Consumer Behavior Prediction and Marketing Strategy Optimization Based on Big Data Analysis

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Abstract:This study delves into how big data analytics can be used to predict consumer behavior and optimize marketing strategies. Our approach combines sequence pattern mining and time series analysis to reveal consumer purchasing patterns and trends on e-commerce platforms. By examining a user's browsing history, purchase history, and feedback, we can identify preferences and predict future behavior. Experimental results show that recommendation accuracy and customer satisfaction are significantly improved. In addition, real-time big data analysis helps dynamically adjust marketing strategies and improve resource allocation efficiency and advertising effectiveness. This study provides a powerful framework for leveraging e-commerce big data to drive intelligent decision-making and improve market competitiveness.

Keywords: Big data analysis, consumer behavior prediction, marketing strategy optimization

1. INTRODUCTION

Big data plays an increasingly important role in enterprise management, especially in providing intelligent decision support. In the past, business managers often relied on limited data and experience to make decisions. This approach was not only inefficient, but also easily affected by subjective factors, which greatly reduced the scientificity and reliability of decision-making. Nowadays, with the rapid development of big data technology, enterprises can efficiently collect, store and analyze massive and diverse data, thereby significantly improving the scientificity and reliability of decision-making. In the field of e-commerce, big data is particularly widely used. Consumers purchase products as individuals on e-commerce platforms, and merchants need to have a deep understanding of the consumers' purchasing habits and preferences in order to provide more accurate and personalized services. For example, by analyzing consumers' browsing history, purchase history and evaluation feedback, e-commerce platforms can accurately recommend relevant products and improve conversion rates and customer satisfaction. Female groups usually like to buy cosmetics and clothing, while men are more inclined to electronic products and household appliances. This differentiated demand analysis allows merchants to better formulate marketing strategies. In addition, big data can help companies optimize inventory management and supply chain operations. By analyzing sales data and market trends, companies can predict future demand changes, thereby more accurately stocking inventory and reducing backlogs and out-of-stock situations. In terms of supply chain management, by monitoring logistics information in real time, companies can improve distribution efficiency and reduce operating costs. When it comes to customer service, big data also plays an important role. By analyzing customer feedback and complaint data, companies can discover and solve problems in a timely manner, improve service quality, and enhance customer satisfaction and loyalty. In short, big data technology not only changes the decision-making method of enterprise management, but also provides strong support in many aspects such as marketing, inventory management, supply chain operations, and customer service, allowing enterprises to occupy an advantageous position in a fiercely competitive market environment. In the Figure 1, the detailed steps of the consumer behavior prediction and the marketing strategy optimization is illustrated.
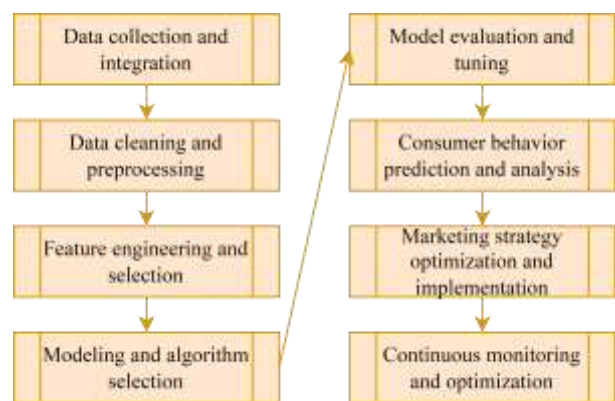

Figure1. The Detailed Steps of the Consumer Behavior Prediction and Marketing Strategy Optimization

2. PROPOSED METHODOLOGY

2.1 The Consumer Behavior Prediction

Big data is becoming increasingly important in business management, especially in providing intelligent decision support. In the past, business managers mainly relied on limited data and personal experience to make decisions. This approach was not only inefficient, but also easily affected by subjective factors, thus affecting the scientific nature and accuracy of decision-making. Nowadays, with the rapid development of big data technology, enterprises can efficiently collect, store and analyze large amounts of diverse data, significantly improving the scientificity and reliability of decision-making. In the field of e-commerce, big data technology is widely used. Consumers purchase products as individuals on e-commerce platforms, and merchants need to have a deep understanding of consumers' purchasing habits and preferences in order to provide more accurate and personalized services. For example, by analyzing consumers' browsing history, purchase history and evaluation feedback, e-commerce platforms can accurately recommend relevant products and improve conversion rates and customer satisfaction. Female groups usually like to buy cosmetics and clothing, while men are more inclined to electronic products

and household appliances. This differentiated demand analysis allows merchants to better formulate the marketing strategies. In addition, big data also helps companies optimize inventory management and supply chain operations. By analyzing sales data and market trends, companies can predict future demand changes, thereby more accurately stocking inventory and reducing backlogs and out-of-stock situations. In terms of supply chain management, by monitoring logistics information in real time, companies can improve distribution efficiency and reduce operating costs.

When it comes to customer service, big data also plays an important role. By analyzing customer feedback and complaint data, companies can discover and solve problems in a timely manner, improve service quality, and enhance customer satisfaction and loyalty. Big data technology not only changes the decision-making methods of enterprise management, but also provides strong support in many aspects such as marketing, inventory management, supply chain operations, and customer service, allowing enterprises to occupy an advantageous position in a fiercely competitive market environment. Sequence pattern mining is a data mining technology commonly used on e-commerce platforms, aiming to discover frequently occurring patterns or sequences from large amounts of sequence data. In e-commerce platforms, sequence pattern mining can be applied to user purchase path analysis. By analyzing the user's purchase sequence, common purchase patterns are discovered, thereby predicting and recommending the user's purchase behavior. For example, through sequence pattern mining, it can be found that many users will purchase mobile phone cases and protective films within a period of time after purchasing a mobile phone. The discovery of this pattern helps the e-commerce platform recommend related accessories after users purchase a mobile phone, thereby Increase sales and customer satisfaction. Time series analysis is another behavior pattern discovery method widely used in e-commerce platforms. It is mainly used to analyze data sequences that change over time to predict future trends and fluctuations. In e-commerce platforms, time series analysis can be applied to activity response analysis to predict future activity participation and user response by analyzing historical activity data. This analysis method can help e-commerce platforms better plan promotional activities, optimize the resource allocation, and improve activity effects.

2.2 The Marketing Strategy Optimization based on Big Data Analysis

Big data analysis technology enables companies to monitor user needs in real time and flexibly adjust marketing strategies. Traditional market research is usually cyclical and relies on regular surveys and data collection, while big data analysis has significant real-time advantages and can capture relevant information at the moment when user behavior changes. By instantly understanding user feedback and behavioral changes, companies can quickly adjust marketing strategies to ensure they are in sync with user needs, thereby achieving more precise marketing. For example, e-commerce platforms can use big data analysis technology to monitor users' browsing and purchasing behaviors. If it is discovered that the number of views and purchases of a certain type of product suddenly increases, the platform can immediately adjust the promotion of the product, increase inventory, and even launch related promotions to meet the immediate needs of users. In addition, by analyzing users' search records and click behaviors, the platform can infer users' potential interests, thereby displaying more relevant recommended

products on the user interface and improving conversion rates. Not only that, big data analysis can also help companies identify market trends and consumer preferences. Through the analysis of historical data, companies can discover the sales patterns of certain products within a specific period of time and prepare for the market in advance. For example, sales of certain seasonal products will increase significantly in specific months, and companies can stock up in advance and develop corresponding promotion plans. Such data-driven decision-making not only improves the company's response speed, but also greatly improves resource utilization efficiency. In terms of advertising, big data analysis also plays an important role. Companies can analyze users' online behavior and social media interactions to understand their interests and preferences, so as to deliver targeted advertisements. Such targeted advertising not only improves the effectiveness of advertising, but also reduces advertising waste, allowing companies to use their advertising budget more effectively. In addition, big data analysis can also help companies optimize customer service. By analyzing customer feedback data, companies can promptly discover common problems and user pain points and quickly take steps to improve them. For example, if a product is found to have a high return rate, the company can further investigate the cause, improve product quality or adjust after-sales service strategies to increase customer satisfaction.

3. CONCLUSIONS

Our research demonstrates the effectiveness of the big data analytics in predicting consumer behavior and optimizing marketing strategies in e-commerce. By using sequence pattern mining and time series analysis, we achieved significant improvements in recommendation accuracy and customer satisfaction. In addition, real-time data analysis enabled rapid adaptation of marketing strategies to meet consumer demand. Future research will focus on integrating advanced machine learning techniques to further refine predictive accuracy and exploring the application of this framework in other industries to validate its versatility and effectiveness.

4. REFERENCES

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