International Journal for Housing Science and Its Applications
Publish August 10, 2025. Volume 46, Issue 4 Pages 7926-7938

https://doi.org/10.70517/ijhsa464680

Bayesian Network-Driven Dual Path Optimization Strategy for the International Dissemination of Micro-Short Dramas

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Abstract The article first explores the influencing factors of the international spread of micro-brief plays using the DEMATEL-ISM integrated model, calculates the centrality and causality of each influencing factor, and identifies the key influencing factors and their associations, and carries out a hierarchical structural analysis of each influencing factor. Establish the Bayesian model of international communication of micro-broadcasts, and inverse the most general causal chain of international communication of micro-broadcasts. The key influencing factors of the international communication effect of micro short dramas are: platform authority, perceived usefulness, subject plurality, presentation structure, attitude tendency, and the direct influencing factors are: content complexity, presentation structure, topic involvement, timeliness. Platform authority→subject influence→platform access→perceived credibility→topic involvement is the most general causal chain of the international communication effect of micro short drama.

Index Terms dematel-ism model, bayesian networks, influencing factors, international communication

I. Introduction

In the context of the booming development of new media, micro short drama is gradually emerging as an emerging form of film and television [1], [2]. Micro short dramas usually refer to small dramas with a short duration of a single episode, a compact plot, and a relatively short production cycle [3], [4]. Its rise is attributed to the development of new media platforms and the increase of audience's fragmented time [5]. With the popularization of mobile Internet, people's entertainment has changed dramatically, and micro short dramas, with their convenience and immediacy, not only satisfy the audience's need for quick access to exciting content, but also burst into strong development vitality in international communication as well, presenting great advantages [6]-[9].

In international communication, mobile digital platforms are more flexible, which enables micro-short dramas to gain greater development opportunities in overseas markets, and micro-short dramas can be created in terms of content and form according to local conditions [10]-[12]. Compared with traditional TV dramas, micro-short dramas have the advantages of user base and utilization rate, controllable costs, rapid adaptability of culture and market, and relatively relaxed regulatory and policy environments, which together bring about the upgrading of communication capabilities, the most typical representative of which is Douyin, the international version of Douyin short video, which has set off a global short video craze [13]-[16]. However, in order for micro-short dramas to continue to be recognized by the international community, it is necessary to optimize their communication strategies, and the key is to focus on producing subtle and subtle and beautiful works with the collaboration of the government, platforms, and creators, and regard them as the path of long-term development [17]-[20].

Literature [21] describes the birth and uniqueness of “micro-drama”, pointing out that the narrative characteristics of micro-drama are closely related to the short video platform, and show a trend of weakening the environment and focusing on the characters in terms of narrative objects. Literature [22] investigates the popularity of online culture in China, systematically introduces cool dramas, points out that most Chinese people have an optimistic attitude towards cool dramas, and emphasizes the possible negative impacts of cool dramas, including over-reliance on virtual fantasies and a decline in the ability to think independently, etc., and proposes countermeasures. Literature [23] introduces the booming trend of Chinese micro-short dramas, and points out that there are deficiencies in the quality of episodes, policy regulation, and depth of content, and puts forward development strategies such as branding and quality building of micro-short dramas, aiming to promote the healthy development of China's micro-short drama industry. Literature [24] explains that micro drama has become a new position for cross-cultural communication between China and foreign countries, and takes “My Billionaire Husband's Double Life” as the research object, and discusses the reasons for the success of “hegemonic short drama” through the analysis of its emotional construction, mood creation and other dimensions. Literature [25] examines the international

communication of Chinese excellent traditional culture by taking the micro short drama “Escape from the British Museum” as an example, and points out that the intuition, emotional resonance and wide audience base of short videos make them have significant advantages in cross-cultural communication. Literature [26] reveals the development of micro short drama and its influence, and emphasizes its serious problems such as shallow themes, repetitive plots and similar characters, which restrict its healthy development, indicating that these problems need to be solved in order to promote the benign development of the micro short drama industry in the new media environment. Literature [27] investigated the characteristics and potential influence of micro drama consumption behavior of youth groups, pointed out that the gender difference of youth groups has a more obvious influence on the consumption behavior of micro dramas, mainly due to the needs of this group in the areas of entertainment, relaxation, etc., and put forward suggestions for the sustainable development of micro dramas and the healthy growth of youth. Literature [28] points out that, as a new media form with great development potential, microshorts dramas bear an important responsibility in the field of inheriting and innovating China's excellent traditional culture, and by combining microshorts dramas with excellent culture, it is conducive to the dissemination of culture and the enhancement of cultural self-confidence. Literature [29] takes “Escape from the British Museum” as the research object, and examines the exploration of effective empathetic communication strategies through short videos in the context of cultural integration, and the results point out that short videos can overcome cultural barriers and realize the purpose of disseminating excellent traditional culture through ingenious narrative techniques and emotional stimulation. Literature [30] introduced the advantages of micro-short dramas, constructed an analysis model of factors influencing the international communication effect of online micro-dramas based on data mining, verified the validity of the model, and pointed out that factors such as cultural attributes, content originality, and user experience play an important role in international communication. Literature [31] specifies the many advantages of current Chinese online micro short dramas and emphasizes that they face challenges such as insufficient content innovation and serious homogenization, based on which it proposes strategies such as strengthening policy guidance and supervision, enhancing creators' quality and sense of responsibility, and strengthening audience education and guidance. Literature [32] considers the necessity of designing a new optimization method for cross-cultural communication operation and management of traditional culture short videos, and verifies that the coefficient of comprehensive communication operation and management of short videos based on this method is high, and its optimization effect is good, reliable and has certain application value. The above study affirms the current development trend of micro short drama in China, emphasizes the advantages over traditional film and television, and points out that there are problems such as low content quality, poor originality, and serious homogenization, which impede the sustainable development of this industry, and also indicates the role of micro short drama in the dissemination of excellent culture.

In this paper, the DEMATEL-ISM model is used as a research method to analyze the influencing factors of the international dissemination effect of micro short dramas. The screened influencing factors are calculated, and the key factors affecting the international communication effect of micro short plays are obtained by analyzing the center degree and cause degree of the influencing factors of the international communication effect of micro short plays. Then, each influencing factor is divided into layers and a multi-layer recursive explanatory structure model is established to get the direct influencing factors of the international communication effect of micro-brief plays. Based on the reference of Bayesian network model, the Bayesian model of international communication of micro-brief plays is constructed, and network inference is carried out to explore the most general causal chain of the international communication effect of micro-brief plays. Finally, the optimization path of “going to sea” is proposed for the international dissemination of short micro-drama.

II. DEMATEL-ISM integration model

II. A.DEMATEL-ISM research methodology

The Decision Making Experimentation and Evaluation Laboratory Method (DEMATEL) was originally developed by the Geneva Research Center of the Battelle Memorial Institute between 1972 and 1976 as a system analysis method using graph theory and matrix tools [33], which can be used to analyze the causality and correlation between dimensions in complex management problems in order to solve them efficiently. The DEMATEL method is based on a structural analysis and is designed to assess the degree of interrelationships and influences between elements in complex systems. By analyzing the logical relationships between elements and determining the degree of influence and the degree of being influenced by each element, it reveals the system structure, assesses the importance of the elements, diagnoses the problems, supports decision-making, and provides guidance for the identification of solutions, and is a powerful tool in both academic research and practical applications. The DEMATEL method of analysis has been widely used in a variety of fields.

ISM is a qualitative analysis method [34], which aims to reveal the structural relationships between elements in complex systems, especially causal, hierarchical and dependency relationships. After that, ISM model is widely used in various fields. The essence of ISM model is to make complex systems simple and reveal the causal, hierarchical and dependency relationships within the system through hierarchical structure. The basic idea of ISM method is to determine the causal relationship between the elements in the system by comparing them two by two and then construct a hierarchical structure model of the system, which helps people to deeper understanding of the internal mechanisms of complex systems and provide effective tools and methods for system management and optimization.

The DEMATEL-ISM integration approach has significant advantages over the use of both DEMATEL and ISM approaches alone [35]. First, the integrated DEMATEL-ISM method can overcome the limitation that the DEMATEL method can only provide causality but lacks hierarchy, and at the same time make up for the lack of quantification of the degree of influence in the ISM method, so as to make a more comprehensive and in-depth analysis of the system structure. Second, by integrating DEMATEL and ISM methods, key elements and relationships in the system can be identified more effectively, providing a more reliable basis for problem diagnosis and solution identification. In addition, the integrated DEMATEL-ISM approach combines the discovery of causal relationships by the DEMATEL method and the modeling of system structure by the ISM method, making the analysis results more accurate and credible.

II. B.Model solving steps

The DEMATEL-ISM steps and process are shown in Figure 1.

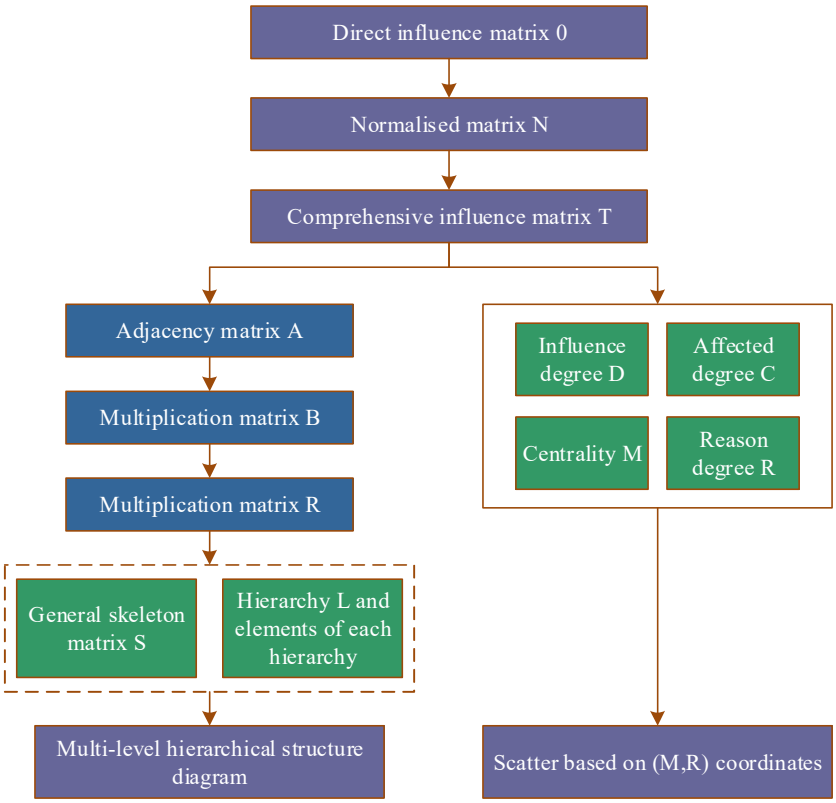

Figure 1: DEMATEL-ISM process

(1) Determining the degree of direct influence between elements

Suppose a total of n elements are sorted out from a system, which is denoted as $S1, S2, \ldots, Sn$. If feature Si has a direct impact on feature Sj, draw an arrow pointing to S_j from S_i, the direction of the arrow indicates the direction of influence, and the arrow in the figure is marked with an integer of 1 to 3 to indicate the strength of the relationship between the features, where "strong" is marked with 3, "medium" is marked with 2, and "weak" is marked with 1.

(2) Constructing a direct influence matrix

The influence relationship between factors is expressed in the form of a matrix. For a system involving n factor, the direct influence relationship between factors can be described by a n-order matrix X, where s_{ij} is the data on the line between factors S_i and S_j in the directed graph, i.e., factor S_i has a direct influence on factor S_j. If there is no connection between elements S_i and S_j, then $s_{ij}=0$. Since the factors do not have to be compared with themselves, the values on the diagonal of the matrix are 0. i.e:

$$X=\begin{bmatrix} 0 & s_{12} & \cdots & s_{1n} \\ s_{21} & 0 & \cdots & s_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ s_{n1} & s_{n2} & \cdots & 0 \end{bmatrix} \tag{1}$$

where Factor $sij\left(i=1,2,3\ldots n;j=1,2,3\ldots,n,i\neq j\right)$ indicates the extent to which Factor si directly influences sj. If $i-j$, then $sij=0$.

(3) Calculate the normalized direct influence matrix

The direct influence matrix is normalized by Eq. (2) to obtain the normalized direct influence matrix $G(G=[gij]n\times n)$:

$$G=\frac{1}{\max\sum_{j=1}^{n}s_{ij}} \tag{2}$$

(4) Determination of the Integrated Impact Matrix

The Integrated Impact Matrix $T=[tij]n\times n$, which represents the combined sum of the interactions between the factors, shows the extent to which the factors in the system directly and indirectly influence each other, and is calculated using the following formula:

$$T=\left(G+G^2+G^3+\cdots\right)=\left(I-G\right)^{-1} \quad \left(Where\ I\ is\ the\ nth\ order\ unit\ matrix\right) \tag{3}$$

(5) Calculate the four degrees of influence

That is, the degree of influence and the degree of being influenced for each element, and the degree of centrality and the degree of cause for each element. The degree of influence indicates the degree to which an element influences other elements, while the degree of being influenced indicates the degree to which an element is influenced by other elements, which can be calculated by summing the rows and columns of the integrated influence matrix. The centrality metric is used to measure the importance of an element in the overall system, and the causality metric is used to measure the degree to which an element influences the overall system. A cause degree greater than zero is called a cause element, and a cause degree less than zero is called a result element. The formulas for Influence fi, Influenced ei, Centrality mi and Causality ni for Element $si(i=1,2,n)$ are shown below:

$$f_i=\sum_{j=1}^{n}t_{ij},i=1,2,\ldots n \tag{4}$$

$$e_i=\sum_{j=1}^{n}t_{ji},i=1,2,\ldots n \tag{5}$$

$$m_i=f_i+e_i \tag{6}$$

$$n_i=f_i-e_i \tag{7}$$

A two-dimensional scatter plot with coordinates of $\{m_i,n_i\}$ is called a causal diagram, and complex causal relationships are transformed into obvious and understandable structural diagrams by drawing causal diagrams.

(6) Calculate the overall impact matrix H

The overall influence matrix $H\left(H=[h_{ij}]n\times n\right)$ is calculated by equation (7):

$$H = T + I, (Where\ I\ is\ an\ n\text{-}order\ unit\ matrix) \tag{8}$$

(7) Establishing the reachability matrix M

Given a threshold λ, the reachability matrix $(M = [m_{ij}]n \times n)$ can be calculated from the overall impact matrix H:

$$m_{ij} = \begin{cases} 1, h_{ij} \geq \lambda\ (i, j = 1, 2, \cdots n) \\ 0, h_{ij} < \lambda\ (i, j = 1, 2, \cdots n) \end{cases} \tag{9}$$

Thresholds are set to filter out the most important or significant influence paths in the system, simplify the system structure, and thus help analysts understand the structure and function of the system more clearly. Threshold λ is generally based on expert experience and expert opinion based on the actual situation of many times to take the value of the analysis and determine, follow the principle of moderate node degree.

(8) Define reachable set R, prior set P and common set C:

$R(S_i) = \{S_j \in S \mid m_{ij} = 1\}$, from the directed graph, i.e., the set of nodes that can go to from node S_i.

$P(S_i) = \{S_j \in S \mid m_{ji} = 1\}$, from the directed graph, i.e., the set of nodes from which all nodes S_i can be reached;

$C(S_i) = \{S_j \in S \mid R(S_i) \cap P(S_i) = R(S_i)\}$.

(9) If $R(S_i) \cap P(S_i) = R(S_i)$, then S_i belongs to the first level of elements and the rows and columns in which the element is located are crossed out in the reachable matrix M.

(10) Repeat steps (8) and (9) to obtain the next level of elements until all elements are graded and all elements in reachable matrix M are crossed out.

(11) According to the step (10), the transposed reachable matrix M' can be obtained, and the recursive structural model of the system is plotted accordingly.

III. Analysis of key influencing factors

III. A. Analysis of calculation results

In this paper, we have sorted out 11 influencing factors of the international communication of micro short dramas, which are subject influence (X1), subject diversity (X2), perceived credibility (X3), content complexity (X4), presentation structure (X5), timeliness (X6), platform authority (X7), platform access (X8), attitudinal tendency (X9), topic involvement (X10), perceived usefulness (X11), and identified the key influencing factors of the international communication of micro short dramas with the help of DEMATEL method.), the key influencing factors of the international communication effect of micro short drama are identified with the help of DEMATEL method.

Table 1: Calculation results

Factor	Di	Rank	Ci	Rank	Mi	Rank	Ri	Rank
X1	4.532	3	3.222	8	7.754	8	1.310	2
X2	4.108	5	4.564	3	8.672	4	-0.456	9
X3	4.311	4	2.594	11	6.905	9	1.717	1
X4	3.898	10	2.663	10	6.561	11	1.235	4
X5	4.051	6	4.871	2	8.922	2	-0.820	10
X6	3.753	11	3.135	9	6.888	10	0.618	5
X7	4.840	1	3.537	7	8.377	5	1.303	3
X8	3.956	7	3.976	5	7.932	6	-0.020	8
X9	3.931	8	5.181	1	9.112	1	-1.250	11
X10	3.924	9	3.851	6	7.775	7	0.073	7
X11	4.590	2	4.330	4	8.920	3	0.260	6

Firstly, the initial influence matrix A is constructed, secondly, the standardized direct influence matrix B is generated, and then the comprehensive influence matrix T is constructed. After calculating the comprehensive influence matrix T, the degree of influence Di and the degree of influenced Ci are obtained by summing up the elements of each row and column of matrix T. From the degree of influence Di and the degree of influenced Ci, we can find out the centrality degree Mi and the reason degree Ri, which are calculated by the formulas, respectively. Mi=Di+Ci and Ri=Di-Ci, the influence degree, influenced degree, center degree and reason degree of each

influencing factor are summarized in the form of a table, and their respective rankings are calculated, the results are shown in Table 1.

According to the ranking of the 11 influencing factors in Table 1, based on the quadrant determination method with the center degree and cause degree as the horizontal and vertical coordinates, respectively, the center degree-cause degree relationship of each influencing factor is plotted as shown in Figure 2. Among them, the internal auxiliary line consists of x = 7.983, y = 0 two lines, 7.983 is the average of the center degree value of each factor. The centrality-causality relationship diagram can visualize the intensity and criticality of the role of each factor on the international communication effect of micro short drama through four quadrants.

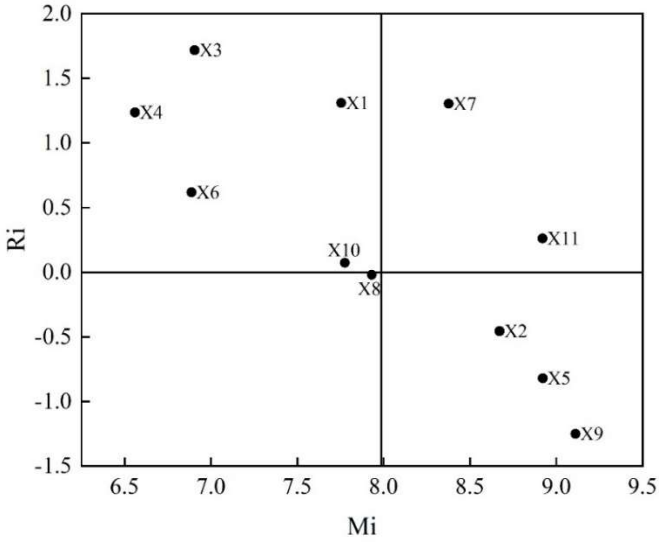

Figure 2: Center degree-reason degree relationship of influencing factors

III. B. Centrality analysis

The magnitude of the centrality value reflects the degree of direct influence of each influencing factor on the effect of online disinformation disinformation. From Table 1 and Figure 2, it can be seen that attitude tendency (X9) has the greatest degree of direct influence, followed by presentation structure (X5), perceived usefulness (X11), subject plurality (X2), and platform authority (X7). Analyzing the degree of influence of the top five factors ranked by centrality, Table 1 shows that the degree of influence of four factors, namely, attitudinal tendency (X9), presentation structure (X5), subject plurality (X2), and perceived usefulness (X11), are ranked the first, the second, the third, and the fourth, respectively, and that the degree of influence of platform authority (X7) is ranked the seventh. Since the value of the degree of influence reflects the strength of the influencing factors to be influenced by other factors, it can be seen from the ranking of the value of the degree of influence that the four factors of attitudinal tendency (X9), presentational structure (X5), subject plurality (X2), and perceived usefulness (X11) are easy to be influenced by other factors, while the platform authority (X7) is relatively stable and not easy to be influenced by other factors.

III. C. Causality analysis

In Table 1 and Figure 2, factors with positive cause degree value of 0 as the dividing line are categorized as cause factors, and factors with negative cause degree value are categorized as result factors. It can be seen that the cause factors are Subject Influence (X1), Perceived Credibility (X3), Content Complexity (X4), Timeliness (X6), Platform Authority (X7), Topic Involvement (X10), and Perceived Usefulness (X11), and the effect factors are Subject Plurality (X2), Presentation Structure (X5), Platform Visits (X8), and Attitude Tendency (X9). The top three cause factors are perceived credibility (X3), subject influence (X1) and platform authority (X7), of which platform authority (X7) ranks first in terms of influence, and the magnitude of the influence value reflects the degree of influence of this factor on other factors in the process of dissemination, and thus other factors are susceptible to the influence of the platform authority factor, and it can be seen that platform authority (X7) is the strong cause factor. Among the outcome factors, attitude tendency (X9), presentation structure (X5) and subject plurality (X2) are ranked as the first, second and third respectively, indicating that these three outcome factors are more likely to be influenced by other factors than other outcome factors.

III. D. Key Influencing Factor Identification and Correlation Analysis

The factors influencing the international dissemination effect of micro short dramas are categorized into four groups: strong cause factor set, weak cause factor set, weak result factor set and strong result factor set. In Figure 2, the factors in the first quadrant are strong causal factors, namely platform authority (X7) and perceived usefulness (X11), which have higher values of centrality and causality, and not only have a higher degree of direct influence on the communication effect, but also play a stronger role in other influencing factors, so that they are regarded as the key influencing factors of the international communication effect of micro short dramas. The factors in the second quadrant are weak causal factors, which are subject influence (X1), perceived credibility (X3), content complexity (X4), timeliness (X6), and topic involvement (X10), which are relatively backward in terms of centrality and have a lower degree of correlation with the other factors, and therefore are not regarded as key factors. The factors in the third quadrant are the weak outcome factor set, Platform Visits (X8), which have a low degree of centrality and cause, and a low degree of association with other factors, so they are also not considered as key factors. The factors in the fourth quadrant are strong outcome factor sets, which are subject plurality (X2), presentation structure (X5), and attitudinal tendency (X9), which have a stronger role in influencing the communication effect and are easily affected by other factors, and are also the key factors influencing the effect of international communication of the microshort dramas.

Based on the above analysis of the centrality and causality of each influencing factor, the following key influencing factors are finally obtained, which are platform authority (X7), perceived usefulness (X11), subject plurality (X2), presentation structure (X5), and attitude tendency (X9).

IV. Analysis of the hierarchy of influencing factors

In order to further determine the hierarchical relationship between the influencing factors, the reachability matrix K is calculated as shown in Table 2. According to the reachable matrix K obtained from the above analysis, the ISM method is used to divide the influencing factors of the international communication effect of the micro short drama into levels, and establish a multilayered recursive explanatory structure model as shown in Figure 3.

As can be seen in Figure 3, the structure of the influence factors of the international communication effect of micro short plays is more complex, showing a 5-level distribution, including 1 essential influence factor, 6 transitional influence factors and 4 superficial influence factors, and the specific results are as follows:

(1) Platform authority (X7) is located in the 5th level, which is the lowest level of influencing factor on the international dissemination effect of microshorts. From the structure of hierarchical division, this factor can only send out directional arrows but cannot receive directional arrows, so this factor profoundly influences the rest of the influencing factors and is regarded as an essential influencing factor.

(2) Subject influence (X1) is located at level 4, subject plurality (X2), platform access (X8), and perceived usefulness (X11) are located at level 3, and perceived trustworthiness (X3), and attitudinal disposition (X9) are located at level 2. These influencing factors are influenced by the essential influencing factors, and at the same time influence the surface influencing factors, and there is a more complex hierarchical relationship of roles between the factors, so these influencing factors are regarded as transitional influencing factors.

(3) Content complexity (X4), presentation structure (X5), topic involvement (X10), and timeliness (X6) are located at level 1. As surface level influencing factors, these 4 factors are the direct influencing factors of the international communication effect of micro short drama.

Table 2: Reachability matrix K of influencing factors

X	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11
X1	1	1	0	1	0	1	1	0	0	1	1
X2	0	0	1	0	1	1	1	0	1	1	1
X3	0	1	0	1	0	1	1	0	1	1	0
X4	1	0	0	0	0	0	0	1	1	1	1
X5	1	0	0	1	1	1	0	0	0	0	1
X6	1	0	0	0	0	1	0	1	1	1	0
X7	0	0	1	0	0	0	1	1	1	0	1
X8	1	1	1	1	1	0	0	0	1	1	0
X9	0	0	1	0	1	1	1	0	0	0	0
X10	0	1	1	1	0	1	0	0	1	0	1
X11	1	0	0	1	0	1	1	0	1	1	0

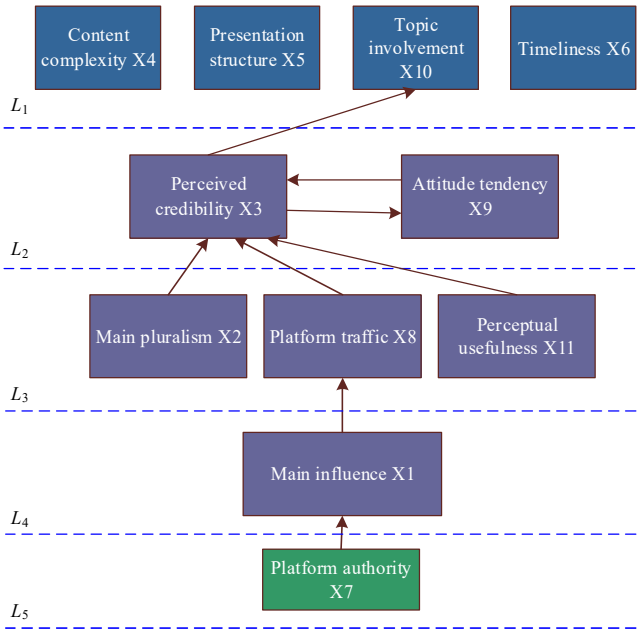

Figure 3: Hierarchical division diagram of influencing factors

V. Bayesian networks

Bayesian network is an extension of Bayesian method [36], which is a combination of probability and graph theory, a graph that can visually describe causal or dependency relationships between things, and is theoretically based on probability for network inference.

Bayesian network contains the model structure and related parameters, is a directed acyclic graph. The directed arcs indicate the dependencies between variables, and the arrows point from cause to effect. Each node of a Bayesian network is accompanied by a probability distribution, and the probability of other nodes can be inferred through calculation, mainly based on the Bayesian formula:

$$P(y \mid x) = P(x \mid y)P(y) / P(x) \tag{10}$$

where $P(x)$, $P(y)$ are the probabilities of occurrence of events x and y respectively, denoted as the a priori probabilities of event x and event y, and $P(x \mid y)$, $P(y \mid x)$ refer to the probabilities of occurrence of event x on the premise of occurrence of event y and the probabilities of occurrence of event y on the premise of occurrence of event x, denoted as the a posteriori probabilities of event x and event y respectively. Its joint probability $P(x, y)$ of x and y can be calculated by the a posteriori probabilities $P(y \mid x)$ and $P(x \mid y)$, which are given by the formula:

$$P(x, y) = P(y \mid x)P(x) = P(x \mid y)P(y) \tag{11}$$

Bayesian networks are very classical graphical models used to describe uncertain causal relationships between variables, in the constructed graphical model, where the nodes represent random variables, the variables are discrete and continuous, usually the continuous variables are converted to discrete variables so that they can be applied to the Bayesian network model, and through parameter learning, so that each node has its own probability distribution. If there is a directed edge between node A and node B and the arrow points from A to B, then A is the parent node of B and B is the child node of A. If a node does not have a parent node, then the node is the root node, which represents the marginal distribution of the variable in the root node, and the conditional probability distribution in the non-root node. Qualitatively, the Bayesian network describes the dependence between variables by constructing directed arcs, and quantitatively, conditional probability distributions are used to portray the degree of dependence of the variables, assuming that the network variables in the nodes are $X_1, X_2, \ldots, X_n$ respectively, the joint distribution is obtained as:

$$P(X_1, X_2, \ldots, X_n) = \sum_{i=1}^{n} P(X_i \mid \pi(X_i)) \tag{12}$$

where $\pi(X_i)$ is the set of parent nodes of variable X_i.

Learning through Bayesian network and then constructing the model structure and adjusting the parameters is the key to constructing the Bayesian network model according to the actual problem, which is mainly composed of two parts, structure learning and parameter learning, structure learning is to fit the structure of the directed acyclic graph through the data, and parameter learning refers to obtaining the conditional probability of each node in the case of known structure.

V. A. Bayesian network structure learning

Bayesian network structure learning is the process of constructing directed acyclic graphs [37], which is the basis for constructing Bayesian network models, and is one of the main steps in the study of practical problems, usually based on sample data or expert knowledge and experience or a combination of both to determine the optimal network topology. In the research process, how to construct the model with the highest fit is the focus of structural learning, if the connection between the variables is increased, i.e., directed arcs, the causal relationship between the variables becomes more complex, and the conditional probability of the node variables needs to be recalculated and learned, and the model fit will also change. At present, for Bayesian network structure learning has established a more mature establishment method, respectively: expert score modeling method, data modeling method and the combination of relevant expert experience and data hybrid modeling method. Based on the comprehensive analysis of the advantages and disadvantages of each method, this paper adopts the hybrid modeling method for Bayesian network structure fitting.

V. B. Bayesian network parameter learning

Parameter learning is based on the already fitted Bayesian network topology, using various methods to calculate the probability distribution of Bayesian network nodes. At present, the topology of the Bayesian network is generally fitted first, when the topology of the Bayesian network is determined, the parameters of the Bayesian network are learned through the data to obtain the probability distribution of the network parameters, and then the conditional probability of each variable is calculated, and the learning methods used are different for the data with different characteristics.

V. B. 1) Complete data

For the complete data, the parameter learning is generally based on the assumption of independent distribution, there are two methods used, the first is the Bayesian estimation method, the main idea is to take the parameter as a random variable, use the data to get its prior probability, and then through the formula to get the posterior probability of the parameters of the Bayesian network, to be able to get the probability distribution of the parameter, then, in the case of a given sample D, the parameter θ is estimated as:

$$P(\theta \mid D) = \frac{P(\theta)P(D \mid \theta)}{P(D)} = \frac{P(\theta)L(\theta \mid D)}{P(D)} \tag{13}$$

where D is the sample data, $L(\theta \mid D)$ is the likelihood function of the sample D and $P(D)$ is the prior probability of the given sample.

The second method is the maximum likelihood estimation method, the basic idea of which refers to the degree of fit between the data and the model based on the likelihood of the sample data and the parameter θ. The frequency of occurrence of the variable when it takes a different value, given the parent set, can be used as the conditional probability parameter for that variable. The logarithmic function of the likelihood takes the form:

$$\begin{aligned} \log L(\theta \mid D) &= \log \prod_{l=1}^{N} P(D_l \mid \theta) = \sum_{l=1}^{N} \log P(D_l \mid \theta) \\ &= \sum_{l=1}^{N} \sum_{i=1}^{n} \sum_{j=1}^{q_j} \sum_{k=1}^{r_i} \log P(D_l \mid \theta_{ijk}) = \sum_{i=1}^{n} \sum_{j=1}^{q_j} \sum_{k=1}^{r_i} N_{ijk} \log \theta_{ijk} \end{aligned} \tag{14}$$

where n is the number of nodes X_i, q_i is the number of state combinations of X_i the set of parent nodes $\pi(X_i)$. $q_i = 0$ if node X_i has no set of father nodes; r_i is the number of states of node X_i; N_{ijk} is the number of samples corresponding to the combination of the k th state of node X_i and the j th state of the set of parent nodes of X_i; and θ_{ijk} is the parameter corresponding to the combination of the k th state of node X_i and the j th state of the set of its parent nodes.

V. B. 2) Incomplete data

For incomplete data Gaussian approximation, EM algorithm and Laplace method can be performed. This paper focuses on the EM algorithm. The basic idea is to iterate from a random value of parameter θ θ^0, when the iteration t times to get the estimate θ^t, and then based on the estimated value of the data to repair, and then after the repair of the data after the calculation of the maximum likelihood estimation of θ to get θ^{t+1}, to achieve the end of the local extremes, where the parameter θ based on the log likelihood function after the repair of the sample is:

$$L(\theta \mid D^t) = \sum_{t=1}^{N} \sum_{X_t \in} P(X_t = x_t \mid D_t, \theta^t) = \log P(D_t, X_t = x_t \mid \theta) \tag{15}$$

where X_t is the set of all missing variables in any sample D_t.

V. C. Bayesian network inference

Combined with the structure of the Bayesian network and the parameter characteristics, for a known node in the network (also known as the evidence variable), the probabilistic network is able to project the probability of other nodes in the network (also known as the query variable), and the inference process is mainly obtained by probabilistic calculation. That is, for a set of random variables A, B is a subset of A taking the value of b, C is a set of evidence variables taking the value of c_i, probabilistic inference is the conditional probability of given $B = b$:

$$P(C_i = c_i \mid B = b) = \frac{P(C_i = c_i \mid B = b)}{P(B = b)} \tag{16}$$

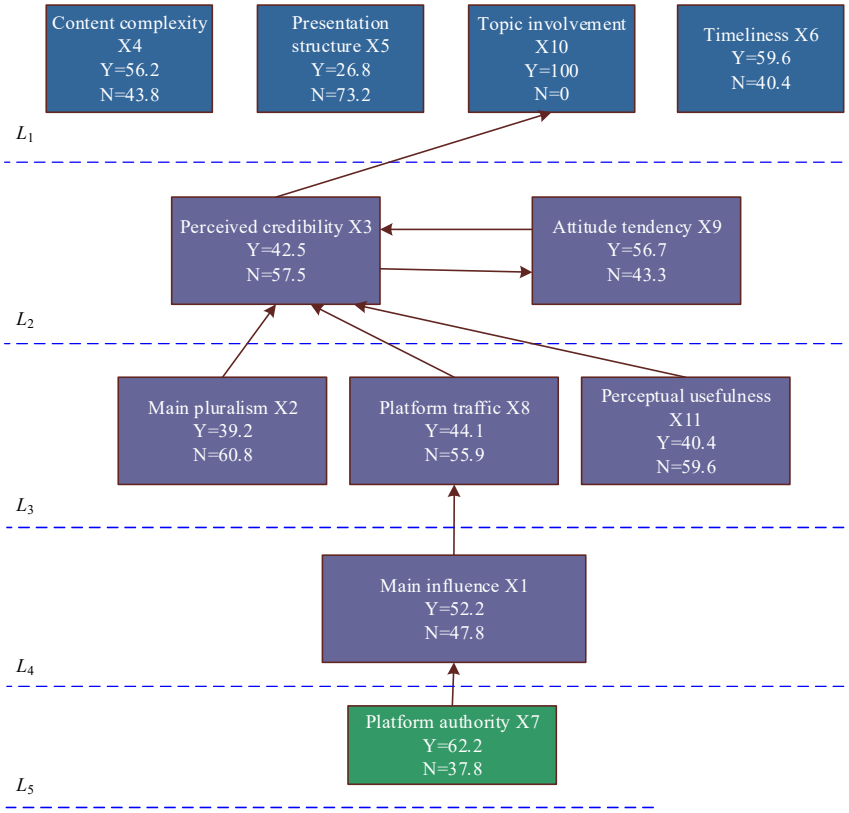

Figure 4: Reverse result of BN model

VI. BN modeling and analysis

Firstly, based on the constructed multi-layer hierarchical explanatory structure model of the international communication effect of micro-short dramas, the structural model of the international communication effect of micro-short dramas was transformed with the help of Bayesian network software Netica, and the BN structural model of the international communication effect of micro-short dramas was constructed. Then, based on the data-driven idea, the sample data of influencing factors in the typical international communication cases of micro-short dramas were imported into Netica for Bayesian network parameter learning, and the prior probabilities of each node were obtained. Finally, by using the fault diagnosis function of the BN structure model of the international propagation effect of micro-short dramas, the probability of the occurrence state of "content complexity", "presentation structure", "topic involvement" and "timeliness" of the parent node is set to 100% respectively, and the posterior probability of each influencing factor is deduced, and the reverse extrapolation result of the BN model is shown in Figure 4.

As can be seen from Figure 4, under the premise of topic involvement, the most important causal chain of international communication of micro short dramas is platform authority → subject influence → platform visits → perceived credibility → topic involvement. The factors in the causal chain above are important factors affecting the effect of international communication of micro short dramas, and it is necessary to strengthen the management of these factors in the process of managing the international communication of micro short dramas in a targeted manner.

VII. Practical Exploration and Path Optimization of Micro Short Drama “Going to Sea”

(1) Building a management mechanism to promote civilization exchange and the spread of Chinese culture

In the context of globalization, the export of culture is not only a display of national image, but also a reinforcement and dissemination of cultural identity. This mechanism needs to combine successful international experience with the current domestic situation to formulate a flexible and operational policy framework to ensure the long-term effectiveness and stability of the process of “going overseas” for short micro-dramas.

The construction of a management mechanism for short micro-dramas to go overseas should be supported by top-level design at the policy level. In order to achieve content diversity, originality and depth of cultural expression, government support policies should be encouraged to ensure the universality and dissemination effect of micro short dramas in different cultural circles by supporting original content, providing guidance on content regulation and promoting international dissemination. In addition, the mechanism should dynamically monitor and adjust the legal requirements, cultural sensitivities and dissemination effects of different regions to ensure that micro short dramas can be more flexibly adapted to the acceptance and regulatory requirements of target markets in the international market.

(2) Constructing a cultural symbol system through micro-dramas to enhance the international recognition of Chinese culture

In order to enhance the influence and recognition of Chinese culture in the international market, Chinese micro-dramas need to build a system of cultural symbols to disseminate representative cultural connotations. The effective construction of cultural symbols requires the cooperation between the government and the industry, and the use of policy guidance and financial support to screen and promote iconic micro short drama works that can be recognized in the international market. The construction of the symbol system should pay attention to the effective integration of the uniqueness of Chinese culture with the international mainstream aesthetics, and promote the transformation of micro short drama from cultural symbols to cultural concepts, and ultimately realize the sublimation of cultural symbols to identities and concepts.

In addition, with the help of globalized digital platforms, the dissemination of micro short plays can achieve wider coverage through social media and major international platforms. Through these platforms and communication strategies, micro-dramas can realize a wider cultural dissemination, enabling viewers to form a deeper emotional connection with them through rich cultural symbols, and thus promoting the recognition and reputation of Chinese culture in the world.

(3) Constructing diversified overseas theme patterns, and creating an industrial system of micro short dramas “going overseas” centered on cross-platform narratives.

The dissemination of Chinese micro short drama should be differentiated and targeted, and should form a cross-platform, three-dimensional combination of integration and development. In the process of “going to sea”, content innovation and the establishment of a cross-platform narrative system are crucial. Cross-platform storytelling can be carried out through video platforms, social media, games and other content carriers, extending the micro short drama from content production to promotion, interaction and other aspects, forming an overall communication ecosystem. The key to cross-platform narrative is to realize multi-level output and diversified display of content, so

that micro short dramas can penetrate rapidly and cover widely through different platforms in the international market, thus promoting the acceptance and influence of micro short dramas in the global market.

(4) Applying cutting-edge technology to improve the production and dissemination efficiency of short micro-dramas “going to sea”.

The development of cutting-edge technology has injected new vitality into the creation, dissemination and operation of short micro-dramas. Generative artificial intelligence (AIGC), virtual reality (VR), augmented reality (AR) and other digital technologies make it possible for micro short dramas to be more abundant and efficient in the process of “going to sea” to complete the creation and distribution of content, and at the same time, they can also more accurately locate the needs of the target audience, and grasp the target audience's aesthetic cognition and attention mechanism.

With the technical support of high-definition image quality and high-efficiency dissemination, the visual effect and audience experience of micro short dramas have been significantly improved. Through modern technologies such as high-resolution video production, advanced film and television post-production software, and intelligent recommendation algorithms, micro-short dramas can further optimize the quality of content and enhance the attractiveness of culture.

(5) Constructing an assessment mechanism and index system for the effect of micro short dramas going overseas

Scientific evaluation of the effects of micro short dramas going overseas is the key to ensuring their long-term dissemination in the international market. Establishing a set of comprehensive evaluation mechanism and index system can help micro short drama enterprises to accurately understand the actual effectiveness of content dissemination. The evaluation system should take into account key factors such as the number of viewers, social media interactions, audience feedback and cultural awareness to ensure the scientific and comprehensive nature of the evaluation. Especially for micro-dramas involving Chinese cultural themes, the evaluation of cultural awareness and audience's cultural resonance should be emphasized in the process of “going overseas”, so as to measure whether the micro-dramas have achieved the goal of promoting cultural exchange and understanding.

VIII. Conclusion

In order to explore the optimization path of the international dissemination of micro short plays, the article solves the key influencing factors of the international dissemination effect of micro short plays through the DEMATEL-ISM integrated model. After identifying the influencing factors, the Bayesian network model is used to construct a Bayesian network inference model for the international dissemination of micro short plays. Through the calculation of the DEMATEL-ISM model, it is found that platform authority, perceived usefulness, subject plurality, presentation structure, and attitudinal tendency are the key factors affecting the effect of international dissemination of microshort dramas. Content complexity, presentation structure, topic involvement, and timeliness are the direct influences on the international communication effect of microshorts. Taking “topic involvement” as an example, the most general causal chain of the international communication effect of short micro-drama by Bayesian inference is as follows: platform authority → subject influence → platform access volume → perceived credibility → topic involvement.

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