

Original Paper

Research on the Digital Transformation of the Intangible Cultural Heritage Industry Chain: A Case Study of Sichuan Opera

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Abstract

Against the background of China's cultural development strategy and the rapid diffusion of "Internet Plus" technologies, the safeguarding and transmission of intangible cultural heritage (ICH) have entered a stage of digitalization. Sichuan Opera, one of the most representative traditional opera genres in southwest China, has encountered development bottlenecks in its traditional industry chain, including an aging and shrinking audience, a shortage of talent, spatially and temporally constrained dissemination, and weak commercial monetization. Taking the Sichuan Opera industry chain as its object, this paper conducts a qualitative single-case study based on policy documents, publicly available industry materials, and the existing literature. It first maps the constituent elements of the industry chain, then diagnoses the problems of the traditional chain, and explores pathways of digital transformation along three dimensions: e-commerce platform construction, cross-industry integration, and the application of new media technology. The study finds that "Internet Plus" can remove the spatial and temporal limitations on the dissemination of Sichuan Opera and reactivate the value of the industry chain; at the same time, the transformation process itself faces challenges of high technology costs, a shortage of interdisciplinary talent, and tension between cultural inheritance and commercial development. Accordingly, the paper proposes strategies covering policy support, talent cultivation, technology and user-experience optimization, and cultural supervision, in order to promote the sustainable development of the Sichuan Opera industry chain. The findings also provide a reference for the digital transformation of other traditional opera genres.

Keywords

Internet Plus, Sichuan Opera, intangible cultural heritage, industry chain, digital transformation

1. Introduction

Intangible cultural heritage (ICH) is a living component of cultural diversity. It embodies human wisdom and historical memory, and its safeguarding, transmission, and utilization are of great significance for continuing historical and cultural traditions, strengthening cultural confidence, and promoting exchanges and mutual learning among civilizations (Song & Wang, 2015). In recent years, China has successively issued the Law of the People's Republic of China on Intangible Cultural Heritage and the 14th Five-Year Plan for the Protection of Intangible Cultural Heritage, which explicitly call for promoting the integration of intangible cultural heritage with modern life and using digital technology to enhance the protection and inheritance of intangible cultural heritage, thereby providing institutional guarantees for ICH innovation (Huang & Tan, 2012). At the same time, "Internet Plus" has penetrated manufacturing, services, culture, and other sectors, reshaping modes of production, dissemination, and business. In the cultural field, short videos, live-streaming e-commerce, and immersive virtual reality (VR) experiences have opened new channels for the transformation and dissemination of traditional culture (Ding, 2019).

Sichuan Opera, a national-level ICH item with a history of more than 300 years, integrates five vocal styles—Kunqiang (derived from Kunqu), Gaoqiang, Huqin (Pihuang), Tanxi (a local form of Bangzi), and Dengdiao (lantern tunes)—and is famous for signature stage skills such as face-changing (*bianlian*), fire-spitting, and kicking up the "third eye" (*ti huiyan*). It is an important symbol of the cultural identity of southwest China. In the new era, however, with the proliferation of media and the diversification of popular entertainment, an art form once "enjoyed by refined and popular audiences alike" has become increasingly marginal. Offline performances depend on fixed venues and reach a limited audience; young people have little knowledge of the genre beyond face-changing and fire-spitting; coordination among the links of the industry chain is weak; and commercial monetization is insufficient to support inheritance and innovation. Against this background, the convergence of the "Internet Plus" strategy and ICH protection policies offers a new opportunity: using digital technology to break through development bottlenecks and to achieve both the living transmission of Sichuan Opera culture and the enhancement of its industrial value has become a necessary choice for the current development of Sichuan Opera (Fan, 2020).

The existing literature provides a useful but fragmented foundation for this topic. At the macro level, studies of ICH digitalization discuss the general logic of digital protection and its relationship with national cultural security (Song & Wang, 2015; Huang & Tan, 2012); at the level of the cultural industry as a whole, scholars have analyzed the theoretical logic and practical pathways of digital transformation and the integration of the cultural industry with the digital economy (Tian, 2018; Zang, 2025). Research specifically on Sichuan Opera has concentrated on single links of the chain — the digital display of facial paintings (Ding, 2019), network transmission channels (Fan, 2020),

communication strategies in the new media era (Peng, 2015), and the application of digital media art in inheritance (Liu, 2016)—or on the design of cultural products (Jiao, 2024). What remains underexplored is a systematic, chain-level analysis: how digital technology can be embedded in the upstream, midstream, and downstream links of the Sichuan Opera industry as an integrated whole, what obstacles this transformation encounters, and how they can be addressed. This paper attempts to fill this gap.

2. Elements of the Sichuan Opera Industry Chain

The Sichuan Opera industry chain is organized around the creation, production, dissemination, and consumption of Sichuan Opera cultural content and can be divided into three interrelated links: upstream, midstream, and downstream.

2.1 Upstream: Creation and Resource Supply

The upstream is the source of the industry chain, where Sichuan Opera cultural content is produced. It comprises three parts: script creation, actor training, and skill transmission. Scripts are created by professional institutions such as the Sichuan Opera Theatre, individual playwrights, university troupes, and folk troupes, based on historical stories, folk tales, or contemporary themes. Actor training refers to the basic-skills education provided by Sichuan Opera academies and troupes, including signature techniques such as face-changing and fire-spitting. Skill transmission is carried out by ICH inheritors and veteran artists through oral instruction and hands-on practice, passing the vocal styles, performance conventions, and stage skills of Sichuan Opera to the next generation. The upstream also includes the production and supply of costumes, props, and musical instruments, which provide the material basis for the midstream.

2.2 Midstream: Performance and Dissemination

The midstream is the hub of the industry chain, responsible for presenting and disseminating Sichuan Opera content. It consists mainly of offline performances, including theater performances, rural performances, and festival performances. Theater performances are regular productions held in professional venues (such as the Chengdu Sichuan Opera Art Center and the theater of the Chongqing Sichuan Opera Museum) for local audiences and tourists. Rural performances bring Sichuan Opera to grassroots audiences, while festival performances, staged during the Spring Festival, the Dragon Boat Festival, and the Mid-Autumn Festival, embed the opera in traditional festive life. The midstream also involves the recording and distribution of performances through traditional media such as television, although the reach and influence of these channels are limited.

2.3 Downstream: Derivative Development and Services

The downstream is the value-realization link of the industry chain, in which derivative products and services are developed on the basis of Sichuan Opera cultural IP. Derivative products include cultural and creative goods (mask dolls, facial-make-up items, pendants, ornaments, and ICH handicrafts), books and albums (on the history, techniques, and repertoire of Sichuan Opera), and digital derivatives

(mobile-phone wallpapers and emoticon packs). Derivative services include training (interest classes for young people and experience courses for adults), cultural-tourism experience projects organized as themed routes, and exhibitions of Sichuan Opera history, costumes, and props. The downstream link converts cultural elements into consumable products and services, expands the audience base, and broadens the profit space of the industry.

3. Problems in the Traditional Sichuan Opera Industry Chain

Although the Sichuan Opera industry chain is structurally complete, under the traditional development model each link faces prominent problems, resulting in low overall operational efficiency and a development bottleneck.

3.1 Audience Attrition and Generational Discontinuity

The traditional audience of Sichuan Opera consists mainly of middle-aged and elderly people, while young people's awareness of the genre is low, creating a marked generational gap. On the one hand, the slow performance rhythm and dialect-based language of Sichuan Opera do not match fast-paced modern life and diversified aesthetic preferences. On the other hand, dissemination has long relied on offline performances and traditional media and has failed to reach young audiences through Internet platforms, so that young people's knowledge of Sichuan Opera is largely confined to face-changing and fire-spitting rather than the culture behind them (Jiao, 2024). Data from the Chengdu Sichuan Opera Theatre indicate that in 2023 more than 60% of its theater audience was aged 50 or above, while less than 10% was under 30 (Wang, 2023). This generational discontinuity has become the principal obstacle to the development of the industry.

3.2 Talent Shortage and Inheritance Difficulties

The upstream of the chain suffers from an insufficient supply of talent. Because the training of Sichuan Opera actors takes many years, demands rigorous basic skills, and offers limited income in the early career stage, few young people are willing to enter the profession. At the same time, there is a shortage of creative personnel such as playwrights and directors, so that new productions are few and of uneven quality, failing to meet the aesthetic expectations of contemporary audiences. In addition, professionals who combine digital-technology skills with knowledge of Sichuan Opera culture are extremely scarce, which deprives the digital transformation of the genre of its human-resource base and keeps content production and dissemination locked in traditional forms.

3.3 Limited Dissemination Scope and Spatio-temporal Constraints

Dissemination relies mainly on offline performances, which are constrained in both time and space. Because performances require fixed venues and physically present audiences, the reach of Sichuan Opera is concentrated around performance sites and cannot extend to national or global markets. Although some troupes use traditional media such as television, these one-way channels lack interactivity and entertainment value, and can hardly stimulate audience participation or willingness to

pay.

3.4 Insufficient Capital Investment and Weak Monetization

majority links of the chain is short of funds, and the industry lacks a continuous capital supply. On the one hand, the cost of a single offline performance is relatively high such as venue rental, actor salaries, and materials, while ticket prices remain low; most troupes depend on government subsidies and lack market-oriented operational capacity. On the other hand, the development of derivative products is still in its infancy and suffers from severe homogeneity and weak competitiveness. The low degree of industrial integration and the low added value of the industry further reduce its attractiveness to outside capital.

4. “Internet Plus” Pathways for the Digital Transformation of the Industry Chain

4.1 Building an E-commerce Platform to Expand Consumption Scenarios

Building a Sichuan Opera cultural e-commerce platform is the core pathway through which “Internet Plus” can empower the downstream of the industry chain. By integrating performance ticketing and cultural-creative retail, the platform can generate chained consumption and promote the coordinated development of online and offline business.

Platform construction should be grounded in market demand and the characteristics of Sichuan Opera to ensure feasibility and competitiveness. For ticketing, the platform can provide nationwide performance information, online booking, seat selection, refunds, and ticket collection, support multi-terminal access, such as mobile, desktop, and mini-program, and offer differentiated packages for different user groups. For cultural-creative e-commerce, distinctive products can be designed around the meanings embedded in classic plays, and product sales can be bundled with ticketing, for example, offering Sichuan Opera-themed refrigerator magnets with ticket purchases so that ticket sales and the promotion of creative products reinforce each other (Peng, 2015).

Platform operation can follow the sequence of attracting, retaining, and converting users. Multi-channel promotion and content marketing, for instance, releasing high-quality Sichuan Opera content on Douyin and Kuaishou to direct traffic to the platform, can expand visibility and attract registration. Personalized recommendation and a tiered membership system (regular and premium, with customized discounts) can then increase user satisfaction, activity, and conversion.

4.2 Cross-Industry Integration to Expand Business Interfaces

Cross-industry integration is another important pathway of “Internet Plus” empowerment. Integrating Sichuan Opera cultural elements with tourism, film and television, and games can open up new business forms, expand the commercial value of the genre, and generate synergistic effects greater than the sum of the parts.

As a regional symbol of Sichuan, the opera has inherent advantages in integrating with tourism. “Sichuan Opera + tourism” products can enrich the cultural connotation of tourism while broadening

the dissemination and consumption channels of the opera. Themed routes can be designed around popular tourism resources in Sichuan, for example, a “Sichuan Opera Culture In-Depth Tour” covering the Sichuan Opera Art Center in Chengdu, ICH inheritance bases, Jinli Ancient Street, and the Sichuan Museum. Sichuan Opera elements can also be embedded in scenic areas, ancient towns, and guesthouses within the province: small theaters can be built in destinations such as Huanglongxi Ancient Town and Langzhong Ancient City, and masks and costumes can be displayed in guesthouses to give tourists an immersive experience of Sichuan Opera culture.

The film, television, and game industries have wide audiences, strong dissemination power, and high commercial value. Incorporating Sichuan Opera’s vocal styles, performance techniques, and costumes into films, web series, and animation can enrich audiovisual works while raising the visibility of the genre; developing Sichuan Opera-themed mobile, console, and VR games can attract young people through the accessibility and entertainment of gaming [8]. For example, IP collaborations with popular games such as Honor of Kings and Game for Peace could introduce character skins based on the “Face-Changing Master” or the *huadan* role type of Sichuan Opera, converting player interest into both revenue and cultural exposure.

4.3 New Media Technology to Activate Dissemination

New media technology provides new tools and channels for dissemination. Short videos, live streaming, and VR can break the limitations of traditional dissemination and present Sichuan Opera in more vivid, interactive, and immersive ways that appeal to young audiences.

Short-video platforms feature very large user bases and rapid diffusion. High-quality live streams and short videos can move Sichuan Opera from offline theaters into online public view and substantially raise its visibility (Tian, 2018). Content can be differentiated by platform: “short, fast, and fun” videos of 15–60 seconds for short-video platforms, and “professional and interactive” medium-length videos of 5–30 minutes for platforms such as Bilibili, supplemented by localized content oriented to community interaction. Existing practice already demonstrates the feasibility of this pathway: the Yuanye Theatre in Wenshu Monastery, Chengdu, a well-known venue for the new-media dissemination of Sichuan Opera, has continuously live-streamed its performances on Douyin with accompanying commentary, reportedly attracting more than two thousand viewers per performance. Live streaming of this kind provides actors with an additional performance platform while realizing dissemination and commercialization simultaneously.

VR and digital-museum technologies can further support immersive display and experience projects. Virtual theaters and stages built with VR allow users to watch Sichuan Opera as if present and to try interactive projects based on its signature skills [10]. In addition, an online Sichuan Opera digital museum can present historical artifacts, role types and repertoire, stage skills, and the stories of inheritors on the web, enabling users to browse and understand Sichuan Opera culture at any time (Liu, 2016).

5. Challenges in the Digital Transformation Process

Digital transformation is not a frictionless process. The case of Sichuan Opera reveals three challenges that arise precisely in the course of transformation.

5.1 High Technology Application Costs

Digital infrastructure, e-commerce platform development and maintenance, VR content production, high-quality video recording requires substantial and continuous investment. As noted, most troupes operate on thin margins and rely on subsidies; small and medium-sized troupes in particular can hardly bear the up-front costs of digital projects, so that transformation risks being confined to a few well-funded institutions.

5.2 Shortage of Interdisciplinary Talent

Digital transformation requires personnel who understand both Sichuan Opera culture and digital technology or platform operation. The talent problems of the traditional chain are amplified here: performers rarely possess digital skills, technology professionals rarely understand the artistic conventions of the opera, and the education system has not yet produced graduates who combine the two. Without such interdisciplinary talent, digital projects tend to remain superficial.

5.3 Tension between Cultural Inheritance and Commercial Development

Digitalization and marketization create incentives to prioritize traffic and revenue, which may lead to the over-entertainment, simplification, or vulgarization of Sichuan Opera content, reducing a complex performing tradition to spectacle fragments such as face-changing. If commercial logic overrides cultural logic, digital transformation may erode the very heritage it is meant to sustain. Balancing authenticity and market appeal is therefore a core governance challenge of the transformation.

6. Strategies for Advancing the Digital Transformation

To address the above challenges, feasible strategies can be proposed from four aspects: policy support, talent cultivation, technology optimization, and cultural supervision to promote the healthy and sustainable digital transformation of the Sichuan Opera industry chain.

6.1 Increasing Policy Support and Reducing Technology Application Costs

Government should play an active role by introducing financial subsidies, tax reductions, and project-based assistance to fund the digital transformation of Sichuan Opera and reduce the technology costs borne by small and medium-sized troupes. On this basis, a Sichuan Opera Digital Transformation Fund could be established with the participation of social forces, providing tiered, performance-linked subsidies for troupes' digital projects such as e-commerce platforms and new-media marketing. Tax-reduction policies can be extended to Sichuan Opera-related digital enterprises, such as cultural-creative and technology companies. In parallel, a public technology-sharing platform can be built to provide small and medium-sized troupes with shared resources for VR development, big-data analysis, and e-commerce operation.

6.2 Building a Talent Cultivation System for Interdisciplinary Talent

A cultivation system integrating school-based education, industry training, and school–enterprise cooperation should be established to supply the interdisciplinary talent. Specialized institutions such as the Sichuan Opera Department of the Sichuan Vocational College of Art could cooperate with comprehensive universities such as Sichuan University to create a “Sichuan Opera digitalization” specialty, cultivating students who are both devoted to Sichuan Opera and proficient in digital technology. Beyond regular coursework, students can participate in periodic training organized by their schools to consolidate skills in this emerging field. Government can further encourage colleges offering such specialties to cooperate with innovative enterprises and e-commerce platforms through school–enterprise programs, so that classroom training is connected with real projects and the maturation of talent is accelerated.

6.3 Improving Product Technology and Enhancing User Experience

Technology should be improved according to the needs of different user groups to enhance the practicality and appeal of digital products. For middle-aged and elderly users, portable and comfortable devices such as glasses-type VR products should be prioritized. Big-data techniques can be used to recommend personalized digital products according to users’ age, region, and interests — for example, recommending Sichuan Opera short videos and VR games to teenagers. User feedback is equally important: opinions collected through questionnaires, interviews, and online comments should feed back into timely technical iteration.

6.4 Establishing a Supervision Mechanism to Balance Inheritance and Development

A joint government–public supervision mechanism should be established to unify standards for the development and operation of Sichuan Opera digital products and to manage the tension. The Sichuan Provincial Department of Culture and Tourism could lead Sichuan Opera associations in formulating cultural-protection standards for digital products, setting clear requirements for cultural connotation and artistic norms. Industry associations should exercise self-discipline, upholding the original purpose of inheritance in commercial operation and resisting over-entertainment and vulgar content. A public reporting hotline and platform should allow citizens to report digital products with excessive commercialization; regulators would verify reports, remove offending products, and disclose the results publicly.

7. Conclusion

Sichuan Opera currently faces audience attrition, talent shortages, constrained dissemination, and insufficient funding. Based on an industry-chain perspective, this study has explored concrete pathways of “Internet Plus” empowerment: building e-commerce platforms, promoting cross-industry integration, and applying new media technology, and has identified the challenges that arise in the transformation process: high technology costs, a shortage of interdisciplinary talent, and tension between cultural

inheritance and commercial development. In response, it has proposed strategies of policy support, talent cultivation, technology and experience optimization, and cultural supervision. The aim is to provide practitioners with transformation directions and operational methods that can turn Sichuan Opera from a niche art form into a living culture with broad public reach, enhancing its capacity for self-sustaining development while safeguarding its authenticity. Digitalization empowers cultural dissemination and inheritance, and marketization supports the sustainable development of the cultural industry; the digital transformation of the Sichuan Opera industry chain under “Internet Plus” is a long-term, systematic project requiring the joint participation of government, industry, enterprises, and the public.

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