E-commerce market prediction and decision support based on big data analysis

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Abstract: Through the comprehensive analysis of huge data sets, enterprises can have a deeper understanding of market trends, consumer behavior and product performance, so as to formulate more targeted market strategies. At the same time, enterprises can also make risk assessment and decision-making optimization by simulating different market situations to adapt to the complex and changeable market environment. These data not only reflect consumers' purchasing preferences and behavior patterns, but also provide strong support for enterprises' market forecasting and decision-making. On the one hand, with the help of data mining and machine learning technology, enterprises can identify consumers' buying patterns and preferences, thus realizing personalized marketing.On the other hand, by analyzing historical sales data and external environmental data, enterprises can make market demand forecasts. Modern consumers are increasingly inclined towards personalized shopping experiences. Through big data technology, companies can analyze consumers' behavior habits and push products or services that meet their interests. Therefore, e-commerce market prediction and decision support based on big data analysis are particularly important. E-commerce market prediction and decision support based on big data analysis is not only an effective means for modern enterprises to enhance competitiveness, but also an inevitable choice to adapt to market changes.

1. Introduction

With the rapid development of information technology and the popularization of the Internet, e-commerce has become an important part of modern business activities [1]. Through comprehensive analysis of huge data sets, companies can gain a deeper understanding of market trends, consumer behavior and product performance, thereby developing more targeted market strategies. Nowadays, consumer choices are diversified and constantly changing, and traditional market research methods can no longer meet the demand for rapid response [2]. At the same time, enterprises can also conduct risk assessment and decision-making optimization by simulating different market scenarios to adapt to the complex and ever-changing market environment. Through the analysis of massive data, companies can identify potential market opportunities, understand changes in consumer demand, and then develop more targeted marketing strategies. These data not only reflect consumers' purchasing preferences and behavioral patterns, but also provide strong support for companies' market predictions and decisions [3].Modern consumers are increasingly inclined to personalized shopping experience. Through big data technology, enterprises can analyze consumers' behavior habits and then push products or services that meet their interests. Therefore, e-commerce market forecasting and decision support based on big data analysis is particularly important [4].

As an important component of the global economy, the development and innovation of e-commerce cannot be separated from in-depth analysis and application of big data. On the one hand, with the help of data mining and machine learning technologies, enterprises can identify consumers' purchasing patterns and preferences, thereby achieving personalized marketing [5]. On the other hand, by analyzing historical sales data and external environmental data, enterprises can make market demand forecasts. This trend not only reflects changes in consumer shopping habits, but also promotes innovation in business models [6]. However, despite the enormous potential of big data analysis in the field of e-commerce, it also faces some challenges. For example, there are difficulties in obtaining and integrating data, and issues of data privacy and security cannot be

ignored [7].These data not only reflect consumers' purchasing preferences and behavior patterns, but also provide strong support for companies' market predictions and decision-making. E-commerce market prediction and decision support based on big data analysis is not only an effective means for modern enterprises to improve their competitiveness, but also an inevitable choice to adapt to market changes [8]. Therefore, an in-depth discussion of the application value of big data in e-commerce will help guide enterprises to make more scientific and effective strategic decisions and lay a solid foundation for future development.

2. Application of Big Data in E-commerce Forecasting

2.1. Data acquisition and preprocessing technology

Data acquisition and preprocessing technologies have developed rapidly in recent years. With the rise of big data, artificial intelligence and Internet of Things, the importance of these technologies has become increasingly prominent. With the development of Internet and social media, data sources have expanded from traditional structured data to unstructured data, such as text, images and videos. This requires us to have more flexibility and adaptability when collecting to meet the processing needs of different types of data. In the future, data acquisition and preprocessing will tend to be more intelligent and automatic, relying on machine learning algorithms to improve efficiency and effectiveness [9]. Big data technology can deeply understand customers' behavior habits and preferences by analyzing users' browsing records, purchase history, social media interaction and other data, and provide a basis for predicting customers' future purchase behavior [10].Despite the continuous improvement of advanced cleaning technologies, the integrity and accuracy of data are still issues that must be addressed. The future data collection and preprocessing will tend towards higher intelligence and automation, relying on machine learning algorithms to improve efficiency and effectiveness. With the advancement of technology, we can foresee the emergence of more intelligent and efficient data collection and preprocessing methods, further promoting the data-driven transformation of various industries. In this process, the compliance, intelligence, and real-time characteristics of technology will become important guidelines for future research and practice.

With the rapid development of the e-commerce industry, big data technology has become a key driving force for continuous innovation in this field. Data collection is the process of obtaining raw data, involving capturing or collecting data from various sources such as sensors, social media, log files, etc. Driven by big data technology, e-commerce forecasting is becoming an important branch of business intelligence. Through in-depth analysis and mining of massive user data, transaction data, and market data, it provides unprecedented business insights and decision support for e-commerce enterprises. Due to issues such as noise, missing values, and duplicate data in raw data, data preprocessing is particularly important.With the continuous development of artificial intelligence technology, data collection and preprocessing technology has broad application prospects in fields such as intelligent recommendation, autonomous driving, and medical health. Through data collection and pre-processing technology, enterprises can obtain and analyze these data in real time, thereby achieving data-driven decision-making and improving operational efficiency and market competitiveness. In the field of e-commerce, data collection and pre-processing technology is constantly developing and innovating, bringing more efficient, smarter and safer services to the industry. With the advancement of technology and the continuous expansion of application scenarios, its role in e-commerce will become more prominent.

2.2. Consumer Behavior Analysis and Trend Prediction

E-commerce, as a business model based on the Internet, has gone through different development courses with the development and changes of the Internet. The application of big data can realize the analysis and prediction of customer demand, and provide personalized service for customers. By collecting and analyzing massive customer data, including purchase records, delivery addresses, preferences, etc., we can understand customer needs and behavior patterns.Secondly, when selling

goods, the number of orders is countless, and customers often purchase different products in batches on the same platform. By using big data technology, order splitting can be quickly carried out, and different products can be merged into addresses. This can deliver goods to consumers at the lowest cost and fastest speed, which not only improves consumer satisfaction but also reduces costs. Security issues have become the most difficult problem to face in the development of e-commerce. As shown in Figure 1.
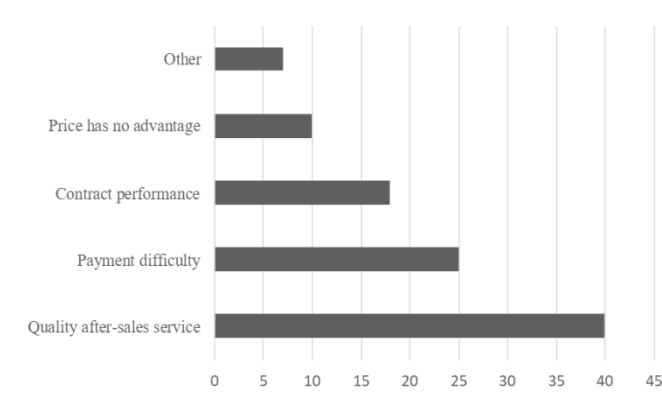

Figure 1 Consumer Concerns about Payment and Security Factors

In addition, in-depth research on online and offline consumer behavior is also needed to better improve the effectiveness of marketing. In the development of e-commerce, there is also a need for improved efficiency and accuracy. For example, user behavior analysis on social media can guide the adjustment of mobile marketing strategies, thereby affecting the creation and distribution of content marketing.This organic integration enables enterprises to formulate more personalized strategies for different marketing channels and customer groups while maintaining brand consistency, and improve overall marketing efficiency and effectiveness. On this basis, China should continue to optimize and expand according to the characteristics of e-commerce big data, and open an e-commerce model law or a unified rules law.

In the context of big data, a major opportunity for e-commerce marketing lies in the organic integration of different marketing models. In response to this issue, relevant departments should consider the overall situation and plan technical standards for e-commerce in a reasonable manner, in order to establish a unified system for e-commerce models and ensure that policies adopted in the domestic e-commerce field are consistent and unified. To achieve true unified management, unified allocation, unified technical planning, and unified industry standards. Although the e-commerce market can rely on many other factors to achieve rapid growth, in the eyes of many people, online payments, contract fulfillment, and the resolution of online security factors will play a significant role in the development of e-commerce. The tasks of data mining generally include association analysis, clustering analysis, classification analysis, anomaly analysis, specific group analysis, and evolution analysis.The classification method can accurately describe each category or establish an analysis model or mine classification rules, which is suitable for discovering buyer classifications with the same purchasing characteristics. By analyzing data such as users' browsing records, purchase records, and interaction records, companies can recommend products that match their interests to users, improving user satisfaction and purchase conversion rates. E-commerce enterprises focus on applying big data technology to improve traditional supply chain technology, building a more reasonable supply chain network, and enhancing the overall operational efficiency of the e-commerce industry's supply chain.

3. Decision Support System for Big Data Analysis

3.1. Structure and composition of decision support system

In the early 1970s, the concept of decision support systems was separated from management information systems, which subsequently sparked a series of discussions about decision support

systems. Based on big data technology, e-commerce enterprises can conduct precise marketing activities and launch personalized marketing plans for different user groups. By analyzing sales data, inventory data, and supply chain data, it is possible to predict product demand, optimize inventory allocation, improve logistics efficiency, thereby reducing inventory and operating costs, and enhancing the responsiveness and flexibility of the supply chain. The SCOR model can enable enterprises to more accurately identify problems in the supply chain. As shown in Figure 2.
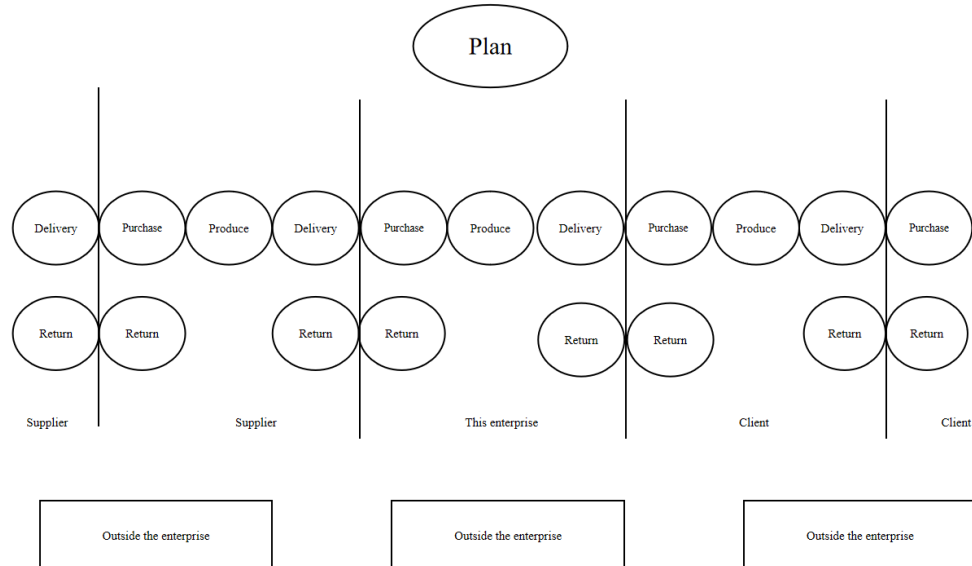

Figure 2 SCOR model

At this stage, the application of big data in the e-commerce industry mostly focuses on data storage, information matching, etc., by storing massive customer information and internal communication information between upstream and downstream enterprises. Enterprises respond quickly when encountering corresponding problems and find matching data in the database to solve the problem. This level of application of big data can help the sales scale of the e-commerce industry continue to grow. In the era of big data, e-commerce can use big data technology to track customers' browsing information and analyze their preferences and consumption habits to enhance the feasibility of their marketing strategies, thereby effectively attracting customers.E-commerce platform provides a channel for consumers to participate in marketing activities. Enterprises can enhance communication with consumers through online surveys and social media interactions, and improve the interactivity and participation of marketing.

In recent years, with the rapid development of information technology, the world has entered an era of large-scale use of big data, and China's e-commerce industry has been empowered by big data. In recent years, the transaction scale has continued to expand, firmly ranking first in the global online retail market. The purchasing intention of consumers is closely related to the brand. In order to enhance market competitiveness, it is necessary to strengthen brand building and increase brand awareness. In addition, through data mining, enterprises can also discover new marketing opportunities, such as discovering new user groups or potential market demands through pattern recognition, achieving value-added marketing resources and maximizing profits.Therefore, in order to promote the effective development of e-commerce payment models, it is necessary to accelerate the construction of network infrastructure. Network infrastructure construction work mainly includes the construction of various information transmission networks, the development of information transmission equipment, and the application of information technology. Adding the method library resulted in a three-repository system, and adding the knowledge base resulted in a four-repository system. Due to technical limitations, small and medium-sized businesses currently do not need to establish a data warehouse system, but directly build the decision support system on the two-database structure of the database system and model library system, and then gradually develop and improve the system functions of the decision support system. By analyzing and

monitoring changes in user behavior and preferences in real time, companies can promptly adjust product mix and pricing strategies to maintain competitive advantages.

3.2. Real-time data analysis and decision making

Data analysis and decision-making is the first step of big data analysis in e-commerce, and its key lies in ensuring the quality and accuracy of data and laying a reliable foundation for subsequent analysis. Constantly explore and innovate, and integrate the upstream and downstream cooperative enterprises and related enterprises in the whole supply chain. With the supply chain as the link, many enterprises are closely linked, forming scale effect and mutual benefit symbiosis, which ensures that massive data can be used efficiently. The data itself is a kind of cost, which further reduces the hidden cost of the supply chain network. For merchants, the third party helps them solve the problem of enterprise operating costs, and really helps them achieve a win-win situation. The economic trend of e-commerce in China has been rising continuously, as shown in Figure 3.
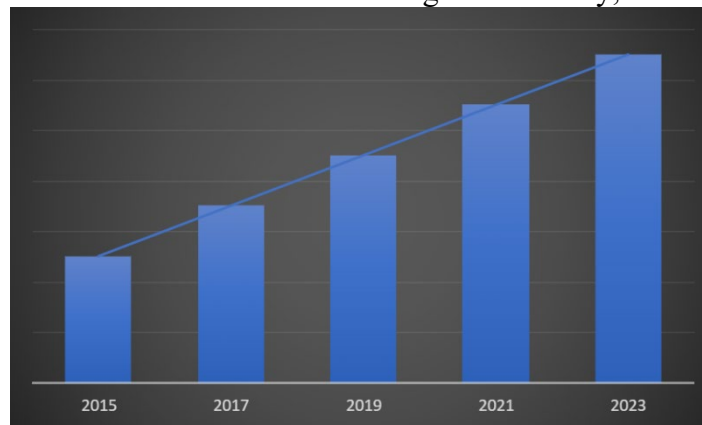

Figure 3 Trend diagram of online economic development of e-commerce

Geographic clustering is because consumers in different regions may have different needs and preferences for the same product.Based on geographical location information, help businesses develop marketing strategies according to the city, region, or country where customers are located. The enterprise regularly updates the data related to the e-commerce industry in the database system according to the decision-making themes of the management and the architecture of the data warehouse.After processing, it is converted into the data warehouse. The data in the data warehouse is non-real-time and does not allow modification. Through data quality management, including establishing data quality indicators, regular review and repair of data quality problems, etc., we can ensure that the results of data analysis and mining are credible and effective, and provide reliable support for e-commerce product selection.

4. Conclusions

With the continuous development and application of big data technology, the e-commerce industry will face more opportunities and challenges. We need to make full use of the advantages of big data technology and make greater efforts in the construction of e-commerce infrastructure.Enterprises utilize big data to improve e-commerce market forecasting and decision support systems, promote the healthy development of e-commerce, and provide support for e-commerce. In addition, the analysis of risk management and compliance guarantee also provides strategic guidance for e-commerce enterprises to protect user privacy and prevent fraud. In the process of system design, internal information sharing should be adopted to ensure that the functions of each module can reach the best state and can effectively resist external attacks and external interference.Based on data warehousing and data mining techniques, on one hand, it can accumulate massive amounts of data related to merchants. On the other hand, enterprises can mine data that is effective for current decision-making. Compare and evaluate different product selection strategies to find the optimal one. We should continue to pay attention to and research big data

technology in e-commerce market prediction and decision support, in order to promote the sustained and good development of the e-commerce supply chain.

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