

Application and Impact of Artificial Intelligence in Digital Marketing: Take TikTok as an Example

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Abstract: Nowadays, artificial intelligence is widely used in digital marketing. TikTok has a unique algorithmic recommendation system and large user base, making it a crucial case for studying AI's role in digital marketing. Throughout a case studies, this study explores how AI is applied in TikTok's digital marketing, aiming to understand its application effectiveness, limitations, and risks. The research finds that AI significantly improves TikTok's marketing effectiveness. Artificial intelligence enables precise targeting via personalized recommendations, offers new marketing ways through virtual influencers, enhances real - time interactions in live - streaming, and provides valuable insights through data analysis. However, there are also many drawbacks. Data privacy issues, like over - collection and misuse, and algorithmic bias, which limits content diversity. To address these problems, TikTok can implement a comprehensive privacy policy, incorporate diversity metrics into algorithms, and offer users more control over content recommendations. These measures can enhance user experience and platform sustainability.

1 INTRODUCTION

With the rapid development of digital technology, artificial intelligence (AI) is increasingly being used across a wide range of industries, especially in digital marketing. As one of the most popular social media platforms in the world, TikTok has become a new bridge for brands and customers to interact, with its unique algorithmic recommendation system and large user base. Besides, AI technologies play a crucial role in enhancing marketing campaigns by leveraging advanced algorithms to analyze vast amounts of user data, enabling personalized content recommendations, efficient ad targeting, and real-time performance optimization.

This study is dedicated to evaluate the application effectiveness of AI on TikTok and has two purposes. The first is to gain a comprehensive understanding of the use of AI in TikTok digital marketing. The second is to identify the limitations and risks associated with these applications. Through case studies, this essay will explore how AI is utilized for personalized recommendations, virtual influencer applications, live e-commerce, interactive enhancements, data analysis and trend prediction on TikTok. Furthermore, this study will identify limitations and

risks of AI marketing. The existing data privacy problems, algorithm deviations and other problems are analyzed, and corresponding improvement suggestions are put forward. Also, by analyzing current applications and their effectiveness, people can gain a deeper understanding of how brands are leveraging these technologies to achieve their marketing goals. In addition, exploring the unique ecosystem of TikTok can help address emerging challenges and pave the way for innovative solutions in digital marketing. While the existing literature extensively addresses the role of AI in digital marketing, but there are clear gaps in the detailed analysis of TikTok. For instance, one study highlights that AI significantly enhances customer engagement through personalized content and efficient ad targeting (Labudová, 2024), dresses the role of AI in digital marketing, but there are clear gaps in the detailed analysis of TikTok. Another relevant work emphasizes the importance of AI in analyzing user behavior and preferences (Duan, 2024). However, such studies often do not delve deeply into TikTok's distinct features and user dynamics.

The structure of this essay is follow: Firstly, this essay will discusses the current state of AI in digital marketing, with a focus on accurate user analytic, precise ad placement, and content generation and

optimization. Secondly, a case study about TikTok and a statement about the role of artificial intelligence in personalized recommendation system, virtual influencers, live streaming, and data analytics will be presented. Furthermore, this essay will explore possible risks, such as data privacy and algorithmic bias, and suggests improvements. Finally, this essay will summarize key findings and outline directions for future research.

2 THE APPLICATION STATUS OF ARTIFICIAL INTELLIGENCE IN DIGITAL MARKETING

2.1 Accurate User Profile Construction and Personalized Recommendations

In the era of digital marketing, accurate user analytic and personalized content recommendations are crucial for brands to achieve more precise targeting and improve advertising effectiveness. As the Internet continues to flourish, it has accumulated massive and diverse information data. These data not only cover users' past shopping records and detailed payment records, but also include precise information such as recipient addresses (Zhou & Zhao, 2024). With advanced algorithms and in-depth analysis capabilities, AI technology is able to dig deeper into the huge value latent in various data and information. Using artificial intelligence (AI), brands can analyze large data sets such as browsing history, purchasing behavior, interaction patterns, demographic information, and sentiment analysis, as machine learning algorithms identify patterns and correlations in these data points and categorize them into different categories based on user behavior and interests. This process helps brands pinpoint the core needs of their users and provides extremely important support for companies planning marketing campaigns. In terms of personalized recommendations, AI uses content-based collaborative filtering techniques to customize content and product recommendations. As a result, brands can accurately deliver personalized ads to specific user groups, optimizing user stickiness and conversion rates. In this way, enterprises can, on the one hand, effectively control marketing costs and avoid unnecessary waste of resources; on the other hand, they can also significantly improve the precision and relevance of their marketing campaigns, thereby dramatically increasing marketing effectiveness and realizing the efficient use

of resources and maximization of business value (Zhou & Zhao, 2024).

2.2 Precision Advertising Delivery

Artificial Intelligence and Big Data technologies are able to process massive amounts of data, optimize marketing decisions, reduce labor costs, and improve the accuracy of advertising, thus reducing marketing costs (Du, 2024). For example, AI tools can monitor ad effectiveness in real time and dynamically adjust ad strategies by selecting the best release times and delivery channels that match the target audience's activity times and interests. In addition, AI can also analyze key metrics such as ad serving size, click-through rate and conversion rate to detect ad serving problems early. If it is found that ads are ineffective during certain times of the day or on certain channels, AI will quickly and dynamically adjust ad serving parameters, such as ad content, ad serving frequency and ad budget allocation, based on predefined or machine-learning optimization strategies to ensure the best ad serving results. By delivering ads to users during their active periods and within their interests, AI increases the likelihood that users will engage with the ads. This will result in higher click-through rates, indicating greater user interest and engagement.

2.3 Content Generation and Optimization

AI also plays an important role in the content marketing space, with its ability to automatically create content and turn data into readable narratives through its natural language generation technology. This capability allows for the rapid production of personalized, relevant content, improving engagement and efficiency. In video production, tools like CapCut and the AI-driven automatic editing function in Adobe Premiere Pro can analyze video clips and suggest edits, effectively saving time and improving the overall quality. When it comes to image generation, platforms such as Midjourney are utilized, which held a 9.90% market share as of July 2023 (Labudová, 2024).

In the realm of written content, ChatGPT has emerged as a dominant tool, boasting a 75.20% usage rate among marketing and advertising professionals. Moreover, according to Labudová's (2024) research, 52.5% of professionals use AI for writing content and creative materials. Clearly, AI significantly enhances the efficiency and creativity in different aspects of content creation.

3 CASE STUDY: ARTIFICIAL INTELLIGENCE FOR DIGITAL MARKETING AT TIKTOK

3.1 Application of Personalized Recommendation System

Artificial Intelligence on TikTok influences users through personalized content recommendations to improve user experience and increase engagement. Furthermore, TikTok uses AI algorithms and large datasets to analyze user behavioral data such as likes, comments, and viewing times, as well as demographic information such as age and location. This provides detailed user profiles for personalized recommendations, helping brands and creators to accurately identify their target audience so they can effectively optimize their content and advertising. Besides, AI algorithms can not only provide personalized content based on users' interests and preferences, but also discover new content relevant to their interests, thereby improving TikTok's overall user experience. A large number of respondents appreciated TikTok's personalized content recommendation feature, which helps them discover new content that matches their tastes and interests and helps them stay engaged and entertained (Loke, 2023).

3.2 Virtual Influencer Applications

TikTok uses artificial intelligence to create virtual influencers that autonomously generate personalized images of AI influencers based on advertisers' scripts and marketers' needs, allowing virtual celebrities to connect with real celebrities and participate in short video sessions. This trend can increase interest in the content and make it more accessible to a wider audience. Furthermore, Virtual influencers can not only promote products without rest, but also eliminate the risk of negative news that real influencers may have, thus reducing marketing costs.

Meanwhile, virtual influencers have realistic characteristics, features and traits of humans. According to a 2022 study by The Influencer Marketing Factory, at least 58% of respondents follow at least one virtual influencer, and 35% have purchased a product promoted by a virtual influencer (Bringé, 2022). In addition, the number of virtual influencers in 2015 was nine, and by 2022, the number has exceeded 200. Virtual influencers offer greater control and lower expenses, but they lack authenticity and can have a negative impact on the

younger demographic (Cowan, 2022). Nevertheless, virtual influencers have a high level of engagement among young people, and their market value reached \$4.6 billion in 2022 and is expected to grow 26% by 2025. Brands such as Puma, Alibaba, and Samsung are already using virtual influencers to increase engagement with younger groups (Plazibat & Marunica, 2024).

3.3 AI Live Streaming and Interactive Enhancement

The trend of AI live streaming is on the rise in TikTok. AI-enabled web hosts are becoming an innovative feature. For instance, certain beauty brands on TikTok have deployed AI hosts to host makeup tutorials. These AI hosts, equipped with natural language processing capabilities, can smoothly follow pre-programmed scripts. Also, the AI is involved in real-time data-driven interactions. If a large number of viewers comment on a specific eyeshadow color, the AI anchor can immediately provide more relevant color demonstrations and how to apply them, thus providing viewers with a novel and engaging visual experience. Besides, in the context of TikTok's live-streaming, AI can promptly filter and review incoming barrages, effectively shielding illegal ones. By continuously updating its filtering mechanisms, AI ensures that users can enjoy a better experience and contributes to shaping a healthier cyberspace (Jiang, 2024).

What is more, AI also plays a crucial role in the TikTok live e-commerce space. Artificial intelligence-based smart customer service can instantly answer users' frequently asked questions. Taking the popular live streaming of electronic products as an example, AI-based customer service can quickly provide accurate data when users ask about the battery life of their smartphones. Additionally, an auto-respond system makes another AI-based feature that ensures user queries are not ignored during a live stream. For example, in a live clothing broadcast, if a user asks if a specific size of a dress is available, the auto-respond system can check inventory and respond in a timely manner, enhancing the user experience and promoting higher conversion rates during e-commerce.

Nowadays, numerous companies and news publishers are now piloting and implementing artificial intelligence (AI) technology within their management platforms. Instead of relying on human moderators to sift through individual comments, they are leveraging AI-driven technology. This is because AI has the capacity to efficiently handle a vast

number of platform comments, streamlining the moderation process and enhancing overall platform management (Jiang, 2024).

3.4 Data Analysis and Trend Prediction

In TikTok, data analytics are key to enhancing live AI broadcasts and interactions. By comprehensively analyzing user behavior data, content data, and social interaction data, TikTok mines valuable insights and gives creators the resources they need to thrive in the dynamic world of live content creation, while optimizing advertising strategies for maximum effectiveness.

In terms of user behavioral data, the platform tracks behaviors such as video viewing, liking, commenting and sharing. Patterns in these behaviors can reveal the genres of content that users are most interested in at any given time. For example, if there is a sudden spike in views and interactions on a dance-related video, TikTok can quickly identify dance as a trending topic. In this way, the platform can highlight currently popular challenges and topics to drive more user engagement.

Content data, including video tags, descriptions, and content categories, is equally important. Analyzing this data helps TikTok understand what types of content resonate with its audience. Creators have access to a range of tools and tips. Meanwhile, they can access detailed analytic reports on video performance, such as viewer retention at different time intervals in a video. This information can help creators adjust their content strategy. In addition, TikTok uses data to recommend creative inspiration and popular music to creators. If a certain music track has been used in a number of highly engaging videos, that music can be recommended to other creators to increase the appeal of their new content.

Social interaction data such as followers, follower lists, and group interactions can also be utilized. These data helps TikTok understand the influence of social networks in the platform. Based on these insights, the platform can push currently trending content or upcoming events with targeted ads. For example, if a large group of users in a particular network are interested in a fitness challenge, ads promoting a new fitness-related live event can be pinpointed to them to maximize the reach and impact of the event.

4 POTENTIAL RISKS OF CURRENT APPLICATIONS AND SUGGESTIONS

4.1 Data Privacy Issues

In order to provide more accurate user analytics and content recommendations through AI algorithms, TikTok can collect a large amount of data. These data will includes many factors such as direct marketing data as well as user location and device information. While the platform claims that this data is used to improve the user experience, there is a high risk of over-collection and possible misuse of data.

Besides that, AI algorithms also collect and aggregate data paths indirectly through tracking technologies, such as browsing history, time on page, and user interactions. Users are often passive in this process, unaware of what data is being collected and how it is being used, which highlights the hidden and opaque nature of data collection.

What is more, storage security also poses significant risks. Large amounts of user data are stored on servers. A security breach in the storage system could lead to a data breach. For example, hacking or internal employee misuse could compromise stored user data, putting personal information at risk (Wang, 2023).

4.2 Algorithmic Bias

TikTok's recommendation algorithm is based on historical user behavior data, which may bias recommendations. For example, if a user initially watches a large number of videos of a certain type or topic (e.g., pet videos) due to random factors, the algorithm may incorrectly assume that the user is only interested in that type of content. As a result, the algorithm will continue to recommend similar videos and ignore other content that the user may be interested in. Based on the user's past behavior, they have access to only a narrow range of information, thus limiting their exposure to a broader and more diverse range of content, creating a homogenized content ecosystem, and reducing the diversity and vibrancy of the community as a whole. Over time, these biases degrade the user experience and reduce platform engagement. Recognizing and understanding these algorithmic biases is critical to improving recommendation systems, increasing user satisfaction, and maintaining a healthy and vibrant platform ecosystem.

4.3 Suggestion

To address the issues of algorithmic bias and enhance user experience on TikTok, several measures can be implemented. Firstly, TikTok should develop a comprehensive data protection mechanism that standardizes data management processes, covering data collection, storage, usage, and transmission, because ensuring users' rights to be informed, choose, access, and delete their data is crucial. Besides, TikTok should set up clear penalties for illegal data acquisition and abuse, so as to effectively protect users' privacy and data rights.

Secondly, TikTok should incorporate diversity assessment metrics into the recommendation algorithm beyond just matching user historical behavior. For example, Diversity scores based on content categories, topics, and styles can be calculated by TIKTOK. This can ensure that recommendations maintain relevance while covering a broader range of topics, preventing over-concentration on similar content types. By doing this, the platform can offer more varied and engaging content to its users.

Thirdly, for new users or those with limited behavioral data, TikTok should use a restart recommendation strategy based on content features rather than relying solely on initial interactions. Besides, general video characteristics such as hot topics and popular elements can be leveraged by TikTok to provide users with diversified initial recommendations. This approach helps users discover a wider array of potentially interesting content, broadening their interest boundaries from the outset.

Moreover, TikTok can offer clear interest adjustment tools within the app interface, such as an "Interest Preferences" button. Users can actively add or remove content categories they are interested in, adjust the weight of existing interest tags, and directly communicate their desire for more diversified content to the algorithm. This feature empowers users to customize their content feed according to their evolving preferences, enhancing personalization and engagement. By implementing these suggestions, TikTok can mitigate algorithmic biases, enhance user satisfaction, and promote a healthier and more dynamic platform ecosystem. These measures not only improve the quality and variety of content recommendations but also ensure greater transparency and control for users over their data and preferences.

5 CONCLUSION

This study examines the use and impact of Artificial Intelligence (AI) in digital marketing, with a focus on TikTok. Through a detailed case study, this essay analyzes how TikTok uses AI for personalized recommendations, virtual influencer adoption, real-time e-commerce, interactive enhancement, data analytics, and trend forecasting. The results show that AI greatly improves marketing effectiveness in TikTok by enabling more precise targeting, increasing user engagement, and facilitating the creation of innovative content. Artificial intelligence-driven personalized recommendation systems leverage large amounts of user data to deliver personalized content and ads that maximize user engagement and conversion rates. The ability of online virtual celebrities to continuously promote without interruption provides brands with a new way to engage young people. In addition, AI-powered live streaming and customer service tools can enhance real-time interactions and provide users with accurate and timely information, thereby increasing user satisfaction and conversion rates. By analyzing data on user behavior, content, and social interactions, TikTok can identify trending topics and issues, providing creators with valuable insights and resources to help them succeed. These data-driven strategies not only enrich the user experience, but also help creators improve their content strategy, contributing to the overall success of the platform.

However, there are also some drawbacks to the current use of AI on TikTok. Data privacy issues are of great public concern, including problems such as excessive collection and potential misuse of user data. Users often remain unaware of the extent of data collection and usage, highlighting the opaque nature of these practices. Meanwhile, algorithmic bias poses a significant risk, where historical user behavior data may limit exposure to diverse content, which degrades the user experience. These risks pose a challenge to the sustainability of the platform.

To mitigate these risks, TikTok can employ a variety of strategies. These risks can be mitigated by implementing a comprehensive privacy policy, incorporating diversity metrics into its algorithms, providing content recommendations and features for new users, and offering interest matching tools. Through these measures, TikTok can ensure that users are given the right to know, the right to choose, the right to access and the right to delete data. At the same time, illegal access and misuse of data is greatly reduced to effectively protect user privacy. In addition, it avoids over-concentration of users on

similar content types, thus enhancing the diversity and richness of the platform's content ecosystem, and allowing new or data-scarce users to discover more diverse content. This also allows users to add or remove content categories, adjust existing interest tags, and express their desire for more diverse content directly to the algorithm.

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