

RESEARCH ON THE DIGITAL TRANSFORMATION PATH OF REGIONAL AGRICULTURAL PRODUCT PUBLIC BRANDS DRIVEN BY LARGE LANGUAGE MODELS

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Abstract: This study aims to explore the application of large language models (LLMs) in constructing the digital transformation path of regional public brands for agricultural products. Through a review of literature and theoretical analysis, the study systematically reveals the specific roles of LLMs in brand cognition, market promotion, product innovation, and user experience. The results indicate that LLMs not only enhance the precision and interactivity of brand communication but also improve the market competitiveness of brands through intelligent personalized services and product innovation. The conclusion suggests that the intelligent application of LLMs will become a vital trend in the digital development of regional public brands for agricultural products, providing specific practical recommendations for policymakers and brand managers.

Keywords: Large language models; Digital path; Regional public brand; Agricultural products; Brand communication; Intelligent application

1 INTRODUCTION

In the process of agricultural modernization and rural revitalization in China, regional public brands for agricultural products, as tools to integrate local resources and enhance market competitiveness, have attracted extensive attention from governments, agricultural enterprises, and researchers at various levels. Regional public brands not only serve as “business cards” for local specialty agricultural products but also play an essential role in promoting local economic development. By shaping and promoting the brand, they can increase the value-added of products and facilitate the extension and upgrading of the agricultural industry chain [1]. However, many regional public brands for agricultural products face a series of challenges in brand management and market promotion, including low brand recognition, traditional promotion methods, and insufficient consumer awareness. These issues limit both the market expansion capability and the potential for national and international development.

Amid the rapid development of the digital economy, the application of large language models has brought new opportunities for brand management. As an advanced natural language processing technology, LLMs can analyze and understand massive amounts of text data, providing intelligent solutions for brand communication, content creation, and consumer interaction. Specifically, LLMs can accurately identify and respond to consumer needs through precise data analysis and generate brand content that aligns with market trends, significantly enhancing the market visibility and promotion efficiency of regional public brands for agricultural products. Through intelligent brand content generation, automated marketing planning, and personalized consumer interaction, LLMs can significantly improve the digital level of regional public brands, achieving comprehensive optimization from brand creation to brand communication.

The primary objective of this study is to analyze the specific paths of LLMs in promoting the digital transformation of regional public brands for agricultural products, focusing on their application in improving brand awareness, optimizing market promotion, and enhancing user experience. The study suggests that applying LLMs in brand building can break through the limitations of traditional brand communication and achieve deep interaction between brands and consumers, thereby improving the brand’s market influence and user engagement. Additionally, the study aims to provide concrete policy recommendations and application strategies for government decision-makers and brand managers to promote the sustainable development of regional public brands for agricultural products.

In summary, exploring the role of LLMs in the digital transformation path of regional public brands for agricultural products not only holds significant theoretical value but also offers new perspectives and methods for practical brand management. This study aims to provide theoretical support and practical guidance for enhancing the competitiveness of Chinese agricultural brands in the global market, thus promoting high-quality agricultural development and the in-depth implementation of rural revitalization in China.

2 LITERATURE REVIEW

2.1 The Concept and Development of Regional Public Brands

Regional public brands refer to brands created under the leadership of the government or industry organizations within a specific region, aiming to integrate the region's superior agricultural products under a unified brand name for promotion [2]. This type of branding not only allows for concentrated resources in brand building but also enhances the market competitiveness of products, thereby promoting agricultural industry upgrades and rural economic development. In recent years, regional public brands have been widely applied across various regions in China, such as “Jingchu Premium Products” from Hubei, “Xiangpin Out of Xiang” from Hunan, and “Qilu Flavors” from Shandong. These

brands have played an active role in increasing market awareness and consumer recognition of local specialty agricultural products. However, challenges persist in the development of regional public brands, such as severe brand homogenization, limited promotional channels, and high brand maintenance costs. These challenges not only affect the market performance of the brands but also restrict their sustainable development.

2.2 Application of Large Language Models in Brand Management

As a major achievement in the field of natural language processing, large language models have been widely applied in brand management and marketing in recent years. Their strength lies in their ability to rapidly analyze and understand massive amounts of text data, providing intelligent support for brand communication, content creation, and user interaction [3]. For instance, LLMs can extract consumer preferences, needs, and pain points by analyzing text data such as consumer reviews and market feedback, offering precise decision-making insights for brand communication strategies. Additionally, in content creation, LLMs can generate advertising copy, social media posts, and other content that aligns with brand positioning and market demand, effectively improving brand communication efficiency and market responsiveness [4]. In terms of user interaction, LLMs can engage in personalized conversations with consumers through dialogue generation, thereby enhancing user experience and brand loyalty. Research indicates that consumer preferences vary significantly for health products, and LLMs can provide personalized brand recommendations based on the analysis of health-related textual data, thereby increasing loyalty [5].

2.3 Integration of Digital Technology and Agricultural Branding

The widespread application of digital technology has brought new opportunities for the construction and promotion of agricultural brands, including the use of big data analysis, artificial intelligence, and the Internet of Things (IoT) in agriculture. These technologies not only enable brands to achieve informatization and intelligence in product traceability, quality control, and market promotion but also enhance brand competitiveness through precise data analysis and real-time market monitoring [6]. Recent studies have shown that by integrating digital technology with agricultural branding, brands can quickly gain market awareness and achieve full-chain optimization from production to sales [7]. For example, using big data analysis, agricultural product brands can optimize product portfolios and market strategies by analyzing historical sales data and consumer feedback, thus achieving precise marketing. Moreover, the combination of AI and IoT technologies enables smart management throughout the entire process from field management to product sales, increasing the market responsiveness and service quality of brands. Research suggests that clear communication of health attributes positively influences consumers' choices of health products. In the promotion of regional public brands for agricultural products, LLMs can generate more persuasive content based on similar health-related studies, enhancing the appeal of the brand [8].

3 THEORETICAL ANALYSIS

3.1 Integration of Large Language Models and Brand Communication Theory

The natural language processing capabilities of large language models offer new application perspectives for brand communication theory. Brand communication theory emphasizes effective communication between the brand and consumers, which often requires extensive data analysis and accurate information transmission. As an advanced tool for text generation and understanding, LLMs can conduct real-time analysis of massive amounts of consumer data, thereby optimizing the brand communication pathway [9]. By analyzing data from social media content related to the brand, user evaluations, and market feedback, LLMs can extract core information about brand communication and capture consumer interests and preferences, generating high-quality brand copy and advertising content [10]. This intelligent communication approach improves the precision and interactivity of brand information and provides brand managers with a basis for optimizing communication strategies.

In practical applications, LLMs can create personalized content strategies for brand communication based on the characteristics of different consumer groups. For example, in promoting regional public brands for agricultural products, LLMs can generate targeted promotional content by analyzing factors such as users' geographic location, consumption habits, and product preferences, thus enhancing the effectiveness of brand communication. Additionally, LLMs can analyze the communication strategies of competing brands, identify market gaps, and develop differentiated communication plans to enhance the brand's market competitiveness.

3.2 Construction of the Digital Path Model

The application of LLMs in the digital transformation of regional public brands for agricultural products can be analyzed from four aspects: brand cognition, market promotion, product innovation, and user experience.

First, precise brand positioning. LLMs can perform semantic analysis on consumers' online behavior and market feedback, extracting key points of consumer attention and evaluation keywords to help brand managers accurately position the brand image [11]. Research shows that understanding consumers' individual differences through genetic analysis helps in developing personalized brand communication strategies. LLMs can generate brand content that aligns with consumers' physiological characteristics based on data analysis of consumers' health attributes, thereby enhancing

brand recognition [12]. For instance, by analyzing consumer feedback on the "Jingchu Premium Products" brand, LLMs can identify the most valued product features and brand values, guiding market positioning and communication strategies.

Second, intelligent optimization of market promotion. In market promotion, LLMs can automatically generate advertising copy and promotional content suitable for different market environments and target audiences. By analyzing real-time data from social media, e-commerce platforms, and other channels, LLMs can dynamically adjust brand communication strategies, achieving efficient transmission and broad coverage of brand information. For example, in promoting "Qianjiang Crayfish," LLMs can generate product copy and marketing plans that better meet market demand by analyzing consumer feedback on crayfish flavors, thereby increasing the brand's market appeal.

Third, intelligent guidance for product innovation. The application of LLMs in product innovation is mainly reflected in demand forecasting and creative product generation. By analyzing consumers' historical purchase records, feedback, and market data, LLMs can predict potential consumer demand for new products and offer suggestions for product improvement or innovation [13]. Meanwhile, LLMs can provide creative support for product naming, packaging design, etc., based on brand positioning and market trends, thereby enhancing the market competitiveness of products. Studies have indicated that consumers emphasize comparative analysis of treatment effects when choosing health services. In promoting health-oriented agricultural brands, LLMs can generate more persuasive product innovation plans based on similar comparative analyses, thereby improving the brand's market competitiveness [14].

Finally, personalized enhancement of user experience. User experience is a crucial factor for brand success, and LLMs play a key role in personalized services. By analyzing text data from consumer-brand interactions, LLMs can develop personalized communication strategies for brands, such as through intelligent customer service and personalized recommendations, enhancing users' brand experience and satisfaction. This personalized service based on consumer needs not only increases user loyalty to the brand but also strengthens the brand's long-term competitiveness in the market.

In summary, LLMs play a pivotal role in the digital transformation path of regional public brands for agricultural products, demonstrating advantages in precise brand cognition, intelligent market promotion, guided product innovation, and personalized user experience. By constructing a digital path model driven by LLMs, regional public brands can achieve more efficient communication and management in a competitive market. This intelligent brand management model not only aligns with the current development trend of the digital economy but also provides new pathways and insights for the sustainable development of Chinese agricultural brands.

4 CONCLUSION

The application of large language models provides new perspectives and methods for the digital development of regional public brands for agricultural products. By constructing a digital path driven by LLMs, regional public brands can accurately identify consumer needs and enhance market competitiveness through intelligent brand communication and personalized consumer services. Specifically, LLMs play significant roles in four key areas: brand cognition, market promotion, product innovation, and user experience.

First, in terms of brand cognition, LLMs analyze consumer behavior data to help brand managers accurately position brand images and generate more appealing brand content. This data-driven optimization of brand cognition not only improves the brand's visibility in the market but also strengthens consumer identification with the brand.

Second, in market promotion, the intelligent text generation and semantic analysis capabilities of LLMs enable brands to dynamically adjust communication strategies based on real-time data, enhancing the effectiveness of brand communication. Brands can utilize LLMs to generate personalized marketing content, achieving efficient interaction with target consumers and standing out in a competitive market.

Third, in product innovation, LLMs accurately predict potential consumer demand and provide creative product development suggestions by analyzing consumer feedback and market trends. This intelligent guidance in innovation not only enhances the market adaptability of products but also promotes the differentiated development of regional public brands.

Finally, in user experience, the personalized recommendation and intelligent customer service functions of LLMs allow brands to better meet consumers' individual needs, increasing user satisfaction and loyalty. This intelligent mode of user interaction not only strengthens the brand's market competitiveness but also fosters long-term relationships between the brand and consumers.

Based on the above analysis, it can be concluded that LLMs provide systematic support for constructing the digital transformation path of regional public brands for agricultural products. Their intelligent application will become an essential trend in future brand management and market promotion. For policymakers and brand managers, actively integrating LLMs and other digital technologies will help improve the market competitiveness and sustainability of regional public brands for agricultural products. Meanwhile, this study also provides directions for future research, such as exploring the comprehensive application of multimodal LLMs in brand building and analyzing the applicability of models across different regional brands.

Despite revealing the important roles of LLMs in regional public brands for agricultural products, this study has some limitations. First, there may be technical bottlenecks in practical applications, such as the accuracy of predicting the needs of segmented markets, which needs to be improved. Additionally, constructing the digital transformation path of brands should also consider the impact of external factors like regional economics and policy environments. Therefore,

future research should combine more empirical analyses and case studies to validate the practical effects of LLMs in brand management and propose more targeted optimization strategies.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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