Research on the Impact of Big Data Technology on Social Media Live Broadcast Marketing Ecology and Its Countermeasures

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Abstract. Due to the rapidly grow of big data technology and social media live broadcast, social media live broadcast marketing has emerged from the deep integration of the two. Based on the information ecology theory, this study constructs the big data technology throughout the entire social media live marketing ecological cycle system, takes an in-depth look at the positive impact on the application of big data technology in the social media live marketing ecological application and the problems and challenges through methods such as literature review, case study analysis, survey analysis method and other methods, explores how to improve the pattern and strategy of the social media live marketing countermeasures and recommendations. The results of this study will help to address how big data technologies can positively contribute to the strategy of social media live broadcast marketing, thereby providing an effective decision support basis for stakeholders in the social media live broadcast marketing ecosystem.

Keywords: Information ecology theory; Big data technology; Live marketing ecology; Application; Countermeasures and suggestions

1 Introduction

In recent years, with the development of big data technology and the price of data traffic civilian, marketing has created a new business model - social media live broadcast marketing. The use of big data technology in social media live streaming improves the user experience by understanding the user's behavioral data and recommending personalized live content for the user; the elements of the live streaming ecosystem are adjusted and enhanced through big data analysis and feedback; possible live streaming risks is identified through traffic prediction and risk monitoring to provide a healthy ecosystem for social media live streaming; it helps merchants, live broadcasting platforms, anchors and others to make more economically maximized business decisions by collecting and analyzing data[1]. Therefore, big data technology in the process of social media live marketing ecological application has very many positive impacts such as improving user experience, innovating live content, and enhancing business value, but at the same time, there are also many problems and challenges such as data quality, personal privacy, network security, and technical limitations. Through the literature review, Xing K scholar thinks that the utilization of big data technology in the marketing field is mainly the path innovation of marketing business model[2], and according to Sun L expert,

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the cross-border integration of different industries can be achieved through big data technology innovation[3]. However, there are few studies on the integration of big data technology and social media live marketing.

In summary, the article applies the information ecology theory and aims to collect and analyze materials by using research methods such as literature review method, case study method and survey analysis method; by analyzing the utilization of big data technology in social media live broadcast marketing ecology, it explores the positive influence of big data technologies on the social media live broadcast marketing ecosystem and the problems and challenges of using big data technologies in the social media live marketing ecosystem and proposes countermeasures and recommendations; it also provides more accurate and effective decision support for the governments, production enterprises, merchants, live broadcast platforms, anchors, etc. to use big data technology in social media live broadcast marketing ecology.

2 Concepts and theoretical foundations related to big data technology and social media live broadcast marketing

As an emerging sales model, social media live marketing is increasingly favoured by businesses because of its low cost, strong interaction, real-time delivery and high conversion rate. The social media live marketing ecosystem refers to the complete ecosystem from the upstream organizations of social media live (e.g. suppliers, service providers, etc.) to the core organizations (e.g. anchors, live streaming platforms, merchants, brands, MCN organizations, etc.) and then to the users (e.g. consumers, viewers, etc.) and other organizations. Social media live marketing is highly dependent on internet technology and big data technology. Facing with the increasing amount of valuable data material in the live marketing industry, data developers have developed data management techniques applicable to social media live marketing to enhance the business value of live marketing. Big data technology integrates various elements in the social media live marketing ecosystem, helps the social media live industry to fully optimize and develop in a benign way. **Fig. 1** demonstrates that big data technology runs through the entire social media live marketing ecosystem.

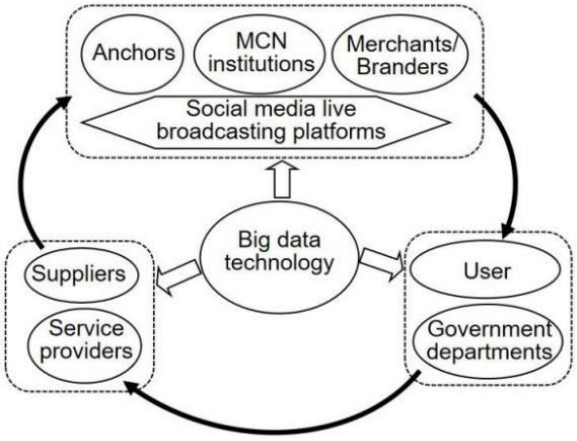

Fig. 1. Social media live broadcast marketing ecosystem

The theoretical basis for the use of big data technology in social media live marketing ecology is the information ecology theory. The information ecology theory sets the research object as 'people, information, information environment as a unified overall information ecosystem'. In the information ecosystem, people are the main body; information is the key factor and the basis of formation, the link and bridge between the information environment and people; the information environment is an artificial environment in which nature, society and technology are intertwined[4]. The use of information ecology theory can be properly understood: Big data technology as an external environment in the information environment, how big data technology can enhance the adaptability and virtuous cycle of the social media live marketing ecosystem, how to optimize the structure of the marketing ecosystem, and how to scientifically configure and arrange the elements in the marketing ecosystem. In the efficient operation of the social media live marketing ecosystem supported by big data technology to discover the positive impact of big data technology on the social media live marketing ecosystem and the existence of problems and prompt early warning, so as to optimize the relationship, behavior, process, etc. in the ecological cycle system of the social media live marketing and precise control. **Fig. 2** shows the theoretical model of the information ecology of social media live marketing.

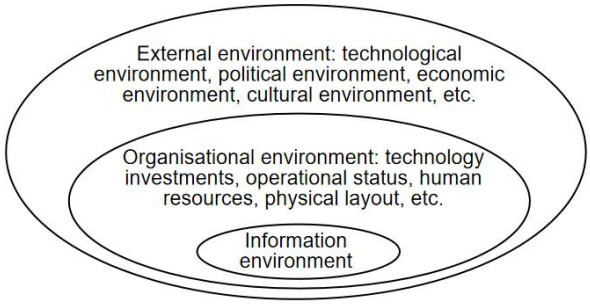

Fig. 2 The theoretical model of the information ecology of social media live marketing

3 The application of big data technology in the social media live broadcast marketing ecology

3.1 Data collection, data modelling and data analysis

The large amount of data generated in the social media live marketing ecosystem can be captured, modeled and analyzed using big data technologies. There are various methods of big data collection, and the commonly used methods are the application programming interface (API) collection method, cookie analysis technology, intelligent probe technology and so on. For e.g., data exchange with mainstream live broadcast platforms is carried out through API interfaces to collect data from live broadcast platforms. Data modelling is a process used to define and analyze live data requirements within a social media live marketing system in order to support live business processes. For instance, One Big Table (OBT) modelling can be used to provide visual representations for live streaming, ensure data quality, enable seamless data integration, and more. Social media live streaming data analysis usually includes product sales analysis, user behavior analysis, market development and competition trend analysis and so on.

Through the live platform data analysis, it can optimize the product mix marketing strategy, commodity recommendation promotion policy, operation tactics strategic decision-making, etc., so as to achieve the accuracy of live marketing content and enhance the efficiency of live marketing. For example, Taobao platform 'seller centre' sets up a 'data centre', merchants and anchors can grasp and analyze their own business situation and competitive strength ranking in real time, so as to promote the efficiency of live marketing.

3.2 Precision marketing through user identification and data contact technology

Through big data identification technology and marketing automation tools, the collected user behavior data is identified according to the data identification code system, which enables the analysis and classification of the participating users of the social media live broadcast. By describing and accumulating user behavioral data over a long term, users are accurately profiled so as to confirm their needs. The basis of user portraiture can be the personal information attribute characteristics, consumption tendency, consumption behavior and so on[5]. For instance, Taobao platform uses the K-mean clustering algorithm and the Euclidean distance formula to obtain target audience groups based on identifiable user identification codes; adopt trans-boundary cooperation, cross-border sales, real-time push and other big data marketing contact methods to push users' interested or concerned content to users, and carry out personalized and precise marketing, so as to increase the conversion rate, growth rate, profitability and competitiveness of social media live marketing.

3.3 Evaluation and feedback of live broadcast marketing effect

The results of analyzing the data from the live broadcasts through data analysis tools can objectively assess the live effect of social media marketing activities and feedback after the live broadcast, so as to optimize the live broadcast marketing strategy and live broadcast content, and to achieve high-speed growth of users and rapid enhancement of the commercial value of the live broadcast. For sample, Taobao businesses use 'shop detective' data tool to deeply dig into the source of live traffic, diversion effect, advertising, conversion effect, user behavior, seven-day perspective, reasons for hot style, competitors' sales trends, marketing activities, etc., identify the specific reasons for the conversion, traffic, turnover, etc., and make targeted adjustments and optimization of marketing measures. **Fig. 3** shows the application model of big data technology in the social media live broadcast marketing ecosystem.

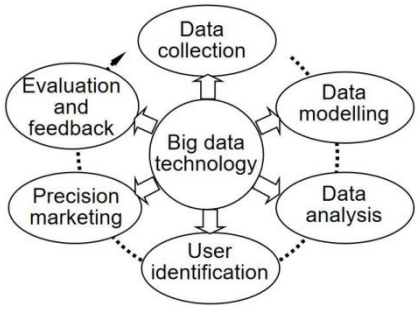

Fig. 3 The application model of big data technology in the social media live broadcast marketing ecosystem

4 The impact of big data technology on the social media live broadcast marketing ecology

4.1 The positive impact of big data technology on the social media live broadcast marketing ecology

(1) Enhancing the user experience

Through the innovation and development of big data technology, the lag phenomenon in social media live broadcast can be reduced, and the playback speed and stability of social media live broadcast can be improved; real-time interaction with the anchor in the live broadcast, such as pop-ups, questions, etc., can enhance the user's sense of experience and participation, and stimulate the user's perceived emotions and desire to buy. By choosing and training a professional live streaming team, the service level and professional ability of the team will be improved, the professionalism of the live streaming is increased and the user's live shopping experience is enhanced. By investigating the Taobao buyer experience, the live broadcasting platform adopts a well-designed interaction design and architecture of the live broadcasting system, well-designed live streaming interface and shopping navigation process, providing valuable live broadcasting content and a good user dynamic experience, so it can improve the user loyalty, conversion rate and merchant's return on investment.

(2) Promoting content innovation and diversification

At present, the content of social media live streaming is highly homogenized, with low levels of innovation, poor quality levels and single content. Big data technology-enabled social media live streaming can optimize content innovation strategies for sustainable live streaming. Through the survey, Taobao live broadcasting platforms take the form of content innovation and diversification strategies: diversify the sources of content ideas; establish a creative screening mechanism to select high-quality creative content; implement incentives to encourage active participation of team members; focus on the user experience, explore new forms of live broadcasting; enhance the user's sense of participation through the interactive sessions and so on.

(3) Increased business value and effectiveness

Big data technology applied to social media live broadcast can be used to optimize the business aspects of live broadcast through data models, data visualization, real-time data delivery and other functions, to further carry out business decision-making in live broadcast sessions, and to improve the business value and efficiency of enterprises. With the support of big data technology, intelligent decision-making in the marketing process is achieved through data mining and processing technology. Taobao platform stores increase the scale of sales and improve marketing efficiency and sales margins shops from the source merchants to purchase goods to save costs and through the selection of products to ensure product quality. Anchors show the advantages of their products in real time through live broadcasting, which can improve brand image, increase brand awareness and enhance brand reputation. Merchants and anchors are marketing through multiple platforms and channels such as Taobao, Douyin, Kuaishou, etc. to increase audience reach and business opportunities and expand sales channels.

4.2 Problems and Challenges of Using Big Data Technology in Social Media Live Marketing

(1) Live broadcast user data privacy and security challenges

It is available to detect and collect various behaviors of users. In order to gain a competitive advantage, various types of social media live streaming can obtain directly from their own data platforms and external big data platforms to buy user's data, meanwhile, these users' data privacy is at risk of being compromised, increasing potential crises and security issues[6]. For example, the website can be accessed without authorization, hacker attacks on the data system, improper implementation of operations by operators or managers of the data platform, security loopholes caused by imperfect data authentication or encryption measures, misuse of data, and unsound laws and regulations on data security, and so on. In particular, once a user's sensitive information is leaked, it may cause widespread dissemination and deep mining of data, leading to the commission of criminal acts by unscrupulous persons and causing harm to the user's credibility, physical health, property and so on.

(2) Limitations of the incorporation of big data technologies and social media live broadcast

The huge amount of data collected may have quality issues due to missing, incorrect or inconsistent data, thus affecting the accuracy of the results of the live data analyses. Algorithmic bias and misdirection in the execution of data mining and processing by big data technologies leads to difficulties in interpreting and understanding the true meaning of the data, and hence making wrong live marketing decisions. Both big data technology and live broadcasting require specialized technical knowledge and skills, and personnel with only knowledge of big data technology or live broadcasting are no longer adapted to the requirements of the position, which raises the requirements for the comprehensive ability of employees. Due to the existence of a huge amount of big data, diverse types, fast access speed, scattered sources and other characteristics, to achieve the deep integration of big data technology and social media live marketing, it is necessary to invest a large amount of human capital and resource costs in data collection, storage, processing and correlation analysis.

(3) Live-streaming market environment and competition

As for the social media live broadcast market environment, the policies, regulations and industry standards of the live broadcast industry are not perfect enough, and frequent violations by anchors and live broadcast platforms have had a negative impact on the live streaming industry and inhibited the rapid development of the live broadcast market. At present, the lower anchor access threshold, difficult content regulation, a single live revenue model, more hidden network security and so on live market environment is in urgent need of improvement. Competitive aspects of the live streaming market, one aspect is that the competition in the live streaming industry has intensified because of the deepening penetration of big data technology in the live broadcast industry and the entry of a wider range of players; another aspect, in order to satisfy the demands of the users, major live broadcast platforms continue to optimize and improve in terms of user resources, business scope, high-quality content, technological innovation and so on, in order to alleviate the pressure of survival and enhance their own level of competition[7].

5 Countermeasures and recommendations

5.1 Strengthening capacity for data governance and protecting users' privacy

The widespread use of big data technology in live broadcast has brought unprecedented challenges such as data leakage, infringement of personal privacy, data security, malicious attacks, etc., while promoting the growth of the live broadcast industry. Therefore, for the purpose of achieving live data-driven marketing decisions and optimizing live business operations and preventing live operation risks, data needs to be effectively controlled and managed through policies, processes, technologies, organizations and usage. At the technical level, live streaming websites can improve data security and protect privacy through big data technologies such as data encryption, anonymization, access control, data backup and recovery. For data collection and use, the principles of minimization, legal compliance and transparency are followed. In terms of staff management and training, the security awareness and data security handling capabilities of staff are enhanced through the implementation of internal control mechanisms and regular security training.

5.2 Enhancing the fairness and transparency of data results and strengthening technology development and application

For the bias in the results of data analyses, the reason may be the limitations in the design of the algorithm, the quality of the data, the quantity of the data, and so on. To ensure the fairness of the data results, measures such as data pre-processing, diversification of data algorithm design, and multi-channel data collection can be taken to eliminate data bias, so that live broadcast decision makers can make correct marketing strategies and decisions. Due to the black box and complex nature of big data systems, there is a lack of transparency in live marketing decisions made through data analysis. To improve the transparency of live marketing decisions with big data technologies, it can be done by reviewing and overseeing measures to optimize the design of algorithms, normalize and standardize decision-making processes, develop big data models and raise the level of technical processing of big data.

5.3 Promoting the integration of technology and human culture and innovating live marketing models and strategies

Social media live marketing uses augmented and virtual reality data processing technology to enhance the user's immersive experience through the in-depth integration of product marketing with traditional culture and customs, enhance the close integration of live broadcasting technology and humanities, show the mission and social responsibility of merchants and anchors, and innovate personalized marketing models and strategies[8]. Through big data intelligent technology, live marketing is able to realize multiple forms of cooperation across fields, such as live broadcasting + agricultural products, live broadcasting + tourism, live broadcasting + medical treatment, etc., to expand the field of live broadcast marketing and the scope of dissemination. For example, Douyin influencer ‘Crazy Little Yang' with ‘native love, Yan'an soul' as the cultural essence of the agricultural products live in Yan'an, China, to achieve the local characteristics of agricultural products of the brand premium, to open up the new generation of local brands, and smooth the new channels of social media live marketing.

6 Conclusions

Through the research, using literature review, case studies and survey research, this paper analyzed the development of big data technologies and social media live marketing, designed a social media live marketing ecological model with the help of information ecology theory, and clarified the positive influence of big data technology in the social media live marketing ecosystem in terms of enhancing the user experience, promoting the innovation and diversification of content, and increasing the commercial value and benefits; pointed out the problems and challenges in data privacy and security, technology-based level and live market environment and competition, and provided countermeasures and suggestions to strengthen the rational application of big data in live broadcast by strengthening data governance and utilization capabilities, enhancing the fairness and transparency of data algorithms, facilitating the integration of technology and human culture, and innovating live broadcast marketing models and strategies. The results of the study showed that big data technology is deeply and closely integrated with all aspects of social media live marketing, which not only provides a channel for the rapid development of social media live marketing, but also provides a direction the better application of future big data technology in the field of live broadcasting. The findings of this essay will serve to provide theoretical support and practical paving the way for future research into the practice of big data technologies influencing the social media live broadcast marketing ecosystem.

References

[1] Liu, L., Aremu, E.O., Yoo, D.: Brand Marketing Strategy of Live Streaming in Mobile Era: A Case Study of Tmall Platform. Journal of East Asia Management. Vol 1, Issue 1, pp. 65-87 (2020)

[2] Xing K.: Research on the Optimization Path of E-commerce Marketing under the Background of Big Data. Trade Fair Economy. Issue 5, pp. 63-66 (2024)

[3] Sun, L.: Research on Key Technologies of Crossover Big Data Fusion Model. Software. Vol 43, Issue 03, pp. 17-19 (2022)

[4] Wang, P.: Connecting the Parts with the Whole: Toward an Information Ecology Theory of Digital Innovation Ecosystems. MIS Quarterly. Vol 45, Issue 1, pp. 397 (2021)

[5] Wang, J.: The Application of Big Data Technology in the Precision Marketing of Featured Agricultural Products. New Technology & New Products of China. Issue 5, pp. 137-139 (2024)

[6] An, L.: Database and Data Mining. China Fortune Publishing Co. China. pp. 124-140 (2019)

[7] Jiwat R., Di, X.: Live Streaming Video E-commerce: Examining the Operational Strategies. Journal Européen Des Systèmes Automatisés, Vol 52, Issue 1, pp. 1 (2019)

[8] Qi, D., Gao, G.: Research on How Online Live Streaming Empowers the Protection, Inheritance and Innovative Development of Intangible Cultural Heritage. Price:Theory & Practice. Issue 12, pp. 194-197+211 (2023)