International Journal for Housing Science and Its Applications
Publish September 9, 2025. Volume 47, Issue 1 Pages 364-374

https://doi.org/10.70517/ijhsa47129

A Study on the Transformation Path of Cultural Communication Models in China's Film Industry in the Digital Age

Tongyao Wang[1,*]
[1] College of Humanities, Shandong Management University, Jinan, Shandong, 250357, China
Corresponding authors: (e-mail: yumi11656@163.com).

Abstract Currently, digitalization has profoundly transformed service industries such as finance, logistics, transportation, tourism, retail, accommodation, and catering, and is gradually penetrating the film industry. This study first constructs an evaluation indicator system for the digital transformation of China's film cultural dissemination model, comprising five criterion layers and 13 indicator layers, and employs the AHP-objective extension model to measure and determine the weights of the indicator system. The weighting results indicate that the digitalization level accounts for the largest proportion and has a significant impact on the digital transformation of the film cultural dissemination model. From five dimensions—digital technology leapfrog, technology integration and synergy, digital infrastructure, policy and environmental support, and corporate competitive pressure—the study employs the fs QCA method for analysis. The findings reveal that the digital transformation of the film industry's cultural dissemination model can be categorized into five types, with digital technology leapfrog and policy and environmental support playing crucial roles in the digital transformation of the film industry's cultural dissemination model.

Index Terms digital transformation, cultural dissemination model, fsQCA, material-element extension model

I. Introduction

In the context of globalization, how the Chinese film industry can fully leverage the cultural dissemination functions of visual media has become a major challenge for the Chinese film industry today. Some Chinese directors, such as Zhang Yimou, Jia Zhangke, and Ang Lee, have made efforts to take Chinese cinema "global." Their films focus on individuals, the underprivileged, and the cultural backdrop of the cinematic era. Through depictions of the social underclass, they address contemporary social issues in China, while also reflecting cultural values through elements such as clothing, language, and geographical settings, thereby embodying the cultural significance of the film industry [1]-[4].

The global digitalization wave is reshaping the ecological landscape of the cultural industry. China's film industry is leveraging digital technology and the platform economy to gradually transition from traditional offline models to an integrated online-offline model. In this process, internet platforms are deeply involved in all stages of the film industry chain through data integration, algorithm optimization, and ecosystem co-construction, becoming a key driver of industrial upgrading [5]-[8]. Although the digital age is far removed from the era of "using literature to convey moral principles," as a spiritual product, film also conveys certain cultural values in another form [9]. Technological aesthetics is the product of the integration of art and technology, bearing the imprint of modern production methods and a commodity-driven economy. The creative approach of "visuals first, story second" not only quietly alters the essence of film art but also reshapes audiences' aesthetic perceptions [10]-[12].

Directors leverage the "creating something out of nothing" advantage of digital technology to craft unforeseeable seascapes, starry skies, and non-existent disaster scenes, successfully endowing technical aesthetic films with the transcendent aesthetic implications once exclusive to traditional cinema, as well as the multifaceted profound meanings rooted in nature, humanity, philosophy, and religion [13]-[15]. Relying on the content of the text, the cultural value of communicability and aesthetic appeal is presented through images and narratives, which is the foundation of the cultural attributes of the film industry and the driving force behind its prosperity [16], [17]. Examples include "Life of Pi," "Journey to the West: Conquering the Demons," "Big Fish & Begonia," Ne Zha, The White Snake: The Origin, and The Wandering Earth. These films have a strong visual impact, but due to overemphasis and reliance on digital technology, some works also suffer from artistic flaws such as exquisite images but rough stories, and rich forms but pale content [18]-[20]. Therefore, the transformation of the cultural communication model of the Chinese film industry is worth exploring.

This paper first constructs an evaluation indicator system for the digital transformation of China's film cultural dissemination model, comprising four criterion layers—digitalization level, cultural heritage transmission degree, modern integration degree, and dissemination innovation degree—and 13 indicator layers. The AHP-objective extension model is employed to determine the indicator weights and analyze the driving factors of the digital transformation of China's film cultural dissemination model. Then, using data samples from 2022 to 2024 as a research case, the study examines five dimensions—digital technology leapfrogging, technology integration and synergy, digital infrastructure, etc.—and employs the fsQCA method for antecedent configuration analysis to uncover the transformation pathways of China's film industry cultural dissemination model in the digital age.

II. Measuring the cultural dissemination model of China's film industry in the digital age

II. A. Construction of an evaluation indicator system

II. A. 1) Principles for constructing the indicator system

To ensure the scientific and objective nature of the measurement results, the following principles should be followed when designing an evaluation indicator system for the current status of the transformation of the cultural communication model in the film industry.

(1) Scientific principle. The constructed indicator system should be based on academic theory and practical evidence, and should objectively reflect the essential characteristics and development level of the transformation of the cultural communication model in the film industry.

(2) Principle of Completeness. The construction of the indicator system must comprehensively cover all aspects of the transformation of the film industry's cultural communication model enabled by digital technology, avoiding the omission of any influencing factors, thereby ensuring the comprehensiveness of the indicator system.

(3) Objectivity principle. The indicator system cannot include all factors influencing the transformation of the film industry's cultural communication model. Therefore, it is necessary to select representative indicators that best reflect the essential characteristics of the transformation, thereby ensuring the authenticity and objectivity of the evaluation results.

(4) Independence principle. Indicators across different dimensions should not overlap or intersect, minimizing the presence of correlations within the indicator system.

(5) Operability principle. All indicators within the indicator system should be quantifiable. This principle encompasses two aspects: first, accessibility, meaning that data should be easily obtainable and manageable; second, implementability, meaning that subjective data can be evaluated through assigned values, while objective indicators can be directly assessed.

II. A. 2) Determination of evaluation indicators

Based on the results of the above survey data analysis, an evaluation index system for the current status of digital transformation of China's film industry cultural communication model has been established, as shown in Table 1.

Table 1: Evaluation index system of cultural communication and transformation in film industry

Target layer	The normative layer	Indicators
Cultural communication and transformation of film industry	Level of digitization (A1)	Digital literacy (B1)
		Number of digital strategies (B2)
		A gathering of digital talent (B3)
		Digital equipment perfection (B4)
	Inheritance of cultural heritage (A2)	Industrial culture value mining (B5)
		The value of industrial culture is evolving (B6)
		Promoting the value of industrial culture (B7)
	Modern convergence (A3)	Cultural stories in movies (B8)
		Functionality of the film industry (B9)
	Innovation in communication (A4)	Audience awareness of culture (B10)
		The audience's understanding of the culture (B11)
		Audience's sense of cultural identity (B12)
		Audience engagement with culture (B13)

II. B. Construction of the physical element extension model

II. B. 1) Structure Element Matrix

A material element is a logical cell in a material element matrix. Material element analysis integrates three elements—things, characteristics, and values—into a single entity. Material element R is represented as R=(N, C, V), where N represents the level of transformation and upgrading of the cultural communication model of the film industry in Chinese provinces and cities, C represents the characteristics of the measured entity N, and V represents the value of characteristic C for the measured entity N. If N has n characteristics, it is represented as:

$$R=\begin{vmatrix} N & C_1 & V_1 \\ & C_2 & V_2 \\ & \vdots & \vdots \\ & C_n & V_n \end{vmatrix} \tag{1}$$

II. B. 2) Determining the classical domain, section domain, and material element to be evaluated

The following elements, their characteristics, and their value range matrix are referred to as the classical domain, where N_i represents the different levels of the measurement of the transformation and upgrading of the cultural communication model of the film industry in Chinese provinces and municipalities; C_n represents the measurement indicators; for the measurement indicator of the transformation and upgrading of the cultural communication model of the film industry in the i-th Chinese province or municipality, the measurement indicator C_n has a value range of (a_{i1},b_{i1}) , i.e., the classical domain, where a_{i1} represents the lower limit of the value range, and b_{i1} represents the upper limit of the value range.

$$R_N=(N_i,C_n,V_n)=\begin{vmatrix} N_i & C_1 & (a_{i1},b_{i1}) \\ & C_2 & (a_{i2},b_{i2}) \\ & \vdots & \vdots \\ & C_n & (a_{in},b_{in}) \end{vmatrix} \tag{2}$$

Based on the range of values for all levels of each characteristic indicator, the domain elements can be determined, where N_p represents the entire set of measurement levels for the transformation and upgrading of the cultural communication model of the film industry in Chinese provinces and municipalities.

$$R_p=(N_p,C_n,V_p)=\begin{vmatrix} N_p & C_1 & (a_{p1},b_{p1}) \\ & C_2 & (a_{p2},b_{p2}) \\ & \vdots & \vdots \\ & C_n & (a_{pn},b_{pn}) \end{vmatrix} \tag{3}$$

For the industrial transformation and upgrading measurement level N_0 of the measurement to be tested, its evaluation object is expressed as:

$$R_0=(N_0,C_n,V_n)=\begin{vmatrix} N_0 & C_1 & V_1 \\ & C_2 & V_2 \\ & \vdots & \vdots \\ & C_n & V_n \end{vmatrix} \tag{4}$$

II. B. 3) Determining weights

The Analytic Hierarchy Process (AHP) treats a complex multi-objective decision-making problem as a system, decomposing elements related to decision-making into multiple objectives or criteria [21]. By considering the comparative relationships between elements at different levels and within the same level, it is particularly suitable for multi-level indicator weighting, enabling a comprehensive network structure to be formed between elements while maintaining computational simplicity. This method is selected in this paper for indicator weighting.

(1) Divide into levels and construct a judgment matrix

The indicators to be analyzed for the digital transformation of the cultural dissemination model in the film industry should be categorized into layers based on their nature or requirements. If a target has n factors under a target, these factors should be compared in pairs to form the following judgment matrix, where $a_{ij}=1/a_{ji}(i\neq j)$ and the value of a_{ij} is determined by experts based on a 1-9 scale.

$$A=a_{ij(n*n)}=\begin{vmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{vmatrix} \tag{5}$$

(2) Calculate weights

The eigenvalue method is commonly used to calculate weights. The calculation steps are as follows:

First, normalize the elements in the matrix:

$$\overline{a_{ij}} = a_{ij} / \sum_{j=1}^{n} a_{ij}, i, j = 1,2,3\cdots\cdots, n \tag{6}$$

Sum the rows of the column-normalized matrix:

$$\overline{W} = (\overline{W_1}, \overline{W_2}, \cdots, \overline{W_n})^T \tag{7}$$

Normalize the vector after adding the vectors together:

$$W_i = \overline{W_i} / \sum_{j=1}^{n} \overline{W_i} \tag{8}$$

Finally, calculate the maximum eigenvalue, where $(AW)_i$ represents the i-th component of AW.

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(AW)_i}{nW_i} \tag{9}$$

(3) Consistency test

After calculating the weights, a consistency test must be performed on the single sorting at each level to determine whether the comparison settings for the importance of each element in the matrix are consistent with the standard. The consistency index CI and consistency ratio CR are used as evaluation indicators. If CR ≤ 0.1, the consistency test is passed.

$$CI = \frac{\lambda \max - n}{n-1} \tag{10}$$

$$CR = \frac{CI}{RI} \tag{11}$$

II. B. 4) Determining grade correlation

The association function indicates the extent to which an object meets the requirements when its value is taken at a certain point on the real axis. It is used to characterize the degree of belonging of each indicator of the object being evaluated to each measurement level. The incompatibility issue can be quantified because the association function of the extended set can be expressed by an algebraic formula. The association function formula is as follows:

$$K(V_i)_j = \begin{cases} \dfrac{-\rho(V_i, V_{ij})}{|V_{ij}|}, V_i \in V_{ij} \\ \dfrac{\rho(V_i, V_{ij})}{\rho(V_i, V_{pn}) - \rho(V_i, V_{ij})}, V_i \notin V_{ij} \end{cases} \tag{12}$$

In the formula, $K(V_i)_j$ denotes the correlation degree of the industrial transformation and upgrading index corresponding to the j th measurement level.

$$V_{ij} = \left| b_{in} - a_{in} \right| \tag{13}$$

$$\rho(V_i, V_{ij}) = | V_{dn} - \frac{1}{2}(a_{in} + b_{in}) | - \frac{1}{2}(b_{in} - a_{in}) \quad i = 1,2,3\cdots n; j = i = 1,2,3\cdots n \tag{14}$$

$$\rho(V_i, V_{pn}) = | V_{dn} - \frac{1}{2}(a_{pn} + b_{pn}) | - \frac{1}{2}(b_{pn} - a_{pn}) \quad i = 1,2,3\cdots n \tag{15}$$

In the formula, V_i, V_{pn} represent the classical domain and node domain value ranges of the industrial transformation and upgrading indicators to be measured, respectively; $\rho(V_i, V_{ij})$ denotes the distance between point V_i and the corresponding finite interval of the feature vector V_{ij}; $P(V_i, V_{ij})$ represents the distance between point V_i and the corresponding finite interval of the eigenvector V_{pn}.

The degree of conformity between the industrial transformation and upgrading measurement indicators and each measurement level is expressed by the comprehensive correlation coefficient, whose formula is:

$$K_i(p)=\sum_{i=1}^{n}\omega_i k(v_i)_j \quad i=1,2,3\cdots n \tag{16}$$

In the formula, $K_i(p)$ represents the single-indicator correlation of the industrial transformation and upgrading indicator to be measured with respect to level i. If $K_{ij}=\max\{K_i(p)\}$, then the i th indicator of the object to be measured belongs to level j of the measurement scale.

When $K_i(p)>0$, it indicates that the industrial transformation and upgrading measurement indicator meets the requirements of the standard object range, and the larger the value, the higher the degree of compliance; When $-1<K_i(p)<0$, it indicates that the measurement indicator does not meet the requirements of the standard object but has the potential to transition into a standard object, with the magnitude of the value indicating the difficulty of the transition; When $K_i(p)<-1$, it indicates that the measurement object does not meet the requirements of the standard object and cannot transition into a standard object.

II. C. Case Studies

II. C. 1) Analysis of indicator weighting results

(1) Determination of indicator system weights

a) Determination of criterion layer weight coefficients

Based on the expert panel's judgment results, construct the criterion layer $A_i(i=1,2,3,4,5)$ for the judgment matrix of the target layer Z, as shown in Table 2. The weight values of criterion layers A1, A2, A3, A4, and A5 are 0.5552, 0.2118, 0.1163, and 0.1167, respectively.

Table 2: Shows the criterion layer judgment matrix Z-Ai

Z	A1	A2	A3	A4	ω_i
A1	1	3	4	6	0.5552
A2	1/3	1	3	7/1	0.2118
A3	1/4	1/3	1	1/6	0.1163
A4	1/6	7	6	1	0.1167

(2) Determine the weight coefficients of the indicators under the criteria layer of the evaluation system.

a) Digitalization level evaluation indicators.

Construct the judgment matrix of the first-level indicators $B_i(i=1,2,3,4)$ under the criteria layer digitalization level A1, as shown in Table 3. The judgment matrix $A1-B$ exhibits satisfactory consistency. The weight values for the first-level evaluation indicators B1, B2, B3, and B4 are 0.1964, 0.5841, 0.1173, and 0.1022, respectively.

Table 3: Digitalization level judgment matrix A1-B

A1	B1	B2	B3	B4	ω_i
B1	1	1/5	4	3	0.1964
B2	5	1	5	7	0.5841
B3	1/4	1/5	1	3	0.1173
B4	1/3	1/7	1/3	1	0.1022

b) Environmental benefit evaluation indicators

Construct the judgment matrix for the first-level indicators $B_i=(i=5,6,7)$ under the environmental benefit A2 criterion layer, as shown in Table 4. This indicates that the judgment matrix $A2-B$ exhibits satisfactory consistency. The weight values for the first-level environmental benefit evaluation indicators B5, B6, and B7 are 0.1423, 0.5584, and 0.2993, respectively.

Table 4: Environmental benefit judgment matrix A2-B

A2	B5	B6	B7	ω_i
B5	1	1/5	1/4	0.1423
B6	5	1	3	0.5584
B7	4	1/3	1	0.2993

c) Modern integration evaluation indicators

Construct the judgment matrix for the first-level indicators $B_i=(i=8,9)$ under the modern integration A3 construction criteria layer, as shown in Table 5. The judgment matrix A3-B has satisfactory consistency, and the weight values of the first-level modern integration evaluation indicators B8 and B9 are 0.2248 and 0.7752, respectively.

Table 5: Modern integration degree judgment matrix A3-B

A3	B8	B9	ω_i
B8	1	1/3	0.2248
B9	3	1	0.7752

d) Evaluation indicators for dissemination innovation

Construct the judgment matrix for the first-level indicators $B_i = (i = 10,11,12,13)$ under the dissemination innovation A4 criterion layer, as shown in Table 6. The judgment matrix A4-B has satisfactory consistency. The weight values of the first-level evaluation indicators B8 and B9 for modern integration are 0.4116, 0.3258, 0.2471, and 0.0155, respectively.

Table 6: Shows the innovation judgment matrix A4-B

A4	B10	B11	B12	B13	ω_i
B10	1	1/3	1/4	1/5	0.4116
B11	3	1	3	1/7	0.3258
B12	4	1/3	1	1/6	0.2471
B13	5	7	6	1	0.0155

(3) Determining the overall ranking of the evaluation system

The overall ranking weights of each indicator for the target layer are shown in Tables 7 and 8.

Table 7: The criterion level

The normative layer	weight	Overall ranking
Level of digitization	0.5552	1
Inheritance of cultural heritage	0.2118	2
Modern convergence	0.1163	3
Innovation in communication	0.1167	4

Table 8: Indicators layer

Indicators layer	A-B weight	Overall sorting weights	Overall ranking
Digital literacy	0.5384	0.3746	1
Number of digital strategies	0.0507	0.0749	9
A gathering of digital talent	0.0309	0.0248	11
Digital equipment perfection	0.0378	0.0248	11
Industrial culture value mining	0.4743	0.142	3
Industrial culture value interpretation	0.2356	0.0779	8
Promoting the value of industrial culture	0.1159	0.0155	12
Cultural stories in movies	0.7159	0.0859	7
Functionality of the film industry	0.5233	0.1158	4
Audience awareness of culture	0.0927	0.0874	6
The audience's understanding of the culture	0.1885	0.1070	5
Audience's sense of cultural identity	0.2187	0.0510	10
Audience engagement with culture	0.0859	0.2763	2

II. C. 2) Evaluation Model Benefit Analysis

Taking the digital transformation of China's film industry cultural dissemination model as the research object, a material-element extension model is established for evaluation, with digitalization level as the material element, and cultural heritage continuity, modern integration, and dissemination innovation as sub-material elements, to classify the evaluation grades of benefits.

(1) Determining the classic domain and section domain

Given that the evaluation indicator system is composed of both quantitative and qualitative indicators, evaluation levels are divided into quantitative and qualitative aspects. Based on the evaluation levels and level intervals defined in Section 2.3.1, these are quantified to determine the classic domain and section domain. The final evaluation indicators' classic domain and section domain are shown in Table 9.

Table 9: Classic domain and section domain

Order number	property	unit	Classic pecks					The realm
			Difference	Not quite	Secondary	Good	Outstanding	
B1	Quantify	%	(0,1]	(1,3,6]	(3,6,6]	(6,8,9]	(8,9.10]	[0,10]
B2	Quantify	%	(0,1]	(1,3,6]	(3,6,6]	(6,8,9]	(8,9.10]	[0,10]
B3	Quantify	%	(0,20]	(20,30]	(30,60]	(65,70]	(70,90]	[0,100]
B4	Quantify	%	(0,25]	(25,35]	(35,65]	(70,80]	(80,100]	[0,100]
B5	Quantify	%	(0,15]	(15,30]	(40,60]	(60,80]	(80,100]	[0,100]
B6	Quantify	%	(0,50]	(50,60]	(60,70]	(70,80]	(80,90]	[0,90]
B7	Determine the nature	/	(0,55]	(55,65]	(65,80]	(80,95]	(95,100]	[0,100]
B8	Quantify	%	(0,5]	(5,10]	(10,20]	(20,30]	(30,70]	[0,70]
B9	Quantify	%	(0,30]	(30,50]	(50,70]	(70,90]	(90,100]	[0,100]
B10	Quantify	%	(0,15]	(15,30]	(30,50]	(50,60]	(60,70]	[0,70]
B11	Determine the nature	/	(0,55]	(55,65]	(65,75]	(75,85]	(85,100]	[0,100]
B12	Determine the nature	/	(0,55]	(55,65]	(65,75]	(75,85]	(85,100]	[0,100]
B13	Determine the nature	/	(0,55]	(55,65]	(65,75]	(75,85]	(85,100]	[0,100]

(2) Calculate the correlation of first-level indicators.

The calculation results for the correlation of the remaining indicators are shown in Table 10.

Table 10: Multi-level correlation at the criterion level

The normative layer	K1	K2	K3	K4	K5	Grade
A1	-0.5321	-0.4702	-0.3723	0.2224	0.2518	Good
A2	-0.3112	-0.1564	0.0825	0.1174	-0.3637	Secondary
A3	-0.6729	-0.4835	-0.2912	0.7931	-0.1825	Secondary
A4	-0.2537	-0.0014	0.0135	-0.2722	-0.2153	Secondary

According to the correlation results, the maximum value is 0.0501, which belongs to the "good" level, as shown in Table 11.

Table 11: Target layer comprehensive correlation

Object to be evaluated	K1	K2	K3	K4	K5	Grade
Cultural communication and transformation of film industry	-0.4923	-0.3418	-0.2123	0.0714	-0.3153	Good

II. C. 3) Analysis of Evaluation Results

(1) Analysis of indicator weighting results

Using the analytic hierarchy process to assign weights to the indicator system, the following analysis is made based on the indicator weighting results obtained above:

a) Digitalization Level

In the digitalization level criterion layer, the weight values are ranked in the following order: digital literacy, number of digital strategies, accumulation of digital talent, and completeness of digital equipment, with the number of digital strategies having the largest proportion. The weight proportions of digital literacy and accumulation of digital talent are not significant, indicating that the project has relatively weak application of digital technology in terms of digitalization level, and the low weight proportion is reasonable.

b) Cultural Heritage Preservation Level

The weighting value for cultural heritage preservation ranks second in the criteria layer, but its weighting value is not significantly higher than that of digitalization level, indicating that the cultural dissemination model of the film industry is not significantly influenced by cultural heritage preservation performance. There is still considerable room for improvement in terms of cultural heritage preservation.

The first-level indicators under cultural heritage preservation include the exploration, interpretation, and promotion of industrial cultural value, among which the interpretation of industrial cultural value stands out and can be quantified through the enhancement of plot-based cultural elements.

c) Communication Innovation Degree

Communication innovation degree has the lowest weighting value in the criteria layer. As an intangible benefit, its difficulty in quantification is also a factor affecting benefit calculations. Compared to digitalization level, cultural heritage transmission degree, and modern integration degree, research on communication innovation degree is not widespread and remains underdeveloped.

(2) Evaluation Grade Results Analysis

The evaluation grade for the digital transformation of China's film industry cultural communication model is "good." Among these, digitalization level performs relatively well, while cultural heritage continuity, communication innovation, and modern integration perform averagely. Efforts should be made to enhance benefits in these areas, improve film industry cultural communication, and leverage the role of plot-based cultural content. Cultural heritage preservation is relatively weak in China's film industry cultural dissemination. It is necessary to give priority to addressing cultural loss caused by this issue and implement measures such as increasing relevant facilities and equipment to enhance the preservation of cultural heritage in film content. Modern integration is also weak in China's film industry cultural dissemination and is significantly influenced by external environmental factors. Therefore, while focusing on improving cultural heritage preservation and dissemination innovation, modern integration will gradually become more prominent.

III. The Transformation Path of China's Film Industry Cultural Communication Model

III. A. Study Design

III. A. 1) Research Methods

In the digital age, the drivers of enterprise digital transformation are complex and diverse, and traditional linear analysis methods struggle to reveal the multidimensional mechanisms driving digital transformation. In complex environments, multiple conditions may be interdependent, forming different configurations, and a single condition is not a direct determinant of digital transformation. Additionally, when there is a correlation between condition variables, their independent effects may be interfered with or masked by other related variables. To address these issues, the qualitative comparative analysis (QCA) method based on set theory offers a new analytical approach. The fsQCA method [22] adopts a holistic perspective, focusing on the analysis of "configuration effects," emphasizing that multiple paths may lead to the same outcome rather than relying on a single optimal solution.

III. A. 2) Sample Selection and Data Sources

The selection of research samples followed the following rules: first, film companies that were subject to special treatment (ST, *ST), companies listed within the specified time frame, and companies lacking key information were excluded from the sample; second, for companies with multiple subsidiaries, after matching the data for each variable, samples with significant data gaps were excluded based on listing time and data availability. For samples with fewer data gaps within the study period, linear interpolation was used to fill in the missing data; Finally, given that policy support for specialized, refined, and innovative enterprises in China will increase significantly after 2022, this paper uses data from 2022 to 2024 for mean processing, and ultimately selects 145 sample data. The variable data comes from the CSMAR database, Juchao Information Network, Wind database, and "China Statistical Yearbook," etc.

III. A. 3) Variable Measurement and Calibration

(1) Outcome variable: The outcome variable in this paper is the digital transformation of the cultural communication model of the film industry (G).

(2) Condition variables: Digital technology leap (H1), technology integration and synergy (H2), digital infrastructure (H3), policy and environmental support (H4), and corporate competitive pressure (H5).

III. B. Analysis Results

III. B. 1) Analysis of the necessity of preconditions

This paper uses the fs QCA software to test the necessity and consistency levels of the prerequisites for the digital transformation and non-transformation of the cultural dissemination model of the film industry under the dimensions of digital technology leap, technology integration and synergy, and digital infrastructure, as shown in Table 12. The results indicate that the consistency levels of all prerequisites are below 0.9, which does not constitute a necessary condition.

Table 12: Analysis of the necessary conditions of transition and non-transition in the pre-and post-periods

Prior conditions	2023		2024	
	Transconformation	Non-transformation	Transconformation	Non-transformation
H1	0.417	0.385	0.377	0.363
~H1	0.609	0.577	0.646	0.562
H2	0.493	0.443	0.452	0.336
~H2	0.545	0.532	0.574	0.596
H3	0.562	0.429	0.534	0.397
~H3	0.488	0.554	0.524	0.559
H4	0.503	0.398	0.535	0.414
~H4	0.531	0.571	0.512	0.543
H5	0.399	0.391	0.464	0.452
~H5	0.601	0.549	0.562	0.526

Note: “~” indicates the logical operation “not.”

III. B. 2) Adequacy Analysis of Condition Configuration

Condition configuration adequacy analysis is a core component of the QCA method. Based on existing research, this study sets the original consistency threshold at 0.8; with a sample size of 145, the frequency threshold is appropriately increased to 2; and the PRI consistency threshold is set at 0.7. Using fs QCA software for analysis, this study identified the core and peripheral conditions of each configuration path with the digital transformation of the film industry's cultural dissemination model as the outcome variable, and conducted configuration analysis for the pre- and post-periods. The results are shown in Table 13.

As shown in the table, in the digital transformation of the film industry's cultural dissemination model, three equivalent paths were generated in 2023, namely S1-1, S1-2, and S1-3, with consistency values of 0.823, 0.941, and 0.889, respectively. The overall consistency of the solutions is 0.817, all exceeding the consistency threshold of 0.8. The original coverage of each configuration is 0.175, 0.071, and 0.077, respectively, with an overall coverage of 0.241. In 2024, there are two sufficient configurations for digital transformation: S2-1 and S2-2, with corresponding consistency values of 0.919 and 0.938, respectively. The overall consistency of the solution is 0.915, with corresponding original coverage values of 0.145 and 0.092, respectively, and an overall coverage of 0.199.

Based on the core conditions of the aforementioned configurations and their explanatory logic, this paper categorizes the configurations of digital transformation in the film industry's cultural dissemination model into five types: fully competitive dual-capability—practical application type, fully competitive coordination—bottom-up driven type, non-fully competitive coordination—bottom-up driven type, fully competitive capability—comprehensive digital development type, and non-fully competitive coordination—practical application type.

Table 13: The configuration of digital transformation occurs in the pre-and post-periods

Prior conditions	2023			2024	
	S1-1	S1-2	S1-3	S2-1	S2-2
H1		▲	▲	●	▲
H2	▲	⊕	⊕	▲	●
H3	▲	Δ	●	▲	⊕
H4	▲	▲	▲	▲	▲
H5	⊕	Δ	●	⊕	▲
Originality	0.823	0.941	0.889	0.919	0.938
Original coverage	0.175	0.071	0.077	0.145	0.092
Unique coverage	0.128	0.031	0.033	0.109	0.059
Overall consistency		0.817		0.915	
Overall coverage		0.241		0.199	

Note: ▲ = core condition present, ⊕ = core condition absent, ● = peripheral condition present, Δ = peripheral condition absent

III. C. Transition Pathways

(1) Drivers of change: technology and demand-driven factors

a) Technology-driven: In the field of virtual production, AI technology has reshaped the technical paradigm of film production processes through the combination of real-time rendering engines and deep learning algorithms. This technological empowerment not only improves production efficiency but, more importantly, changes the relationship between creators and technical resources, redefining the boundaries of content production. In the box office prediction field, AI leverages multi-source heterogeneous data analysis, including social media sentiment, pre-sale data, and competitor release schedules, to build high-precision market prediction models. This has transformed the market feedback mechanism from a lagging assessment to a forward-looking guidance system. This technology-driven intelligent transformation fundamentally alters the information foundation and operational logic of industry decision-making.

b) Market demand: Generation Z audiences as the mechanism for forming ecological niche selection pressure. The consumption preferences of Generation Z constitute the key driving force behind industrial ecological niche transformation. As digital natives, their demand for personalized narratives and interactive participation has been transformed into operable ecological niche resources through AI technology: film and television platforms use AI user profiling to achieve "precise ecological niche filling," while AIGC technology has enabled the large-scale production of personalized content. This cycle of "demand definition—technical response—demand upgrade" not only guides industry players to adjust their ecological niche strategies, but also shapes the direction of technological research and development, forming an endogenous driving force for the evolution of the ecosystem.

(2) Direction of Change: Ecological Niche Differentiation and Reconstruction

a) Ecological Niche Differentiation: Intelligent technology is reshaping the hierarchy of content production. Within the film industry ecosystem, the ecological niche of content producers is defined by their resource acquisition capabilities and functional roles. AI technology is driving functional differentiation among content creation entities, forming a tiered ecological niche structure characterized by "human-machine collaboration and end-to-end intelligence." For example, in 2023, Mobis Vision launched "Momito," which features "lightweight processes + cinematic-level virtual effects." By collaborating with SenseTime to co-create AI digital humans and innovative virtual scenes, combined with the one-click switching function of virtual cameras, it can efficiently produce short videos and mid-length videos with rich visuals and realistic content.

b) Ecological niche reconstruction: Data-driven evolution of distribution and marketing networks. AI technology has reconstructed the ecological niche function map of this link through a three-level transmission mechanism of "data analysis—decision optimization—resource matching," driving a leap from extensive experience-based decision-making to precise intelligent response. First, the technical expansion of the precision marketing ecological niche has disrupted the traditional resource matching model.

(3) Construction Model: Triple Innovation of Ecological Niche, Collaborative Network, and Dynamic Balance

a) Ecological Niche Construction: Embedding of Technological Entities and Functional Iteration. AI technology is reshaping the ecological niche structure of China's film industry. Algorithm developers and data platforms have formed a new "technological ecological niche" layer within the system, while technology suppliers like Huawei Cloud have risen from supporting roles to become core content producers through intelligent tools. Meanwhile, production companies have transformed into "technology curators," shifting the focus of their ecological niches from artistic creation to technological integration; cinema chains, on the other hand, have leveraged intelligent scheduling systems to shift value from spatial supply to data services. This restructuring process follows the evolutionary logic of "technology empowerment—functional upgrading—value reshaping," ultimately forming a more flexible ecological niche distribution pattern.

b) Collaborative network optimization: Data-driven ecological niche interaction mechanisms. The flow of data elements driven by AI technology has constructed a non-linear collaborative network across ecological niches. Data platforms have formed a "neural network" connecting various ecological niches by mastering core resources such as user profiles and behavioral trajectories; the collaborative model between ecological niches has shifted from mechanical cooperation to intelligent symbiosis. Currently, AI technology is reshaping collaborative relationships through two mechanisms: first, establishing predictive collaboration, such as many film and television companies integrating cross-ecological niche data like social media sentiment and competitor scheduling to enable investment decisions to intervene in the content production process earlier; second, forming creative collaboration, such as Alibaba's DAMO Academy AI screenwriting system, which can automatically generate plot branches with different cultural adaptability based on regional market characteristics at the distribution end, driving the deep integration of production and distribution ecological niches. Under a policy support framework, such collaborative mechanisms have established an enhanced loop of "data flow—smart decision-making—value creation," significantly improving the overall efficiency of the ecosystem.

3) Dynamic balance: self-organization and adaptive evolution of ecosystems. AI-enabled ecosystems exhibit a new steady state of dynamic equilibrium: when the expansion of data platform niches threatens the survival of traditional distributors, self-organizing regulatory mechanisms give rise to hybrid niches combining "technology + content." The system's adaptive evolution manifests in three levels of innovation. First, at the infrastructure layer, the introduction of blockchain technology establishes a decentralized trust mechanism. Second, at the value creation layer, generative AI drives the evolution of niche functions from value transmission to value creation.

IV. Conclusion

This study selected data from 2022 to 2024 for analysis, yielding 145 sample data points as the research sample. Based on the established evaluation indicator system for the cultural dissemination model of the film industry, the weights of the indicators were calculated using the material-element extended model, and the comprehensive benefit evaluation grade was determined. Subsequently, configuration thinking and fsQCA methods were employed to investigate the factors influencing the digital transformation of the cultural dissemination model of the film industry. The following conclusions were drawn:

(1) According to the evaluation results, the overall performance of the film industry cultural dissemination model is good, with digitalization being the most prominent aspect. The number of digital strategies accounts for the largest proportion of this indicator, exerting a significant influence on the digital transformation of the film industry cultural dissemination model and warranting continued attention. This also validates the effectiveness of the model.

(2) Digital technology leapfrogging and policy and environmental support play a crucial role. Digital technology leapfrogging (H1) and policy and environmental support (H4) serve as the backbone of the digital transformation of the film industry's cultural dissemination model, providing a clear direction for the digital transformation of China's film industry's cultural dissemination model.

(3) Through configuration analysis, the study identified five conditional configurations that drive digital transformation, including: competitive environment with dual capabilities—practice-application type, competitive environment with coordination—bottom-up driven type, non-competitive environment with coordination—bottom-up driven type, competitive environment with capabilities—comprehensive digital development type, and non-competitive environment with coordination—practice-application type.

References

[1] Tian, L., & Wang, X. (2025). Cultural strategies and national expression in overseas dissemination of Chinese and Thai films. International Communication of Chinese Culture, 12(1), 131-147.

[2] Luo, X. (2017, June). Exploration of Image-building and Cultural Dissemination in Films and Television Drama from the Perspective of Regional Culture. In 2017 2nd International Conference on Education, Sports, Arts and Management Engineering (icesame 2017) (pp. 99-103). Atlantis Press.

[3] Ke, Z., Maharam, M. E., & Yahaya, W. A. W. (2021). The Chinese Film Industry's Cross-Cultural Communication Strategy in the Context of the" One Belt, One Road" Initiative. Asian Journal of Arts, Culture and Tourism, 3(4), 24-28.

[4] Tsai, M. H. (2023). 'Chinese cinema'going Hollywood: the making of 'good Chinese narrative'for global markets. The Journal of International Communication, 29(1), 126-143.

[5] Mei, W. (2025). Efficacy Reconstruction of Cultural Intermediaries in the Digital Era: Examining Industrial Upgrading and Overseas Dissemination Paths of the Animation Film Industry through. Academic Journal of Humanities & Social Sciences, 8(6), 57-63.

[6] Liu, Y., & Li, J. (2024). " Expansion" and" Obstacles": The New Wave of Intelligent Media Empowering the Development of Film and Television Arts with Digital Technology. Journal of Social Science Humanities and Literature, 7(6), 57-66.

[7] Marchetti, G. (2021). Chinese film studies online: technological innovations, pedagogical challenges, and teaching Chinese-language cinema in the digital age. Journal of Chinese Film Studies, 1(1), 135-152.

[8] Yu, Y. (2023). CHINESE AI IN THE FILM INDUSTRY. Digital Transformation: Organizational Challenges and Management Transformation Methods, 193.

[9] Xin, X. R., & Mossig, I. (2017). Co-evolution of institutions, culture and industrial organization in the film industry: the case of Shanghai in China. European Planning Studies, 25(6), 923-940.

[10] Nedaei, A. H., & Khanlari, R. (2018). Digital Technology and Its Effects on the Aesthetic of Expression in Film. Journal of Interdisciplinary Studies in Communication and Media, 1(2), 137-156.

[11] Luchen, F., & Sishi, C. (2024, June). The Technical Aesthetics and Spectacular Narratives of Science Fiction Films in the Perspective of Digital Media. In 2024 5th Technology Innovation Management and Engineering Science International Conference (TIMES-iCON) (pp. 1-5). IEEE.

[12] Li, Z. (2024). The transformation of images of Nezha and the changing cultural discourses in Chinese national style animated films from 1979 to 2019. Humanities and Social Sciences Communications, 11(1), 1-8.

[13] Lu, W. J. (2019). Made in Taiwan: paratexts of Life of Pi and a dynamic sense of place. Critical Studies in Media Communication.

[14] Zong, X., & Kim, Y. (2023). Transformation of Film Directing and Cinematography through Technological Advancements: Focusing on Ang Lee's Films. International Journal of Advanced Culture Technology, 11(2), 64-72.

[15] Wang, S., & Luo, E. (2023). The Wandering Earth II: A happy union between science and film. The Innovation, 4(2).

[16] Sun, Y., & Hua, J. (2023). On strategies and effects of cross-cultural communication of Chinese mythological animated films—With Nezha and White Snake as examples. European Journal of Language and Culture Studies, 2(6), 6-14.

[17] Haiyan, C., Wei, Q., & Xiuli, C. (2024). The Innovative Expression of Traditional Chinese Cultural Archetypes in Animated Films: Establishing a Reliable, Admirable, and Respectable Image of China. Contemporary Social Sciences, 9(1).

[18] Lin, S., Wang, A., & Yu, D. (2023, March). Analysis of the Development of Domestic 3D Animation-Take Nezha: Birth of the Demon Child as an Example. In 2nd International Conference on Education, Language and Art (ICELA 2022) (pp. 231-238). Atlantis Press.

[19] Baoying, C. (2024). The Impact of Digital Special Effects Technology on China's Film Industrialization-A Case Study of the Wandering Earth Series. International Journal of Internet, Broadcasting and Communication, 16(4), 367-374.

[20] Khan, A. (2020). Technology Fetishism in The Wandering Earth. Inter-Asia Cultural Studies, 21(1), 20-37.

[21] Richard Musiime,Juan Ferriz Papi & Amanda Marshall Ponting. (2025). Developing a Pavement Condition Assessment Method for Unpaved Roads Using the Analytic Hierarchy Process (AHP). International Journal of Pavement Research and Technology,(prepublish),1-16.

[22] Guowen He,Lehua Bi & Xuehui Yang. (2024). Driving Product Innovative Performance Through Network Connections: A Study Based on the fsQCA Approach .Sustainability,16(24),10815-10815.