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Research Article

Management Problems of Modern Logistics Information System Based on Data Mining

Enhou Zu,[1] Ming-Hung Shu,[2,3] Jui-Chan Huang,[4] Bi-Min Hsu,[5] and Chien-Ming Hu[2]

[1]*School of Management, Henan University of Science & Technology, Luoyang City Kaiyuan Avenue, Luoyang 471023, China*
[2]*Department of Industrial Engineering and Management, National Kaohsiung University of Science and Technology, Kaohsiung City 80778, Taiwan*
[3]*Department of Healthcare Administration and Medical Informatics, Kaohsiung Medical University, Kaohsiung City 80708, Taiwan*
[4]*Yango University, Fuzhou 350015, China*
[5]*Department of Industrial Engineering and Management, Cheng Shiu University, Kaohsiung City 83347, Taiwan*

Correspondence should be addressed to Chien-Ming Hu; i108143101@nkust.edu.tw

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With the development of technology, the data stored by humans is growing geometrically. Especially in the logistics industry, the rise of online e-commerce has created a huge data flow in the informatized logistics network. How to collect, analyze, and organize this information in time and analyze the meaning of this information from it is a difficult problem. The paper aims to learn the management of logistics systems from the perspective of statistics. This article uses random analysis of 1,000 customers' logistics records from the logistics enterprise information system, uses mathematical analysis and matrix theory to analyze the correlation among them, and analyzes customer types and shopping. The information on habits, daily consumption patterns, and brand preferences is classified and summarized using mathematical statistics. The experimental results show that the results of the study can well reflect customers' daily habits and consumption habits. The experimental data show that mining effective and accurate information from massive information can help companies to quickly make decisions, formulate scientific logistics management programs, improve operating efficiency, reduce operating costs, and obtain good benefits.

1. Introduction

The modern logistics system is a complex system, including transportation, warehousing, distribution, handling, and packaging and logistics reprocessing, etc. The information flow is huge. The huge data flow makes it difficult for companies to collect and process these data accurately and efficiently, so it is difficult for decision makers to make fast and accurate decisions, to control the logistics process, and to reduce the logistics cost of the entire process. Logistics management information system is the basis of enterprise information systems and enterprise informatization.

The main trend of global economic development is the informationization of the economy [1–3]. It is precisely due to the status quo that e-commerce, one-stop online shopping, and integrated network distribution processes have transformed the traditional logistics industry into high-tech new industries. The management of such systems has become a hot research direction for scholars from all sides. Because the logistics industry has different distribution methods and business planning methods, it is necessary to focus on fuzzy data analysis in the design [4, 5]. The logistics method of the modern logistics system of data mining will be an important direction of logistics development. Therefore, GPS technology, GIS technology, and logistics industry need to be organically combined [6, 7].

Scholars such as Xuegin aim to use modern information technology to manage the medical traceability of implants. Methods: collect and analyze the problems existing in the traceability management of implantable medical devices,

combine their own work practices, draw on the advanced methods of other industries and the research and analysis process of traceability management in key foreign countries to find out the network traceability model, and plan basic requirements of sexual management. Xuegin has designed and developed an implantable medical device traceability management information system, including logistics, supervision, traceability, and use traceability. Conclusion: the system standardizes the traceability management system well, unifies the traceability management process, and improves the efficiency of traceability management [8]. Qiang and other scholars use traditional classification methods to process the intercepted signals, and the different operating states of a single radar can be easily classified as multiple emitters, which adversely affects signal classification [9].

The information age is a "customer-centric" era. Enterprises are no longer just building cars behind closed doors to develop products but are coming to customers. They truly treat customers as God, understand customer needs, and serve customers wholeheartedly. Analyzing customers' consumption habits from their daily consumption is a problem currently being solved. This article uses random analysis of 1,000 customers' logistics records from the logistics enterprise information system, uses mathematical analysis and matrix theory to analyze the correlation among them, and analyzes customer types and shopping. The information on habits, daily consumption patterns, and brand preferences is classified and summarized using mathematical statistics. The experimental results show that the results of the study can well reflect customers' daily habits and consumption habits.

2. Proposed Method

2.1. Research Status of Enterprise Logistics Based on Data Mining

2.1.1. Research Status of Enterprise Logistics. After several years of rapid development, China's logistics industry has entered a stable and mature period, but there are still some problems compared with foreign advanced logistics companies:

(1) The development of China's logistics industry is still constrained by market demand. Many companies have logistics departments inside, which has a certain impact on the development of China's professional logistics enterprises.

(2) Relatively speaking, the service model of logistics companies is limited, and the management level of logistics companies needs to be further improved.

(3) There is no overall unified management of the logistics industry, which hinders the establishment of a global logistics system.

(4) The legal environment of the logistics industry is relatively bad. However, the logistics industry attaches great importance to the research of informatization and focuses on the hot research direction of the Internet of things. In 2010, the whole logistics industry began to realize the centralized integration of enterprise logistics information into a unified information system and use an advanced electronic label and bar code identification technology to speed up the efficiency of goods sorting [10–12]. In short, logistics companies are facing development opportunities and pressures in the fields of intelligent management and control, data mining, and big data processing. China's logistics enterprises can also learn from the development experience of foreign logistics enterprises. With the support of efficient and fast logistics technology, they are equipped with high-tech data mining and intelligent management and control technology so that logistics enterprises have an advantage in market competition.

2.1.2. Research Status of Data Mining Technology. With the increasing amount of data in recent years, data mining technology [13, 14] has also received more and more attention. At present, China's research on data mining mainly involves three aspects:

(1) Research on data mining aspects, such as clustering research, association method research, and decision tree research.

(2) Research based on data mining applications, such as financial data, medical data, e-commerce, and spatial geographic data.

(3) Data mining based on the Internet, which mainly aims at mining and integrating a large amount of scattered data on the Internet [15, 16]. As the top e-commerce company in China, the owner of Alibaba Company has a huge amount of user visits and shopping habits data. It can use data mining technology to analyze users' shopping habits, personalized needs, and behavior characteristics from a large number of complex data to design network products that are more suitable for users. The logistics industry also needs massive data mining and analysis. Now more and more logistics companies have begun to focus on the mining of logistics data, the calculation of logistics costs, and the evaluation of PKI performance.

2.2. Components and Functions of Logistics Information System

2.2.1. Composition Framework. The content and scope of modern logistics enterprises or enterprise logistics operations generally cover the links of raw materials and materials procurement, transportation, warehousing, distribution processing, loading and unloading, packaging, distribution, and corresponding information management, so the module composition of their logistics information system should include the requirements of these links and their derivatives provide corresponding management functions. Figure 1 shows the general framework of functional modules of a logistics information system.

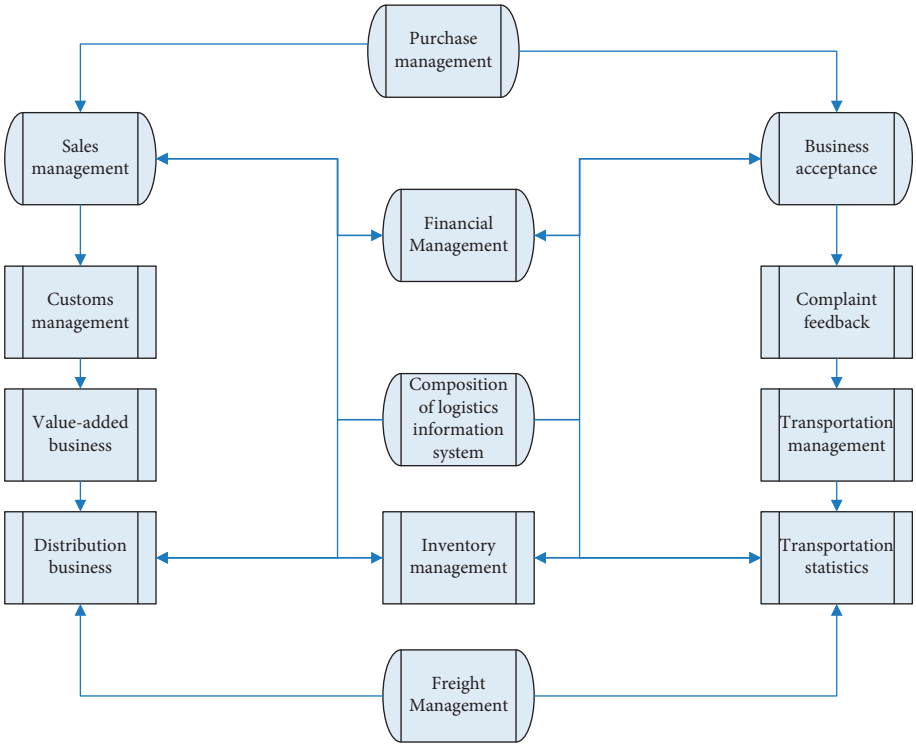

Figure 1: Composition framework of logistics information system.

2.2.2. Steps of Data Mining. Hardware, software and users constitute the three major factors of the data mining environment. After the environment is ready, the next step is to follow the requirements analysis, initial data preparation, data mining implementation, and application of mining results to several stages of data mining. Figure 2 shows the basic steps and content of data mining.

2.3. CRM Based on Data Mining Technology

2.3.1. The Role of CBR. CRM is a cyclic process of interaction between enterprises and customers, and then it generates, collects, and analyzes customer data, and then the enterprise applies the results to its services and marketing activities. At the same time, CRM is an enterprise business model. A well-designed CRM solution can help companies improve their communication with existing customers while expanding new sources of revenue. This knowledge is generally expressed in the form of concepts, rules, rules, or patterns. Generally speaking, data mining is a key step of knowledge discovery in databases. It uses some specific knowledge discovery algorithms to search the data to find the knowledge hidden in these data.

2.3.2. Application of CBR. The application of data mining in CRM is mainly focused on the following aspects:

(1) Acquisition of new customers: mining new target customers is the key to the continuous growth of the enterprise, and it is also the first step in the life cycle of CRM customers. Acquiring new customers includes finding customers who do not know about your product and customers who previously received the services of your competitors. The use of data mining can help complete the increasingly heavy division of potential customer groups, thereby effectively managing the cost of acquiring new customers and improving the effects of these activities, which can significantly increase the response rate of marketing activities and improve the return rate of marketing activities. Generally, methods such as statistical regression, logistic regression, decision tree, neural network, etc., are used in data mining to predict and analyze consumers' future behavior, generate prediction models, and establish scoring models. This model analyzes the potential customer groups and determines the target customers of the marketing activities from them [17, 18].

(2) Customer segmentation: segmentation can be achieved by using sorting, decision tree, or clustering methods in data mining. A few years ago, some banks subdivided their customers into four types of customer groups: top, important, core, and public. They provided targeted differentiated services, and their operating income more than doubled.

(3) Cross-selling: now the relationship between enterprises and customers is constantly changing. Once a person or a company becomes a customer of our company, we must try our best to make this customer relationship tend to continue and develop for our company. In general, this can be achieved by maintaining this relationship for the longest time,

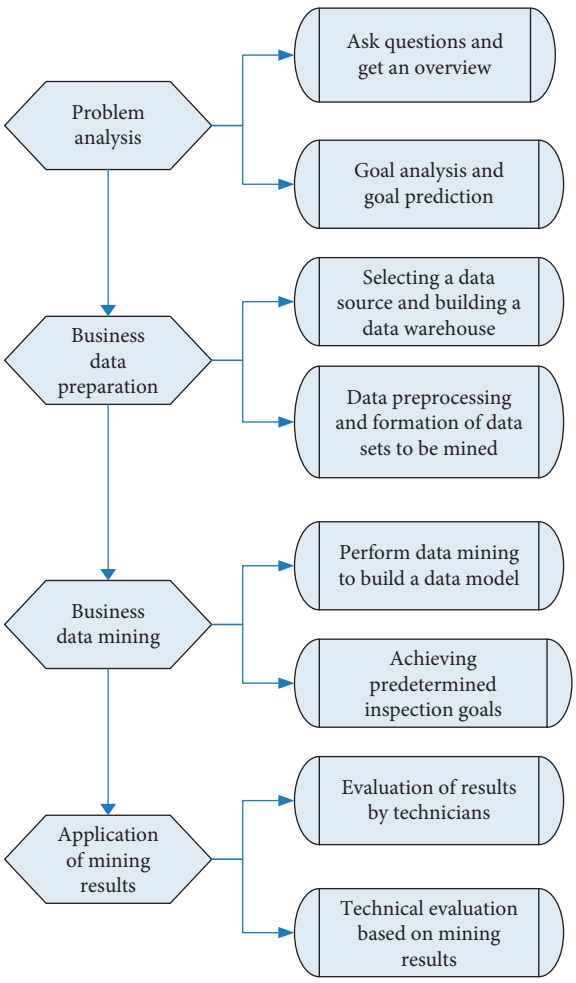

Figure 2: Data mining steps.

trading with the customer a maximum number of times, and guaranteeing the maximum amount of profit per transaction. Therefore, companies need to cross-sell existing customer groups. It is based on the principle of "win-win" between enterprises and customers. For customers, they can get more and better products and services. For enterprises, they will also benefit from increased sales. Relevant analysis, sequence analysis, and other methods are usually used to implement cross-selling to customers. Data mining can help you analyze the optimal and reasonable sales match.

2.4. Data Mining-Related Technologies Involved in System Construction

2.4.1. Definition of Data Mining in Logistics Information Management. The three major areas of data mining technology application in logistics enterprise information management are customer relationship management, supply chain system management, and decision support. The use of data mining in customer relationship management can help logistics companies perform customer satisfaction analysis, customer churn analysis, customer value segmentation, customer loyalty analysis, and cross-selling analysis. Under the supply chain operation mode, whether the connection of each link and process of the logistics enterprise is reasonable and scientific is vital to the efficiency of the entire system. It is even more important to introduce data mining technology into supply chain analysis and diagnosis [19]. In short, data mining technology has a very important support and support role in the decision support system of logistics enterprises.

2.4.2. System Construction. The data mining-related technologies involved in building a data mining-based enterprise logistics intelligent management and control system [20, 21] can be divided into knowledge-based data mining technology and statistics-based data mining technology. Specifically, the application fields of statistical data mining technology are relatively extensive, and the application theory is relatively mature. It mainly includes clustering data mining technology, data regression technology, clustering and measurement technology, and selection of proximity technology. Knowledge data mining technology mainly includes four aspects: neural network technology, genetic algorithm, decision tree technology, and rough set technology. The following four technologies are introduced in detail:

(1) Neural network technology: it is to imitate biological neural networks in terms of structure. It uses learning and training to complete the design of nonlinear prediction models. It regards each link as a separate processing unit and uses imitating human brain nerve operations. The pattern completes the data clustering, classification, and mining [22–24].

(2) Genetic algorithm technology: this algorithm can start from any initial population by simulating the reproduction and gene mutation phenomenon in natural and genetic processes and use a random crossover, selection, and mutation to construct new populations.

(3) Decision tree technology: its technology uses a tree-like method to train various variables in the data and build decision rules according to the goals. The more commonly used methods are CHAID and CART. Decision tree technology uses the variable groups in the decision set to build a tree structure and displays the construction method of the set under certain specific conditions. It is often used for risk analysis of loans.

(4) Rough set technology: in the process of theory application, it is not necessary to grasp the prior conditions of the problem to determine the inherent law of the problem. Rough set technology theory is mainly applied in fuzzy recognition and decision analysis [25].

3. Experiments

3.1. Experimental Settings

3.1.1. Experimental Background. The acceleration of the pace of economic globalization and the integration of the world market has made the market competition increasingly

faced by enterprises, and logistics has gradually become the third source of profit for enterprises and an important area to cultivate their core competitiveness. Modern logistics activities and operations are integrated services that integrate transportation, warehousing, distribution processing, packaging, distribution, customer service, and information management. Each link generates and aggregates a large amount of information. A large amount of business information data has been accumulated during operation and implementation. In the information age, only with the help of advanced data analysis and mining tools can a large amount of business data information be processed and intelligently analyzed in a timely manner and can be effectively mined and found hidden behind the data knowledge and business model characteristics, so as to provide managers with effective data support for business management decisions [26–29].

3.1.2. Experimental Process. This paper randomly selects 1,000 customers' logistics records from a city's logistics enterprise information system in a certain area, uses mathematical analysis and matrix theory to analyze the correlation among them, and analyzes the four types of customer types, shopping habits, daily patterns, and brand preferences. Information, use mathematical statistical methods to classify and summarize.

3.2. Experimental Analysis

3.2.1. Experimental Steps

(1) Prepare the experiment, randomly select the logistics records of 1,000 customers from a logistics company, analyze the data, and use mathematical analysis and matrix theory to analyze the data classification, and classify according to customer types, shopping habits, daily patterns, and brands.

(2) Software preparation requires professional computer personnel to operate and analysis is performed using software MATLAB and finite element software. Obtain experimental data.

(3) Mining association rules: the association rule mining algorithm is a very important algorithm in the data mining technology algorithm. The basic idea is to find an association rule in a transactional database that meets given minimum support and minimum reliability. The mining process includes two basic operations. First, the project dataset is found in the transactional database according to the minimum support threshold, and then all association rules are generated according to the project dataset and the minimum confidence.

(4) Perform deep data mining and use mathematical statistics to find the laws and consumption habits behind the data.

(5) The obtained experimental data is combined with the enterprise to verify the analysis results.

3.2.2. Precautions

(1) The experimental data are real and randomness must be achieved

(2) When the software is analyzed, if the operating personnel have the certain operating experience to prevent analysis errors caused by operating errors

(3) Analyze the results of the analysis and classify them using mathematical statistics

(4) Analyze the results and dig deeper into the laws behind it

4. Discussion

4.1. Data Analysis Experiment

(1) There are 1000 customer logistics records in the analysis data, and the quantity is 1000 customers, [1100] is the first group, [101–200] is the second group, and so on, one group for every 100 people. Study the group's shopping patterns and brand preferences. The study found that most consumers like to buy big brands and shop online. The general shopping patterns of customers are shown in Table 1 and Figure 3. The customer's brand style is shown in Table 2 and Figure 4.

(2) Based on the above data, a classification analysis was performed on the types of customers. A survey of different consumer groups found that corporate personnel, civil servants, and company high collars accounted for a higher proportion of consumer groups. In addition, the survey also found that some staff have college students at home and abroad, especially female college students who have stronger spending power. The specific survey data are shown in Table 3 and Figure 5.

4.2. Statistics

(1) After surveying customer types, consumption habits, shopping patterns, and brand preferences and conducting data analysis, using association principles for data mining, the ratio of purchase money and modification times is used as the integrity, and each group averages the average. Analyze each type of customer, from which you can analyze that the type of customer belongs to the credibility of the company's executives and corporate personnel and the number of integrity purchases is the highest. The type of customer is the highest purchasing power of female college students, but the integrity is low. The level of purchasing power of civil servants is stable and their integrity is relatively high. According to the results of data mining, by applying association rules, logistics companies can take the following measures to improve the quality of logistics services. The data summarized in the analysis are shown in Table 4 and Figure 6.

Table 1: General shopping patterns of customers.

	First group	Second group	Third group	Fourth group
Online shopping	60	58	62	64
Take away from on-site shopping	12	11	10	16
Same city express	18	15	16	10
Delivered by the store after viewing the goods on site	8	13	14	6
Others	2	3	4	4

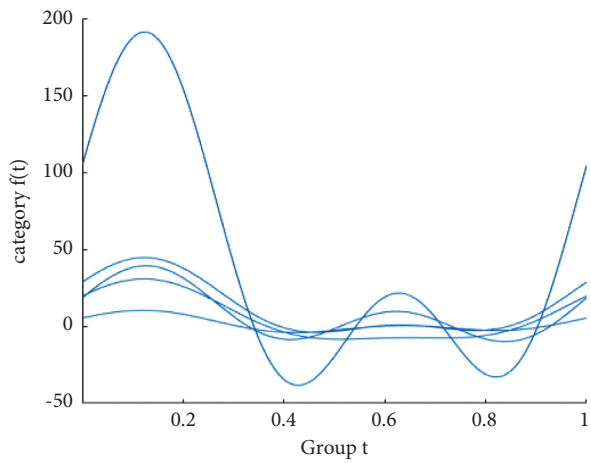

Figure 3: General shopping patterns of customers.

Table 2: Customers' favorite shopping brands.

	Fifth group	Sixth group	Seventh group	Eighth group
Li Ning series	20	15	24	23
Anta series	45	24	23	36
361 series	35	32	34	37
Others	5	28	19	4

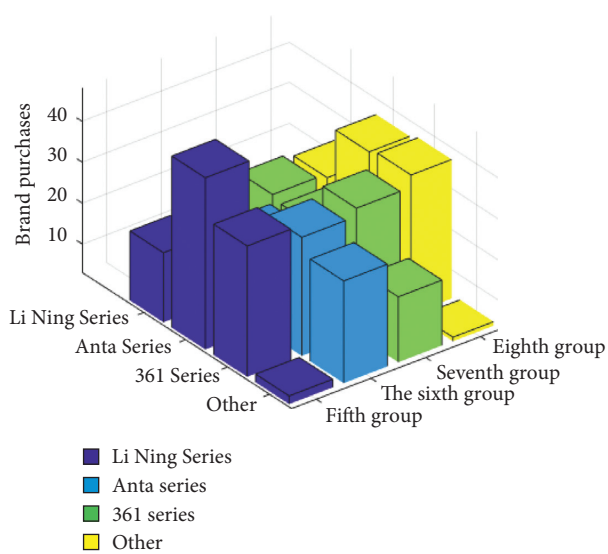

Figure 4: Customers' favorite shopping brands.

(2) The data analysis from Figure 7 shows that different types of customers, purchasing power, and purchasing habits should increase the development of these high-quality customers; the types of customers with long operating hours have relatively stable sources of logistics goods and a higher level of

Table 3: Customer type survey.

	First group	Second group	Third group	Fourth group
High school girl	30	45	34	26
Company executives and corporate personnel	35	40	46	37
Civil servant	20	10	12	20
Others	15	5	8	17

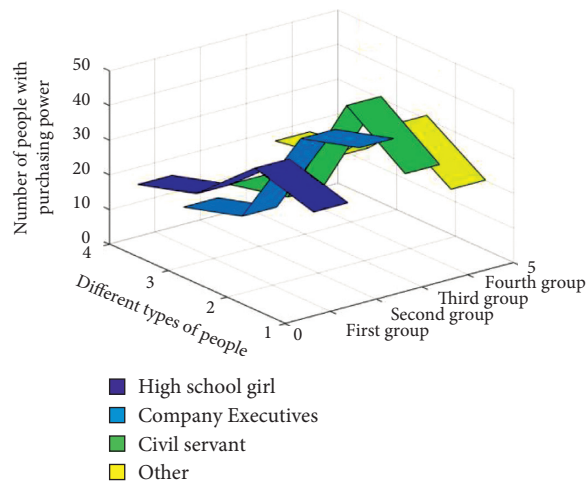

Figure 5: Customer type survey.

Table 4: Confidence in integrity purchase (unit%).

	Under 200 yuan	200–500 yuan	500–800 yuan	800–1200 yuan	1200 or more
Corporate executives and corporate personnel	90.3	92.5	92.3	90.5	87.4
High school girl	65.4	56.7	53.2	45.6	42.5
High school girl	78.6	73.6	70.3	69.3	68.9
Others	49.4	48.4	45.3	43.6	41.2

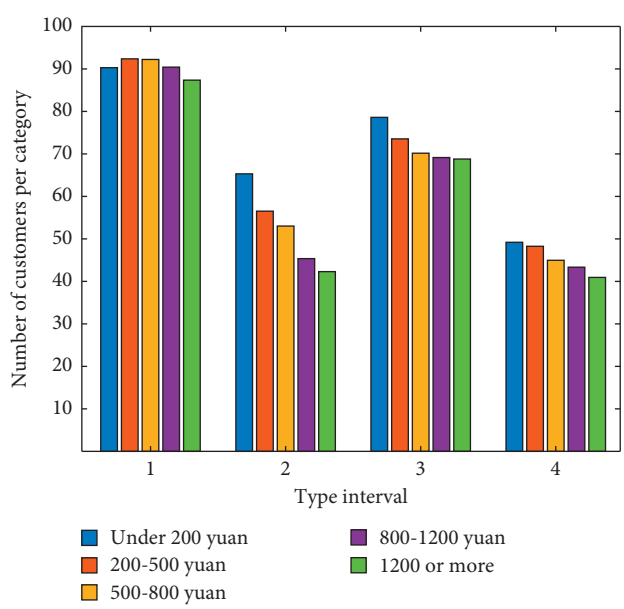

Figure 6: Confidence in integrity purchase (unit%).

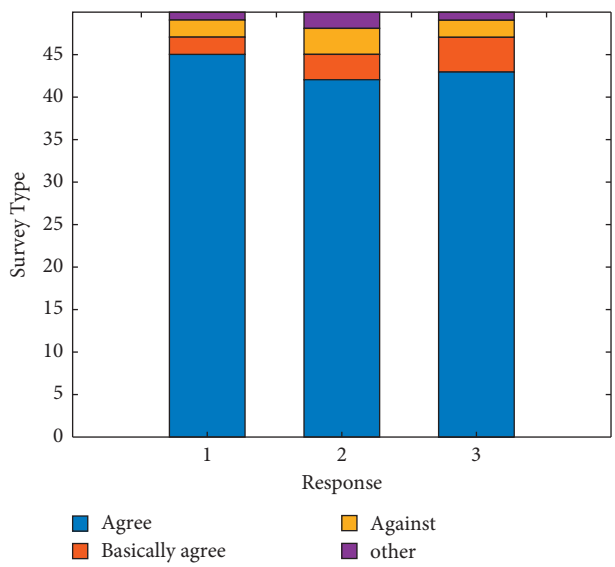

Figure 7: Type satisfaction survey.

integrity, but their purchase money is not necessarily large. These logistics companies should give more preferential policies to consolidate the relationship with these customers to prevent customer outflow. The obtained experimental data was verified, and a random survey of 50 front-line personnel who performed this work was conducted.

5. Conclusions

(1) With the rapid growth of logistics companies and the widespread application of information systems, the amount of data information has also shown exponential growth. To improve the processing speed and processing effect of this massive information, it must be introduced in the logistics information system human data mining technology. Data mining technology can effectively perform data mining and knowledge discovery in the areas of transportation management, sales management, procurement management, inventory management, and financial management in logistics information systems, improve the operational efficiency of the logistics link, and reduce related redundancy. Remaining operations and reducing logistics costs can also provide a scientific basis and data support for logistics business management decisions.

(2) Analysis of customer types has become popular among logistics companies, and data mining technology is also developing vigorously. How to select the appropriate data mining algorithm for specific application problems is the key to the success of logistics companies. Explore and summarize. In addition, the application of data mining technology to identify important customers of the company is only the first step in customer relationship management. It is of vital significance for survival and development.

(3) This article uses random analysis of 1,000 customers' logistics records from the logistics enterprise information system, uses mathematical analysis and matrix theory to analyze the correlation among them, analyzes customer types and shopping. The information on habits, daily consumption patterns, and brand preferences is classified and summarized using mathematical statistics. The experimental results show that the results of the study can well reflect customers' daily habits and consumption habits. The experimental data show that mining effective and accurate information from massive information can help companies to quickly make decisions, formulate scientific logistics management programs, improve operating efficiency, reduce operating costs, and obtain good benefits.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors state no conflicts of interest.

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