Application Analysis of Internet of Things Technology in Large Chain Stores

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Abstract—The application of the Internet of Things technology in large chain stores can not only accurately locate the location of the goods, understand the information of the goods, and improve the business efficiency of mall operators, but also help consumers quickly find the items they need. At the same time, this can also reduce unnecessary cashier queuing time and help increase the attractiveness and competitiveness of the store. Based on this, this article will analyze how to use the Internet of Things to realize the operation and management of intelligent large-scale chain stores based on the analysis of related concepts. This article studies how to use the Internet of Things business management system to improve business levels and improve operating conditions.

1.INTRODUCTION
Large chain stores are one of 18 retail formats. In recent years, with the development of e-commerce and science and technology, chain stores are not only physical stores, but also continue to expand online stores, brands, delivery, and customer service. In order to better connect all links, chain stores need to adopt innovative technical arrangements to realize the application of existing resources. Among these technologies, the Internet of Things technology is a computer-based technology that can realize the connection between objects and objects, and people and objects. People only need to connect radio frequency identification, infrared sensing equipment, GPS equipment, etc. to the object to realize the connection between the object and the Internet, so as to realize the intelligent identification and positioning of the object, and complete the corresponding communication and transmission work. At present, solutions and equipment such as industrial sensors, networked machines, in-store analysis equipment and smart retail management have been widely used in the market. These innovative technical equipment will help to change the operation and management methods of large chain stores. Connecting these networked devices with items in various links of large-scale chain stores facilitates timely positioning and retrieval, and improves the efficiency and quality of mall management.

2.OVERVIEW OF IOT TECHNOLOGY
The Internet of Things is based on computers. In order to realize the Internet of things and things exchanges, sensor devices are connected to the network of things. It can be combined with protocol constraints to realize the connection with the Internet, realize intelligent identification and control, and information exchange and communication transmission between items. The use of wireless smart terminals such as mobile phones can also realize real-time supervision and control of objects, and realize real-time and accurate physical positioning. The Internet of Things mainly includes three parts: information perception, information transmission and processing. Its basic structure includes perception
layer, transmission layer and application layer. Among them, the perception layer is to use sensing equipment, combined with various technologies to achieve the collection of object-related information. The communication network refers to the connection between the existing Internet, communication network, broadcasting network and various access networks and private networks. The application layer contains various applications and services, which can intelligently process information and then use the terminal to implement corresponding application services [1].

The three main components of the Internet of Things in large chain stores are coding standards, radio frequency identification systems and information network systems. Among them, the coding standard, that is, the electronic coding of commodities is the core of the Internet of Things system of large chain stores. The code must be unique and the number is infinite. The Internet of Things uses this single standard coding system to code any commodity in the world. In the radio frequency identification system, it refers to the use of radio signals to transmit the information stored in the new film to the receiving system, and then complete the collection of data information. It is not only a kind of wireless communication technology, but also a module that realizes automatic collection of commodity electronic codes. The information network system includes a local network and a global Internet, which is a module for information management and information circulation. The system uses coding standard middleware on the basis of the Internet to realize the interconnection between the target object name resolution server and the entity markup language.

3. APPLICATION ADVANTAGES OF IOT TECHNOLOGY IN LARGE CHAIN STORES

3.1. More Accurate Location Tracking
Location tracking refers to the positioning of goods in each store of the chain store. It can help operation managers find goods quickly and accurately and manage them by classification. As long as the Internet of Things is connected to the GPS positioning system, the specific location of the goods can be tracked accurately. The role of IoT sensors can also quickly track the status of goods and analyze the impact of the external environment, such as temperature and humidity, and delivery time, on the quality of goods. It can discover goods that are about to expire or have expired in time, and play a significant advantage in the transportation management of corrosive, cooked food, and fresh goods.

3.2. Personalized Information
In the Internet of Things, beacons and geofences refer to a special kind of information marking and location positioning, enclosing this special area to quickly and accurately carry out specific marketing. The specific operation in large chain stores is: using Bluetooth beacons, FRID or Wi-Fi, store operators can better tap potential customers. It can quickly trigger personalized and targeted marketing advertisements at that location when customers enter or leave a specific geographic boundary. Such marketing advertisements are often aimed at specific groups of people, and such groups of people tend to enter the position at a specific time. Putting this kind of personalized marketing information in a conspicuous place is conducive to advertising conversion and enhances the practical value of marketing advertising.

3.3. Contribute to Supermarket Shopping Basket Analysis
In the shopping basket analysis of large chain stores, the Internet of Things can be used as a data analysis technology to predict future purchases based on historical shopping checkouts and items in the shopping basket. Merchants can use the Internet of Things technology to obtain data on the purchase process of consumers. These data including the goods they buy, the movement from one type to another, their buying behavior and changes in mall layout, etc. These data can be obtained by using IoT devices. Merchants can install IoT search equipment, such as sensors in shopping carts, attach radio frequency identification tags to goods, or locate them via smartphones. Through the analysis of these data and information related to shopping carts, it is helpful for operators to re-deploy store layout and shelf layout. Supermarkets can place customers' favorite commodities in a conspicuous position, and then
reasonably adjust the purchase quantity of various commodities according to the actual purchase situation of buyers [2].

3.4 Conducive to Inventory Maintenance
Accurate maintenance of inventory is also one of the focuses of large chain stores. In the traditional sales model, the point of sale system is related to the quantity of goods. However, after using the Internet of Things technology, the sales system can provide more complex information through Internet of Things retrieval devices such as Internet of Things radio frequency identification tags. This information includes the temperature of the goods, the current condition, whether the goods are damaged, and the shelf life. The use of IoT sensors can also help operators know whether the same type of goods are placed in the same location, and whether they will adversely affect sales if placed in different locations. The use of advanced Internet of Things technology and its equipment can also improve the security of the store, and the use of radio frequency identification tags can prevent customers from stealing or forgetting to pay.

3.5 Predictive Equipment Maintenance
In the operation and management of large chain stores, some important equipment is easily damaged and malfunctioning equipment needs frequent maintenance. After applying IoT technology to large chain stores, IoT sensor devices can be installed in these devices. People can determine whether to perform maintenance by monitoring the functions of these devices. This can determine the maintenance cycle and greatly reduce the probability of failure. For example, refrigeration equipment is a common equipment in large chain stores, and it is also an extremely problematic equipment. Once a problem occurs in the refrigeration equipment, it will affect the quality of the food. Therefore, the supervision and management of such equipment must be strengthened. The use of the Internet of Things technology can make the management of these equipment systems more intelligent, and can timely monitor the changes in the temperature and function of the control system and the impact of these changes on the stored goods. When a failure occurs, people can immediately arrange for maintenance. This can prevent the sudden occurrence of failures that affect daily business activities and affect product quality.

4. The Development of the Internet of Things in Large Chain Stores
The first application of the Internet of Things in large chain stores was the future store invested by Metro Group in Rheinberg, Germany in 2003. In the operation and management of the store, advanced IoT technologies such as radio frequency identification were used for the first time. This is also the first use and successful case in the retail industry. Using the Internet of Things technology, each product is labeled with a radio frequency identification tag. The label is globally unique. It can not only store the information of the product, but also uses a non-contact identification method, so that the location, status, and damage of the product can be obtained without direct contact with the product. The positioning of the goods includes all the processes from the transportation of the goods to the shelves. Placing commodities with radio frequency identification tags on the shelves and installing radio frequency readers on the shelves can obtain timely and accurate information on the labels. Then, people can use the wireless network and the management information system to send the real-time information on the shelf to the database for storage in a timely and accurate manner. The shelf has also changed from a traditional shelf to a shelf with certain intelligent functions. When the goods on the shelf are lower than the latest display quantity, the shelf can automatically send a replenishment request to the system. When the goods on the shelf exceed the shelf life, or are damaged, or there are quality problems such as rot, the shelf will also issue a warning to the system in time to remind the clerk to deal with these goods in time.

The application of the Internet of Things technology in the operation and management of this future supermarket not only makes it possible for the Internet of Things and its equipment to enter large chain stores, but also effectively improves the customer experience after entering the mall. After entering the store, customers can use an intelligent shopping cart equipped with radio frequency identification
equipment to shop. The personal consumption assistant installed in the shopping cart serves as an intelligent shopping computer system. The supermarket can automatically identify and record the goods put in the shopping cart in a timely and accurate manner, and display the total amount and total price on the display screen. Future supermarkets also provide a smart electronic scale device. People install electronic cameras in the device, which can automatically identify the goods placed on the scale, and accurately calculate the weight of the goods and calculate the total price. In short, the intelligent shopping cart and the intelligent cash register make shopping in the mall an intelligent thing. For consumers, this saves time for settlement. Consumers can even check out independently, which also improves the efficiency of the cashier. Consumers can calculate the total price as soon as the shopping cart passes the cashier. In addition, smart dressing mirrors have appeared in some stores. Consumers get clothes with radio frequency identification tags and stand in front of the mirror. The mirror can automatically identify and display the effect of the clothes that customers are trying on. Some can even recommend clothes of the right size for consumers, or other clothes that match this kind of clothes.

5. USE THE INTERNET OF THINGS TO BUILD A LARGE-SCALE CHAIN STORE BUSINESS MANAGEMENT SYSTEM

People can use the Internet of Things technology to build a large-scale chain store business management system. The technology used in the system includes mobile computer technology, wireless network technology, multiple data exchange interface technology, barcode and automatic identification technology, mobile middleware technology, etc. The functions of the system include store system, purchasing center system, customer shopping guide system, and distribution center, accounting center, etc. [3].

![Business Management System Architecture](image)

5.1. Application in Store System

The store system includes store purchase and return management, inventory processing, and price control. That is, a real-time data acquisition system based on wireless network technology is used to provide operators with an intelligent operating environment. This not only can effectively control the flow of inventory in the store, but also can combine the front-end system with the back-end system to speed up the circulation of goods and improve operational capabilities. In the meantime, people can track customer purchases, making store operations more convenient and efficient. For example, in inventory processing, people can get information about commodities from the center by scanning the barcode. People can also carry out real-time quantity counting and automatic recording to speed up the counting speed. In this way, it can also calculate the inventory loss in real time, and automatically notify the same commodity on the shelf, and check the placement of the commodity on the shelf. Stores will install radio frequency identification tags on each shopping basket or shopping cart, as well as
radio frequency readers that can radiate the entire store to check consumer shopping behavior and mobile lines at any time. This can help operators understand the unpopular places in the store and make reasonable adjustments. In product classification, people can also use radio frequency identification tags and radio frequency readers to reflect the order of consumers in shopping, and discover the correlation between products in time. This is conducive to the timely classification and placement of goods, making the goods on the shelf more attractive.

5.2. Application in Guiding Customers to Purchase and Manager's Store Inspection

In large chain stores, some customers may purchase a large amount of goods at once, especially some companies purchase. In order to ensure the efficiency of store operations, shopping malls combined with Internet of Things technology can optimize customer service. For example, shopping guides can use wireless terminals to help customers purchase, record product types, quantities, etc., and transmit them to the background in real time to prepare for customers. After the purchase, the customer can complete the settlement directly in the background, or directly pick up the goods or deliver the goods to the door. The manager can quickly grasp relevant information by using the Internet of Things technology during the inspection process of the store, and make decisions based on this. Use the wireless terminal to inquire about the purchase price, inventory, sales, etc. of the product directly in the host by scanning the barcode during the tour. This is also convenient for managers to quickly make a decision whether to adjust the price according to the on-site sales situation [4].

5.3. Application in Collection Charges

With the improvement of people's living standards and the acceleration of the pace of life, people hope to shorten the shopping time. In order to solve the time of consumers, large chain stores can attract customers through reasonable store layout, improving service level, and formulating reasonable price strategies. Meanwhile, they should also save consumers time when making payments, avoid a large number of queues and slow settlement speeds. The long waiting time for payment will inevitably adversely affect sales and the attractiveness of the store. The application of the Internet of Things technology can solve the time-consuming shortcomings of traditional label scanning through radio frequency identification tags and cashier radio frequency readers. The goods in the consumer's shopping cart can pass through the RF scanner all at once. This not only saves waiting time for consumers, but also improves their satisfaction and enhances the attractiveness of the market. At present, many large supermarkets have begun to widely use automatic payment equipment. The application of this equipment not only liberates manpower, but also reduces the work pressure of cashiers. Consumers can automatically complete the checkout simply by scanning the barcode.

5.4. Application in Loss Prevention and Theft Prevention

Affected by the education level of consumers, the quality of the customers who come to the mall to consume varies. Some consumers open the package without authorization because they want to know the information in the product before the settlement, and the product is destroyed, and some small products are also easy to be stolen in this environment. Although cameras are installed in large shopping malls, theft still exists. In order to solve this problem, in addition to placing valuable products on special counters, shopping malls can also use radio frequency identification barcodes and QR code technologies. In this way, consumers can obtain more information about products by using their smart phones. The radio frequency identification technology and radio frequency scanning can play a role in real-time monitoring of each item.

5.5. Application in Supply Chain and Logistics

The functions of the distribution center system include receiving and shipping processing, sorting and handling processing. The distribution center, as a distribution point for merchants' goods, includes multiple links such as unloading, tallying, receiving, distributing, shipping, transferring, and storing vehicles. These links need to be synchronized and staggered. The use of real-time multi-process
management can not only perform timely and accurate information registration and processing, but also speed up logistics turnover and reduce intermediate process losses, thereby reducing the operating cost of goods. The real-time data acquisition system based on wireless technology plays an important role in the distribution process. Among them, the receiving processing includes automated order search and goods inventory. It requires checking the order quantity with the actual arrival quantity, verifying the actual situation of the order completion, checking whether the variety of the goods is consistent with the scheduled requirements, and registering the time, name, and shelf life of the goods. Realize automatic identification and pairing of goods and pallet codes, and match the codes with the types of goods to facilitate the later search of goods on the shelf. Delivery processing includes automated search and search of invoices, and correspondence between the number of invoices and the number of outgoing warehouses. It also includes checking the actual situation of the shipment, whether the goods out of the warehouse are consistent with the requirements on the invoice, checking and registering the time when the goods are out of the warehouse and the name of the customer, etc. Otherwise, this also includes automatic generation of distribution orders and logistics routes, and automatic generation of loading orders. In the process of sorting and handling, information guidance can be realized through wireless network technology, and automatic sorting and handling control can also be completed quickly. This also greatly improves work efficiency. Moreover, this can ensure the accuracy of goods sorting and placement, and complete the corresponding scheduling work. Simultaneously, in the sorting system, the first-in-first-out of goods can also be realized, as well as the detection and lock of the corresponding position of the goods position and the forklift [1].

6. CONCLUSION
In summary, this article studies the application of the Internet of Things, Internet of Things technology and its equipment in the operation and management of large-scale chain stores. Through the construction of a business management system, various links including purchases, shelves, circulation, and sales can be linked. Through radio frequency identification technology, GPS technology, two-dimensional code technology, etc., not only the products can be quickly and accurately located, but also consumers can know the specific information of the products and the shopping situation in time. Furthermore, this is also convenient for customers to buy, reduce the waiting time for consumers, and help increase the attractiveness of the store. At present, with the development of the Internet of Things, the Internet of Things equipment is continuously improved and optimized, and the industry standards are becoming more and more night. In the future, the further development and maturity of technology can also solve the cost problem. This will also make the Internet of Things technology play a significant value in the chain retail industry.

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