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# A Study on User Behavior of E-commerce Platforms based on Data Analysis

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**Abstract:**With the popularity of the Internet and the rapid development of mobile technology, e-commerce platforms have become one of the main channels for people's shopping and transactions. On e-commerce platforms, users' behavioral data are widely recorded and stored, which provides a rich data resource for studying user behavior. Studying data analysis of user behavior on e-commerce platforms helps to understand users' behavior patterns and provides a scientific basis for e-commerce platforms to optimize marketing strategies, improve user experience and realize personalized recommendations. The article elaborates on the data collection and processing work from three aspects: data source selection and acquisition, pre-processing and cleaning, data feature extraction and variable selection, and studies the user behavior of e-commerce platform from three perspectives: user purchasing behavior, user browsing behavior, and user commenting behavior, to promote the development and enhance the competitiveness of e-commerce platform.

**Keywords:** data analysis; e-commerce platform; users; behavior

## Introduction

Through technologies such as data mining, machine learning, and artificial intelligence, researchers can deeply analyze user behavior data to reveal users' purchase intentions, preferences, and decision factors, and provide decision support and personalized recommendations for e-commerce platforms. Meanwhile, researchers are focusing on cross-platform and cross-device user behavior analysis to gain a comprehensive understanding of users' behavior and conversion paths on different channels, and then optimize user experience and promotion strategies. In addition, user experience and sentiment analysis is an important direction for user behavior research on e-commerce platforms, and by analyzing users' emotional feedback on products and services, targeted suggestions for improvement can be provided. However, with the continuous collection and analysis of user behavior data, privacy, and security issues have become the focus of attention, and researchers need to pay more attention to the privacy protection and security of user data.

## 1. Data collection and processing

### 1.1Data source selection and acquisition

Rich, comprehensive, and reliable data can provide powerful support for user behavior analysis, so choosing a suitable data source and acquiring data is one of the more important steps, and when choosing a data source, it is necessary to choose a data source with wide coverage and good sample representation to obtain more universal and reliable research results. The general data comes from e-commerce platforms and third-party data providers (Hao, & Ren, 2021). The internal data of e-commerce platforms mainly include user purchase records, browsing records, search records, transaction details and review data, etc. Comprehensive and detailed data can be obtained by establishing a cooperative relationship with the target e-commerce platform. Third-party data providers, on the other hand, specialize in collecting and selling user behavior data from e-commerce platforms. These data providers usually have data from multiple

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e-commerce platforms and can provide a broader sample and cross-platform insights into user behavior. When selecting a third-party data provider, you should assess the quality, accuracy, and legitimacy of their data and ensure a partnership with them.

**1.2 Data pre-processing and cleaning**

To obtain high-quality data and provide a reliable basis for subsequent user behavior analysis to gain insights into user purchase behavior patterns, trends, and preferences, data pre-processing and cleansing are required. The goal of data pre-processing is to ensure the quality and consistency of the data. Not only do we need to check and remove duplicate data to avoid duplicate effects on the results, but we also need to deal with missing values, such as missing shipping address fields for some orders in the purchase records. We can choose to remove these missing values or use interpolation methods to fill them based on the address patterns of other orders to ensure data completeness and accuracy (Wang, 2021). At the same time, correction of erroneous data, including data that are incorrectly formatted, out of the range of values taken, or logically illogical, is performed. Finally, standardization and normalization of data are necessary to eliminate dimensional differences between features and to deal with outliers, which can be removed or processed using reasonable methods. For example, when comparing purchase amounts, there may be huge differences between different users' purchase amounts. By normalizing or normalizing the purchase amount, we can eliminate this difference and make the comparison between different users more fair and accurate.

**1.3 Data Feature Extraction and Variable Selection**

The purpose of data feature extraction and variable selection is to mine and identify features and variables that have a significant impact on user behavior. Suppose we have a dataset of user behaviors of an e-commerce platform, we need to extract some useful features from these raw data, such as the average browsing time of users on the platform, which reflects the level of interest of users in products, and the frequency of purchase, by calculating the average number of purchases per user per month to understand the activity of users (Xu, & Qi, 2022). After feature extraction, a large number of features may be faced, and to select the most relevant and important variables, correlation analysis can be used to calculate the correlation coefficient between features and target variables (e.g., purchase behavior) and select features that are highly correlated with the target variables. For example, by performing correlation analysis, we may find a positive correlation between purchase frequency and user loyalty, i.e., users who purchase more frequently are more likely to become loyal users. Through data feature extraction and variable selection, we can identify the features and variables that have a significant impact on user behavior. These features and variables will help us better understand user behavior patterns, optimize marketing strategies and improve user experience.

**2. Analysis of user purchasing behavior**

**2.1 Analysis of user purchase path and purchase cycle**

Analysis of user purchase path and purchase cycle is an important method to study the process and time interval of users' purchase behavior on e-commerce platforms. For the user purchase path, mainly from two aspects as the focus, on the one hand, the page conversion path, through the analysis of the user's page browsing records on the e-commerce platform, you can build the user purchase path. Identifying the conversion path of users from browsing to adding to the shopping cart, and then placing orders and making payments reveals the behavioral conversion and conversion rate of users in the purchase process (Liu, 2021). On the other hand, identify users' key conversion nodes in the purchase path based on key conversion nodes, such as following the product detail page, adding to the shopping cart, or submitting an order. The conversion rates and behaviors of users at these nodes are analyzed to determine which links have a significant impact on the purchase decision. Analyzing the user purchase cycle, mainly considering the user's purchase interval, can understand the user's purchase cycle and identify the user's purchase frequency and purchase cycle distribution, which can further reveal the user's purchase behavior pattern and consumption habits.

### 2.2 Cross-platform purchase behavior research

Analyzing users' cross-platform purchase behavior, e-commerce platforms can better understand users' purchase behavior on different platforms and channels, to optimize their operation strategies, improve user experience, and develop cross-platform personalized marketing strategies to improve user conversion rate and satisfaction, but this involves analyzing users' purchase behavior and conversion paths on different e-commerce platforms or multiple online channels (Qin, 2021). For cross-platform and cross-channel purchase paths, based on identifying users' purchase paths between different platforms and channels, we understand users' behavior patterns and conversion rates during cross-platform purchases by analyzing their conversion and purchase behaviors from one platform to another. At the same time, we study users' purchase preferences on different e-commerce platforms and their purchase paths on different online channels (such as e-commerce platforms, social media, search engines, etc.). By analyzing users' purchase behavior data on multiple platforms, we can understand the differences in users' conversion and purchase behavior between different platforms and reveal their preferences and tendencies for different platforms. Accordingly, we may find that users browse products on one e-commerce platform, but eventually make purchases on another platform. This indicates that users may prefer to browse and acquire information on one platform and complete their purchase behavior on another platform.

## 3. Analysis of user browsing behavior

### 3.1 user browsing habits and browsing path analysis

Browsing habits generally focus on analyzing popular pages, identifying the most frequently visited pages and product categories, and understanding users' browsing interests and preferences. Through the analysis of page visits, clicks and dwell time, and other indicators, popular pages and products can be found, which in turn provides the basis for the recommendation system of the e-commerce platform. Further, it is necessary to pay attention to the cross-page conversion and page access sequence of users in the browsing process, track the conversion of users from one page to another, and view the user browsing history data, which can construct the page access sequence of users and reveal their interest transfer and associated browsing behavior, as well as their behavioral paths and behavioral habits in the purchase decision process (Huang, & Chen, 2021). Specifically, through browsing habits and browsing path analysis, we may find that certain users first browse popular recommendation pages on e-commerce platforms, jump to relevant product category pages, and finally further view specific product details. This browsing path analysis can help e-commerce platforms understand users' shopping interests and behavioral habits, optimize the recommendation algorithm and page layout, and improve the conversion rate of users' purchases.

### 3.2 Product click-through rate and page dwell time analysis

Product click-through rate and page dwell time are important indicators in e-commerce platforms to evaluate users' interest and engagement with products and pages. Product click-through rate is not only to count the number of clicks for each product but also to understand which products are receiving attention and clicks from users. Based on the ranking of clicks, popular products and popular product categories can be identified, so that product recommendation strategies and inventory management can be adjusted. And it is necessary to calculate the average click-through rate of each product, which is the number of clicks on the product page after it is visited divided by the number of visits. Based on comparing the average click-through rate of different products, the attractiveness of the product and the level of interest of the user can be evaluated. To analyze the page dwell time, for each page, we should calculate the average dwell time of users on that page, and observe the distribution curve of dwell time, which can understand the browsing habit of users on the page and the concentration of dwell time. And comparing the average dwell time on a page, the attractiveness of the page and the user's level of interest in the content can be assessed, and a longer dwell time may indicate the user's in-depth attention

and reading of the page content (Jin, 2020). Product click-through rate and page dwell time are closely related to each other, let's say we may find that a product has a high click-through rate, but the user's dwell time on that product page is short. This may indicate that the product's page design or product description is not attractive enough, causing users to simply click on the product without going deeper. Such analysis results can help e-commerce platforms optimize the content, layout, and presentation of the product page to improve user interest and engagement in the product.

## 4. Analysis of user commenting behavior

### 4.1 User comment characteristics and sentiment analysis

User review features can be extracted based on keywords as well as scoring analysis to capture precise features. Extracting keywords in user reviews, such as product features, service experience, price, delivery speed, and other aspects, identifying and counting keywords with high probability, can understand how much users pay attention to different aspects. The rating analysis, on the other hand, analyzes the rating information in user reviews, such as star ratings or satisfaction ratings, and counts the distribution of different ratings to further understand the overall satisfaction and rating distribution of users on goods and services. Different from extracting review features, user review sentiment requires extracting sentiment words and classifying sentiment polarity. In the process of extracting sentiment words, natural language processing techniques are needed to extract sentiment words in user reviews, such as positive, negative, or neutral words, and analyze the overall sentiment tendency of user reviews (Zhao, 2017). Based on this, the user comments are classified into positive, negative, or neutral sentiment categories by machine learning or deep learning methods. The training of sentiment classification models using the training dataset allows for the sentiment classification of new user comments to understand the sentiment tendencies and attitudes of users. For example, in the analysis process, it was found that users frequently mentioned positive keywords such as "good quality" and "good price" in their reviews of a certain product, and the sentiment words in the reviews also tended to have positive sentiment polarity. This indicates that users have a high evaluation and satisfaction with the product, which can be used as a reference for other users.

### 4.2 Impact of user reviews on Sales and brand image

Positive user reviews can enhance the brand image and recognition on social media, review platforms, or product pages, attracting more consumers' attention and purchase. On the contrary, negative user reviews may cause consumers to have doubts about the product, reducing sales and brand image. Therefore, e-commerce platforms and brands should pay attention to the impact of user reviews and actively interact with users to respond to their concerns and improve their products and services to boost sales and build a good brand image. Excellent user reviews are not only limited to making merchandise sales grow but also help build brand image. User reviews are an important part of word-of-mouth communication. Positive user reviews can drive other users to become interested in a product and purchase it, leading to increased sales. Word-of-mouth communication among users can increase product awareness and market share. And positive user reviews and high ratings can build trust and increase potential buyers' confidence in a product, making consumers more willing to buy. In brand image building, user reviews are one of the channels for consumers to interact with the brand. By actively responding to and handling user reviews, brands demonstrate the importance of user concerns and enhance their brand image.

## Conclusion

In summary, the user behavior research based on data analysis has achieved some important conclusions, revealing the purchase path and purchase cycle of users, providing guidance for optimizing user experience and improving conversion rates, and also discovering some patterns of user browsing habits and browsing paths that can help improve page design and content layout, and studying the influencing factors of

product click-through rate and page dwell time, providing a basis for optimizing product recommendation and advertising. However, the limitations and shortcomings of the study still need to be recognized. Future research needs to further address the challenges of data collection and analysis, and explore more accurate and comprehensive research methods. By continuously improving and refining the research methods, we will be able to better understand and apply the user behavior data of e-commerce platforms and provide better decision support and user services for e-commerce platforms.

**Conflict of Interest**

The authors declare that they have no conflicts of interest to this work.

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