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Research on the Current Status and Future Development Trends of Artificial Intelligence in Precision Marketing

Taoran Ye

China University of Political Science and Law, Beijing, China
220404052@cupl.edu.cn

Abstract. In the era of the digital economy, the fragmentation of consumer behavior and the personalization of demands have posed challenges to trad1itional marketing models. Artificial intelligence technology provides technical support for precision marketing and promotes the transformation of marketing from "wide network" to "deep interaction". Through a novel three-dimensional framework of "Technology-Scenario-Efficiency", this study systematically analyzes AI's current technological pathways, practical effectiveness, and emerging challenges. The results show that big data analytics, deep learning and generative artificial intelligence form three core technology pillars that enable dynamic personalization of recommendation systems, intelligent advertising and customer behavior predictions across different industries. However, data silos, privacy compliance, resource constraints, and a fragmented AI ecosystem are preventing wider adoption.

Keywords: Artificial Intelligence, Precision Marketing Technology, Multi-modal Generative AI, Dynamic Customer Profiling, Marketing Ethics Governance

1. Introduction

The digital economy demands a shift from traditional marketing models to AI-driven, data-driven approaches. Fueled by AI's deep integration into consumer insights, content generation, and delivery optimization, the global precision marketing market—valued at $5.48 billion in 2024—is projected to grow to $12.05 billion by 2033.

This study aims to systematically explore the current applications of artificial intelligence in precision marketing, analyze its technical pathways and practical effectiveness, and envision future development trends and potential challenges. The research will focus on the following core topics: This text explores how AI can overcome demographic limitations through emotional computing and real-time behavior tracking, achieving dynamic personalized reach. It also discusses how AI can overcome the marketing paradox of precision, scale, efficiency, and quality, promoting particle diffusion and user companionship.

This research holds both theoretical and practical significance. Theoretically, it addresses gaps in systematic research on AI marketing by constructing a three-dimensional analytical framework of "Technology-Scenario-Efficiency." Practically, it provides enterprises with strategic guidelines for implementing AI-driven marketing. At the same time, it is predicted that after the popularity of generative AI fades, the rational return of traditional AI and sentiment analysis technology will

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reshape the customer service value chain and help enterprises seize the opportunity to grow in the era of technological equality.

2. Theoretical framework

2.1. Theory of accurate marketing

Traditional precision marketing theory mainly relies on static data such as demographics, geographic information, and limited purchase history—for customer segmentation and targeting. It is impossible to integrate emerging dimensions such as social media and real-time behavior, and it is difficult to capture rapidly changing consumer preferences and behavior patterns [1]. The coarse subdivision particle size leads to insufficient personalization, and the accuracy of response prediction is limited. This has led to the rise of data-driven marketing. Han et al. has confirmed that initial data integration can be achieved through customer relationship management (CRM) systems to improve customer satisfaction and increase potential customer conversion rates, but it is still relatively static records [2]. In recent years, AI-powered dynamic customer profiling has emerged as a core driver. By real-time integrating multi-source heterogeneous data—including transaction records, browsing traces, social interactions, and IoT device data—and continuously updating it via machine learning, AI constructs dynamic profiles that reflect consumers' real-time intentions, emotional inclinations, lifecycle stages, and even predict their future behaviors [3]. This portrait breaks through the traditional static label and lays the foundation for the accurate reach of "thousands of people and thousands of faces".

Existing studies indicate that AI promotes the evolution of precision marketing to intelligence and automation by improving data processing capabilities and model accuracy. In the future, the integration of generative AI and multi-modal data will become the core direction, and this paper needs to pay attention to the challenges of data privacy and algorithm fairness. Promote the responsible application of generative AI and balance personalization with potential misleading risks. Overall, the cross-platform integration and real-time decision-making capabilities of AI technology will further reconstruct the marketing value chain and achieve a leap from "precise reach" to "intelligent creation needs" [4].

2.2. Dynamic interaction mechanism of "technology-scenario-efficiency"

This study argues that within AI-driven precision marketing systems, a dynamic closed-loop interaction mechanism is constituted by "Technology-Scenario-Efficiency". Its core lies in the bidirectional transmission and iterative optimization of data flows and decision flows. This mechanism realizes the continuous upgrade of the marketing system through the spiral evolution of technology empowering scenarios, scene conversion efficiency, and efficiency feeding technology.

The technology layer supports scenario implementation through triple architecture, including data, algorithm, and application layers. The scenario layer transforms technical capabilities into specific marketing practices, using multi-modal data fusion and emotional computing for cross-domain demand mining. The performance layer drives system evolution through a multi-dimensional index system, quantifying the synergy effect of technology scenarios through direct and indirect value indicators. Real-time feedback of performance data drives dynamic tuning of algorithm parameters, guides scenario strategy reconstruction, and promotes continuous innovation of underlying technologies like privacy computing.

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The essence of this dynamic interaction lies in the symbiotic evolution of the three: the technology layer provides underlying support through data integration, algorithm innovation and application development, the scene layer realizes value transformation through user insight, precise reach and effect optimization, and the performance layer forms closed-loop feedback through indicator evaluation and dynamic optimization. Ultimately, this forms a positive cycle of "Technological Iteration — Scenario Innovation — Efficiency Enhancement — Technological Re-iteration".

3. Current status of application of artificial intelligence in precision marketing

3.1. Technical application scenarios

Technologically, the application of AI in precision marketing mainly relies on three pillars. First is big data analytics, which processes massive, high-dimensional, and real-time consumer data to serve as the "fuel" for AI models. Cao et al. noted that marketing analytics can extract previously unknown valuable insights and generate intelligence spanning the entire customer lifecycle [5]. Second, deep learning. Customer clustering is the core of precision marketing. Through deep learning, hidden patterns in nonlinear and high-dimensional behavior data can be mined to improve clustering accuracy, so as to realize "providing the right product to the right person at the right time [6]." Third, Generative AI (GenAI). This is the explosion point in recent years. Large language models (LLMs) such as GPT-like models and Claude can automatically generate highly personalized marketing copy, synthesize realistic image and video materials, conduct intelligent conversations, and even dynamically create product prototype concepts based on user preferences [7].

In terms of applications, AI-driven precise marketing has penetrated into multiple core scenarios: First, personalized recommendation systems. Artificial intelligence has achieved a transition from static labels to dynamic emotional computing in the fields of customer portraits and segmentation. Through multi-modal data analysis (such as social media behaviors, transaction records) with federated learning technology, cross-domain data is integrated on the premise of ensuring privacy and compliance, so that the granularity of customer portraits is deepened to psychological motivation and real-time scenario needs. Zhang et al. argued that RNN sequence analysis can predict user purchase intentions, and e-commerce recommendation systems have significantly improved the accuracy and diversity of recommendations through real-time behavior adjustment strategies [8]. Secondly, smart advertising. Analyze user behavior and preferences based on big data to accurately target target groups. At the same time, real-time dynamic optimization of delivery channels, time slots and bidding strategies, and automatic generation of personalized advertising materials, thus significantly improving advertising accuracy, conversion rate and ROI. Thirdly, customer behavior and value prediction: survival analysis model is used to predict customer churn risk, future purchase tendencies, and life cycle value, thereby achieving active intervention. Incremental learning and reinforcement learning technologies, such as those used in programmatic advertising bidding systems, can execute thousands of real-time decisions per second, drastically improving conversion efficiency. Incremental algorithms, which only require new data for model updates and reduce computational latency [9], are particularly suitable for industries like pharmaceuticals that demand rapid strategy adjustments [9].

AI applications in various industries vary due to demand characteristics. The pharmaceutical industry focuses on high compliance scenarios, builds doctor portraits through AI, dynamically optimizes academic conference invitation strategies, and improves ROI conversion rates [10]. Pharmaceuticals use AI for compliance, doctor portraits, and academic conference invitations.

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Manufacturing uses AI for cost reduction and overseas inquiry. Consumer goods use AI for emotional demand. E-commerce and tourism use AI for immersive interaction and increased user participation.

3.2. Technology application bottleneck

At present, the application of artificial intelligence technology in precision marketing has encountered three bottlenecks—data, resources, and ecology—seriously impeding the release of its efficiency and its in-depth development.

First, data silos and privacy compliance constitute primary obstacles. The EU General Data Protection Regulation (GDPR) requires data to be "available and invisible", which has kept the scope of cross-industry joint modeling at a low level, and it is difficult to fully realize data sharing and integration. Meanwhile, the application of AI technology in precision marketing also faces the risks brought about by technology abuse. In recent years, ethical issues such as deep forgery and biological information infringement have become increasingly prominent. Violation of AI products not only harms consumer rights, but also has a negative impact on the healthy development of the entire industry. Although federated learning can address data privacy issues through distributed training, non-IID (non-independent and identically distributed) data still undermines model performance.

At the resource level, small and medium-sized enterprises in developing countries generally face the predicament of low awareness and acceptance of AI technology, and the application penetration rate is not high [11]. Behind this is both technical threshold and cost pressure, which leads to small and medium-sized enterprises lack successful experience in AI marketing for reference, lack of confidence and thus reduce investment, which also reflects deeper resource constraints. Specifically, small and medium-sized enterprises lack compound talents with AI professional knowledge and skills, and the employee training system is incomplete, making it difficult to quickly improve their skills. Additionally, the costs of deploying and maintaining AI technology are high, exceeding the budgets of SMEs, which also lack sufficient government subsidies and financial support. For countries or regions with low overall development levels, weak technical infrastructure, such as insufficient network coverage, unstable data transmission, lack of high-performance computing equipment and storage facilities, also lead to many difficulties in AI application.

In addition, the fragmentation of AI tools and the lack of ecological coordination are seriously restricting their release of effectiveness. Many enterprises simultaneously use multiple single-point AI solutions at the same time, such as content generation tools and customer service robots, resulting in system splits and the efficiency of cross-channel analysis has significantly decreased. Although leading service providers have attempted to build a closed loop of "content-reach-operation" through APIs, the standardization of cross-platform protocols remains severely inadequate, and the coverage of full-link automation is still low. This fragmentation phenomenon not only increases the operating costs of the enterprise, but also hinders the collaborative work between AI tools, which cannot fully utilize the potential effectiveness of AI in precision marketing. This split state makes enterprises face huge challenges in integrating data, unifying strategies and optimizing processes, and it is difficult to achieve efficient and accurate marketing goals.

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4. Future development trends and challenges

4.1. The future evolution of precision marketing: technology integration and ecosystem reconstruction

Generative AI is expected to continue evolving towards a multi-modal fusion in precision marketing, enhancing the attractiveness and immersion of marketing content. This progress will enable more intelligent and accurate real-time adjustments, facilitating more personalized adaptation of marketing materials. Predictive marketing will focus on deepening cross-field collaboration and intelligent decision-making, breaking industry and data silos and integrating macroeconomic, social, cultural, industry, and consumer behavior data on multiple platforms and scenarios. This will enable a more accurate prediction model that can predict short-term consumer behavior and long-term group consumption trends. Forecasting marketing will be deeply integrated with enterprise decision-making systems, promoting precise marketing and driving in-depth changes in the future market competition landscape. Virtual marketing in the metaverse will be increasingly intertwined with the real economic system, forming a unique marketing ecosystem. Virtual goods or services purchased in the metaverse can be converted into physical goods or privileged experiences through specific technological mappings, while real-world consumption behaviors can unlock exclusive rights and identity symbols in the metaverse—thus enabling the mutual transformation of virtual and real consumption values. The OMO business model will move towards omni-channel intelligent integration and experience reshaping, integrating online and offline data in real-time, accurate, and in-depth. The formulation and implementation of marketing strategies will focus on consumers' real-time needs and scenarios, dynamically allocating resources to achieve accurate reach. Technologies such as AR and VR will help create immersive shopping experiences that integrate online and offline, improving consumers' shopping experiences and leading the intelligent transformation of the future business ecosystem [12].

4.2. Challenges and response strategies

To ensure the sustainable development of precision marketing technology, enterprises must establish a forward-looking governance system for ethical and compliance risks. This involves embedding ethical review mechanisms from the beginning of technology development, formulating technical ethical standards, and ensuring that technology always serves public interests and consumer rights. Enterprises should integrate ethics and compliance into corporate culture and strategic planning, ensuring transparency and traceability of data usage. To mitigate the risk of technological obsolescence, enterprises must implement cross-domain talent strategies and foster continuous innovation capabilities. They should also establish mechanisms for continuous innovation and encourage internal employees to explore new technologies. The key path for enterprise transformation lies in the construction and deepening of the private domain traffic ecosystem, which will become a consumer-centric full-life cycle value mining system. This ecosystem will enhance user stickiness, loyalty, and create a stable competitive foundation for enterprises in the era of precise marketing.

5. Conclusion

This article believes that artificial intelligence breaks through the limitations of traditional precision marketing through technical means such as dynamic customer portraits and multi-modal data fusion,

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establishing a dynamic closed-loop interaction mechanism of "Technology-Scenario-Efficiency" and promotes the continuous upgrading of the marketing system. At present, big data analysis, deep learning and generative AI have become the three technical pillars of precise marketing, and are widely used in scenarios such as personalized recommendations, intelligent advertising delivery and customer behavior prediction. Different industries have developed differentiated application models based on their unique characteristics. However, problems such as data islands, privacy compliance, resource restrictions and lack of ecological coordination have restricted the release and in-depth development of artificial intelligence in precise marketing. Looking to the future, generative AI will deepen to multi-modal integration, predictive marketing focuses on cross-domain collaboration and intelligent decision-making, meta-universe virtual marketing scenarios and real economic systems intertwined and integrated, and OMO business model moves to a new stage of omni-channel intelligent integration. Meanwhile, precision marketing needs to address challenges such as ethical compliance risks and technology obsolescence crises. Enterprises should build a forward-looking governance system, cultivate cross-field talents and continuous innovation capabilities, and deepen the value mining of the private domain traffic ecology.

To sum up, the future development trend of artificial intelligence in the field of precision marketing is full of potential and changes. The continuous evolution of technologies, the innovative integration of scenarios, and the challenges and response strategies faced by enterprises, jointly outline a grand blueprint for precision marketing to move towards an intelligent, ecological and forward-looking future. If an enterprise can keep up with the technological trend and actively respond to challenges, it will surely shine in the future precise marketing market, gaining the initiative and driving force for continuous growth.

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