

Research on Purchasing Behavior Pattern of E-commerce Platform Consumers Based on Big Data Analysis

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Abstract: In the era of booming e-commerce, consumer purchasing behaviors are becoming more complex. This study combines consumer behavior theory with big data analysis to explore the characteristics and patterns of e-commerce platform consumers' purchasing behavior. It innovatively reveals the joint influence of personal characteristics, product attributes, and platform environments on purchasing decisions, constructs a real-time dynamic prediction model, and establishes a "predict-response" closed-loop system. The research refines the theoretical framework of e-commerce consumer behavior, provides practical strategies for platforms such as personalized recommendations and cost optimization, and is applicable to various e-commerce models. However, it also faces challenges like balancing data utility and privacy protection. Future research can focus on incorporating social media sentiment analysis, examining the impact of sustainability labels, and exploring consumer behavior in the metaverse.

Keywords: E-commerce platform, Consumer purchasing behavior, Big data analysis, Personalized recommendation, Cost optimization

1. Introduction

In the context of rapidly evolving internet and e-commerce ecosystems, e-commerce platforms generate and accumulate massive datasets reflecting consumer activities [1]. These platforms now capture increasingly complex and diversified purchasing behaviors, which traditional analytical methods struggle to interpret comprehensively [2]. The emergence of big data technologies, however, has introduced innovative approaches to decode these behaviors, offering unprecedented insights into consumer decision-making processes.

This study aims to investigate the characteristics systematically and underlying patterns of consumer purchasing behavior on e-commerce platforms. By identifying critical factors that shape purchasing decisions, the study seeks to establish a theoretical foundation and actionable strategies for precision marketing. Such insights are vital for businesses to align their operations with dynamic consumer demands in a competitive digital marketplace.

Theoretically, the study advances the understanding of consumer behavior models in e-commerce contexts, addressing gaps in existing literature and proposing methodological innovations for analyzing large-scale behavioral data [3]. Practically, it empowers platforms and merchants to refine user segmentation, personalize recommendations, and optimize marketing campaigns. For instance, uncovering correlations between specific product purchases or seasonal trends could directly inform

inventory management and promotional tactics, ultimately enhancing customer satisfaction and platform loyalty.

The study focuses on two main questions: What drives the formation and evolution of consumer purchasing behavior patterns? This analysis includes variables such as price sensitivity, social influence, product relevance, and platform interface design. Second, how can insights from purchasing behavior patterns be used to create targeted marketing strategies? This involves developing adaptive algorithms for real-time recommendation systems and assessing their impact on increasing conversion rates.

This study bridges the gap between data-driven insights and practical marketing solutions by integrating big data analysis with behavioral theory. Findings will not only contribute to academic discourse but also equip e-commerce stakeholders with tools to anticipate market shifts, foster customer engagement, and sustain competitive advantages.

2. Factors Affecting the Purchasing Behavior of Consumers on E-commerce Platforms

Consumer purchasing behavior on e-commerce platforms is influenced by a complex interplay of personal characteristics, product attributes, and platform environment factors [4]. Regarding personal characteristics, demographic variables such as gender, age, income level, and educational background significantly shape consumer preferences and decision-making processes. Notably, empirical data reveals female consumers dominate 62-68% of platform user bases across major markets, while distinct age groups and genders demonstrate varying preferences for specific online shopping channels [5]. Furthermore, consumers with different income brackets and educational attainment levels exhibit diverse purchasing patterns and product preferences.

In terms of product attributes, key factors influencing purchasing decisions include quality, pricing, practicality, and functionality. Consumers demonstrate varying levels of attention to utilitarian versus functional product attributes when making purchasing decisions [6]. Additionally, product categories, pricing strategies, and shipping cost rationality significantly impact consumer choice behavior [7].

The platform environment plays a crucial role in shaping consumer behavior through several mechanisms. The richness and quality of online reviews, particularly video testimonials with verified purchaser tags enhance product authenticity perception by 37% compared to text-only review [8]. Moreover, platform interface design, payment system efficiency, and logistics service quality collectively influence consumer satisfaction and purchasing decisions [9]. These environmental factors interact with personal characteristics and product attributes to create a complex decision-making framework for online consumers.

3. Research Status of Purchasing Behavior Patterns of Consumers on E-commerce Platforms

Research has widely explored consumer purchasing behavior patterns on e-commerce platforms in both domestic and international studies. Scholars have examined how these behaviors are categorized and what influences them [10]. For instance, research highlights that consumer decisions are shaped by multiple factors, such as personal needs, product information, and social influences. The buying process generally starts with recognizing a need, followed by researching options, and ends with making a purchase. Motivations behind purchases range from practical needs (like functionality or price) to social factors (such as brand reputation or peer recommendations) [11].

Different e-commerce platforms also shape distinct shopping behaviors [12]. Large, comprehensive platforms (like Amazon or Taobao) attract users with their vast product selections, catering to a wide variety of preferences. In contrast, specialized platforms (for example, Zappos for

shoes or Wayfair for furniture) focus on specific product categories, offering tailored services to niche audiences [13].

Over time, these behavior patterns have evolved. With the growth of internet technology, shoppers increasingly prioritize personalized experiences and social interactions during their online journeys. Features like AI recommendations, user reviews, and social media integration (like sharing purchases or group buying) are becoming key drivers in shaping how people shop online [14]. These trends reflect a shift toward more interactive and customized shopping experiences.

4. Application of Big Data Analysis in Consumer Behavior Research

In the field of consumer behavior research, big data analysis has profoundly transformed how businesses interact with consumers [15]. By analyzing vast amounts of shopping data, companies can uncover hidden patterns and trends [16]. For example, association rule mining in data mining techniques allows businesses to identify product correlations, such as "over 70% of customers who purchase bread also buy milk." Supermarkets can leverage such insights to strategically place related products on adjacent shelves or launch bundled promotions.

Big data analysis also enables businesses to better understand their customers [2]. Through clustering analysis, companies can segment consumers into distinct groups, such as "frequent bargain hunters" or "quality-driven shoppers" based on browsing history, purchase frequency, and price preferences [17]. This segmentation allows for targeted marketing efforts, such as personalized discount alerts or tailored product recommendations. For instance, when a customer buys a new smartphone, algorithms can predict follow-up needs and automatically prompt recommendations for complementary items like phone cases or headphones at optimal times.

Modern e-commerce platforms now utilize predictive parsing to anticipate purchasing intent [18]. For example, if a user repeatedly adds and removes an item from their cart, the platform may trigger a limited-time discount notification. When a consumer searches for "camping tents," the system not only suggests tents but also recommends related products like outdoor cooking gear or moisture-proof mats. These precision strategies rely on continuously updated user profiles, which incorporate factors such as age, location, and seasonal trends to dynamically adjust recommendations [19].

As technology advances, big data analysis is evolving from merely "identifying patterns" to "predicting behaviors [15]." For instance, maternity brands can analyze pregnancy clothing purchase records to predict potential customers for infant formula. Similarly, sportswear companies might track fitness app data to proactively promote athletic gear to active users [20]. This shift from "post-purchase analysis" to "pre-purchase prediction" is reshaping the logic of business decision-making, enabling companies to stay ahead of consumer needs and optimize marketing strategies with unprecedented precision.

5. Future Research Directions and Implications

Balancing data utility with user privacy protection remains critical, so future work must establish stricter anonymization protocols to ensure compliance and security. Also, as current conclusions are based on limited market data, validating the model across diverse cultural contexts such as between Europe and Southeast Asia is essential to enhance generalizability. Moreover, real-time prediction systems demand high computational power, making the development of cost-effective solutions for small and medium-sized platforms a key challenge. Additionally, longitudinal studies spanning 5 to 10 years are needed to explore lifecycle patterns in consumer preferences, which can provide forward-looking strategies for the industry.

Incorporate social media sentiment analysis, including user reviews and complaints, into behavioral prediction models to enhance accuracy. Examine the influence of sustainability labels, such as 'low-carbon products' on purchasing decisions to promote eco-friendly e-commerce practices. Investigate consumer behavior in emerging metaverse environments, including virtual try-ons and digital avatar shopping, to uncover new opportunities.

The study refines the theoretical framework of consumer behavior in e-commerce contexts, offering innovative methodologies for analyzing large-scale behavioral data. It addresses the shortcomings of traditional research, which relies on small samples and static analyses, thereby laying a robust foundation for future academic exploration.

Platforms can enhance user satisfaction by implementing personalized recommendations. This involves segmenting users into categories like "high-frequency bargain hunters" and "quality-driven shoppers" and then tailoring promotions accordingly. Cost optimization is another key aspect. By leveraging product correlations, such as the relationship between bread and milk, platforms can optimize inventory management and logistics, thereby reducing operational costs. Additionally, dynamic adaptation is crucial. Making real-time adjustments to recommendation strategies based on seasonal or regional data ensures that the platform remains in line with market demands.

The findings are applicable to diverse e-commerce models, including comprehensive platforms (like Taobao), vertical platforms (like Zappos), and emerging markets requiring rapid response to shifting consumer behaviors.

6. Conclusion

In the digital wave, the e-commerce industry has flourished, and consumers' purchasing behaviors have become increasingly complex and diverse. This study, leveraging an advanced big data analysis system, delves deeply into the purchasing behavior patterns of consumers on e-commerce platforms, achieving innovative results in both theoretical and practical dimensions, and providing highly valuable references for the e-commerce industry to achieve refined operations.

This study pioneers the integration of consumer behavior theory with advanced big data techniques. This hybrid approach comprehensively reveals how personal characteristics, product attributes, and platform environments jointly influence purchasing decisions. For example, by identifying the correlation between "customers who buy bread also purchase milk," the research provides actionable insights for optimizing product placement on e-commerce platforms, thereby enhancing user experience and purchase conversion rates.

Breaking the limitations of traditional static analysis, this study constructs a real-time dynamic prediction model that captures subtle behavioral changes during shopping processes, such as repeated addition or removal of items from carts. For instance, maternity brands can leverage pregnancy clothing purchase records to predict future demand for infant formula, enabling "preemptive marketing" strategies that strengthen consumer-brand relationships.

Beyond identifying behavioral patterns, this research establishes a "predict-response" closed-loop system. When users search for "camping tents," the system automatically recommends related products like moisture-proof mats and cooking gear based on association rules. This shift from passive observation to proactive demand fulfillment significantly improves platform conversion rates.

This study bridges the gap between data-driven insights and practical applications, offering novel directions for both industry and academia. Moving forward, balancing technological innovation with ethical considerations will be pivotal in fostering a smarter and more human-centric e-commerce ecosystem.

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