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The Application Path of Consumer Behavior Data in Precision Marketing in Retail Management

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Abstract:

In the digital age, competition in the retail industry is shifting from "traffic wars" to "precision targeting," with consumer behavior data collection and analysis becoming crucial for businesses to enhance market competitiveness. This article explores the application pathways of consumer behavior data in precision marketing within retail management, discussing how data-driven strategies can achieve more efficient consumer insights and marketing effectiveness. Research reveals that establishing an integrated online-offline data collection system forms the foundation of precision marketing, enabling comprehensive tracking of consumers' digital and physical behavioral patterns. With this data in hand, businesses can build dynamic user profiles using tools like the RFM model and behavioral tagging systems—which in turn help them achieve consumer segmentation and precise stratification. Then, by rolling out algorithmic recommendations, smart shopping carts, and personalized promotions, companies can close the loop on a full-cycle marketing process: "consumer profiling – content adaptation – scenario-based engagement." On top of that, linking online and offline scenarios seamlessly and connecting data across all channels doesn't just boost users' shopping experience—it also ramps up conversion efficiency. The study also notes that right now, when businesses use consumer behavior data, they run into several challenges: things like inconsistent data quality, not having enough technical capacity, a shortage of interdisciplinary talent, and risks around privacy compliance. To address these, the study offers solutions such as setting up a master data management system, using open-source tools, stepping up industry-academia-research collaboration to train talent, and refining privacy protection frameworks.

Keywords: Consumer behavior data; precision marketing; data collection; user portrait; omni-channel linkage.

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1. Introduction

In today's digital age, the retail industry is undergoing an unprecedented transformation. With the rapid development of internet and mobile technologies, consumer shopping behaviors and demands have become increasingly diverse and personalized. Traditional marketing methods often fall short of modern consumers' needs, which is why retailers have to step up their competitiveness with more targeted marketing strategies. These days, collecting and analyzing consumer behavior data has grown essential for pulling off targeted marketing in retail. By digging deep into that behavior data, businesses can get a clearer grasp of what customers need and prefer—letting them craft more tailored marketing plans that strengthen their market edge and grow their share of the market.

Collecting and analyzing consumer behavior data also matters a lot when it comes to retail management. For one thing, targeted marketing strategies can really boost a company's sales efficiency and customer satisfaction. By looking at consumers' purchase histories, browsing habits, and social media activity, businesses can predict future needs, roll out personalized product recommendations and promotions—and that in turn lifts conversion rates and customer loyalty. For another, analyzing consumer behavior helps businesses refine their products and services. By checking out customer feedback and reviews, they can quickly spot problems with what they're offering, make fixes, and boost user satisfaction. What's more, targeted marketing cuts down on marketing costs while making the most of marketing resources.

Previous research in consumer behavior data and precision marketing has yielded significant achievements. Studies have explored how social media analytics and e-commerce platform logs can be leveraged to analyze consumer behavior, revealing their potential in predicting consumer needs and optimizing marketing strategies. For instance, research demonstrates that by analyzing user comments and interactions on social media, businesses can gain insights into consumers' genuine demands and emotional tendencies, enabling them to adjust product strategies and marketing approaches. Other studies focus on consumer segmentation and profile construction, proposing various models and methods such as the Recency-Frequency-Money (RFM) model for multi-dimensional user stratification. These help companies better identify high-value customers and dormant clients, allowing them to develop targeted marketing strategies. Additionally, research explores scenario-based marketing and omnichannel integration practices, emphasizing how deep online-offline integration enhances shopping experiences and purchase conversion rates.

While previous research has made significant strides in consumer behavior data and precision marketing, several limitations remain. First, most studies focus primarily on theoretical exploration and model development, lacking validation through real-world case studies. Second, existing research pays insufficient attention to data quality and privacy compliance issues, failing to adequately address their impact on consumer behavior data applications. Furthermore, current studies lack effective solutions to the challenges of technological capabilities and a shortage of interdisciplinary talent in small and medium-sized enterprises (SMEs).

This paper explores the application pathways of consumer behavior data in precision marketing within retail management, focusing on how to establish a comprehensive consumer behavior data collection system through deep integration of online and offline data acquisition systems combined with third-party data. By analyzing the processes of collecting, processing, and interpreting consumer behavioral data, the study examines how to leverage such data to build customer segments and profiles for developing targeted marketing strategies. It further investigates how scenario-based marketing and omnichannel coordination can enhance shopping experiences and purchase conversion rates. Finally, the article addresses challenges including data quality, technical capabilities, and privacy compliance encountered during data application, proposing corresponding countermeasures.

This study aims to provide retail enterprises with a systematic approach for collecting and analyzing consumer behavior data, enabling them to implement precision marketing strategies that enhance market competitiveness and expand their market share. Furthermore, this research will serve as a valuable reference for academic studies in related fields, driving the advancement of consumer behavior analytics and precision marketing practices.

2. Collection of Consumer Behavior Data in Retail Management

Amid the digital revolution, the retail sector is undergoing unprecedented transformation. The quality of consumer behavior data collection has become the lifeline for precision marketing in the industry. In an increasingly competitive market environment, businesses that accurately grasp consumer behaviors and demands will gain a competitive edge. Building integrated online-offline data collection systems, supplemented by third-party data, is emerging as a new trend in industry development.

2.1 Online Channel Data Collection

Online channels leverage real-time interaction features to accurately capture users' virtual behavioral patterns. E-commerce platform log systems comprehensively record critical data such as browsing duration, page dwell

time, and product add-to-cart moments – these digital footprints serve as vital references for identifying latent consumption demands. Taking a fresh food e-commerce platform as an example, through App tracking technology monitoring user activity frequency, functional module preferences, and promotional click-through rates, they successfully developed a dynamic model of purchasing time preferences. This model predicts consumer demand across different time periods based on historical behavior, enabling personalized product recommendations and promotional campaigns. For example, during busy periods when people are buying lots of fresh produce, the system sends out recommendations for in-season veggies and fruits—plus the right discounts to go with them—and that really helps lift conversion rates.

Social media engagement data also gives a different angle on what consumers truly think. The comments people leave, how they share content, and which keywords they use when talking about a brand's account don't just show how well a product is regarded—they also reveal what kind of mood or feelings users have. By looking at social media data, retail businesses can quickly get a handle on consumers' reviews and feedback, which lets them adjust their product strategies and marketing plans [1]. If shoppers say they're unhappy with specific parts of a product in their reviews, companies can fix those issues fast to boost user satisfaction. At the same time, by keeping an eye on which keywords get mentioned, businesses can figure out what consumers are worried about or need when it comes to products—and that provides useful input for product development and promotion [1].

Mini programs are a new way for brands to connect with customers, so their operational data is something retailers should pay extra attention to. Numbers like how often people visit a mini-program or how many coupons actually get used can help guide retailers to bring more foot traffic into their physical stores. And since these mini programs are easy to use, they do a great job of drawing in more consumers. By looking at how users behave on these platforms, retailers can spot what shoppers are interested in and what they need—giving them practical ideas for offline marketing efforts. For instance, if users keep browsing certain product categories on a specific mini-program, stores can stock more of those items and run in-store promos to encourage more purchases.

2.2 Offline Channel Data Collection

Offline channels possess unique advantages in capturing "experiential behaviors" [2]. The deep integration of POS systems with membership systems has enabled digital transformation of the "consumer-product relationship". Taking infant product retail as an example, cross-referencing milk purchase records with member profiles allows businesses to precisely identify maternal and child-focused customer segments. These groups demonstrate strong purchasing potential and loyalty, enabling companies to deliver personalized products and services tailored to their needs. For instance, providing parenting guides and family activity suggestions can significantly enhance user engagement and satisfaction [3].

The store customer flow monitoring system utilizes infrared sensing technology and AI visual recognition algorithms to capture in real-time foot traffic, dwell time in specific areas, and movement trajectories. These spatial behavioral data provide scientific foundations for optimizing shelf layouts and enhancing space efficiency. By analyzing customer flow patterns, businesses can understand consumer behavior and needs within stores, enabling them to adjust product displays and shelf arrangements accordingly. For instance, if a particular area experiences high foot traffic but short dwell times, companies may consider modifying product displays in that zone by adding consumer-attracting elements, thereby increasing customer retention and purchase conversion rates [4].

The customer reviews and demand notes recorded by sales staff act as decoders of behavioral data, enabling retail enterprises to penetrate quantitative metrics and gain insight into the underlying motivations behind consumer behavior. For instance, a sports brand identified declining sales of a running shoe through sales records, ultimately tracing it back to users' widespread complaints about breathability issues in product reviews. By revising this feedback, the company could promptly improve product quality and performance to better meet consumer needs.

3. The Core Link and Implementation Path of Precision Marketing Based on Consumer Behavior Data

The value transformation of consumer behavior data requires the construction of a full-link operation system of "group portrait-content adaptation-scene linkage", which is essentially a systematic project to transform data assets into marketing momentum.

3.1 Consumer Grouping and Portrait Construction

In consumer segmentation and profile construction, the RFM model remains one of the most practical tools. By establishing three-dimensional coordinates of "last purchase time", "purchase frequency", and "purchase amount", businesses can stratify user value in a multi-dimensional manner. Practical experience shows that defining "users with purchases within 30 days" as high-activity groups and "users without purchases for 90 days" as dormant users effectively guides the design of reactivation strategies. For high-activity groups, companies can offer

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more personalized services and promotional activities to further enhance their loyalty and purchase frequency. For dormant users, businesses can activate their consumption desire through targeted reactivation coupons and customer service follow-ups [5].

The development of behavioral tagging systems requires deeper insight into user needs. Price-sensitive users typically respond strongly to promotional offers, while quality-conscious consumers prioritize product reviews and brand value. By analyzing user behavioral tags, businesses can deliver tailored recommendations and marketing strategies. For example, companies could push more discount promotions to price-sensitive customers, while recommending premium-priced products with detailed reviews and compelling brand stories to quality-oriented buyers.

The development of dynamic profiling systems poses significant challenges to enterprises' data management capabilities. Real-time updates of seasonal and holiday-specific tags ensure the freshness of user profiles. As seasons and festivals change, consumer demands and behaviors also evolve. Businesses can adjust marketing strategies and product recommendations accordingly. For instance, during summer, companies may promote cooling products for heat relief; during Spring Festival, they could recommend festive gifts and New Year's goods.

3.2 Precision Marketing Content and Channel Adaptation

When it comes to integrating precision marketing content with distribution channels, algorithm-powered personalized recommendations are totally changing how businesses operate. In digital retail, collaborative filtering algorithms now let retailers pull off cross-category smart recommendations. Take one FMCG brand, for instance—they used recommendation systems to pair shirts with ties in a thoughtful way, and it ended up boosting their cross-selling numbers. When these algorithms look at users' past purchase habits and preferences, they can send over personalized product tips; this not only lifts individual purchase conversion rates but also makes bundled sales perform better [6].

Offline smart shelves connect with membership systems using facial recognition tech, so they can display products tailored to what each person likes. When a customer walks up to one of these shelves, the system uses biometric checks to figure out who they are, then suggests products based on their past purchases and spending habits. This kind of smart shopping experience doesn't just make customers happier—it also boosts conversion rates, all thanks to those personalized product picks.

Picking the right channel means matching it closely to how users consume media. Short video platforms are great for reaching younger groups; SMS channels still have a unique edge in lower-tier markets; and WeCom has become the go-to for professional audiences. Different user groups like different types of media, so people need to tweak marketing strategies accordingly. Here's what that looks like in practice: Younger people love engaging video content—stuff that draws them in with creative stories; businesses in less developed areas should use SMS to make sure their messages get through on time; and for corporate professionals, WeCom's professional services and streamlined communication tools are a real help.

3.3 Scenario-Based Marketing and Omni-Channel Linkage

Scenario-based marketing and omnichannel integration are redefining consumer experiences. In online environments, features like personalized homepage hero boards, smart cart abandonment alerts, and product lifecycle management reminders all play crucial roles at key decision points. By displaying tailored products and promotional content through dynamic hero board layouts, businesses can enhance click-through rates and conversion rates by showcasing items aligned with user interests. When users add items to their carts but abandon purchases, intelligent reminders prompt them to complete purchases, boosting conversion rates. As products enter their final lifecycle stages, reminders encourage repeat purchases, effectively increasing repurchase rates [7].

In physical retail scenarios, technologies like augmented reality makeup trials and AI shopping assistants enhance user experience. A cosmetics brand optimized its counter displays using thermal sensing systems, significantly boosting exposure of best-selling products. AR makeup trials allow consumers to virtually try on cosmetics, improving shopping experiences and conversion rates. AI shopping assistants provide personal recommendations, enhancing customer satisfaction. Through thermal sensing systems, businesses can track consumer dwell time and focus areas at counters, enabling display optimization and increased exposure of popular items [8].

4. Challenges and Responses

Retail enterprises are faced with multiple challenges such as data quality, technical capability and privacy compliance in the process of promoting the application of consumer behavior data.

4.1 Data Quality Issues

Data quality issues remain particularly prominent, with decision-making biases frequently caused by multi-source data conflicts. A garment manufacturer once faced a product launch failure due to severe discrepancies between online preference data and offline purchasing behaviors.

The cumulative effect of invalid data is equally concerning. Operational data from a chain supermarket revealed that invalid data such as incorrect address records, duplicate accounts, and expired information once accounted for 35% of total data, severely compromising user profile accuracy. To resolve data quality issues, companies need to establish a master data management system to standardize data definitions and collection criteria. A retail group reduced invalid data from 32% to 9% through implementing a data cleansing initiative. Enterprises must also integrate and validate multi-source data to ensure consistency and accuracy [9].

4.2 Technical Capability Shortfalls

The technological capability gap is particularly pronounced among SMEs. The prohibitively high costs of professional analytics tools like SAS and SPSS force many companies to rely on basic office software for data processing, resulting in limited depth and accuracy in data analysis. To address this technical challenge, businesses can adopt open-source solutions such as Apache Kylin distributed computing frameworks, enabling cost-effective big data analytics for small and medium enterprises. These open-source tools offer low implementation costs and exceptional flexibility, perfectly meeting the operational needs of SMEs.

4.3 Lack of Multi-Disciplinary Talents

The shortage of versatile professionals has become a critical bottleneck hindering industry development, with the talent gap for individuals proficient in both retail operations and data-driven thinking reaching the million-level. To address this challenge, companies should enhance talent cultivation and recruitment strategies. For instance, Suning.com and Nanjing University have jointly established a Retail Data Lab, which has trained hundreds of interdisciplinary talents through industry-academia-research collaboration. Additionally, enterprises can adopt recruitment and training programs to attract and develop professionals who possess both retail expertise and data literacy.

4.4 Privacy Compliance Risks

Privacy compliance risks have become a Sword of Damocles hanging over enterprises. Excessive collection of user data not only poses legal risks but also erodes consumer trust. A cross-border e-commerce brand faced heavy penalties from regulators for illegally collecting users' geolocation information, resulting in an 18% user churn rate. To address privacy compliance challenges, companies need to enhance their privacy protection systems through both technological and managerial improvements. The application of federated learning technology enables data availability without visibility. A bank implemented differential privacy technology to protect user privacy, improving data sharing efficiency while reducing compliance risks. Enterprises should also strengthen employee training and management to enhance privacy awareness, ensuring business operations comply with legal requirements [10].

As retail enterprises advance the application of consumer behavior data, they must fully recognize the challenges and implement effective strategies to address them. By improving data quality, enhancing technical capabilities, cultivating interdisciplinary talent, and strengthening privacy protection systems, companies can better leverage consumer behavioral data for precision marketing, thereby boosting their competitiveness and market share.

5. Conclusion

This paper focuses on the application path of consumer behavior data in precision marketing in retail management. By combining case analysis, theoretical elaboration and problem countermeasures, this paper discusses data collection, precision marketing implementation and challenge response.

The article first analyzes the online and offline data collection systems: Online, user behaviors are captured through e-commerce logs, social interactions, and mini-program records. Offline, it relies on POS systems, customer flow monitoring, sales guide records, and third-party data to expand dimensions, laying the foundation for precise marketing. It then focuses on the "consumer segmentation-content adaptation-scenario-based integration" full-chain approach, elaborating on consumer profiling, marketing content and channel adaptation, and scenario-driven omnichannel coordination, demonstrating how data transforms into marketing momentum.

It also points out the current challenges faced by enterprises, such as data quality, technical shortcomings, lack of multi-disciplinary talents, privacy compliance risks, etc., and puts forward countermeasures such as establishing master data management system, applying open-source tools, cultivating talents in industry-university-research, and improving privacy protection system.

Research indicates that effective utilization of behavioral data is crucial for retail enterprises to enhance precision marketing capabilities and strengthen competitiveness, requiring optimized data management, technological advancement, and compliance oversight. As AI continues to evolve, businesses should deepen data mining and real-time analytics, strengthen cross-channel integration, innovate privacy protection technologies, and drive precision marketing toward intelligent and personalized development.

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References

[1] Arumugam M, Jayanthi C. Erratum to: Consumer Behavior Analysis in Social Networking Big Data Using Correlated Extreme Learning. Optical Memory and Neural Networks, 2025, 34(3): 470-470.

[2] Guo Haiyan. The Relationship Between Consumer Behavior and Purchase Decision Based on Big Data Analyse. Journal of Economics and Management Sciences, 2025, 8(2): 231-231.

[3] Baray Jérôme, Cliquet Gérard. AI-Driven Sentiment Analysis for Retail Management: A Graph-Based DSS Comparing Franchise and Company-Owned Stores. Managerial and Decision Economics, 2024, 46(4): 2345-2363.

[4] Liu Bin. A Deep Learning-Based Object Representation Algorithm for Smart Retail Management. Journal of The Institution of Engineers (India): Series B, 2024, 105(5): 1121-1128.

[5] Sarkar Biswajit, Seok Hyesung, Jana Tapas Kumar, Dey Bikash Koli. Is the system reliability profitable for retailing and consumer service of a dynamical system under cross-price elasticity of demand? Journal of Retailing and Consumer Services, 2023, 75: .

[6] Ali Mohammed, Essien Aniekan. How can big data analytics improve outbound logistics in the UK retail sector? A qualitative study. Journal of Enterprise Information Management, 2025, 38(2): 424-449.

[7] Yang Xiaodong. Research on Precision Marketing for Market Consumer Groups by Using Consumer Portraits. Journal of The Institution of Engineers (India): Series C, 2025, (prepublish): 1-8.

[8] Shen Haoran. Application of Big Data and Statistical Modeling to Enable Consumer Behavior Analysis in the Digital Economy Landscape. Modern Economics & Management Forum, 2025, 6(3).

[9] Duan Jun. Research on Precision Marketing Model of Enterprise Market under the Background of Digital Finance. Computer Informatization and Mechanical System, 2024, 7(5): 79-81.

[10] Huang Silong, Liu Zichen. The Impact of Personalized Recommendation Systems on Consumer Purchase Decisions Under Data Law Frameworks: An Empirical Study Based on E-Commerce User Behavior Data. Journal of Organizational and End User Computing (JOEUC), 2025, 37(1): 1-28.