics possible, and LM is no longer relying on manual operations like the traditional ones. The research of

LM system based on two-dimensional bar code technology is of great significance for improving the current management mechanism of enterprises. It is hoped that the LM of enterprises can be integrated and optimized, so as to improve the efficiency of LM.

There are many researches on the optimization of enterprise LM information system. Li H discussed the optimization of the picking process, which can effectively allocate warehouse resources and reduce operating costs [1]. Zhou Q pointed out that with the increasingly fierce market competition, the challenges faced by small and medium-sized enterprises have gradually increased, and there is an urgent need to improve the level of LM in order to improve the economic benefits of enterprises [2]. Linkai establishes a scientific LM system, fully integrates logistics management information, optimizes its processes, and ultimately achieves the goal of improving LM business efficiency, reducing operating costs, and enhancing corporate competitiveness [3]. Although predecessors have done a lot of research on the optimization of enterprise LM information system by QR code technology is very limited. Therefore, this article mainly focuses on the optimization of enterprise LM information system by QR code technology.

This article mainly studies the optimization of the enterprise LM information system of QR code technology. After introducing the theoretical basis related to the QR code and LM information system, this paper launches specific experimental research. The experiment is divided into two parts. The first part compares and analyzes the current situation of LM between China and other countries by looking up the literature. The second part uses questionnaire survey to analyze the effect of QR code technology on the optimization of LM information system.

2 Theoretical Basis for Optimization of Enterprise Logistics Management Information System Based on QR Code Technology

2.1 QR Code Technology

Two-dimensional bar code technology began to appear in the 1980s and has attracted the attention of many countries in the world. QR code is a brand new information storage, transmission and recognition technology. One-dimensional barcodes and two-dimensional barcodes are distinguished according to the way the barcode carries information and how much information it carries. Two-dimensional bar code and one-dimensional bar code are both means of information representation, carrying and reading [4]. Bar code information in one-dimensional bar codes is transmitted by the different widths and positions of bars and spaces, and the amount of information is affected by the width of the bar code and the accuracy of printing. Compared with the same dimension bar code, the information capacity of the two-dimensional bar code is larger. The two-dimensional code image can be generated by a variety of devices such as mobile phones and ordinary computers, and the production cost is very low [5]. The decoding error rate of ordinary barcodes of two-dimensional codes is very low. When the damaged area of the QR code reaches 50%, it can still be read correctly. The barcode symbol shape and size of the two-dimensional code can be changed. While keeping the information represented by the barcode unchanged, the shape, size and size of the barcode can be

continuously adjusted according to the area of the carrier. The one-dimensional bar code only expresses information in one direction, but does not express any information in the vertical direction. Two-dimensional codes can express information both horizontally and vertically [6].

2.2 Logistics Information Management

The inventory management system mainly includes three parts including order processing, inventory management and distribution management. The LM system makes the product circulation intelligent, which integrates a large number of modern information technologies, mainly including GIS technology, GPS technology, information exchange technology and barcode recognition technology. GPS is mainly composed of three parts: transmitting device, receiving device and monitoring center [7]. The software with GPS positioning and tracking function is installed on the vehicle, which can track the transportation of vehicles and real-time goods, so that consumers and shippers can timely understand the transportation location and environment of goods, so as to maintain an efficient and high-quality operation state in the whole transportation process. GPS technology not only expands the display range, but also intuitively displays cargo information and transportation route from the map. Logistics management system combines GPS and GIS technology [8]. The monitoring center and users can clearly display the specific location of the vehicle, and display the specific situation of the location of the vehicle in the form of a map, so as to send dispatch signaling, query signaling and information to the driver. The application of network technology can not only realize the information sharing of various business points in the logistics process, but also provide a network environment for processing data [9].

There are great differences and connections between traditional logistics management and modern logistics management. For traditional logistics management, the environment of traditional logistics management is poor and the level of productivity is not high. In the process of development and growth, enterprises generally pay attention to important factors such as capital, raw materials and labor force [10]. Due to a variety of factors, the development of traditional logistics is becoming increasingly difficult. Manual operation of the logistics chain is not conducive to the development of traditional logistics companies, which often encounter the problem of insufficient human resources. The modern LM model has greatly liberated the human burden, and the staff can use modern information technology to scientifically and effectively manage the entire logistics chain. In practice, LM companies often put too much energy on reducing the cost of a certain link, but the different links in the LM activities are closely linked, forming an indivisible whole with each other. The activities in some links are mutually restrictive [11]. The integration of modern science and technology and modern LM enables the sharing of information resources in different links in logistics activities. The supply chain management method of modern LM is conducive to coordinating and consolidating the connections between different enterprises.

2.3 Related Technologies Used in Logistics Management Information Systems

The LM information system is realized by means of Web [12]. In the information management of logistics, the C/S system structure can be used to establish a direct connection between the client and the server. The storage management of data is transparent to the client, and the client can complete all the work without interfering with the process behind the data storage [13]. B/S structure can greatly reduce development costs and is an effective software system construction technology. The B/S model has a three-tier structure. The first layer is the client, which is the access point between the user and the system. The second layer is the Web server. The third layer is the database server, its function is to manage the database, and is responsible for coordinating with the Web server to process the information processing request submitted by the user. Compared with the C/S mode, the three-tier structure of the B/S mode is more convenient for the design of the application system, and has many advantages that the C/S structure does not have. For logistics companies focusing on information processing, a management information system built with a B/S structure can realize information sharing, save costs, and ensure data security. The functions of JSP technology and ASP technology are similar [14]. JDBC is a Java API for executing SQL statements. MySQL is currently one of the most commonly used relational database management systems. MySQL relational database can increase the speed of program invisibility and improve the flexibility of the system. MySQL is an open source database, its use is completely free, and does not take up redundant resources. The following formulas are mainly involved in the operation of MySQL.

$$S_j = \sum_{i=1}^N w_{ij}x_i \quad (1)$$

where x is the input sample and i represents the i -th element. The weight after the competition is adjusted according to the following weight formula. For i , there are:

$$w_{ij}(t+1) = w_{ij}(t) + a(x_jm - t) \quad (2)$$

Among them, a is the learning parameter, and m is the number of neurons whose output is 1 in the input layer.

3 Experiment on Optimization of Enterprise Logistics Management Information System Based on QR Code Technology

3.1 Experimental Background

In the early days, the data and information of the products were all processed manually, and the manual processing was inefficient and the error rate was high. With the rapid development of the Internet today, QR code technology plays an increasingly important role in LM. LM is no longer relying on manual operations like the traditional ones. At present, there is still a big gap between modern LM enterprises in our country and logistics enterprises in developed countries, especially the lack of the combination of

theory and technology. More new technologies like QR code technology should be introduced into modern LM, and modern LM should be raised to a new level. Therefore, the research on the optimization of enterprise LM information system based on QR code technology in this paper has become more realistic.

3.2 Experimental Process Steps

After fully expounding the related concepts of QR code technology and logistics management information, this paper designs an experiment by using literature survey and questionnaire survey. The first half of the experiment comprehensively reflects the current situation of logistics management by comparing the average turnover cycle, transportation cycle and storage cycle of enterprise products in several different countries. In the second half of the experiment, the questionnaire is used to investigate the optimization effect of QR code technology on logistics management information system. The survey objects are the logistics information managers of ten different enterprises. The content of the questionnaire is the optimization effect of QR code technology on logistics management information system.

4 Experimental Analysis of Optimization of Enterprise Logistics Management Information System Based on QR Code Technology

4.1 Comparative Analysis of the Status Quo of Logistics Management Between China and Other Countries

Table 1. Comparison of the status quo of logistics management in different countries

	Stock time	Transportation time	Total time
China	30 days	5 days	25 days
U.S.	7 days	9 days	16 days
Japan	5 days	7 days	12 days
India	32 days	10 days	42 days

The product turnover of an enterprise will affect the logistics cost of the enterprise to a certain extent, and the turnover cycle of the product is mainly affected by the transportation cycle and the storage cycle. Enterprises with long transportation and storage periods have relatively high logistics costs. It can be seen from Table 1 and Fig. 1 that the product turnover cycle of Chinese companies is 35 days. In some developed countries abroad, the average product turnover cycle of companies in the United States is 16 days, which is 19 days shorter than that in China. The product turnover cycle of Japanese companies is the shortest, only 12 days. The product turnover cycle of Indian companies is the longest, up to 42 days, which is 30 days longer than the product turnover cycle of Japanese companies. There is little difference in the transportation cycle of companies in

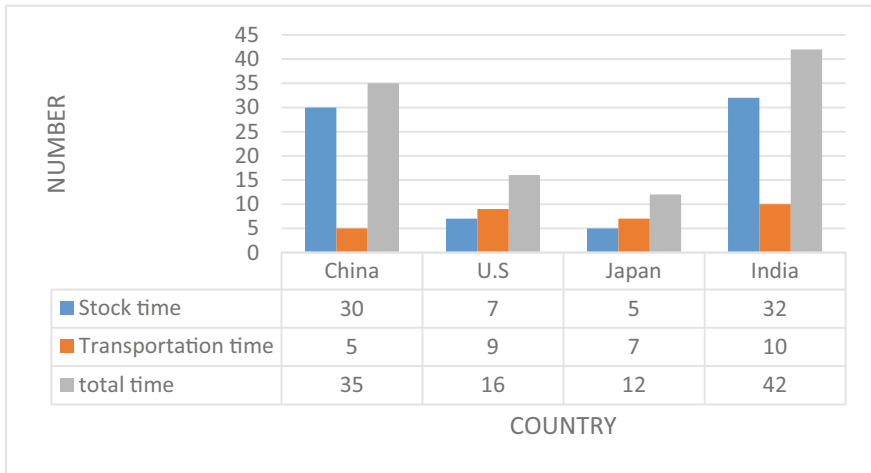


Fig. 1. Comparison of the status quo of logistics management in different countries

these four countries. The longest transportation cycle is 10 days in India and the shortest is 5 days in China. There is only a 5 day difference between the two. It can be seen that the storage cycle is the main factor affecting the product turnover cycle. The average storage cycle of Chinese companies is 30 days, while the storage cycle of American and Japanese companies is only about one week. Therefore, establishing an integrated logistics information management system and optimizing material procurement and material storage processes are of great significance for reducing enterprise costs in one step.

4.2 Two-Dimensional Code Technology Acts on the Optimization Process and Effect Analysis of the Logistics Management Information System

When items are shipped out, in, or in inventory, the company’s LM personnel use a special mobile phone to scan the QR code on the item’s packaging box, and after identifying the information on the QR code, send the information to the back-end server via the wireless local area network. The background server sends the received text information to the database. The above is the entire optimization process of QR code technology applied to enterprise logistics information management.

It can be seen from Table 2 and Fig. 2 that 45% of people believe that when QR code technology is applied to the LM system, companies can quickly query customer and product information. 11% of people believe that the LM information system implemented by the application of two-dimensional bar code technology can ensure the normal operation of enterprise goods in and out of the warehouse, and make the management of the warehouse more standardized. 24% of people agree with the view that the two-dimensional code technology can make the statistical information of the product faster and more accurate when it is applied to the LM system. The remaining 20% suggested that QR code technology helps to establish the relationship between actual production and database records for enterprises when it is applied to the LM system.

Table 2. Analysis of the effect of QR code technology

	Number	Proportion
Quickly query customer and product information	45	45%
Ensure the normal operation of goods in and out	11	11%
Product statistics are fast and accurate	24	24%
Establish the relationship between actual production and database records	20	20%

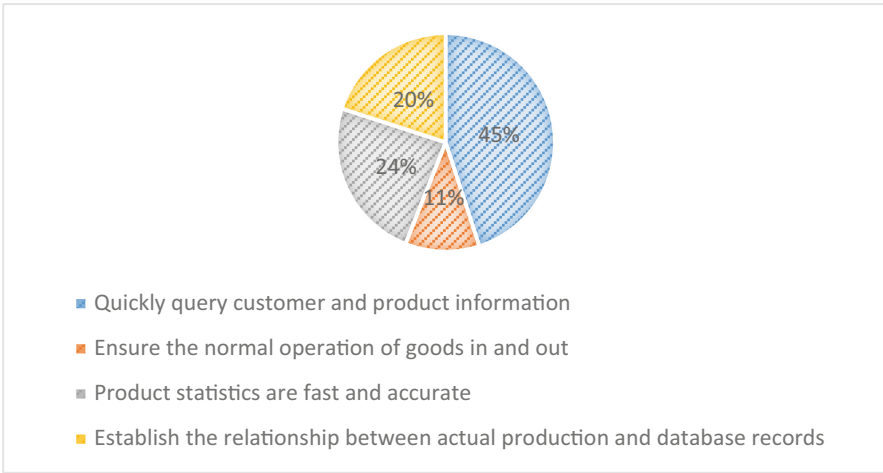


Fig. 2. Analysis of the effect of QR code technology

5 Conclusion

With the continuous improvement of science and technology, many technologies and industries have also become stronger. LM is no longer relying solely on manual operations like the traditional one. With the emergence of a range of new technologies, the logistics industry is facing a wealth of opportunities and challenges. Due to the low cost of barcode technology and a complete standard system, it is the most common identification technology used before. The emergence of barcode technology has made modern LM a qualitative leap. LM has been the economic bloodline of an enterprise, and it plays an inestimable role. Various enterprises have worked hard to reduce logistics costs and improve logistics service levels, so as to achieve the ultimate strategic goal of rapid development of enterprises. Therefore, the research on the optimization of enterprise LM information system based on two-dimensional code technology in this paper is of great significance to help enterprises improve production efficiency.

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