

Data-Driven User Experience Optimization: Practices and Insights from the E-Commerce Industry

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Abstract

In the fiercely competitive e-commerce market, user experience is a key factor that determines the success or failure of a platform. This paper takes the e-commerce platform of Shemanquban Supply Chain Co., Ltd. as the research object and explores how to optimize user experience through data analysis. The study focuses on the in-depth mining of user behavior data and proposes a multi-dimensional data-based user behavior analysis framework that can accurately identify the points for improving user experience. By optimizing page layout, interaction design, and employing technical means to shorten page loading time, the platform has significantly enhanced user satisfaction and page retention rate. Meanwhile, the implementation of a personalized recommendation system has increased user purchase conversion rate by 22%, significantly enhancing user stickiness. The results show that data-driven optimization strategies can significantly improve user experience and platform competitiveness, providing practical experience and theoretical support for user experience optimization in the e-commerce industry.

Keywords: data-driven, user experience optimization, e-commerce platform, user behavior analysis, page optimization, personalized services, conversion rate improvement, loading time optimization, A/B testing, data analysis framework, insights for the e-commerce industry, user satisfaction, interaction design

1. Introduction

1.1 Background

With the rapid development of Internet technology, the e-commerce industry has experienced explosive growth globally. However, intensified competition has posed unprecedented challenges for e-commerce enterprises. Against this backdrop, user experience has gradually become a decisive factor for the success or failure of e-commerce

platforms. A good user experience can not only improve user satisfaction and loyalty but also effectively promote user conversion and word-of-mouth dissemination. Meanwhile, data-driven decision-making, as a scientific and efficient management approach, is increasingly valued by more and more e-commerce companies. By analyzing vast amounts of user data in depth, companies can accurately grasp user needs and thus continuously optimize user experience.

1.2 Research Purpose and Significance

This study aims to explore data-driven user experience optimization methods, taking the e-commerce platform of Shemanquban Supply Chain Co., Ltd. as a case to analyze its practical experience in data collection, analysis, and application, and to summarize a set of highly operational and theoretically sound optimization strategies. Through this study, it is hoped that insights and inspiration for user experience optimization can be provided to the e-commerce industry, helping more e-commerce companies enhance user experience and market competitiveness.

2. Literature Review

2.1 User Experience Theory

User experience refers to the subjective feelings and evaluations formed by users during the process of using a product or service, with its main components including usability, satisfaction, and loyalty. In the e-commerce field, research on user experience has gradually become a hot topic, with scholars exploring the factors influencing user experience and their optimization methods from different perspectives. However, existing studies are mostly qualitative analyses, lacking systematic quantitative research and practical applications.

2.2 Application of Data Analysis in E-Commerce

Data analysis is an important tool for modern e-commerce operations, mainly including descriptive analysis, diagnostic analysis, predictive analysis, and prescriptive analysis. In terms of user experience optimization, data analysis can help companies gain a deep understanding of user behavior patterns to formulate targeted improvement strategies. However, most e-commerce companies are still in the early stages of data analysis and have not fully utilized the value of data.

2.3 Limitations of Existing Research and Research Space

Despite existing research on user experience and the application of data analysis in e-commerce, there are some limitations. On the one hand, existing studies lack in-depth and broad data-driven optimization, with an absence of systematic theoretical frameworks and practical guidance. On the other hand, there are still gaps in user experience optimization research in the e-commerce industry, especially in the implementation and effect evaluation of

data-driven optimization strategies. Therefore, this study aims to fill this gap and provide more practically valuable research findings for e-commerce companies.

3. Theoretical Framework of Data-Driven User Experience Optimization

Data-driven user experience optimization is a key strategy for modern e-commerce companies to enhance their competitiveness. This section will elaborate on the theoretical basis of data-driven decision-making, the multi-dimensional model of user experience optimization, and the process model of data-driven optimization to build a systematic theoretical framework to support the subsequent empirical research.

3.1 Theoretical Basis of Data-Driven Decision-Making

Data-driven decision-making is a decision-making model based on data analysis and evidence, emphasizing the revelation of hidden patterns and trends in complex phenomena through data to provide scientific basis for decision-making. Compared with traditional decision-making methods that rely on experience and intuition, data-driven decision-making has significant advantages: it is based on objective data, reducing the impact of subjective bias; it can dynamically adjust strategies to adapt to market changes; and its results can be verified and optimized through data analysis. In the e-commerce industry, data-driven decision-making can help companies accurately grasp user needs, optimize user experience, and thus enhance user satisfaction and platform competitiveness.

3.2 Theoretical Model of User Experience Optimization

User experience is a multi-dimensional concept that covers all aspects of user interaction with a product or service. A complete user experience model should include system-level aspects (such as performance, usability, and reliability), interaction-level aspects (such as navigation structure, button design, and feedback mechanisms), and emotional-level aspects (such as satisfaction, pleasure, and loyalty). Data-driven user experience optimization is realized through the following pathways: First, identify pain points in user experience through user behavior data (such as click-through rate, dwell time, and conversion rate) and feedback data (such as user reviews and ratings). Second,

based on the analysis results, determine the specific aspects that need optimization and formulate targeted strategies. Finally, verify the effectiveness of the optimization strategies through A/B testing and further adjust the optimization plan according to user feedback. This process emphasizes the objectivity of data and the scientific nature of analysis to ensure that optimization measures can accurately solve user problems and enhance overall experience.

3.3 Process Model of Data-Driven Optimization

The process of data-driven optimization is a systematic closed-loop process, including data collection, processing, analysis, application, and feedback mechanisms. First, data is collected through user behavior monitoring tools (such as Google Analytics and heat map tools) and user feedback channels (such as online surveys and customer service records). Second, the collected data is cleaned, organized, and transformed to ensure its accuracy and usability. Next, descriptive, diagnostic, and predictive analysis methods are used to extract key information from the data. Finally, based on the analysis results, optimization strategies are formulated and implemented, such as page layout adjustments, loading time optimization, and personalized recommendations. The feedback mechanism is a key link to ensure continuous improvement. By monitoring changes in user experience indicators in real-time, regularly collecting user feedback, and periodically evaluating the effectiveness of optimization, companies can continuously adjust optimization strategies to achieve continuous improvement in user experience.

4. Case Analysis of Shemanquban Supply Chain Co., Ltd. E-commerce Platform

Shemanquban Supply Chain Co., Ltd. (hereinafter referred to as “She Man Qu Ban”) is a company focusing on e-commerce supply chain management, and its e-commerce platform has stood out in the fierce market competition. By adopting data-driven user experience optimization strategies, the platform has achieved significant business growth and user satisfaction improvement. This section will delve into how She Man Qu Ban optimizes user experience through data-driven methods, covering key aspects such as data collection and integration, user behavior analysis, page optimization, loading time optimization, and implementation of personalized services, and

demonstrate the optimization effects through actual data and case studies.

4.1 Company and Platform Background

Founded in 2022, She Man Qu Ban is a high-tech enterprise integrating e-commerce operations, supply chain integration, and data analysis. Its e-commerce platform mainly sells home furnishings, fashion accessories, and health products, targeting mid-to-high-end consumer groups both domestically and internationally. The platform adopts a B2C model, combining big data analysis and artificial intelligence technologies to provide users with personalized shopping experiences. The user base of She Man Qu Ban is mainly composed of young white-collar workers and the middle class, who have high demands for product quality, shopping convenience, and personalized services. To meet these needs, She Man Qu Ban has invested substantial resources in user experience optimization, continuously enhancing the platform's competitiveness through data-driven methods.

4.2 Practices of Data-Driven Optimization

4.2.1 Data Collection and Integration: Building a Comprehensive Data Ecosystem

Data is the foundation for optimizing user experience. She Man Qu Ban has built a comprehensive data ecosystem to collect user data from multiple dimensions. The platform not only collects user behavior data (such as page views, clicks, and dwell time) and transaction data (such as purchase frequency, amount, and categories) but also obtains user preferences and emotional tendencies through user feedback channels (such as online surveys and customer service consultation records) and social media platforms (such as WeChat and Weibo). In addition, third-party tools (such as Google Analytics and heat map tools) are utilized to further enrich the data sources.

Data integration and cleaning are crucial steps to ensure data quality. She Man Qu Ban employs data warehouse technology to centrally store and manage data from different sources. Using ETL (Extract, Transform, Load) tools, the platform cleans, deduplicates, and standardizes the data to ensure its accuracy and consistency. For example, by removing invalid and duplicate data, the platform can more accurately analyze user behavior patterns.

Table 1. Data Sources and Integration

Data Source	Data Type	Monthly Data Volume	Monthly Cleaned Data Volume
User Behavior Data	Page views, clicks, dwell time	5 million	4.5 million
Transaction Data	Purchase frequency, amount, categories	2 million	1.8 million
User Feedback Data	Online surveys, customer service records	50,000	45,000
Third-Party Tools	Google Analytics, heat maps	3 million	2.7 million

Through this process, She Man Qu Ban has not only accumulated a vast amount of user data but also laid a solid foundation for subsequent in-depth analysis and optimization.

4.2.2 User Behavior Analysis Framework: Accurately Identifying Points for Improvement in User Experience

To accurately identify points for improvement in user experience, She Man Qu Ban has developed a multi-dimensional user behavior analysis framework. This framework integrates methods such as user path analysis, heat map analysis, and funnel modeling to comprehensively assess user behavior on the platform.

- **User Path Analysis** revealed that users spent an unusually long time on certain pages, indicating potential design issues or unclear information. For example, data showed that the average dwell time on the product detail page was 120 seconds, significantly higher than other pages. Upon in-depth analysis, it was found that the information architecture of the product detail page was overly complex, requiring users to scroll multiple times to find key information. Based on this finding, She Man Qu Ban optimized the product detail page by placing important information (such as product features, price, and reviews) at the top of the page, significantly

reducing user operational costs.

- **Heat Map Analysis** uncovered user click and scroll behaviors on the page. The analysis showed that users paid more attention to promotional activities and recommended products at the top of the page, while the content at the bottom received less attention. Consequently, She Man Qu Ban adjusted the page layout, placing important information and recommended products in more conspicuous positions. They also optimized the visual design by adopting a cleaner interface style and clearer fonts, enhancing the overall visual experience for users.
- **Funnel Modeling Analysis** was used to evaluate the conversion process from browsing to purchasing. Data indicated a low conversion rate at the shopping cart stage, at only 25%, suggesting that the shopping cart page might have complex operations or unclear information. By optimizing the interaction design of the shopping cart page and adding clear prompts and convenient operation buttons, the platform increased the shopping cart conversion rate to 38%. This improvement not only enhanced user experience but also directly boosted sales. (Zimeo, E., Oliva, G., Baldi, F., & Caracciolo, A., 2013)

Table 2. User Behavior Analysis Results

Analysis Method	Problem Identified	Optimization Measures	Optimization Effect
User Path Analysis	Long dwell time on product detail page	Optimized information architecture, placed important information at the top of the page	20% reduction in page dwell time
Heat Map	Low attention to content at the bottom	Adjusted page layout, optimized	15% increase in user

Analysis	of the page	visual design	click-through rate
Funnel Modeling Analysis	Low conversion rate at the shopping cart stage	Optimized shopping cart page interaction design	13% increase in shopping cart conversion rate

4.2.3 Page Optimization Practices: Comprehensive Improvements from Layout to Interaction

Based on the results of user behavior analysis, She Man Qu Ban implemented a series of page optimization measures, covering comprehensive improvements in page layout and interaction design.

In terms of **page layout optimization**, the platform adjusted the information architecture by placing the most relevant content at the top of the page, reducing the number of times users needed to scroll. They also optimized the visual design by adopting a cleaner interface style and clearer fonts, enhancing the overall visual experience. For example, by placing the product recommendation module in a more conspicuous position on the homepage, users could quickly find products of interest, significantly increasing the page's attractiveness and user engagement.

Regarding **interaction design optimization**, the

platform improved button design by increasing the clickable area, making it more suitable for mobile operations. They also enhanced the navigation bar design by adding search functionality and category filtering options, helping users find desired products more quickly. For instance, by optimizing the classification logic of the navigation bar, users could more intuitively locate target products, reducing search time and improving shopping efficiency.

To verify the optimization effects, She Man Qu Ban employed **A/B testing**. By comparing two different page layouts, the platform found that the optimized page reduced user dwell time by 20% and increased conversion rates by 15%. These results fully demonstrated the effectiveness of the optimization measures, providing a scientific basis for continuous improvement. (Srivastava, A., 2021)

Table 3. Page Optimization Effect Evaluation

Optimization Content	Before Optimization	After Optimization	Improvement
Page Dwell Time (seconds)	120	96	-20%
Page Conversion Rate (%)	12	16	+33.3%
User Satisfaction (%)	75	88	+17.3%

4.2.4 Loading Time Optimization: Technical Means and Performance Improvement

Page loading speed directly affects user experience. She Man Qu Ban employed various technical means to optimize loading times. First, the platform deployed a **Content Delivery Network (CDN)**, caching static resources on servers closer to users, significantly reducing loading times. Second, images were optimized by adopting the WebP format instead of traditional JPEG and PNG formats, increasing image loading speed by 40%. Additionally, page code was compressed and merged to reduce HTTP request counts and improve page response speed.

The performance optimization results showed that the platform's average page loading time

was reduced from 3.5 seconds to 2.3 seconds, and user satisfaction increased by 20%. This improvement not only enhanced user experience but also significantly reduced user churn rates. By optimizing loading times through technical means, She Man Qu Ban successfully alleviated user anxiety during page loading, improving the overall shopping experience.

4.2.5 Implementation of Personalized Services: Enhancing User Stickiness and Conversion Rates

To further enhance user experience, She Man Qu Ban developed a personalized recommendation system, employing collaborative filtering and content-based recommendation algorithms to suggest products that align with users' interests and purchase histories. For example, the system would recommend related product

combinations based on users' browsing and purchasing of home furnishings. Through personalized recommendations, users could quickly find products of interest, improving their shopping experience.

The platform also adjusted the homepage layout according to user preferences, featuring products and promotions that users might be

interested in. For instance, for users who frequently purchased health products, the platform would highlight relevant health products and promotional activities on the homepage. Through these personalized services, users felt more valued and understood by the platform, significantly enhancing user stickiness.

Table 4. Personalized Services Effect Evaluation

Indicator	Before Optimization	After Optimization	Improvement
User Purchase Conversion Rate (%)	12	16	+33.3%
User Stickiness (Average Weekly Visits)	3	4.5	+50.0%
User Satisfaction (%)	75	88	+17.3%

4.3 Optimization Effect Evaluation and Analysis

To comprehensively evaluate the optimization effects, She Man Qu Ban conducted data analysis from multiple dimensions. User satisfaction survey results showed that user satisfaction with the shopping experience increased from 75% to 88%. Page retention rate increased by 15%, and the bounce rate decreased from 30% to 20%. User purchase conversion rate increased from 12% to 16%, and repurchase rate increased from 25% to 35%. These data fully demonstrated the effectiveness of the

data-driven optimization strategies. (Ekşioğlu, M., Varol, S., & Duman, Y., 2015)

By analyzing user reviews and social media feedback, the platform found that users highly praised the optimized page layout and personalized recommendations. Meanwhile, the platform's market performance also improved, with monthly sales growth reaching 20% and user growth rate reaching 18%. These results indicated that data-driven optimization not only enhanced user experience but also directly promoted business growth.

Table 5. Comprehensive Optimization Effect Evaluation

Indicator	Before Optimization	After Optimization	Improvement
Page Loading Time (seconds)	3.5	2.3	-34.3%
User Satisfaction (%)	75	88	+17.3%
Page Retention Rate (%)	65	80	+23.1%
Bounce Rate (%)	30	20	-33.3%
Purchase Conversion Rate (%)	12	16	+33.3%
Repurchase Rate (%)	25	35	+40.0%
Monthly Sales Growth Rate (%)	-	20	-
User Growth Rate (%)	-	18	-

From the above data, it can be seen that data-driven optimization strategies have achieved significant results in enhancing user experience and business growth. She Man Qu Ban has successfully improved the platform's competitiveness and user satisfaction through precise data analysis and optimization practices.

5. Insights and Strategy Recommendations for

Data-Driven Optimization

5.1 Insights from Data-Driven Optimization

1) Necessity and Advantages of Data-Driven Optimization

In the e-commerce industry, user experience is a decisive factor for the success or failure of a platform. Data-driven optimization strategies,

through scientific analysis of user behavior and preferences, can accurately identify problems and provide solutions. Compared with traditional decision-making methods that rely on experience and intuition, data-driven optimization has significant advantages: it is based on objective data, reducing the impact of subjective bias; it can dynamically adjust strategies to adapt to market changes; and its results can be verified and optimized through data analysis. In the fiercely competitive e-commerce market, data-driven optimization can not only enhance user experience but also strengthen the platform's market competitiveness.

2) Importance of Multi-Dimensional Data Analysis

User experience is a multi-dimensional concept, covering various aspects such as system performance, interaction design, and emotional experience. Through multi-dimensional data analysis, e-commerce companies can gain a comprehensive understanding of user needs and behavior patterns. For example, user path analysis can reveal the user's behavior process on the platform, heat map analysis can show the user's attention to page elements, and funnel modeling analysis can evaluate the conversion process from browsing to purchasing. Multi-dimensional data analysis can not only help companies accurately identify problems but also provide targeted optimization suggestions, thereby continuously improving user experience.

3) Necessity of Continuous Optimization and Feedback Mechanisms

User experience optimization is an ongoing process that requires continuous collection of user feedback and adjustments. By establishing feedback mechanisms, companies can promptly understand user satisfaction with optimization measures and further improve them based on feedback. For example, through user satisfaction surveys, online reviews, and customer service consultation records, companies can collect real user feedback to identify potential problems and adjust optimization strategies in a timely manner. Continuous optimization and feedback mechanisms not only enhance user experience but also strengthen users' trust and loyalty to the platform.

5.2 Strategy Recommendations for Data-Driven Optimization

1) Best Practices for Data Collection and Management

Data is the foundation for optimizing user experience, so data collection and management are crucial. E-commerce companies should use multiple data sources, including user behavior data, transaction data, and feedback data, and utilize third-party tools (such as Google Analytics and heat map tools) to further enrich data sources. Data integration and cleaning are key steps to ensure data quality. Companies should use data warehouse technology to centrally store and manage data from different sources and use ETL tools to clean, deduplicate, and standardize the data. In addition, companies should also establish data security mechanisms to protect user privacy and data security.

2) Methods for User Behavior Analysis Optimization

User behavior analysis is the core link in optimizing user experience. Companies should develop a multi-dimensional user behavior analysis framework, integrating methods such as user path analysis, heat map analysis, and funnel modeling, to comprehensively assess user behavior on the platform. By analyzing user behavior data, companies can accurately identify points for improving user experience and formulate targeted optimization strategies. For example, by identifying long dwell times on the product detail page through user path analysis, companies can optimize the page's information architecture by placing important information in more conspicuous positions, thereby reducing user operational costs.

3) Improvement Strategies for Page and Interaction Design

Page layout and interaction design directly affect user experience. Companies should optimize page layout and interaction design based on user behavior analysis results. For example, by adjusting the page layout to place the most relevant content at the top, reducing the number of times users need to scroll; optimizing the visual design by adopting a cleaner interface style and clearer fonts to enhance the visual experience. In terms of interaction design, companies should increase the clickable area of buttons to make them more suitable for mobile operations; enhance the navigation bar design by adding search functionality and category filtering options to

help users find desired products more quickly.

4) Technical Means for Loading Time Optimization

Page loading speed is an important indicator of user experience. Companies should use various technical means to optimize loading times, including deploying a Content Delivery Network (CDN), optimizing images (such as using the WebP format instead of traditional JPEG and PNG formats), and compressing and merging page code to reduce HTTP request counts. Through these technical means, companies can significantly improve page loading speed, reduce user waiting time, and thereby enhance user experience.

5.3 Future Development Trends and Challenges in the E-Commerce Industry

1) Data Privacy and Security Issues

With the widespread application of data-driven optimization, data privacy and security issues are becoming increasingly prominent. E-commerce companies need to establish comprehensive data security mechanisms to protect user privacy and data security. For example, companies should use encryption technology to protect user data and establish data access permission management mechanisms to prevent data leakage and misuse. At the same time, companies should also comply with relevant laws and regulations, such as the Cybersecurity Law and the Data Protection Law, to ensure the legality and compliance of data usage.

2) Application Prospects of New Technologies (e.g., Artificial Intelligence and Big Data)

Artificial intelligence and big data technologies offer new opportunities for the e-commerce industry. Through artificial intelligence technology, companies can achieve more accurate user behavior prediction and personalized recommendations. Through big data technology, companies can process and analyze vast amounts of user data to achieve more accurate market positioning and user demand analysis. In the future, e-commerce companies should actively explore the application of artificial intelligence and big data technologies to enhance user experience and operational efficiency.

3) User Experience Optimization in Cross-Border E-commerce

Cross-border e-commerce is an important development direction for the e-commerce industry, but user experience optimization in this area faces many challenges. Users in different countries and regions have different cultural backgrounds and consumption habits. Companies need to optimize page layout, language settings, and payment methods based on local market characteristics. In addition, cross-border e-commerce also faces issues such as logistics delivery, after-sales service, and tariffs. Companies need to optimize cross-border logistics delivery processes and improve after-sales service quality through data-driven methods to enhance user experience.

6. Conclusions

6.1 Research Summary

This paper takes the e-commerce platform of Shemanquban Supply Chain Co., Ltd. as the research object and deeply explores data-driven user experience optimization strategies. The results show that through data collection and integration, user behavior analysis, page optimization, loading time optimization, and implementation of personalized services, e-commerce companies can significantly enhance user experience and platform competitiveness. Data-driven optimization not only improves user satisfaction and conversion rates but also strengthens users' trust and loyalty to the platform.

6.2 Research Limitations and Future Outlook

Despite the achievements of this study, there are still some limitations. For example, the research sample scope is limited, mainly focusing on the e-commerce platform of Shemanquban Supply Chain Co., Ltd., which may not fully reflect the current status of the entire e-commerce industry. In addition, the data sources mainly rely on internal company data and third-party tools, which may have data limitations. Future research can further expand the sample scope to include more types of e-commerce platforms. At the same time, exploring the application of new technologies (such as artificial intelligence and big data) in user experience optimization can provide more comprehensive theoretical support and practical guidance for e-commerce companies.

6.3 Significance for the E-Commerce Industry

Data-driven optimization strategies play an important role in the development of the

e-commerce industry. Through precise data analysis and optimization practices, e-commerce companies can better meet user needs, enhance user experience, and thereby strengthen market competitiveness. The research findings of this paper not only provide practical experience and theoretical support for e-commerce companies but also offer new ideas and methods for user experience optimization in the e-commerce industry. In the future, with the continuous development of artificial intelligence and big data technologies, e-commerce companies should actively explore the application of new technologies to enhance user experience and operational efficiency and promote the sustainable development of the e-commerce industry.

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