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Construction of Communication Effect Indicator System for Short Video Native Advertisement: Based on Information Ecology Perspective

Chen Dongsheng[1,a,*], Lu Zhaoyu[1,b]

[1]*Faculty of Letters and Journalism and Communication, Chengdu University, Chengdu, Sichuan China*
[a]*578915183@qq.com*, [b]*1262280975@qq.com*
**corresponding author*

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Abstract: With the innovation of digital intelligence technology, the evolution of market demand and the optimisation of policy environment, short video native advertisement has shown rapid development, and the scientific evaluation of its communication effect has become the focus of the industry. This study aims to build a systematic communication effect evaluation system for short video native advertisement, and to solve the problem of the lack of existing evaluation tools for short video native advertisement. Based on the framework of information ecology theory, this paper adopts the hierarchical analysis method (AHP) to construct a hierarchical model containing 4 first-level indicators (exposure, awareness, interaction, loyalty) and 12 second-level indicators, establishes a judgement matrix through the Delphi expert consultation method, and uses SPSSPRO tools for data processing and consistency testing. The index system provides the industry with an evaluation tool with both theoretical depth and practical operation, which not only expands the application boundary of information ecology theory, but also provides methodological support for advertisers to optimise advertisement content and regulators to establish evaluation standards. It is suggested that subsequent studies can combine the index system with empirical research, and make necessary adjustments and optimisation to the evaluation system according to the empirical results.

1. Introduction

In the digital era, short videos have become an important channel for Internet users to get news and information, to have leisure and entertainment, and to have social interactions. According to the 54th Statistical Report on Internet Development in China released by China Internet Network Information Centre (CNNIC), as of June 2024, the number of Chinese netizens reached 1.1 billion, of which the number of short video users has continued to grow to more than 1 billion, accounting for 95.5%, and it is the main application for netizens to 'touch the Internet'. Application. Native advertising refers to advertisements whose content style is consistent with the page, whose design is

embedded in the page, and which are consistent with the user's behavioural habits of the original page [1]. The innate advantages of short video in new media communication and marketing promotion have driven the growth of native advertisement exposure. After a long period of development, short video native advertisement has become a brand new form of advertisement, and has shown an extremely considerable market effectiveness [2].

The prosperous practice of the industry has pushed short video native advertisement into the research vision of scholars. The current research on short video native advertisement pays more attention to the profit model, marketing strategy, communication strategy and regulatory mechanism issues. For example, from the perspective of industry practice reflection to explore the development path [3]; Starting from the aspect of the dissemination characteristics of short video advertisements, the regulatory path of short video advertisements will be elaborated [4]; On the communication characteristics and laws of short video native advertisements, exploring the influence mechanism of user behaviours [5]; and research on the relationship between the transparency of native ads and ad effects [6]. Many research results have provided intellectual support for promoting the industry practice of short video native advertisement and expanding the theoretical boundaries of advertising in the digital era. However, how to effectively use digital intelligence technology to improve the accuracy of native advertising content distribution? The solution to this problem requires scientific and systematic measurement indexes as support. Therefore it is necessary to conduct research on the index system of short video native advertisement distribution effect based on the existing results.

At present, scholars have conducted research on the influence and dissemination effect of short videos. However, there are relatively few relevant research results to evaluate the communication effect of short video native advertisement. In view of this, this study is based on the perspective of information ecology theory and uses the hierarchical analysis method (AHP), aiming to provide a set of targeted and operational communication effect evaluation tools for short video native advertisements, which can help assist advertisers, platforms, and content creators in scientifically evaluating the effectiveness of advertisements and optimising the content production and placement strategies.

The purpose and significance of this paper. First, to build a communication effect evaluation system for short video native advertisement. This study aims to systematically sort out the characteristics and operation mechanism of short video native advertisement communication in the era of digital intelligence, and design a set of comprehensive, scientific and practical short video influence evaluation system. Secondly, it provides a basis for the optimisation of short video content ecology. This study will provide an objective, quantitative and systematic evaluation tool to enable them to identify their own strengths and shortcomings, and provide references for their content strategy adjustment, user strategy optimisation, business model innovation and other decisions. Third, it will promote the improvement and standardisation of evaluation standards in the short video advertising industry. This study is expected to promote the further improvement and standardisation of evaluation standards, and provide valuable references for relevant policy making, industry supervision, academic research and public supervision.

2. Literature Review

2.1. Short video native advertisement

With the deep integration of mobile Internet technology and short video platforms, the evaluation of the communication effect of short video native advertisement has gradually become a research hotspot in the cross field of advertising and communication. Existing studies can be divided into the following three categories according to the core topics: the first type of research focuses on the technology-driven and content innovation of short video native advertisement, and its core viewpoint

is that the combination of technological upgrading and creative design is the key to improving communication efficiency. This type of research can be subdivided into two representative paths: one emphasises the direct effect of technological empowerment, for example, the enhancement of user immersion through AR/VR technology in the 5G era [7], or using algorithms to shorten the advertising conversion chain [8]; another advocates the cultural appropriateness of content creativity, such as the deep fusion of traditional cultural symbols and brand narrative in the case of 'Li Ziqi'[9]. The two types of studies reveal a basic consensus that technology is a means to an end, while user value perception is the end. The second category of research revolves around user engagement and behavioural driving mechanisms, attempting to parse the key variables that influence ad acceptance. This type of research further diverges into two theoretical orientations: one is a quantitative analysis based on the UTAUT model, which verifies the positive effect of interaction motivation and ad quality on engagement [10]; Secondly, from the scene theory, we propose the moderating effect of user experience on decision-making in fragmented contexts [11]. Although the two types of orientations have different methods, they both point to the same logic: user behaviour is the ultimate test of technology application and content creativity. The third category of research focuses on the construction of advertising transparency and regulatory frameworks, and its core contradiction lies in the tension between technological innovation and ethical constraints. Some scholars have shown that highly transparent advertisements can indirectly enhance the effect by improving user trust; other studies expose the risk of false propaganda caused by algorithmic invisibility and call for collaborative governance by multiple parties [12]. The contribution of such studies is to complement the neglect of the ethical dimension in the first two categories. All in all, the established studies provide support for the construction of the indicator system from strategy optimisation, behavioural analysis to ethical norms, but the lack of multidimensional integration limits its explanatory power.

2.2. Information Ecology Theory

With the deep penetration of digital society, information ecology theory provides an explanatory framework for understanding the complex relationship between people, technology and environment. In recent years, existing research results have focused on two main topics. One is the theoretical paradigm debate. It mainly focuses on the weight of elements and interaction logic of information ecosystem. One viewpoint advocates 'environmental decision', which believes that the constraints of the information environment can shape the information flow pattern [13]; Another viewpoint emphasises 'technology empowerment', pointing out that information technology becomes the core variable in the evolution of information systems by reconstructing the logic of information production and distribution [14]. Although the two types of views have different focuses, they jointly suggest the important value of structure and function in the information ecosystem. The other group is committed to building a bridge between theory and practice. For example, the information ecosystem theory is used to explain the adoption motivation of group purchase information of mobile network community users [15], as well as analysing the amount of characteristics and behavioural laws of online public opinion in the new media environment [16] et al. In conclusion, the information ecology theory has formed a relatively well-grounded and scenario-rich knowledge map, which provides an applicable theoretical tool for this study.

3. Short Video Native Advertisement Communication Effect Indicator System Construction

3.1. Indicator Selection Basis

Given that the current indicator system for the communication effect of short video native advertisements has not been systematically constructed, this study integrates the relevant research

results of the existing short video communication evaluation system, combines the communication characteristics of short video native advertisements, and constructs a set of indicator system applicable to the communication effect of short video native advertisements in the digital era. This study follows the principles of purposefulness, systematicity, comprehensiveness and operability to ensure that the evaluation system can accurately reflect the characteristics of short video native advertisements as well as provide practical references for practical operation. Specifically, based on the theoretical framework of information ecology, this study establishes four core dimensions, namely, 'Degree of Contact', 'Degree of Recognition', 'Degree of Interaction', and 'Degree of Loyalty'. The study establishes four core dimensions, forming a multi-dimensional linkage evaluation index system.

3.1.1. Degree of Contact

The contact degree mainly measures the degree of users' exposure to short video native advertisements, which is the basic premise for the advertisement information to reach the users, and also the basic condition for the subsequent communication effect. This dimension reflects the exposure intensity and coverage of the ad content in the target audience. Its core indicators include: (1) Fan Scale: the total number of cumulative attention users of the advertisement account; (2) Information Density: the number of compliant advertisement videos released by the account during the evaluation cycle; (3) Frequency of Exposure: the number of systematic Willingness to Recommends of the advertisement content per unit of time.

3.1.2. Degree of Recognition

Cognitive degree characterises the degree of users' recognition and memory of the subject and content of the advertisement, and as an antecedent variable for attitude formation, it can have a subsequent impact on users' subsequent viewing and purchasing behaviours. The core indicators of recognition include: (1) Quality Cognition: users' comprehensive evaluation of the production level and credibility of the advertisement content; (2) Functional Cognition: users' accurate recognition of the advertisement's communication objectives, such as brand publicity, product promotion, etc.; and (3) Brand Association: the strength of the association between the advertisement content and the promotional subject in the users' mind.

3.1.3. Degree of Interaction

The interaction degree reflects the level of immediate interaction between users and advertisement content, reflecting the depth of advertisement content dissemination and the intensity of user participation. A high degree of interaction not only reflects the degree of user recognition of the video content, but also indicates that the account subject has a high degree of participation and stickiness. In this paper, the number of likes, comments and retweets are used as indicators to measure the degree of interaction. (1) Likes: the total number of likes received by the account subject posting short video native advertisements during the evaluation period; (2) Comments: the total number of comments and messages received by the account subject posting short video native advertisements during the evaluation period; (3) Retweets: the total number of shares and forwards received by the account subject posting short video native advertisements.

3.1.4. Degree of Loyalty

Loyalty characterises users' tendency to pay continuous attention to the advertisement subject and behavioural stickiness, reflecting the long-term communication effect. This paper mainly measures it through two dimensions. (1) Willingness to Recommend: the strength of users' subjective willingness

to recommend advertisement content or products to others; (2) Willingness to Use: the frequency of users' behaviours to keep the account attention status and actively return to it; (3) Content Expectation: the degree of users' active search and viewing expectation for newly released short video native advertisements.

3.2. Indicator System Construction

The hierarchical analysis method (AHP) carries out quantitative assessment by systematically decomposing the decision-making problem into a multilevel structure from the general objective to the subobjectives of each level, the evaluation criteria, and up to the specific alternatives, and by using the method of solving the eigenvectors of the judgement matrix. This method combines the advantages of qualitative and quantitative analyses, and is well suited for dealing with complex evaluation problems characterised by multi-dimensionality and non-uniform quantiles. In the case of this paper, it specifically includes four steps: constructing a hierarchical model, constructing a judgement matrix, consistency testing and calculating weights and ranking. In terms of data processing, this study uses the SPSSPRO analysis tool to unify the collected data.

3.2.1. Constructing the Hierarchical Structure Model

As mentioned earlier, when constructing the communication effect hierarchy model of short video native advertisement, this study combines the existing evaluation index system and the characteristics of short video native advertisement in the digital era, and selects evaluation indexes from the four dimensions of Degree of Contact, Degree of Recognition, Degree of Interaction, and Degree of Loyalty, based on which it forms the evaluation hierarchy model of communication effect of short video native advertisement. The details are shown in Figure 1.

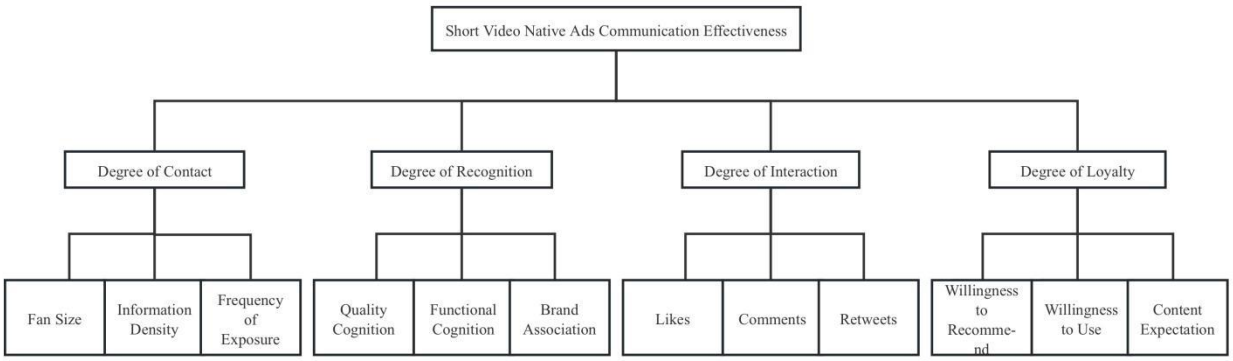

Figure 1: Hierarchical Model for Evaluating the Communication Effect of Short Video Native Advertisements.

3.2.2. Constructing the Judgement Matrix

In determining the composition of the evaluation team, this for the study takes into account the feasibility of practical operation and scientific rigour, and assesses the relative weights of the indicators at the same level. In view of this, this study selected professionals from related fields, such as scholars of journalism and communication, teachers in the field of short video creation, short video operators, industry experts, and in-depth users of short videos, to form an evaluation team, aiming to provide a comprehensive analytical perspective for the evaluation of the communication effects of short video native advertisements by means of their professional insights and accumulated experience.

After the formation of the expert team, this study constructed a systematic judgement matrix based on the '1-9 scale method' to quantify the relative importance of each evaluation index. This process

can transform the experts' opinions into quantifiable data, which lays a solid foundation for the subsequent data analysis. Its assignment criteria are shown in Table 1.

Table 1: Criteria for the Assignment of Values on the '1-9 Scale'.

Scale	Meaning
aij=1	Element i is as important as element j
aij=3	Element i is slightly more important than element j
aij=5	Element i is more important than element j
aij=7	Element i is more important than element j
aij=9	Element i is more important than element j

3.2.3. Calculation of Indicator Weights and Consistency Test

The five review experts all belong to the state of independent scoring and evaluation. Each of them has the same analysis process. The final weight results of each indicator are shown in Table 2, and the consistency test results are shown in Table 3.

Table 2: AHP Hierarchical Analysis Results.

Item	Eigenvector	Weighted Value (%)	Maximum Characteristic Root	CI Value
Degree of Contact	1.88	47.003	4.021	0.007
Degree of Recognition	0.662	16.554		
Degree of Interaction	0.729	18.221		
Degree of Loyalty	0.729	18.221		

Table 3: Consistency Test Results.

Maximum Characteristic Root	CI Value	RI Value	CR Value	Results
4.021	0.007	0.882	0.008	pass

According to the short video native advertisement communication effect level 1 index weights, it can be found that the weight order of the 4 level 1 indexes is from largest to smallest: degree of contact, degree of interaction, degree of loyalty, and degree of recognition. In the consistency test matrix, CR=0.008< 0.1, the consistency test of the judgement matrix is passed.

Table 4: Single-level Weighting of Degree of Contact

Item	Eigenvector	Weighted Value (%)	Maximum Characteristic Root	CI Value
Fans Size	0.589	19.621	3.003	0.001
Information Density	1.238	41.276		
Frequency of Exposure	1.173	39.103		

Table 5: Consistency Test Results

Maximum Characteristic Root	CI Value	RI Value	CR Value	Results
3.003	0.001	0.525	0.003	pass

According to the table of the weights of the secondary indicators under the first level indicator of short video native advertisement 'degree of contact' shown in Table 4, we can find that the weights of the two secondary indicators are: information density, frequency of exposure and fan size in

descending order. In the consistency test shown in Table 5, CR=0.003< 0.1, the consistency test of the judgement matrix is passed.

Table 6: Single-level Weighting of Degree of Recognition

Item	Eigenvector	Weighted Value (%)	Maximum Characteristic Root	CI Value
Quality Recognition	1.769	58.96	3.009	0.005
Functional Recognition	0.586	19.54		
Brand Association	0.645	21.501		

Table 7: Consistency Test Results

Maximum Characteristic Root	CI Value	RI Value	CR Value	Results
3.003	0.001	0.525	0.003	pass

According to the table of the weights of the secondary indicators under the primary indicator 'degree of recognition' of short video native advertisement shown in Table 6, we can find that the weights of the two secondary indicators are: quality recognition, brand association, and functional recognition in descending order. In the consistency test shown in Table 7, CR=0.005< 0.1, the consistency test of the judgement matrix is passed.

Table 8: Single-level Weighting of Degree of Interaction

Item	Eigenvector	Weighted Value (%)	Maximum Characteristic Root	CI Value
Likes	1.978	65.943	3.039	0.019
Comments	0.814	27.134		
Retweets	0.208	6.923		

Table 9: Consistency Test Results

Maximum Characteristic Root	CI Value	RI Value	CR Value	Results
3.039	0.019	0.525	0.037	pass

According to the table of the weights of the secondary indicators under the first level indicator of short video native advertisement 'degree of interaction' shown in Table 8, it can be found that the weights of the three secondary indicators are: likes, comments, and retweets, in descending order. In this matrix shown in Table 9, CR=0.037< 0.1, the consistency test of the matrix is passed.

Table 10: Single-level Weighting of Degree of Loyalty

Item	Eigenvector	Weighted Value (%)	Maximum Characteristic Root	CI Value
Willingness to Recommend	1.201	40.043	3.002	0.001
Willingness to Use	0.919	30.645		
Content Expectation	0.879	29.312		

Table 11: Consistency Test Results

Maximum Characteristic Root	CI Value	RI Value	CR Value	Results
3.002	0.001	0.525	0.002	pass

According to the table of the weights of the secondary indicators under the first-level indicator of short video native advertisement dissemination effect 'degree of loyalty' shown in Table 10, it can be found that the weights of the two secondary indicators are in descending order: Willingness to Recommend, Willingness to use, and content expectation. In this matrix shown in Table 11, CR=0.002< 0.1, the consistency test of the matrix is passed.

By multiplying the weights of the primary and secondary indicators, the overall weights of the indicators in the short video native advertisement communication effect evaluation index system are obtained, and the specific results are shown in Table 12.

Table 12: Table of Weight Coefficients of Short Video Native Advertisement Communication Effect Evaluation Index System

Target Level	Normative Layer	Weights ω i①	Programme Layer	Weights ω i②	Total Weights ω ①*②
Video Active Advertising Communication Effect Evaluation Index System	Degree of Contact	47.003%	Fans Size	19.621%	9.222%
			Information Density	41.276%	19.401%
			Frequency of Exposure	39.103%	18.380%
	Degree of Recognition	16.554%	Quality Recognition	58.96%	9.760%
			Functional Recognition	19.54%	3.235%
			Brand Association	21.501%	3.559%
	Degree of Interaction	18.221%	Likes	65.943%	12.015%
			Comments	27.134%	4.944%
			Retweets	6.923%	1.261%
	Degree of Loyalty	18.221%	Willingness to Recommend	40.043%	7.296%
			Willingness to Use	30.645%	5.584%
			Content Expectation	29.312%	5.341%

4. Conclusion

With the in-depth evolution of digital technology, short video has leapfrogged into an important carrier of advertising communication, and the construction of its effect evaluation system is not only an important proposition for the theoretical innovation of communication and advertising, but also an important way to optimize the content ecology of the advertising industry. Based on the rich research results, combined with the information ecology theoretical framework, and considering the communication characteristics of short video native advertisements, this paper innovatively constructs a four-dimensional evaluation model of short video native advertisements' communication effects, namely, Degree of Contact, Degree of Recognition, Degree of Interaction, and Degree of Loyalty, which enriches the research on short video native advertisements. At the methodological level, this study follows the path of hierarchical analysis, firstly constructing a structural hierarchical model containing the target layer, criterion layer and programme layer; then constructing a judgement matrix through the Delphi expert consulting method, and passing the consistency test to ensure the logical rigour; and finally processing and analysing the collected data using the SPSSPRO analytical tool, in order to further improve the accuracy and reliability of the evaluation system.

The theoretical value of this study lies in enriching the study of communication effect and constructing an evaluation system of short video native advertisement with adaptability; the practical level provides a quantifiable diagnostic tool for the platform operator, which provides a powerful

support in formulating communication strategy, optimising content production, and enhancing user experience. It should be noted that the current study mainly focuses on the theoretical model construction, but has not yet been empirically tested. The practical application value and effect of the evaluation system still need to be further verified and improved through empirical data. Therefore, future research can further verify the scientific and practicality of the evaluation system through empirical testing, and make necessary adjustments and optimisations to the evaluation system based on the empirical results, which will help to improve the accuracy and scientificity of the evaluation system.

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