Information System Design for Logistics Warehouse Management Based on Struts

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Abstract: The user interface of this system is implemented by struts, and SQL Server 2016 is used as the backstage data server to increase the security and integrity of the system and improve the speed of system response. The whole software system is based on Browser/Server mode. The system interface design is generous, concise, practical, simple and convenient to operate. It is a software completely suitable for the storage information management of the general logistics centre. It can realize the intelligent management of warehouse such as warehousing, outbound, inventory checking and inventory control, and can improve the efficiency of inventory management. At the same time, the owner can browse his own goods through various documents such as the receipt, issue and count sheet, which is convenient for feeding back information to the logistics enterprise.

1 INTRODUCTION

Warehousing is the temporary storage of products and articles due to the pre order or pre market forecast in the process of product production and circulation (Zhang, R. F., 2022). It is a comprehensive place that reflects the material activities of the factory. It is a transit station connecting production, supply and sales, and plays an important auxiliary role in promoting production and improving efficiency. At the same time, clear and accurate statements, document accounts and accurate accounting information of the accounting department are also carried out around the activities of the warehousing entity. Therefore, warehousing is the integration of logistics, information flow and document flow.

WMS (warehouse management system) is the abbreviation of warehouse management system. It is a business operating system for inventory goods management and processing (Mao, J., 2018). WMS can help enterprises realize the refined management of local single warehouse. It can also help manufacturing enterprises, logistics enterprises and chain industries to realize warehouse management in different places across the country. From the specific scope of application, it can dynamically arrange the storage and shipment of goods, and can electronically operate the whole process of warehousing operation process (Luo, J., 2022). It can establish a data

interface with the customer service center to enable customers to realize remote cargo management through the Internet, and can also seamlessly connect with the ERP system of the enterprise.

With the development of information technology, the original warehouse management will be replaced by the information-based WMS. Therefore, the logistics warehouse management system is taken as a research topic to promote the development of the logistics industry and warehouse industry from a small perspective (Kmiecik, M., 2022).

In recent years, the logistics industry has achieved rapid development, which is not only promoted by economic development, but also closely related to technological progress, especially the progress of information network technology (Klumpp, M.-Kembro, J.). An effective and advanced information network system is very important to ensure the realization of the company's service commitments to customers. The flow of information in the process of logistics is carried out across enterprises. Logistics information must realize the functions of cross regional real-time transmission, remote data access, the combination of data distribution processing and centralized processing, and multiple remote LAN connections. From the perspective of development, some new concepts and new business models have been bred with the support of information technology (Jiang, J. J., 2020). For example, the introduction of the concept of "virtual" has produced "virtual

warehouse" and "virtual warehouse". In my understanding of their meaning, this refers to the so-called "warehouse system" based on the computer database system. In other words: from the perspective of computer technology, both warehouses and inventories exist, which can be mobilized and solve problems, but from the perspective of traditional warehouses and storage, they are in a decentralized state, or even dynamic (He, S. H.- Ferrara, F.). From this point of view, a modern large-scale logistics enterprise does not necessarily have how many means of transport, warehouse area and facilities, but must have a group of high-quality employees, a set of software for logistics management according to modern concepts and relatively complete network information hardware facilities. It can use economic leverage and effective agreements to schedule various required logistics facilities and fulfill various commitments to customers. The "logistics warehousing system" based on "virtual warehouse" technology and "zero inventory" technology can ensure that large-scale production enterprises achieve zero inventory production, so that the cost of raw materials in its working capital can be greatly reduced, and the warehousing facilities of new production enterprises can also be greatly simplified, thus reducing production costs (El Kihel, Y., 2022). However, its service capacity, efficiency and quality have been greatly improved, and its benefits will also increase year on year.

In today's extremely fierce market competition, how to occupy a larger market, improve the competitiveness and popularity of products, and reasonably reduce the marketing cost, is a common topic faced by every enterprise. Therefore, it is urgent to use computers and communication networks for scientific management of materials management, so as to automate the login, query, modification, storage, processing and distribution of information, so as to liberate managers from daily complicated things, improve the quality and efficiency of management work, reduce errors and reduce labor intensity(Chen, J., 2019). The networking of logistics warehousing has many advantages that traditional methods cannot match, and can provide fast, good and low-cost solutions for enterprise marketing. We have reason to believe that more enterprises can take advantage of the new weapon of information management to win the market and strive for greater business opportunities.

WMS came out in the mid-1970s and has developed rapidly since then. It originates from the traditional inventory management system, and expands and adds various new functions on this basis.

According to j.m.hill, an American WMS expert, there are nearly 375 WMS suppliers worldwide (Binos, T., 2020). The current application of WMS abroad can be summarized as follows:

Users are increasing, and large, medium and small enterprises account for a certain proportion. By comparing the prices of a set of software and hardware and the installation of WMS in 1993 and 1998, we can know that the price of WMS has decreased significantly. In 1993, the average price was US $510000. In October 1998, 51 WMS suppliers were surveyed. The price was US $275000, down nearly 46%, mainly due to market competition and the price reduction of electronic technology (Klumpp, M., 2021).

According to the report of IHS magazine, the distribution center of a sanitary ware factory in the UK saved 393000 pounds annually in storage costs after using WMS, and its total investment was recovered within 14 months. American magazine believes that it can generally get a return within two years. It is also estimated that warehouse users with an area of more than 3500 square meters are expected to recover it within one year. The article entitled "investigation of raw material treatment practice", the author pointed out that users who properly implement WMS can improve productivity by 20%-30%, inventory accuracy by more than 99%, and labor cost savings by more than 25% (Binos, T., 2020).

Based on the above-mentioned WMS price decline and its economic benefits, WMS users are increasing day by day. At the same time, the decline of WMS price also makes its users develop from large enterprises to small and medium-sized enterprises. According to the data of arc group in the United States, WMS' global sales in 2008 were 910million US dollars. Among the buyers, 41% were large and medium-sized enterprises, 42.2% were medium-sized enterprises, and 16.8% were small enterprises. People concerned predict that the number of small business customers will increase significantly in the future.

According to the survey of its members by the Automotive Warehouse Distributors Association Logistics & Technology Committee, nearly 50% of manufacturing enterprises have implemented WMS, while more than 60% of warehouse distributors have implemented WMS; In the next year, there are relatively few manufacturing enterprises preparing to implement WMS, and there are relatively many warehousing and distribution enterprises, nearly 10%. For the time being, more than 19% of the manufacturing enterprises have no plans to implement WMS, and about 17% of the warehousing

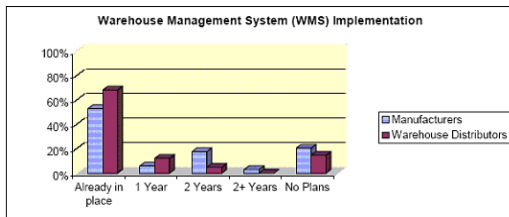and distribution enterprises have no plans to implement WMS.

Figure 1. WMS implementation.

2 SYSTEM ANALYSIS

At the beginning of the system development, the specific business needs of the inventory in the logistics warehouse management system are analyzed. By fully interacting with users, correctly understanding the inventory business process, and making reasonable and user acceptable process improvements, the logistics and transportation business requirements of the application system are obtained. The system mainly includes administrator login interface, main interface module, warehousing management module, warehouse out management module, customer information module, supplier information module, customer information module, etc. After in-depth research, in order to improve the quality and efficiency of logistics warehouse management and reduce the cost of warehouse management, the author has formulated the following design goals in the development expenditure:

(1) Around business and function, it is suitable for warehouse management department;

(2) Friendly interface and simple operation;

(3) Different operators can have different operation permissions;

(4) It has strong versatility, safety, reliability, stability and maintainability.

At the beginning of the system development, the specific business requirements in the logistics warehouse management system are analyzed. Through full interaction with users, correctly understand the logistics business process, and make reasonable and user acceptable process improvement, get the new application system logistics transportation business requirements. First, the warehouse keeper shall make preparations before warehousing according to the actual order information, then receive the goods and inspect them, and then carry out warehousing handover. Outbound is just the opposite. The administrator prepares the goods according to the delivery requirements, and then conducts inspection, and then hand over with the goods receiving personnel. There is also in warehouse management between receipt and issue.

According to the business demand analysis of logistics companies, the main functions of logistics warehouse management information system are summarized as follows:

(1) System user basic information management

User name and password information used in the system. Super administrator can add, modify and delete user information.

(2) Cargo basic information management

The basic information of goods includes basic information such as goods number, goods name, specification, origin, etc. In the basic information of goods, the detailed information of goods is entered according to the goods provided by the supplier.

(3) Goods warehousing information management

In the goods warehousing information, the corresponding supplier name and the goods provided by the supplier are obtained through the supplier number in the basic information. Carry out warehousing operation for goods. Goods warehousing information also includes warehousing number, warehousing date, handler and other information. In the goods warehousing information, you need to add and delete the goods warehousing information.

(4) Goods outbound information management

In the goods outbound information, relevant information such as goods name, goods unit and goods unit price can be obtained through the warehousing number. Use these basic information to issue goods. The goods issue information also includes the issue number, issue date, handler and other information. In the goods issue information, you need to add and delete the goods issue information.

(5) Goods inventory query

In goods inventory query, you can query goods specification, goods unit, goods unit price, and goods quantity by goods name.

(6) Password modification settings

In the password modification setting, the operator and password can be modified through the original password.

(7) Statistical function

Users can make statistics on the receipt and delivery information of logistics according to different conditions, view and analyze the statistical results, so that users can make corresponding adjustments according to the statistical data.

3 SYSTEM IMPLEMENTATION

Struts is an open source project sponsored by the Apache Software Foundation (ASF). It started as a sub-project within the Jakarta project and became ASF's top project in March 2004. It implements the application framework based on the Model-View-Controller (MVC) design pattern of Java EE web applications by using Java Servlet/JSP technology, which is a classic product in the MVC classic design pattern.

The advantages of Struts are mainly concentrated in two aspects: Taglib and page navigation. Taglib is Struts' tag library, which is flexible and versatile, which can greatly improve development efficiency.

The name Struts comes from the support metal frames used in construction and older aircraft. It is intended to reduce the time spent developing web applications using the MVC design model. You'll still need to learn and apply the architecture, but it will do some of the heavy lifting. Struts is an open source software, which is one of its great advantages, allowing developers to have a deeper understanding of its internal implementation mechanisms. A servlet named ActionServlet already acts as a controller, forwarding the request for a view and assembling the response data model according to the configuration file .xml struts-config that describes the correspondence between the model, view, and controller. In the Model part of MVC, it is often divided into two main subsystems (the internal data state of the system and the logical action of changing the data state), which correspond to the ActionForm and Action in Struts, respectively, that need to inherit the implementation superclass. Here, Struts can be combined with a variety of standard data access technologies, including Enterprise Java Beans (EJB), JDBC, and JNDI. On the View side of Struts, in addition to using standard JavaServer Pages (JSP), it also provides a large number of tag libraries to use, and can also be integrated with other presentation layer component technologies (products), such as Velocity Templates, XSLT, etc. By applying the Struts framework, end users can focus most of their attention on their business logic (action) and mapping configuration files (struts-config.xml). Apache Struts 2.3 is an open source web application architecture for developing Java EE web applications. It leverages and extends the Java Servlet API to encourage developers to adopt the MVC architecture.

Permission management is the user's setting of system management permission (user account and password are set in the form of database establishment). The client user inputs his own account and password. The server side accepts the user's login request, authenticates the user's request, and records the authenticated account information in the form of session. If the user is not logged in or the logged in account and password are wrong, the user cannot operate the system.
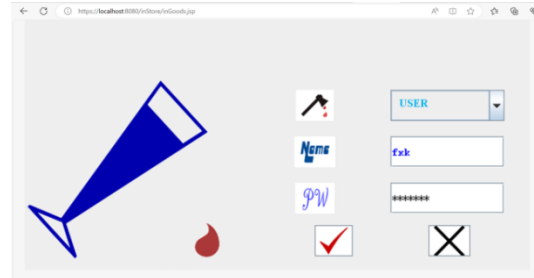

Figure 2. User login interface.

When the administrator clicks the "login" hyperlink, it will lead to a login page. Enter the account and password in the login page box, and press the OK button. The two parameters will be passed to the database for judgment. If the data is consistent with the data in the database, it will show that the login is successful and will be transferred to the background management. Otherwise, the login failure prompt box will pop up. This function is applied to the JavaScript package. The following is part of the code to check whether it is a legal user:

```
public void actionPerformed(java.awt.event.ActionEvent e)
{
        String mode=(String)jComboBox.getSelectedItem();
        String id=jTextField.getText().trim();
        String pw=jPasswordField.getText();
          if(mode.equals("USER"))
          {
              if(id.equals("")||pw.equals(""))
              {
JOptionPane.showMessageDialog(null," User name and password cannot
be empty！");
              }
          }
}
```

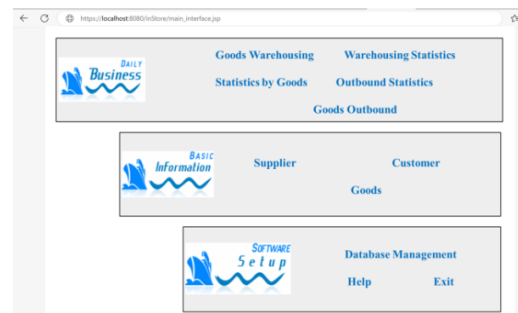The main interface of the system is shown in Figure 3.

Figure 3. The main interface of the system.

4 CONCLUSION

The research content of this paper is the design and implementation of the company's warehouse management information system. In the design process, firstly, the operation characteristics of the logistics company are studied, and combined with these characteristics, the design scheme of the logistics warehouse management system is proposed. Finally, the design of the system is completed according to the actual situation. During the design process, a reasonable database is constructed to store the information of goods, suppliers and customers. The design can make the warehouse management of logistics companies more effective, around the business, applicable functions, friendly interface and simple operation. The system is very strong versatility, safety, reliability, stability and maintainability. The expected goal has been basically achieved.

This system has quite practical functions. In the aspect of query, the system realizes the fuzzy query of multiple conditions and arbitrary fields, and realizes the dynamic generation in the classification query. The system can automatically identify the different inputs of users. A good link relationship has been established among goods receipt, delivery and inventory. A certain part of the modification will automatically trigger the system to modify its related parts.

The system inevitably encounters various problems in the design process. Because the whole system has many functions, some functions need to be improved to improve the convenience of the whole system operation, and there are still many deficiencies.

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