

RESEARCH ARTICLE

Analysis of the promoting and hindering pathways of socio-psychological factors in the cultural heritage environment on the development of Sichuan opera facial makeup

Xiaoyi Li, Somchai Seviset*, Thanate Piromgarn

Department of Architectural Education and Design, Faculty of Industrial Education and Technology, KingMongkut's Institute of Technology Ladkrabang, Bangkok, Thailand

* **Corresponding author:** Somchai Seviset, somchai.se@kmitl.ac.th

ABSTRACT

As a core carrier of China's intangible cultural heritage, Sichuan Opera Facial Makeup (SOFM) is subject to the interactive influence of the cultural heritage environment (material, institutional, and socio-cultural environments) and socio-psychological factors. Currently, it faces dilemmas such as the imbalance between traditional preservation and modern innovation, as well as insufficient inheritance motivation. This study aims to systematically identify key socio-psychological factors affecting SOFM's development within the cultural heritage environment, and analyze their promoting and hindering pathways, thereby providing theoretical and practical support for the sustainable inheritance of intangible cultural heritage. A mixed-methods approach was adopted: First, Quantitative research: A questionnaire survey was conducted among 300 participants, including SOFM inheritors, cultural scholars, the public, and policy implementers, with structural equation modeling (SEM) used to verify the correlation between socio-psychological factors and SOFM development indicators; Second, Qualitative research: In-depth interviews were conducted with 20 senior inheritors and intangible cultural heritage managers, combined with three typical cases (e.g., modern SOFM innovative design, commercial transformation failure) to explore the pathway mechanisms. The core results indicate five types of promoting factors (e.g., cultural identity, professional identity, innovative self-efficacy) and four types of hindering factors (e.g., traditional awe anxiety, aesthetic cognitive bias, perceived unfairness in resource allocation). The cultural heritage environment acts on SOFM's development through the "psychological perception-behavioral decision-making" chain, with policy support intensity and public cultural participation exerting moderating effects. This study further addresses key deficiencies in existing research from the interdisciplinary perspective of social psychology and cultural heritage studies, by conducting a granular analysis of the socio-psychological factors' promoting and hindering pathways for SOFM development, and provides empirical evidence for formulating targeted cultural heritage protection policies and optimizing inheritance mechanisms.

Keywords: Sichuan opera facial makeup; cultural heritage environment; socio-psychological factors; sustainable development; promoting pathways; hindering pathways

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1. Introduction

1.1. Research background and practical significance

Cultural heritage sustainability is shaped by the dynamic interaction between the multi-dimensional cultural heritage environment and human behaviors^[1]. The cultural heritage environment comprises three core dimensions: the material environment (e.g., Sichuan Opera theaters, intangible cultural heritage (ICH) exhibition bases), the institutional environment (e.g., ICH protection laws, inheritance support mechanisms), and the socio-cultural environment (e.g., public perceptions of traditional culture, media communication trends)^[2]. As a "visual soul of Sichuan Opera," Sichuan Opera Facial Makeup (SOFM) carries profound regional cultural genes through its color symbols (e.g., red for loyalty, white for treachery) and pattern connotations, serving as both an artistic expression and a cultural narrative medium^[3]. However, SOFM faces pressing developmental challenges: an aging inheritor pool^[4] (over 60% of senior inheritors are aged 55+), erosion of traditional aesthetics by modern popular culture, and inadequate innovation in cross-domain adaptation (e.g., limited integration with digital media or creative industries)^[5].

The inheritance and development of cultural heritage are inherently "human behavioral processes," where socio-psychological factors act as critical intermediaries between the external environment and practical outcomes^[4]. For SOFM, inheritors' psychological motivations (e.g., professional identity, fear of tradition erosion) influence their willingness to pass on skills and experiment with innovations; the public's aesthetic attitudes and cultural identity shape market demand and dissemination scope; and policy implementers' sense of responsibility and resource allocation biases determine protection effectiveness^[6]. Prior interdisciplinary research has confirmed that socio-psychological factors (e.g., cultural identity, self-efficacy) bridge macro-environmental conditions and micro-individual behaviors, directly affecting heritage transmission, innovation, and public acceptance^[7]. For example, Chen et al.^[4] found that inheritors with strong professional identity are 37% more likely to engage in innovative practices, highlighting the need to unpack these psychological mechanisms in the context of SOFM.

1.2. Research gaps

Despite growing scholarly attention to ICH protection, three critical gaps persist. First, existing SOFM research predominantly focuses on artistic aesthetics (e.g., color symbolism, pattern evolution) or historical textual analysis, with few empirical investigations of the "socio-psychology-behavior-development" mechanism^[8]. Most studies treat SOFM as a static artistic object rather than a dynamic practice shaped by human psychology. Second, in broader cultural heritage research, socio-psychological factors are often mentioned in general terms (e.g., "cultural identity matters") but lack granular analysis of their distinct promoting or hindering pathways^[9]. For instance, while traditional awe is linked to heritage preservation, it remains unclear whether and how it inhibits innovation. Third, interdisciplinary integration is insufficient: few studies systematically combine social psychological theories (e.g., Social Identity Theory, Theory of Planned Behavior) with the cultural heritage environment to construct a holistic analytical framework^[10], limiting explanatory power for real-world challenges.

1.3. Research objectives and research questions

This study aims to address these gaps by: (1) identifying key socio-psychological factors influencing SOFM's development within the cultural heritage environment; (2) analyzing the specific promoting and hindering pathways of these factors on SOFM's inheritance, innovation, and dissemination; and (3) verifying the moderating effects of institutional and socio-cultural environments on the relationship between socio-psychological factors and SOFM's development.

Guided by these objectives, three research questions (RQs) are proposed: RQ1: Which socio-psychological factors in the cultural heritage environment have significant impacts on SOFM's inheritance and innovation? RQ2: Through what specific pathways (direct or indirect) do these socio-psychological factors promote or hinder SOFM's development? RQ3: Do institutional factors (e.g., policy support intensity) and socio-cultural factors (e.g., public cultural participation) moderate the strength of these pathways?

1.4. Research framework and paper structure

This study's theoretical framework is constructed as follows: the cultural heritage environment (independent variable) exerts an influence on SOFM's development (dependent variable, operationalized as four dimensions: inheritance scale, innovation level, dissemination scope, and market acceptance) through socio-psychological factors (mediating variable). Based on the core conclusions of existing cultural heritage research^[10,11] and the research focus on the "socio-psychological mechanism of SOFM development", policy support intensity (core institutional environment factor) and public cultural participation (core socio-cultural environment factor) are selected as the key moderating variables in this study, which are the most direct environmental factors affecting the relationship between socio-psychological factors and SOFM's development. Other environmental factors of the cultural heritage environment are not included in the moderating variable system in this study for the sake of research focus and model parsimony, and their potential moderating effects can be explored in subsequent extended research.

This study makes three distinct contributions. Theoretically, it constructs and validates an integrated "cultural heritage environment-socio-psychology-cultural heritage development" framework, enriching the interdisciplinary theoretical system of ICH protection by systematically integrating social psychology and cultural heritage studies. Methodologically, it adopts a mixed-methods approach (quantitative structural equation modeling combined with qualitative interviews and case studies), complementing the strengths of both paradigms to enhance the scientific rigor and credibility of the findings. Practically, it identifies specific promoting and hindering pathways of socio-psychological factors, providing actionable recommendations for policymakers, inheritors, and cultural institutions to optimize SOFM's inheritance mechanisms and support the sustainable development of similar ICH.

2. Literature review

2.1. Definition of core concepts

2.1.1. Cultural heritage environment

Based on UNESCO's cultural heritage protection framework, the cultural heritage environment refers to all external environmental elements that influence the inheritance and development of cultural heritage, encompassing three interconnected dimensions^[12]. The material environment includes physical spaces such as inheritance venues (e.g., Sichuan Opera training studios) and exhibition facilities (e.g., ICH museums) that provide carriers for heritage transmission. The institutional environment consists of laws, regulations, and support policies (e.g., government funding for inheritors, ICH protection regulations) that offer systemic guarantees. The socio-cultural environment involves public cultural identity, media communication trends, and social attitudes toward traditional culture, which shape the cognitive context and market demand for heritage.

For Sichuan Opera Facial Makeup (SOFM), this multi-dimensional environment plays a pivotal role: the material environment provides physical platforms for inheritors to practice and display skills; the institutional environment affects the sustainability of inheritance through resource allocation and policy

incentives; the socio-cultural environment determines public acceptance of SOFM and drives demand for its innovation and dissemination.

2.1.2. Socio-psychological factors

In the context of cultural heritage inheritance, socio-psychological factors refer to the cognitive, attitudinal, motivational, and identity-based psychological states formed by individuals or groups during interactions with cultural heritage^[13]. These factors span three stakeholder groups: inheritors (e.g., professional identity, innovative self-efficacy, traditional awe), the public (e.g., cultural identity, aesthetic attitudes, willingness to pay), and policy implementers (e.g., sense of responsibility, resource allocation preferences).

Notably, these factors are not isolated but dynamically interact with the cultural heritage environment. For example, inheritors' innovative self-efficacy is shaped by both institutional support (e.g., training opportunities) and socio-cultural feedback (e.g., public recognition of innovative works), directly influencing their behavioral decisions regarding SOFM inheritance and innovation.

2.1.3. Development of Sichuan opera facial makeup

To operationalize SOFM's development, this study adopts a four-dimensional framework referenced from ICH development indicator research^[14], with multi-indicator combination to mitigate the inherent difficulty of precise quantification for artistic and market-related variables: (1) Inheritance scale, measured by the quantifiable indicators including the number of active inheritors, the effectiveness of apprentice training, and the continuity of skill transmission; (2) Innovation level, reflected in a combination of objective practice and subjective evaluation indicators such as the integration of modern design elements (e.g., digital art, pop culture), cross-domain application scenarios (e.g., cultural and creative products, fashion design), and the diversity of artistic expressions evaluated by senior inheritors and cultural scholars; (3) Dissemination scope, evaluated by quantifiable digital and offline indicators including public awareness, social media engagement (e.g., views, shares of SOFM-related content), and international exhibition participation; (4) Market acceptance, assessed through a mixed indicator system of objective commercial performance (e.g., commercial cooperation cases, sales volume of SOFM-derived products) and subjective consumer feedback (e.g., consumer satisfaction with SOFM-derived products, the success of cultural IP transformation).

2.2. Theoretical foundations

2.2.1. Social identity theory

Proposed by Tajfel ^[15], Social Identity Theory posits that individuals derive self-concept from their membership in social groups and exhibit behaviors consistent with group norms to enhance self-esteem. Recent extensions of this theory emphasize that cultural identity—an important form of social identity—shapes individuals' attitudes and behaviors toward cultural heritage^[6].

In the context of SOFM, the core compatibility between Social Identity Theory and SOFM's cultural context lies in the dual attribute of SOFM as a core Bashu cultural symbol and a national intangible cultural heritage, which makes the cultural identity and professional identity of stakeholders show unique characteristics different from general cultural forms. For the public, cultural identity with SOFM is not only the identification with Sichuan Opera art, but also the emotional belonging to Bashu regional culture through the color and pattern symbols of SOFM (For example, the unique facial makeup of Sichuan Opera clowns reflecting Bashu folk customs). This regional cultural identity makes public participation in SOFM protection more targeted and emotional. For inheritors, professional identity (a sense of belonging and pride

in SOFM inheritance) is bound to the identity of "ICH inheritor and craft guardian", which is not only a professional identity of artistic creation, but also a social identity of cultural inheritance. This dual identity strengthens their commitment to skill transmission and restricts their innovative practices to the bottom line of "keeping the authenticity of core cultural symbols", making SOFM innovation follow the rule of "innovation based on orthodoxy".

2.2.2. Theory of planned behavior (TPB)

Ajzen's ^[16] TPB argues that behavioral intention is determined by three factors: attitude toward the behavior, subjective norms, and perceived behavioral control, which in turn predict actual behavior. Recent applications of TPB in cultural research have confirmed its explanatory power for heritage-related behaviors^[17].

The core compatibility between TPB and SOFM's cultural context lies in the fact that SOFM's inheritance and innovation are typical ICH practice behaviors, whose behavioral intention and actual behavior are not only affected by the general three factors of TPB, but also show unique characteristics under the constraints of SOFM's traditional craft attributes and ICH institutional attributes. For SOFM inheritors, a positive attitude toward innovation is not a blind recognition of modern elements, but a positive attitude toward "innovative integration on the basis of retaining the core cultural symbols of SOFM (e.g., color symbolism of loyalty and treachery)"; the subjective norms are not only the social approval from peers and the public, but also the professional norms of the SOFM inheritance circle on the "authenticity of craft inheritance". Perceived behavioral control is a dual dimension for SOFM inheritors: the internal technical dimension (mastery of traditional SOFM painting techniques and modern design skills) and the external institutional dimension (access to ICH protection resources such as policy funding, training opportunities, and exhibition platforms), which are indispensable for promoting SOFM innovative practices. For the public, favorable attitudes toward SOFM products are based on the recognition of SOFM's cultural value, and the subjective norms are shaped by the social atmosphere of ICH protection and the cultural cognition of Bashu regional culture; the perceived behavioral control of consumption and dissemination behaviors is mainly reflected in the ease of accessing SOFM products (e.g., online purchasing channels, offline exhibition venues) and the clarity of SOFM's cultural connotation interpretation (e.g., whether the product is accompanied by cultural explanation of SOFM symbols).

2.2.3. Diffusion of innovations theory

Rogers' ^[18] Diffusion of Innovations Theory identifies key factors influencing the adoption of innovations: relative advantage, compatibility, complexity, trialability, and observability. These factors interact with audience psychological characteristics to determine the speed and scope of innovation diffusion, and for cultural heritage innovation, the symbolic authenticity of cultural heritage has become a key extended factor affecting the diffusion of its innovations, which makes the compatibility of cultural heritage innovation not only refer to the compatibility with modern aesthetics, but also the compatibility with the core cultural symbols of heritage^[19]. As a core Bashu cultural symbol and national intangible cultural heritage, SOFM has a high degree of cultural symbolic connotation and craft authenticity requirements, which makes the application of Diffusion of Innovations Theory in SOFM need to be deeply integrated with its unique cultural context, and the innovation diffusion of SOFM shows three distinctive characteristics different from general cultural and artistic innovations, which is the core compatibility between the theory and SOFM's cultural context. First, the dual compatibility constraint of SOFM innovation diffusion: the compatibility of Rogers' theory is extended to the dual dimension of aesthetic compatibility (with modern public aesthetic habits) and symbolic compatibility (with SOFM's core cultural symbols such as color symbolism and classic

character patterns). Only when SOFM innovations meet both dimensions (e.g., SOFM-themed cultural and creative products that retain red for loyalty and white for treachery and fit modern daily aesthetic) can they achieve effective diffusion; innovations that only pursue modern aesthetics and abandon core cultural symbols will be rejected by both the inheritance circle and the public. Second, the dual-circle diffusion structure of SOFM innovation: the diffusion of SOFM innovation is divided into the professional inheritance circle (SOFM inheritors, cultural scholars) and the mass consumption circle (general public, cultural and creative product consumers). The professional inheritance circle focuses on the craft authenticity and symbolic integrity of SOFM innovation, which is the "gatekeeper" of SOFM innovation diffusion; the mass consumption circle focuses on the aesthetic and practical value of SOFM innovation, which is the "promoter" of diffusion. The effective diffusion of SOFM innovation must first pass the recognition of the professional inheritance circle, and then gain the acceptance of the mass consumption circle. Third, the policy-driven diffusion characteristic of SOFM innovation: as a national intangible cultural heritage, SOFM innovation diffusion is highly dependent on the guidance of ICH protection policies (e.g., SOFM innovation design competitions, cultural and creative product incubation projects), which can effectively reduce the complexity of SOFM innovation cognition and improve the trialability and observability of SOFM innovations for the public. In the context of SOFM, the relative advantage of its innovations is reflected in the combination of cultural value and economic value, and socio-psychological factors such as public cultural identity and aesthetic attitudes moderate the perceived value of SOFM innovations by shaping the public's cognition of SOFM's cultural symbolic connotation, thereby affecting the market acceptance and diffusion scope of SOFM innovations. Public cultural participation can effectively reduce the public's aesthetic cognitive bias of SOFM, enhance the public's understanding of the dual compatibility of SOFM innovation, and thus accelerate the diffusion of SOFM innovations in the mass consumption circle.

2.2.4. Cultural capital theory

Bourdieu ^[20] defined cultural capital as intangible resources including cultural knowledge, skills, and identity, which can be converted into economic and social capital. Recent empirical research has extended this theory to cultural heritage studies, highlighting that the cultural capital of intangible cultural heritage has a dual structure of symbolic capital and craft capital, and the conversion of this capital into sustainable development outcomes depends on stakeholder psychological perceptions of both the cultural symbolic value and craft skill value of heritage^[21]. The core compatibility between Cultural Capital Theory and SOFM's cultural context lies in the unique dual structure of SOFM's cultural capital, which is composed of Bashu cultural symbolic capital and traditional craft skill capital, and the conversion of SOFM's cultural capital must be based on the preservation of the core cultural symbols, which is the premise of realizing the economic and social capital conversion of SOFM. SOFM's cultural symbolic capital is embodied in its color symbolism (like red for loyalty, white for treachery), pattern connotations (as the unique "face-changing" facial makeup of Sichuan Opera) and regional cultural connotations (Bashu folk customs and ethical values), which is the core of SOFM's cultural capital and the basis for the public to form cultural capital identity. SOFM's craft skill capital is embodied in the unique painting techniques, material selection and makeup application skills of SOFM, which is the scarce resource of SOFM's cultural capital and the core of inheritors' capital conversion cognition. The successful conversion of SOFM's cultural capital into economic value (such as through cultural and creative products, digital art) requires inheritors to balance the preservation of core cultural symbols and craft skills with market-oriented innovation, and the public to form a comprehensive cultural capital identity that recognizes both SOFM's symbolic value and craft value. Stakeholders' socio-psychological factors (such as inheritors' innovative self-efficacy, public's cultural

identity) shape the psychological perception of SOFM's cultural capital, and thus determine the efficiency and sustainability of SOFM's cultural capital conversion into economic and social capital..

2.3. Review of relevant research

2.3.1. Socio-psychological research in cultural heritage protection

Recent studies (2020–2025) in this field have focused on three core themes: inheritors' psychological motivations, public protection attitudes and behaviors, and psychological perceptions in policy implementation. For example, Garcia et al.^[6] found that inheritors' professional identity and life satisfaction significantly predict their long-term inheritance intentions. Zhang et al.^[22] confirmed that public cultural identity and perceived responsibility positively influence participation in heritage protection activities.

Scholars generally agree that cultural identity is a core driver of cultural heritage sustainability^[10]. However, controversy persists regarding the role of traditional awe: some studies argue that excessive awe leads to fear of changing heritage forms, inhibiting innovation^[23], while others contend that moderate awe fosters respect for heritage essence, ensuring the preservation of core cultural values^[24].

2.3.2. Research on influencing factors of traditional art development

Existing research identifies two categories of factors affecting traditional art development: external factors (such as policy support, market demand, media coverage) and internal factors (such as inheritors' skills, innovation capabilities, psychological states)^[25]. For example, policy support such as funding and exhibition opportunities directly expands the development space for traditional art, while inheritors' innovation capabilities determine their adaptability to modern society.

However, a critical gap remains: few studies clarify the mediating role of socio-psychological factors in the relationship between external environments and traditional art development. Most research treats psychological factors as auxiliary variables rather than core mechanisms, failing to analyze the specific promoting or hindering pathways through which they influence development outcomes.

2.3.3. Research on Sichuan opera and SOFM

Current research on SOFM primarily focuses on artistic aesthetics (e.g., color symbolism, pattern evolution) and historical textual research^[26]. A small number of studies mention inheritance dilemmas such as aging inheritors and limited market demand^[27], but these investigations lack in-depth analysis of the psychological roots of these problems.

Compared with international research on cultural heritage, SOFM-related studies suffer from two levels of interdisciplinary integration deficiency: first, they rarely combine social psychology theories to explore the "environment-psychology-behavior" mechanism; second, even the few studies that refer to socio-psychological theories only apply the theoretical framework to verify simple variable relationships, without exploring the compatibility between the core mechanisms of these theories and the unique cultural context of SOFM (For example, its attributes as a Bashu cultural symbol and intangible cultural heritage). For example, the application of Diffusion of Innovations Theory only refers to general innovation acceptance factors, ignoring the influence of SOFM's cultural symbolic authenticity on its innovation diffusion rules. This dual gap limits the development of targeted solutions to SOFM's inheritance and innovation challenges and the in-depth interpretation of the psychological mechanism of SOFM development.

2.4. Hypothesis development

Based on the above literature review and theoretical foundations, the following hypotheses are proposed to address the research questions:

H1: Positive socio-psychological factors (cultural identity, professional identity, innovative self-efficacy, sense of responsibility, willingness to pay) have a significant positive impact on SOFM's development (inheritance scale, innovation level, dissemination scope, market acceptance) (promoting pathways).

H2: Negative socio-psychological factors (traditional awe anxiety, aesthetic cognitive bias, perceived unfairness in resource allocation) have a significant negative impact on SOFM's development (hindering pathways).

H3: The cultural heritage environment (institutional environment and socio-cultural environment) moderates the relationship between socio-psychological factors and SOFM's development. Specifically, strong policy support (the core regulatory factor of the institutional environment) strengthens the positive impact of professional identity on SOFM's inheritance and innovation, while high public cultural participation (the core cognitive factor of the socio-cultural environment) enhances the positive impact of innovative self-efficacy on market acceptance. This hypothesis focuses on the two most representative environmental factors based on the research focus and theoretical parsimony, and other environmental factors are not included in the hypothesis testing for the time being.

3. Research methods

This section may be divided by subheadings. It should provide a concise and pre-cise description of the experimental results, their interpretation, as well as the experi-mental conclusions that can be drawn.

3.1. Research design

This study adopts an explanatory sequential mixed-methods design, which integrates quantitative and qualitative approaches in a sequential manner ^[28]. The design follows a two-phase logic: first, a quantitative study is conducted to identify key socio-psychological factors and verify their correlational and causal relationships with the development of Sichuan Opera Facial Makeup (SOFM); second, a qualitative study is implemented to deeply interpret the underlying mechanisms of these pathways. This sequential integration enables the complementary strengths of both paradigms—quantitative data provides empirical validation of "what relationships exist," while qualitative data explains "why and how these relationships operate"—thereby enhancing the comprehensiveness and credibility of the research findings ^[29]. Given the complexity of the "cultural heritage environment-socio-psychology-SOFM development" mechanism, this mixed-methods design is particularly suitable for unpacking the multi-layered interactions between variables.

3.2. Research participants

3.2.1. Quantitative research sample

The quantitative sample consists of 300 participants, stratified into four stakeholder groups to ensure representativeness. A combination of stratified sampling and convenience sampling was used: stratified sampling ensured proportional representation of each stakeholder group, while convenience sampling facilitated practical data collection (like collaborating with ICH institutions to distribute questionnaires). The final valid sample included 286 questionnaires, with an effective recovery rate of 95.3%. **Table 1** presents the demographic characteristics of the quantitative sample.

Table 1. Demographic characteristics of the quantitative sample (N = 286).

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	149	52.1
	Female	137	47.9
Age	18–30 years	90	31.5
	31–50 years	131	45.8
	51+ years	65	22.7
Occupation	SOFM Inheritor	100	34.9
	Cultural Scholar	50	17.5
	Public	100	34.9
	Policy Implementer	36	12.6
Region	Sichuan	195	68.2
	Chongqing	61	21.3
	Other Provinces	30	10.5

3.2.2. Qualitative research sample

Semi-structured interviews were conducted with 30 participants, and three typical cases were selected for cross-case analysis based on theoretical sampling principles ^[30]. Detailed information on interview participants and cases is presented in **Table 2** and **Table 3**, respectively.

Table 2. Basic information of qualitative interview participants.

Participant Group	Number of Participants	Key Characteristics
Senior SOFM Inheritors	20	≥15 years of professional experience; covers Sichuan/Chongqing
ICH Management Directors	5	≥5 years of ICH management experience; local cultural and tourism departments
Cultural Enterprise Practitioners	5	Involved in SOFM cultural and creative (CC) product development; ≥3 years of industry experience

Table 3. Overview of typical cases.

Case Type	Case Description	Core Research Focus	Data Sources
Successful Case	A SOFM CC brand integrating modern design (e.g., pop culture, digital art) with traditional symbols; high market sales and social media attention	How positive socio-psychological factors (e.g., innovative self-efficacy) drive successful innovation	Enterprise reports, media coverage, field visits
Challenging Case	A local Sichuan Opera troupe facing inheritor loss, limited funding, and low innovation willingness	How negative socio-psychological factors (e.g., perceived unfairness in resource allocation) hinder development	Policy documents, interview data with troupe members
Controversial Case	A modern artistic adaptation of SOFM (e.g., abstract painting style) sparking public debates on "traditional alienation"	How conflicting socio-psychological factors (e.g., traditional awe anxiety versus public aesthetic bias) shape development outcomes	Media reports, public comment data, expert interviews

3.3. Data collection tools and procedures

3.3.1. Quantitative questionnaire

The questionnaire was adapted from validated scales in existing literature, optimized for the SOFM context, and refined through expert review and pre-survey (n = 30) to ensure reliability and validity. The scale structure and item distribution are summarized in **Table 4**.

Table 4. Structure of the questionnaire scale

Scale Name	Dimensions	Number of Items	Measurement Scale
Cultural Heritage Environment	Material Environment	3	5-point Likert Scale (1 = Strongly Disagree, 5 = Strongly Agree)
	Institutional Environment	4	
	Socio-Cultural Environment	5	
Socio-Psychological Factors	Cultural Identity	5	
	Professional Identity	4	
	Innovative Self-Efficacy	4	
	Traditional Awe Anxiety	3	
	Aesthetic Cognitive Bias	3	
	Perceived Unfairness in Resource Allocation	3	
	Sense of Responsibility	3	
SOFM Development	Inheritance Scale	4	
	Innovation Level	4	
	Dissemination Scope	4	
	Market Acceptance	4	
Moderating Variables	Policy Support Intensity	4	
	Public Cultural Participation	4	

Data were collected between 2025 through online surveys (via Wenjuanxing, a Chinese professional survey platform) and offline distribution at ICH events and Sichuan Opera venues.

3.3.2. Semi-structured interview guide

The interview guide focused on four core themes: (1) inheritors' professional psychology and innovation decision-making processes; (2) policy implementers' perceptions of SOFM development and resource allocation logic; (3) cultural enterprises' psychological predictions of SOFM market acceptance; and (4) psychological attributions of SOFM development dilemmas. Each interview lasted 40–60 minutes, was audio-recorded with participants' consent, and transcribed verbatim into approximately 150,000 Chinese characters of text data.

3.3.3. Case data collection

Case data were triangulated from multiple sources (policy documents, media reports, enterprise reports, and field notes) to ensure reliability^[31].

3.4. Data analysis methods

3.4.1. Quantitative data analysis

Descriptive statistics: SPSS 26.0 was used to analyze demographic characteristics and descriptive indicators (mean, standard deviation) of key variables;

For reliability and validity tests, Cronbach's α coefficient was used to assess scale reliability ($\alpha \geq 0.7$ was considered acceptable), and confirmatory factor analysis (CFA) via AMOS 24.0 was conducted to test construct validity; for correlation analysis; For pearson correlation analysis was used to examine the bivariate relationships between variables; For hypothesis testing: Structural equation modeling (SEM) was employed to verify the direct effects of socio-psychological factors on SOFM development, and hierarchical regression analysis was used to test the moderating effects of policy support intensity and public cultural participation.

3.4.2. Qualitative data analysis

For coding analysis: NVivo 12.0 was used for three-level coding: open coding (extracting initial concepts from interview texts), axial coding (categorizing concepts into core categories), and selective coding (constructing pathway mechanisms around core categories); And for Cross-case analysis, comparative analysis was conducted across the three cases to identify similarities and differences in the role of socio-psychological factors.

4. Results

4.1. Sample characteristics

The demographic profile of the quantitative sample (N=286) and basic information of the qualitative sample are summarized in **Table 5** and **Table 6**, respectively.

Table 5. Demographic characteristics of the quantitative sample.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	149	52.4
	Female	137	47.6
Age	18–30 years	90	31.5
	31–50 years	131	45.8
	51+ years	65	22.7
Occupation	SOFM Inheritor	100	34.9
	Cultural Scholar	50	17.5
	Public	100	34.9
	Policy Implementer	36	12.7
Region	Sichuan	195	68.2
	Chongqing	61	21.3
	Other Provinces	30	10.5

Table 6. Basic information of the qualitative sample.

Participant Group	Number of Participants	Average Tenure (Years)	Key Backgrounds
Senior SOFM Inheritors	20	23.6	Mastery of traditional facial makeup techniques; covers Sichuan/Chongqing
ICH Management Directors	5	8.9	Responsible for local ICH policy implementation
Cultural Enterprise Practitioners	5	6.3	Specialized in SOFM cultural and creative product development

The quantitative sample was balanced in gender and age, with the 31–50 age group (45.8%) forming the largest segment, reflecting the core stakeholder group driving SOFM development. Geographically, over 89%

of participants were from Sichuan and Chongqing, ensuring alignment with SOFM's regional cultural context. Qualitative participants' extensive professional experience (e.g., inheritors with an average of 23.6 years of practice) guaranteed the depth of interview data.

4.2. Reliability and validity of scales

4.2.1. Reliability test

Cronbach's α coefficients were used to assess scale reliability, with $\alpha \geq 0.7$ considered acceptable^[32]. As shown in **Table 7**, all scales exhibited excellent reliability, with α coefficients ranging from 0.82 to 0.89, well above the threshold.

Table 7. Reliability test results.

Scale Name	Cronbach's α Coefficient	Number of Items	Reliability Evaluation
Cultural Heritage Environment	0.82	12	Excellent
Socio-Psychological Factors	0.89	25	Excellent
SOFM Development	0.86	16	Excellent
Policy Support Intensity	0.83	4	Excellent
Public Cultural Participation	0.81	4	Excellent

4.2.2. Validity test

Confirmatory Factor Analysis (CFA) was conducted to verify construct validity. The fit indices in **Table 8** indicate that the measurement model aligns well with the data ($\chi^2/df = 2.36 < 3$, RMSEA = 0.068 < 0.08, CFI = 0.92 > 0.90, TLI = 0.91 > 0.90), confirming good structural validity^[33].

Table 8. CFA fit indices.

Fit Index	χ^2/df	RMSEA	CFI	TLI	Acceptance Criterion
Measurement Model	2.36	0.068	0.92	0.91	Meets Standards

4.3. Correlation analysis results

Pearson correlation analysis revealed significant associations between key variables (**Table 9**). Positive socio-psychological factors (cultural identity, professional identity, innovative self-efficacy, sense of responsibility) were strongly positively correlated with SOFM development dimensions ($r = 0.42\text{--}0.68$, $p < 0.001$). In contrast, negative socio-psychological factors (traditional awe anxiety, aesthetic cognitive bias, perceived unfairness in resource allocation) showed significant negative correlations with SOFM development ($r = -0.35$ to -0.57 , $p < 0.001$). Additionally, all dimensions of the cultural heritage environment were significantly correlated with socio-psychological factors and SOFM development ($p < 0.01$), laying the foundation for subsequent path analysis.

Table 9. Summary of correlation coefficients (r).

Variables	SOFM Inheritance	SOFM Innovation	SOFM Dissemination	SOFM Market Acceptance
Cultural Identity	0.62***	0.58***	0.55***	0.49***
Professional Identity	0.57***	0.68***	0.51***	0.53***
Innovative Self-Efficacy	0.45***	0.63***	0.48***	0.65***
Sense of Responsibility	0.42***	0.47***	0.61***	0.50***
Traditional Awe Anxiety	-0.41***	-0.57***	-0.38***	-0.45***
Aesthetic Cognitive Bias	-0.39***	-0.48***	-0.35***	-0.54***

Variables	SOFM Inheritance	SOFM Innovation	SOFM Dissemination	SOFM Market Acceptance
Perceived Unfairness in Resource Allocation	-0.52***	-0.43***	-0.37***	-0.40***
Cultural Heritage Environment	0.56***	0.59***	0.53***	0.51***

Table 9. (Continued)

Note: *** $p < 0.001$

4.4. Hypothesis testing results (Path analysis)

Structural Equation Modeling (SEM) and hierarchical regression analysis were used to test the proposed hypotheses. The results confirmed that H1 and H2 were fully supported, while H3 was partially supported.

4.4.1. Promoting pathways (H1 supported)

As shown in **Figure 1** and **Table 10**, four significant direct promoting pathways were identified:

Cultural Identity to SOFM Inheritance Scale ($\beta = 0.52$, $p < 0.001$): Higher public cultural identity was associated with greater participation in SOFM inheritance (such as apprenticeship, supporting heritage activities).

Professional Identity to SOFM Innovation Level ($\beta = 0.48$, $p < 0.001$): Inheritors with stronger professional pride were more willing to integrate modern elements (e.g., pop culture, digital design) into SOFM.

Innovative Self-Efficacy to SOFM Market Acceptance ($\beta = 0.55$, $p < 0.001$): Creators' confidence in their innovative capabilities significantly enhanced the market acceptance of their SOFM products.

Sense of Responsibility to SOFM Dissemination Scope ($\beta = 0.41$, $p < 0.001$): Policy implementers and scholars with a stronger sense of responsibility actively promoted cross-regional and cross-media dissemination of SOFM.

An indirect promoting pathway was also verified: Institutional Environment (Cultural Heritage Environment) to Professional Identity to SOFM Innovation Level (mediation effect = 0.23, $p < 0.01$). This indicates that sound policy support (e.g., funding, training opportunities) strengthens inheritors' professional identity, which in turn fosters innovation.

4.4.2. Hindering pathways (H2 supported)

Three significant direct hindering pathways were confirmed (**Figure 1** and **Table 10**):

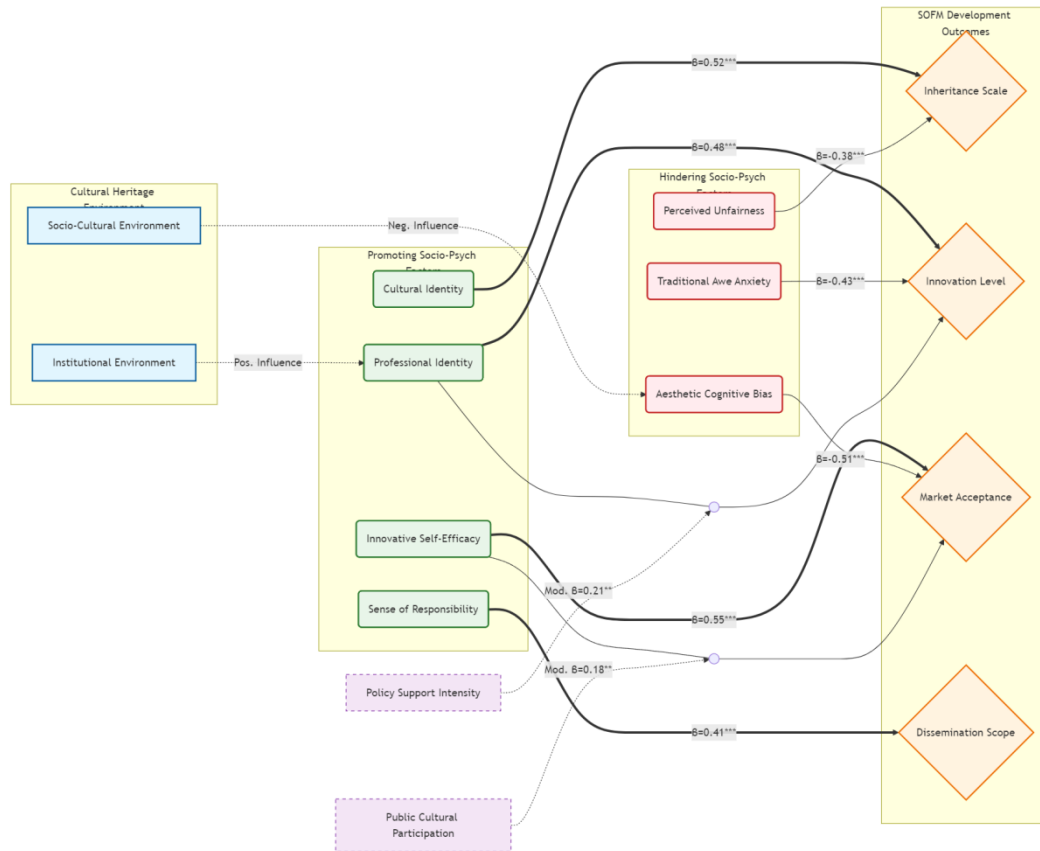


Figure 1. Structural equation model of promoting and hindering pathways.

Table 10. Direct and indirect path coefficients.

Pathway	Standardized Coefficient (β)	p-Value
Direct Promoting Pathways		
Cultural Identity to Inheritance Scale	0.52	<0.001
Professional Identity to Innovation Level	0.48	<0.001
Innovative Self-Efficacy to Market Acceptance	0.55	<0.001
Sense of Responsibility to Dissemination Scope	0.41	<0.001
Indirect Promoting Pathway		
Institutional Environment to Professional Identity to Innovation Level	0.23	<0.01
Direct Hindering Pathways		
Traditional Awe Anxiety to Innovation Level	-0.43	<0.001
Aesthetic Cognitive Bias to Market Acceptance	-0.51	<0.001
Perceived Unfairness to Inheritance Scale	-0.38	<0.001
Indirect Hindering Pathway		
Socio-Cultural Environment to Aesthetic Cognitive Bias to Market Acceptance	-0.19	<0.01

Traditional Awe Anxiety to SOFM Innovation Level ($\beta = -0.43$, $p < 0.001$): Inheritors' fear of "traditional alienation" led to resistance to modern innovations, resulting in rigid SOFM styles.

Aesthetic Cognitive Bias to SOFM Market Acceptance ($\beta = -0.51, p < 0.001$): The public's aesthetic perception of SOFM was confined to traditional opera scenes, reducing acceptance of cross-domain innovative products (such as SOFM-themed animations).

Perceived Unfairness in Resource Allocation to SOFM Inheritance Scale ($\beta = -0.38, p < 0.001$): Inheritors' perception that resources were skewed toward renowned masters reduced their inheritance willingness, leading to a shrinking inheritance scale.

An indirect hindering pathway was identified: Socio-Cultural Environment (Cultural Heritage Environment) to Aesthetic Cognitive Bias to SOFM Market Acceptance (mediation effect = $-0.19, p < 0.01$). Limited dissemination of SOFM in traditional contexts reinforced public aesthetic rigidity, hindering the market acceptance of innovative products.

4.4.3. Moderating effects (H3 partially supported)

Hierarchical regression analysis revealed two significant moderating effects (Table 11):

Table 11. Moderating effect results.

Moderator Variable	Moderated Pathway	β	p-Value
Policy Support Intensity	Professional Identity to Innovation Level	0.21	<0.01
	Cultural Identity to Inheritance Scale	0.09	>0.05
Public Cultural Participation	Innovative Self-Efficacy to Market Acceptance	0.18	<0.01
	Sense of Responsibility to Dissemination Scope	0.11	>0.05

Policy Support Intensity moderated the path "Professional Identity to SOFM Innovation Level" ($\beta = 0.21, p < 0.01$): Stronger policy support amplified the positive impact of professional identity on innovation. However, it had no significant moderating effect on "Cultural Identity to SOFM Inheritance Scale" ($p > 0.05$).

Public Cultural Participation moderated the path "Innovative Self-Efficacy to SOFM Market Acceptance" ($\beta = 0.18, p < 0.01$): Higher public participation (e.g., participating in SOFM innovation design contests, voting for SOFM cultural and creative products) strengthened the link between creators' self-efficacy and market acceptance. From the perspective of ****Diffusion of Innovations Theory combined with SOFM's cultural symbolic attributes****, this moderating effect is essentially that public cultural participation enhances the public's cognition of the dual compatibility (aesthetic and symbolic) of SOFM innovation, reduces the public's aesthetic cognitive bias of SOFM, and thus makes the public more able to recognize the value of SOFM innovations with strong innovative self-efficacy (innovations that balance traditional cultural symbols and modern design). Policy support intensity, on the other hand, as a key driving factor for SOFM innovation diffusion, mainly plays a role in the ****professional inheritance circle**** of SOFM, enhancing the inheritors' professional identity and thus amplifying the positive impact of professional identity on innovation level. It did not moderate "Sense of Responsibility to SOFM Dissemination Scope" ($p > 0.05$). It should be noted that the moderating effects analyzed in this study are limited to environmental-level variables (policy support intensity, public cultural participation). The potential regulatory effects of individual-level boundary condition variables (e.g., SOFM inheritors' age, educational background) on key paths such as "Innovative Self-Efficacy to Market Acceptance" have not been explored in this study, and the specific mechanisms by which these variables alter the strength of the above path relationships remain to be verified by subsequent empirical research. In particular, different age and educational background of inheritors may shape different cognition of SOFM's cultural symbolic authenticity and modern innovation, thus showing different moderating effects on the innovation diffusion of SOFM.

4.5. Qualitative research and case analysis results

4.5.1. Core categories from interview coding

NVivo 12.0-based coding identified core categories aligned with quantitative findings (**Table 12**):

Table 12. Core categories from qualitative coding.

Factor Type	Core Categories	Representative Quotes
Promoting Factors	Inheritance Pride (Professional Identity)	"Being an SOFM inheritor makes me proud—I want to pass on this craft to more people."
	Innovation Motivation ("Keep SOFM Alive")	"We need to integrate modern elements so young people will like SOFM."
	Cultural Continuity (Cultural Identity)	"SOFM is part of our cultural roots; we can't let it disappear."
Hindering Factors	Fear of Tradition Loss (Traditional Awe Anxiety)	"Changing SOFM too much means losing its essence—it won't be Sichuan Opera anymore."
	Public Aesthetic Rigidity (Aesthetic Cognitive Bias)	"Young people don't watch traditional operas, so they don't understand SOFM's beauty."
	Resource Inequity Perception (Perceived Unfairness)	"Funding and opportunities all go to big troupes—small inheritors struggle to survive."

4.5.2. Cross-case comparison

The three typical cases further validated the quantitative pathways:

Successful Case: A SOFM cultural and creative brand achieved high market acceptance through "traditional symbols plus modern design." The founder's strong innovative self-efficacy, coupled with policy support (ICH CC product funding) and high public participation (online design voting), reinforced the promoting pathways.

Challenging Case: A local Sichuan Opera troupe faced inheritor loss and stagnant innovation. Senior inheritors' severe traditional awe anxiety led to resistance to change, while insufficient resource allocation (no special inheritance funding) exacerbated perceived unfairness, weakening inheritance motivation.

Controversial Case: A modern artistic adaptation of SOFM sparked debates. The core conflict stemmed from public aesthetic cognitive bias (perceiving the adaptation as "deviating from tradition") and divergent professional identities among inheritors (some supported innovation, others defended tradition).

5. Discussion

5.1. Interpretation of core research results

5.1.1. Dual pathways of socio-psychological factors

The promotion pathways identified in this study follow a core logic of "dual driving forces: cultural identity and self-efficacy." Cultural identity provides a value orientation for "why to act"—for example, the public's identification with Sichuan Opera culture motivates participation in inheritance activities, while inheritors' recognition of SOFM's cultural value fuels their commitment to skill transmission. Self-efficacy (including innovative self-efficacy and professional self-efficacy) supplies the confidence for "how to succeed": inheritors with strong professional identity and innovative self-efficacy are more willing to experiment with modern adaptations, as they believe in their ability to balance tradition and innovation. This aligns with the core propositions of Social Identity Theory ^[15] and the Theory of Planned Behavior ^[16], which emphasize that identity-based values and perceived behavioral control jointly shape behavioral intentions.

In contrast, the hindrance pathways originate from "psychological conflicts between tradition and modernity." Traditional awe anxiety reflects a "fear of change"—inheritors worry that modern innovations will erode SOFM's core cultural essence, leading to rigid adherence to traditional forms. Aesthetic cognitive

bias stems from "cognitive inertia"—the public's perception of SOFM is confined to traditional opera scenes, resulting in low acceptance of cross-domain innovations (such as SOFM-themed animations). Perceived unfairness in resource allocation arises from "distrust of the environment"—small-scale inheritors feel excluded from policy support and resource distribution, reducing their inheritance willingness. These findings complement existing research on the hindrances to traditional art development by uncovering the psychological mechanisms underlying external challenges, addressing the gap in granular analysis of hindrance pathways ^[6].

5.1.2. Moderating role of the cultural heritage environment

The moderating effect of policy support intensity reveals that policies serve not only as "material guarantees" but also as "psychological boosters." By providing funding, training, and professional certification, policies enhance inheritors' professional identity and perceived resource control, amplifying the positive impact of professional identity on innovation. This aligns with the "policy psychological effect" proposed by Liu et al.^[11], which argues that well-designed policies can shape stakeholders' psychological states to promote behavioral change. However, the non-significant moderating effect on the "cultural identity to inheritance scale" pathway may be attributed to the fact that cultural identity is a deep-seated value orientation formed through long-term socialization, which is less susceptible to short-term policy interventions.

Public cultural participation moderates 'innovative self-efficacy towards market acceptance' by reducing aesthetic cognitive bias: participation deepens public understanding of SOFM innovation's dual compatibility (traditional symbols plus modern aesthetics), validating extended Diffusion of Innovations Theory and supplementing cultural heritage innovation's unique diffusion rule—perceived relevance includes both modern life and core cultural symbols. Public cultural participation makes the public realize that SOFM innovation is not the "alienation of tradition" but the "activation of tradition" based on the preservation of core cultural symbols, which fundamentally reduces the public's psychological resistance to SOFM innovation and accelerates the diffusion of SOFM innovations in the mass consumption circle. In addition, the moderating effect of public cultural participation also reflects the characteristics of SOFM's dual-circle diffusion structure: public participation is the key link connecting the professional inheritance circle and the mass consumption circle of SOFM innovation, which can transmit the professional recognition of SOFM innovation (symbolic authenticity) to the mass consumption circle, and thus realize the effective diffusion of SOFM innovation across the two circles.

5.1.3. Boundary conditions of variable relationships: Potential moderating effects of individual-level variables

This study focuses on the moderating effects of environmental-level variables, and does not empirically test the individual-level boundary conditions of the relationship between socio-psychological factors and SOFM development. However, combined with the practical characteristics of SOFM inheritance and existing cultural heritage research ^[10,19], individual-level variables of inheritors such as age and educational background may have significant moderating effects on the key paths of SOFM development, and their potential boundary mechanism is tentatively interpreted as follows, which helps to clarify the applicable scenarios of the research conclusions.

First, the moderating effect of inheritors' age on the path of Innovative Self-Efficacy towards Market Acceptance. Young inheritors (under 40 years old) have a stronger sense of integration with modern popular culture and digital media, and their innovative design of SOFM is more in line with the aesthetic preferences of young consumer groups, which is the main body of the cultural and creative product market. Therefore,

for young inheritors, the positive impact of innovative self-efficacy on SOFM market acceptance is likely to be strengthened; while senior inheritors (over 55 years old) have a deeper understanding of traditional SOFM art, but their grasp of modern market demand and digital communication methods is relatively limited, so the positive impact of innovative self-efficacy on market acceptance may be weakened. This means the conclusion of "innovative self-efficacy promoting market acceptance" is more applicable to the young SOFM inheritor group.

Second, the moderating effect of inheritors' educational background on the path of Innovative Self-Efficacy towards Market Acceptance. Inheritors with higher educational backgrounds (bachelor's degree or above) have stronger abilities in design innovation, market research and resource integration, and can more effectively translate their innovative self-efficacy into practical market-oriented products such as SOFM-themed cultural and creative products, digital artworks. Thus, the positive impact of innovative self-efficacy on market acceptance is amplified for this group; while inheritors with only vocational or technical education are more proficient in traditional SOFM painting techniques, but lack the ability of market-oriented innovation and product operation, leading to the attenuation of the above path effect. This indicates the conclusion of "innovative self-efficacy driving market acceptance" has a more significant effect in the high-education SOFM inheritor group.

In addition, inheritors' professional tenure (like years of SOFM practice) may also moderate the path of Professional Identity towards Innovation Level: inheritors with medium tenure (10-20 years) balance traditional inheritance and modern innovation, and their professional identity has a stronger positive impact on innovation level; while inheritors with short tenure (less than 5 years) lack sufficient traditional skills, and those with long tenure (more than 30 years) have a stronger sense of traditional awe, so the above path effect may be relatively weak.

The above potential boundary mechanisms are all tentative inferences based on practical logic and existing research, and need to be verified by subsequent empirical research with larger samples and more detailed individual attribute data.

5.2. Dialogue with existing literature

This study aligns with prior research by confirming that cultural identity and professional identity are core drivers of ICH inheritance^[7]. However, it extends the literature in three key ways: first, it identifies "traditional awe anxiety" and "perceived unfairness in resource allocation" as critical hindering factors for SOFM development, a finding not explicitly addressed in previous SOFM-related studies^[8]; second, it unpacks the indirect pathways through which the cultural heritage environment shapes SOFM development via socio-psychological factors, filling the gap in interdisciplinary research that lacks systematic integration of environmental and psychological mechanisms^[10]; Third, it resolves the academic controversy surrounding traditional awe—this study finds that moderate awe fosters the preservation of core cultural symbols, while excessive awe triggers anxiety that inhibits innovation, providing a nuanced middle-ground explanation for conflicting findings in existing research^[23,24]. Fourth, it deepens the application of socio-psychological theories in SOFM research by exploring the compatibility between the core mechanisms of socio-psychological theories (such as Diffusion of Innovations Theory, Social Identity Theory) and SOFM's unique cultural context (Bashu cultural symbol plus national intangible cultural heritage). Unlike previous studies that only apply socio-psychological theories to verify simple variable relationships, this study extends the core mechanisms of relevant theories according to SOFM's cultural symbolic attributes and craft authenticity requirements (such as the dual compatibility constraint of SOFM innovation diffusion, the dual structure of SOFM cultural capital), and integrates the theoretical core mechanisms with the empirical analysis of SOFM

development, realizing the in-depth integration of social psychology theories and the research subject of SOFM, and providing a reference for the localized application of socio-psychological theories in the research of Chinese intangible cultural heritage with strong cultural symbolic attributes.

5.3. Theoretical contributions

First, this study constructs and validates an integrated "cultural heritage environment-socio-psychology-SOFM development" framework, systematically integrating social psychological theories (Social Identity Theory, Theory of Planned Behavior) with cultural heritage research. This framework enriches the interdisciplinary theoretical system of ICH protection by clarifying the mediating role of socio-psychological factors and the moderating role of environmental factors, addressing the insufficient interdisciplinary integration noted in prior research ^[10].

Second, the identification of the "dual pathway" mechanism (promotion versus hindrance) of socio-psychological factors provides a replicable analytical framework for future studies on the psychological drivers of cultural heritage development. By distinguishing between positive and negative factors and their direct/indirect pathways, this study moves beyond the generalizations of previous research (like cultural identity matters) to offer granular insights into how psychological factors shape development outcomes.

5.4. Practical implications

5.4.1. Strategies for inheritors

To strengthen positive socio-psychological factors: relevant institutions should establish a "professional honor certification system" (like selecting "ICH Inheritance Masters") to enhance inheritors' professional identity; offer training programs on modern design, cultural and creative product development, and digital media to improve innovative self-efficacy.

To alleviate negative socio-psychological factors: organize "symposiums on balancing tradition and innovation" to guide inheritors in recognizing that innovation can enhance SOFM's vitality without eroding its core value, thereby reducing traditional awe anxiety; implement a "resource allocation transparency system" (like publicizing funding distribution and training opportunities) to mitigate perceived unfairness.

5.4.2. Strategies for policymakers

To optimize the institutional environment: increase resource inclination toward small and medium-sized inheritance groups (such as special funding for grassroots inheritors, mobile training workshops); integrate "socio-psychological guidance" into ICH protection policies, such as supporting psychological counseling for inheritors and launching public education campaigns on traditional culture.

To strengthen policy moderating effects: design targeted policies to enhance inheritors' perceived resource control (such as flexible funding use, independent project design rights) to amplify the positive impact of professional identity on innovation; build public participation platforms (like SOFM innovation design competitions, online voting for dissemination projects) to boost public cultural participation.

5.4.3. Strategies for market and dissemination

To guide public aesthetics: utilize new media (e.g., short videos, live broadcasts) to showcase SOFM's modern adaptations (such as SOFM-themed cosmetics, digital art) and highlight the compatibility of traditional symbols with modern life, breaking the public's cognitive bias that "SOFM belongs only to traditional opera."

To promote cultural capital conversion: encourage cooperation between cultural enterprises and inheritors to develop products that align with modern aesthetics while retaining SOFM's core cultural

symbols (such as animated characters, fashion accessories); leverage e-commerce platforms and cultural exhibitions to expand the market reach of innovative products, enhancing market acceptance.

6. Conclusion and future research

6.1. Research conclusions

Using a mixed-methods design, this study identifies four categories of positive socio-psychological factors (cultural identity, professional identity, innovative self-efficacy, sense of responsibility) and three categories of negative socio-psychological factors (traditional awe anxiety, aesthetic cognitive bias, perceived unfairness in resource allocation) influencing the development of Sichuan Opera Facial Makeup (SOFM). These factors affect SOFM's inheritance, innovation, dissemination, and market acceptance through direct and indirect pathways, with the cultural heritage environment (policy support intensity, public cultural participation) exerting moderating effects on specific pathways. The core driver of positive factors lies in "value identification and ability confidence," while the root cause of negative factors stems from "psychological conflicts between tradition and modernity." In terms of theoretical application, this study verifies the applicability of classic socio-psychological theories in SOFM research, and deeply explores the compatibility between the core mechanisms of these theories and SOFM's unique cultural context by extending the theoretical core mechanisms according to SOFM's cultural symbolic attributes and craft authenticity requirements. The study finds that the application of socio-psychological theories in ICH research must be combined with the cultural characteristics of the research object, and the localized extension of theoretical mechanisms is the key to realizing the in-depth integration of theory and research subject.

6.2. Research limitations

First, the quantitative sample is mainly concentrated in Sichuan and Chongqing, limiting regional representativeness, and the small size of qualitative interview samples may affect the generalizability of conclusions. Second, precise quantification of SOFM's innovation level and market acceptance remains inherently challenging due to the subjective aesthetic characteristics of traditional opera art and the dynamicity of market demand for cultural and creative products. Although this study has adopted a mixed indicator system of objective data and subjective expert/consumer evaluation to improve measurement accuracy, the indicators still cannot fully capture the artistic connotation of SOFM innovation and the multi-dimensional characteristics of market acceptance, leading to potential gaps in measurement accuracy. Third, the cross-sectional design makes it challenging to establish definitive causal relationships between variables, as longitudinal data are lacking to verify temporal dynamics. Fourth, the moderating variables in this study are only limited to policy support intensity and public cultural participation, and other key environmental variables of the cultural heritage environment are not included in the analysis, such as the construction level of material heritage venues (material environment), the intensity of media communication (socio-cultural environment), and the market competition degree of cultural and creative products (external market environment). These variables may also exert moderating effects on the relationship between socio-psychological factors and SOFM's development, for example, the perfect material heritage venues may strengthen the positive impact of cultural identity on SOFM's inheritance scale, and the high-intensity media communication may reduce the negative impact of aesthetic cognitive bias on market acceptance. The lack of these variables may lead to the incompleteness of the moderating effect analysis, which limits the comprehensiveness of the research framework. Fifth, this study only empirically tested the moderating effects of environmental-level variables (policy support intensity, public cultural participation), and did not analyze the individual-level boundary conditions of the relationship between socio-psychological factors and SOFM

development, such as inheritors' age, educational background, and professional tenure. In particular, the potential moderating effects of inheritors' age and educational background on the key path of "Innovative Self-Efficacy towards Market Acceptance" were not included in the empirical analysis, which makes it impossible to accurately judge the differential applicability of the research conclusions in different inheritor groups. In addition, the lack of analysis of boundary conditions also leads to the incompleteness of the theoretical framework, and fails to fully reveal the complex multi-level interaction mechanism between socio-psychological factors and SOFM development.

6.3. Future research directions

Future studies could expand the sample to cover national SOFM inheritors and the public to test the generalizability of conclusions. Additionally, it is necessary to incorporate more key environmental variables of the cultural heritage environment into the moderating variable system, such as the construction level of material heritage venues, media communication intensity, and market competition degree of cultural and creative products, to explore their joint moderating effects with policy support intensity and public cultural participation, and further improve the comprehensiveness of the "cultural heritage environment-socio-psychology-SOFM development" framework. Meanwhile, incorporating more individual-level moderating/mediating variables can clarify the boundary conditions of the promoting and hindering pathways. Methodologically, longitudinal research could track long-term relationships between socio-psychological factors and SOFM development, or experimental designs could verify the effectiveness of interventions. Finally, applying this research framework to other intangible cultural heritage can further validate its universality, and adjust the core variables according to the characteristics of different ICH types to improve the adaptability of the framework.

Conflict of interest

The authors declare no conflict of interest.

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