

Research on the Application of Big Data analysis in E-Commerce

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Abstract: With the advent of the era of big data, big data has set off a huge wave of change in many fields. The explosive growth of data has brought enormous pressure to enterprises, and has also spawned the development of data-driven business. The core capability of e-commerce information system is to process, analyze and mine big data. Based on the role of big data analysis in promoting marketing in e-commerce, this paper first analyzes the characteristics of big data in e-commerce, and then in-depth discusses the relationship between e-commerce and big data analysis, and discusses the significance and significance of big data analysis in e-commerce effect. This paper puts forward the construction ideas and plans of the comprehensive practice platform for e-commerce big data analysis, and focuses on the core technology of the platform and the corresponding data analysis process modules. Secondly, this paper focuses on expounding the index system of e-commerce big data analysis. Through the research on the index system of e-commerce big data analysis, the big data-driven e-commerce operation can be refined, and the operation effect and performance can be improved. Finally, this paper focuses on some application strategies of big data analysis in e-commerce, in order to provide a reference for promoting the development of e-commerce under the background of big data.

1. Introduction

The concept of big data has been gradually introduced into the future development planning of enterprises in the process of enterprise development. In the context of the development of e-commerce, enterprises need to constantly innovate existing marketing models and marketing methods, speed up the adjustment of marketing strategic thinking, and strengthen the application of various information technology methods and technical management models. Effectively combine the information related to market development, the enterprise adjusts the work objectives of marketing management, and realizes the stable development of the company. The traditional e-commerce marketing model relatively lacks in-depth research on customer needs and consumer markets. The starting point of traditional e-commerce marketing relies on the subjective promotion

of commodities, which leads to the blind promotion of commodities and services in the process of traditional e-commerce marketing, and this is not in line with consumer preferences and needs. Traditional e-commerce marketing is often unilateral by merchants and cannot accurately analyze the positioning relationship between products and customers. The use of big data has provided effective help for analyzing and obtaining marketing data. By analyzing the company's own data and industry data, it is possible to find out the company's position in the industry, existing problems and possible opportunities. Through the correlation analysis the characteristics of customer and product, enterprises can design products that make customers more satisfied. Through big data analysis, enterprises can more accurately predict product demand. On this basis, enterprises organize procurement and production to achieve "multi-variety, small-batch" lean production, and can carry out personalized product customized production according to personalized product design. Through big data analysis, enterprise-oriented customer service can quickly respond to and solve customer problems according to the needs and characteristics of individual customers, improve customer service experience, and provide customers with targeted and characteristic services. Through big data analysis, enterprises can more accurately grasp people's consumption preferences, and accurately divide the market according to people's behavior habits, so as to achieve precise marketing and intelligent push to the greatest extent. Enterprises make more targeted marketing plans to make marketing more accurate to a certain extent, maximize profits for e-commerce, and promote the sustainable development of enterprises.

Big data analytics can makes e-commerce companies use data more efficiently, improve conversion rates and decision-making accuracy, and enhance the ability to attract new customers and retain existing ones. Big data analysis can improve the cost efficiency of market transactions by improving. Big data analytics can improve high-performance business processes and meet a wide range of business needs. Big data analytics in the context of e-commerce is business process optimization, technological optimization, and emotional connection to data usage, which are critical to dramatically improve a company's analytical capabilities [1]. Credit card companies use and track data related to call center activity, enabling them to provide customers with personalized offers in milliseconds [2].

E-commerce is designed to achieve both transactional and strategic value. E-commerce transforms production, inventory, innovation, risk, finance, knowledge, relationships and human resource management with analytics-driven insights in digital marketplaces [3]. Businesses earn significant revenue by driving consumers to their retail partners with sophisticated analytics platforms [4].

However, in actual work, there are still many problems in the application of big data in e-commerce marketing management, which requires relevant technical personnel to adjust and optimize relevant work measures under the support of existing technical work concepts. Therefore, based on the basic requirements of the existing work, this paper analyzes the current situation of marketing under the background of e-commerce, and proposes targeted countermeasures to better carry out the operation management of the enterprise and create greater market value for the enterprise. Big data plays a very important role for enterprises to locate relevant consumers and formulate and modify relevant marketing plans. It is of great practical significance to carry out research on the impact of big data analysis in e-commerce on e-commerce.

2. The Role of Big Data Analysis in E-Commerce

If e-commerce wants to stand out and gain a firm foothold in many industries, it must not be separated from the strong technical background of big data.

2.1. Big Data Analysis Promotes Enterprise Marketing Data Security

In order to ensure that consumers can browse and select products on the pages of e-commerce companies, companies must improve the security of web pages, continuously improve the security factor and security level of web pages, and use this as a selling point for marketing. Big data marketing can prompt companies to improve the information security of their own marketing platforms and data collection platforms, and constantly solve website loopholes.

2.2. The Impact of Real-Time Data Feedback on the Implementation of Business Strategies

Enterprises adjust the original product launch strategy according to the consumer group, background, age and other reasonable division of marketing content. By using big data, companies can segment the market in more detail, grasp the needs of each consumer, and timely and accurately deliver personalized products and services to consumers. Big data analysis can transform massive industry data into precise insights through the integration and mining of data resources and a series of dynamic technical processes. Big data analysis provides the basis for stable marketing strategies and business problem solutions. Big data analysis technology can also help e-commerce companies continue to carry out marketing innovation [5]. Enterprises analyze consumers' various consumption behaviors, consumption habits and consumption preferences through massive data, accurately predict consumers' consumption plans, and effectively integrate these data with the data of the marketing department. The company has set up targeted promotional activities to maximize economic benefits for the company.

2.3. Big Data Analysis is Conducive to Providing Accurate Data and Promoting the Innovation of Marketing Models

Big data analysis can provide more accurate data information for e-commerce marketing and help enterprises conduct marketing [6]. Big data analysis of e-commerce has a promoting effect on marketing. The practical application of big data analysis in e-commerce enterprises is the key technology for enterprises to go to the next level. With accurate data analysis results, enterprises can determine the most suitable marketing plan for their own enterprises, improve enterprise efficiency, and promote enterprise development. Under the background of big data, the marketing methods of enterprises are changeable, and they all need to launch products based on the results of big data analysis. Enterprises can timely analyze and adjust the programs with poor marketing effect, continuously enrich the marketing forms, improve and optimize the marketing content, so as to achieve personalized promotion and marketing. The arrival of the era of big data can provide real-time and accurate data analysis results for marketing. According to the accurate data analysis results of big data, enterprises should judge their marketing methods, innovate marketing models, improve production efficiency, and achieve precision marketing.

2.4. Big Data Analysis Helps to Effectively Improve User Experience

All kinds of data collection and analysis in e-commerce marketing require big data technology. Big data analysis of marketing data in e-commerce is carried out according to consumers' personal consumption preferences and consumption habits, so that every consumer can achieve the most satisfactory state and bring consumers a different user experience [7-8].

The analysis of user consumption data by big data is processed according to the personal preferences and consumption habits of customers. Making full use of accurate analysis of existing consumption data, the analysis results ensure the satisfaction of each customer in the greatest sense.

3. The Construction of a Comprehensive Practice Platform for Big Data Analysis

This paper takes open source platform technology as the core architecture, and proposes a comprehensive practice platform solution for big data analysis based on e-commerce data in terms of data collection, data storage, data cleaning, data analysis and mining, and data visualization [9].

The big data analysis comprehensive practice platform takes the open source platform as the basic framework. The comprehensive practice platform framework consists of software and hardware base layer, architecture layer and application layer. The hardware and software base layer includes distributed clusters, virtual machines, etc. E-commerce big data needs to be analyzed, including basic customer information, social relationships and behaviors. To fully utilize the positive role of big data analysis work, it is necessary not only to dig deep into customer, enterprise product and order data, but also to collect, organize and analyze external data on a regular basis. Data analysis and mining are the basis for providing decision support, from which potential correlations between data are mined. Visually display the information after data analysis, and display the results in graphs, tables or other ways. The comprehensive practice platform for big data analysis uses tools such as web crawlers to obtain the data objects to be analyzed from the entire network. The web crawler technology adopted by the data acquisition module can be divided into two operating modes. For static web pages, the comprehensive practice platform for big data analysis uses a web crawler tool written in Python to complete data collection. For dynamic web pages, the comprehensive practice platform for big data analysis uses a web crawler tool written in JavaScript to complete the corresponding work. The organic combination of Python and JavaScript ensures the comprehensiveness of crawling information. The data storage module selects distributed data as the storage carrier to pave the way for big data scenarios in practice. The data cleaning module can remove missing, redundant and abnormal data stored in the database by cleaning the data, thereby improving the data quality. The data cleaning module includes five modules: preliminary preparation, data detection, quality assessment, data correction, and data output.

In the preliminary preparation, it is necessary to conduct a simple analysis of the stored data, establish the cleaning goals and the required specific implementation methods, and obtain a complete data cleaning plan. Data detection needs to complete data preprocessing and basic detection, and then count the detection results. Data preprocessing is mainly used to eliminate data inconsistency, null data, invalid data, etc. When the data is submitted, it is necessary to combine the previous cleaning plan and quality assessment to verify whether the cleaned data is true and reasonable. If it is satisfied, it is provided to the data mining module. If it is not satisfied, the data quality can be improved repeatedly. Data cleaning runs through the entire life cycle of data processing. Data cleaning filters the data sources that meet the input requirements, evaluates and corrects the mined data, and ensures the correctness of the output data. The data cleaning framework can provide high-quality data at different stages. And it has the advantages of loose coupling, high flexibility, scalability and good interaction. In terms of data analysis module, data analysis is the basis for providing decision support, and comprehensive big data analysis processes such as real-time computing and offline computing are realized through machine learning algorithms.

Machine learning algorithms can do reasonable inductive reasoning, Data analysis mines potential correlations between data. In terms of data visualization module, the integrated practice platform data visualization module is realized by integrating Baidu open source project visualization tools. By integrating the Baidu open source project, the results of data mining are graphically drawn to present the association between data.

4. Indicator System for E-Commerce Big Data Analysis

The index system of e-commerce big data analysis generally includes overall operation index, website traffic index, sales conversion index, customer value index, commodity and supply chain index, marketing activity index, risk control index and market competition index [10].

The overall indicators of the overall operation of e-commerce include four indicators: traffic indicators, order generation efficiency indicators, overall sales performance indicators, and overall indicators. The number of unique visitors refers to the number of unique users who visit the e-commerce website. Page visits refers to the number of page views. Each time a user visits each web page in an e-commerce website or mobile e-commerce application, it is recorded once, and the user visits the same page for multiple times, and the number of visits is accumulated. The number of page visits per capita reflects the stickiness of website visits. The order generation efficiency indicators include the total number of orders and the conversion rate from visits to orders. The total number of orders refers to the total number of orders placed online by visitors. Website turnover refers to netizens placing orders and generating order numbers. The sales amount is the total amount of the item sold. The overall indicators include sales gross profit and gross profit margin.

Gross profit on sales is the difference between sales revenue and cost. E-commerce big data analysis integrated practice platform is shown in Figure 1.

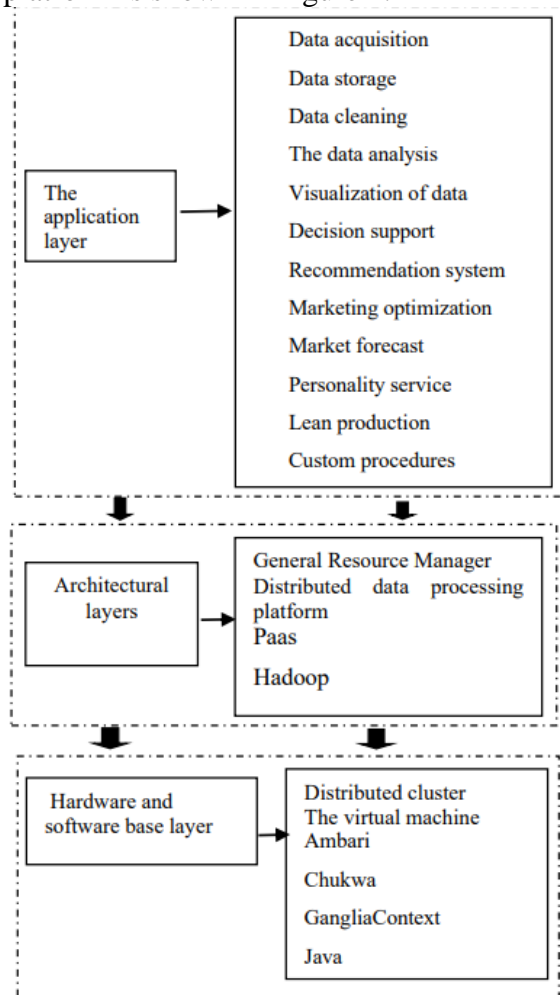


Figure 1: E-commerce big data analysis integrated practice platform

The traffic cost category includes the unit visitor acquisition cost. The unit visitor acquisition cost refers to the ratio of the advertising costs incurred by the advertising campaign in the traffic

promotion to the number of unique visitors brought by the advertising campaign. Traffic quality indicators include bounce rate, page access time, and per capita page views. Bounce rate is the number of exits divided by the number of visits to the page. Page access duration refers to the time a single page is accessed. Page views per capita refers to the average number of pages viewed by each visitor during the statistical period. Membership indicators include the number of registered members, the number of active members, the active member rate, the member repurchase rate, the average number of member purchases, the member repurchase rate, the member retention rate, and the retention rate.

The average number of purchases by a member refers to the average number of purchases by each member during the statistical period. E-commerce sites with a high rate of repurchase by members also have a high average number of purchases. Member repurchase rate refers to the ratio of active members at the end of the previous period who have purchase behavior in the next period. Member retention rate means that members begin to visit your website within a certain period of time, and after a period of time, they will continue to visit your website, which is regarded as retention. Shopping cart indicators include basic indicators and conversion indicators. Basic indicators include the number of times added to the shopping cart, the number of buyers added to the shopping cart, and the number of items added to the shopping cart within a certain statistical period. Conversion indicators are mainly shopping cart payment conversion rate, that is, the ratio of the number of buyers who add to the shopping cart for payment to the number of buyers who add to the shopping cart in a certain period. Ordering indicators include basic indicators and conversion indicators. Conversion indicators are mainly the conversion rate of browsing orders, that is, the ratio of the number of buyers placing orders to the number of website visitors. Basic statistical indicators, including the payment amount, the number of paid buyers, and the number of paid goods in a certain statistical period.

Customer value indicators include customer value indicators and common old customer indicators.

Common new customer indicators include the number of new customers in a certain statistical period, the cost of acquiring new customers, and the unit price of new customers. Customer consumption amount refers to the amount purchased by customers in the most recent period of time. Repeat purchase rate refers to the number of times consumers make repeated purchases of the brand's product or service. Commodity and supply chain metrics include total product metrics. The total product index is a collection of reusable and easily retrieved standardized information, including product advantage index and brand stock index. Campaign metrics include: New Visitors, New Registrations, Total Visits, Orders, Order Conversion Rate, and ROI. ROI refers to the ratio of the transaction amount generated during a campaign period to the campaign delivery cost amount. Advertising indicators include new visitors, new registrations, total visits, orders, order conversion rate, and advertising return on investment. Risk control indicators include buyer evaluation indicators, buyer negative evaluation rate, and complaint rate. Buyer evaluation indicators reflect users' participation in evaluations. E-commerce websites are currently actively guiding user evaluations as a reference for other buyers to shop. The buyer's negative review rate is a very worthy indicator. Once it is found that the buyer's negative review rate is increasing rapidly, it is necessary to analyze the reasons for the increase in the negative review rate and improve it in time. The level of complaints also plays an important role, Market competition indicators are related indicators of market share.

Market expansion rate refers to the percentage increase in the share of shopping sites compared to the previous statistical period. User share refers to the proportion of the number of unique visitors to shopping websites to the total number of unique visitors to all B2C shopping websites in the same period. Website ranking includes transaction volume ranking and traffic ranking. Transaction

volume ranking refers to the ranking of e-commerce website transaction volume among all similar e-commerce websites. Traffic ranking refers to the ranking of the number of unique visitors of an e-commerce website among all similar e-commerce websites. The index system of e-commerce big data analysis can draw different categories of indicators corresponding to different aspects of e-commerce operations. The indicators of e-commerce big data analysis all need systematic statistics and monitoring, so that enterprises can better discover the problems of the health of e-commerce operations, can better improve and optimize in a timely manner, and can better increase e-commerce revenue.

5. E-Commerce Development Strategy Based on Big Data Analysis

5.1. Optimization Strategy of E-commerce Marketing Management Under the Background of Big Data Analysis

Big data technology can accurately collect all the operations of potential consumers on the e-commerce platform, reflect the changes in consumers' consumption interests, and find the differences between the individual needs of each potential consumer. The prediction function of big data technology has a very critical impact on the decision-making of enterprises, and technology prediction can often reflect the future development trend of the market. Enterprises need to realize the optimization of data information. Customer data information is the basis for enterprises to realize customer analysis. Enterprises need to summarize information about consumers' daily browsing of products. Enterprises need to find consumers' browsing preferences, and enterprises can use this to infer every potential consumer. The type and price range of the desired commodity, the enterprise can realize the hierarchical management of the commodity, the enterprise can formulate its own marketing management plan, the enterprise can accurately grasp the market changes, and the enterprise can meet the future development trend of the market.

5.2. Application Strategy of Big Data Analysis in E-commerce Marketing

Enterprises should be able to continuously improve the enterprise system and form a more normative construction standard, so as to effectively integrate scattered data, so as to realize the sharing of information resources at different levels. The setting of the team should break through the traditional member structure, and be able to rationally analyze and use big data, so as to promote the development of e-commerce enterprises. Enterprises use big data analysis to effectively integrate customer information, accurately locate consumer groups, carry out targeted promotions, and realize personalized product marketing models. Enterprises use big data analysis to achieve the goal of publicity and marketing, and can use communication devices to stimulate consumers to consume anytime, anywhere. Enterprises build a secure network environment to provide favorable conditions for the development of e-commerce, ensure consumer information security, and reduce the intake of unsafe factors. Enterprises should conduct big data analysis based on the actual development of the enterprise. Big data analysis should be closely linked with the development trend of the enterprise, and the enterprise marketing strategy should be updated and upgraded according to the results of the big data analysis, so as to ensure that e-commerce marketing is in line with the market. Development trends, in line with consumer needs, can bring real benefits to enterprises.

5.3. Application Strategy of Big Data Analysis in E-commerce

Enterprises should establish and improve big data management and control systems or mechanisms. When collecting and processing data, enterprises should comprehensively summarize information including users, merchants, markets, transactions, retrieval, after-sales and other links. Enterprises compare different types or levels of information, select more effective and valuable information, and integrate and compare with marketing strategies and decision-making judgments in a timely manner to predict the future and avoid risks. With big data as the core, enterprises regulate the way, authority and scope of data collection, interaction and use, unified management of data storage and access, and formulate a scientific and safe big data development strategy. Enterprises should improve the application level of big data technology. Big data analysis needs to master the corresponding technology, clarify the source of information, and reasonably collect valuable information. Enterprise operators should strengthen the training of relevant personnel to ensure the validity and reliability of information.

6. Conclusion

The application era of big data is a new starting point for the development of e-commerce enterprises. Big data analysis can bring better data support for e-commerce in the marketing process, and help e-commerce formulate more targeted marketing strategies for different consumers. Big data is also increasingly used to optimize business processes. Enterprises can properly use data analysis methods to better provide website operations, website planning and editing, website promotion, customer service, network marketers, logistics, supply chain, etc. All aspects of e-commerce services and applications. The development of enterprises is inseparable from the support of data. In actual marketing, big data analysis is used reasonably, and corresponding marketing plans are formulated according to the characteristics of consumers' behaviors and interests, so as to more accurately grasp the needs of consumers.

Based on the relationship between big data analysis and e-commerce, this paper proposes that big data analysis can build a new transaction scenario and transaction closed loop for e-commerce. The software and hardware base layer, architecture layer and application layer are the framework of the comprehensive practice platform for e-commerce big data analysis. Data collection, data storage, data cleaning, data analysis and data visualization are the application cores of the comprehensive practice platform for e-commerce big data analysis. Overall operation indicators, website traffic indicators, sales conversion indicators, customer value indicators, commodity and supply chain indicators, marketing activity indicators, risk control indicators and market competition indicators are the indicator systems for e-commerce big data analysis. Data analysis provides relatively accurate analysis dimensions and data, and provides the basis and support for the objective evaluation of big data analysis e-commerce. In a word, big data analysis has become the key core of technological innovation and extensive competition in the field of e-commerce, and enterprises should actively embrace the opportunities brought by the era of big data.

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