

Research on Innovative Development Pathways for Traditional Culture Empowered by Digital Intelligence

Yiqi Shi

Xi'an University of Posts & Telecommunications, Xi'an, Shaanxi, 710121, China

ABSTRACT

Against the backdrop of the digitalization wave profoundly impacting the cultural industry, Huxian folk paintings, as a folk art form with distinctive regional characteristics, face the dual challenges of inheritance and innovation. This paper analyzes the current state of development in the areas of creation, dissemination, and marketization, identifying issues such as insufficient technical application capabilities, imbalanced talent structures, and difficulties in copyright protection. Drawing on domestic and international case studies, it proposes strategies in three areas: technological integration and innovation (popularization of digital tools, VR/AR), talent cultivation and recruitment (tiered training systems, school-enterprise collaboration), and cross-industry integration (cultural tourism and education, animation and film IP development). The aim is to establish a digital and intelligent ecological closed loop encompassing "creation-dissemination-operation," promoting sustainable development while upholding the artistic authenticity of traditional folk art, and providing practical references for its modern transformation.

KEYWORDS

Digitalization; Huxian folk paintings; Traditional culture

1 Introduction

Cultural revitalization is the root and soul of rural revitalization, and it holds a special position and mission in rural development. Rural areas are rich in cultural resources, and farmers' paintings, as a unique category of Chinese folk art, use their distinctive language to express the spirit of the times and convey emotions^[1]. In the era of digital intelligence, the cultural industry is undergoing transformation and facing opportunities due to the application of technologies such as big data and artificial intelligence. However, farmers in Huxian County are facing multiple challenges. Under the pressure of modern lifestyles and diverse cultures, their audience is shrinking, and the younger generation is paying less attention to them. In the process of digital intelligence transformation, farmers lack technical application skills and there is a shortage of multi-skilled talent, which restricts creation, dissemination, and industrial development. The cultural market is highly competitive, and the creation of competitive brands is an urgent issue that needs to be addressed.

2 Literature review

Meanwhile, over the past decade, significant progress has been made in academic research on Huxian folk paintings. Scholars have conducted comprehensive analyses from multiple perspectives, covering aspects such as historical origins, artistic characteristics, cultural connotations, and inheritance and development. Historical research has confirmed that Huxian folk paintings originated in the 1950s, evolving from folk art in the Guanzhong region and undergoing distinct developmental stages. Artistic feature studies have revealed their bold and vibrant use of color, unique composition, and rustic forms, all closely tied to folk art traditions. Cultural significance research has uncovered their role in embodying the regional culture, folk customs, and spiritual world of the Guanzhong region and its farming communities. The study on inheritance and development focuses on the current challenges faced by the art form, such as the lack of a new generation of creators and insufficient market development. It proposes strategies such as collaborating with universities to cultivate talent and integrating with the cultural tourism industry to expand the market. However, the study still has certain limitations, such as insufficient exploration of the development path of Huxian folk paintings under globalization and a lack of quantitative research on the acceptance levels of different audience groups. Future research should strengthen these areas.

In terms of heritage preservation, Huiyuan District (formerly Huxian County) has established a large and diverse farmer painting creation system. The first farmer painting art academy in China—Shaanxi Institute of Technology—has attracted many young talents to its farmer painting training programs, infusing new vitality into this ancient art form. Additionally, Huiyuan District leverages the Folk Painting Exhibition Hall to regularly offer various training programs, including basic art skills, creative enhancement, and on-site sketching, continuously supplying fresh talent to the creative workforce. Furthermore, some creators have successfully transitioned into individual business operators, combining their artistic pursuits with entrepreneurial activities. This not only facilitates their personal transformation but also drives the evolution of folk painting from artistic creation toward market-oriented operations, thereby bridging the gap between creative

output and market demand.

3 Influences of the times

3.1 Positive impact

Driven by the ongoing wave of digitalization, Huxian folk paintings have undergone breakthrough changes in terms of creative methods, dissemination channels, and industrial models, injecting new vitality and vigor into this traditional folk art form.

In terms of creative methods, the deep integration of digital technology has broken the traditional single model of hand drawing. Farmers' painters leverage digital tools such as graphics tablets and drawing software to seamlessly blend the folk customs and rural life of the Guanzhong Plain with modern digital art techniques. This not only significantly enhances their creative freedom but also enables the artwork to achieve the rich layers and visual effects that were previously difficult to achieve through traditional hand-drawn methods. Much like in professional software such as Adobe Photoshop, the abundance of brush tools, layer functions, and special effects filters enable artists to easily adjust colors, modify brushstrokes, and efficiently bring their creative concepts to life. The introduction of AI-assisted creation systems can also provide creators with inspiration and color suggestions, sparking a new fusion of traditional artistic expression and technological innovation.

In terms of expanding communication channels, digital intelligence has opened up multiple paths. AI technology can be integrated into the process of promoting intangible cultural heritage, leveraging the power of technology to better disseminate intangible cultural heritage, and achieving the digitization, informatization, networking, and intelligence of intangible cultural heritage promotion^[2]. The widespread adoption of the internet and mobile devices has enabled Huxian folk paintings to break free from their regional constraints. Online exhibitions have overcome the limitations imposed by time and space, allowing Huxian folk paintings to be showcased through digital exhibition platforms. Through diverse digital media such as short video platforms, social media, and online art exhibitions, the exhibition reaches a global audience in high definition and three dimensions through a variety of formats, including text, images, videos, and VR experiences. Viewers can browse freely on their electronic devices and participate in interactive exchanges, thereby enhancing the dissemination of the works and audience engagement. The rise of new business models such as live-streaming e-commerce and art e-commerce has further enabled these artworks steeped in rural charm to directly enter millions of households, achieving a stunning transformation from "being hidden away and unknown to the world" to "known to all under heaven".

The transformation of the industrial model has laid a solid foundation for the long-term development of Huxian folk paintings. Under the impetus of digital intelligence, the local area has established an integrated industrial chain system encompassing creation, production, sales, and derivative development. By leveraging big data analysis to understand market demand, it has precisely targeted consumer groups to develop diversified business models such as cultural and creative products, digital collectibles, and art licensing. The application of blockchain technology grants each artwork a unique digital identity, safeguarding creators' rights and enhancing the commercial value of artistic works.

3.2 Key issues

In the process of promoting the innovative development of Huxian folk paintings through the digital intelligence revolution, deep-seated contradictions have emerged in areas such as technology application, talent reserves, and copyright protection, which have become key bottlenecks constraining their sustainable development.

In terms of technological application, the farmer painter community faces a significant digital divide and cost pressures. Due to limitations in their educational backgrounds, most farmer painters find it difficult to overcome the technical barriers associated with digital technology. Basic functions in professional drawing software, such as layer management and color adjustment, as well as intelligent creation assistance systems and VR/AR interactive technologies, present significant learning obstacles for creators lacking computer knowledge. This results in limitations on both creative efficiency and the quality of their work. At the same time, the hardware equipment and software licensing costs required for digital and intelligent creation are exorbitant. A digital drawing tablet can cost hundreds or even thousands of yuan, and the annual subscription fee for professional drawing software can also reach hundreds of yuan. Introducing VR/AR devices and related development would require even higher investments. Additionally, ongoing expenses such as equipment maintenance and software upgrades, as well as the labor costs associated with professional technical support, further exacerbate the economic burden on farmer artists, posing practical obstacles to the widespread adoption of digital and intelligent technologies.

The imbalance in the talent structure severely hampers industrial upgrading. The current creator community is dominated by traditional painters who lack digital technology application skills and modern operational thinking,

resulting in capability gaps in the areas of creation, dissemination, and industry operations. There is a severe shortage of versatile talents who understand both artistic characteristics and modern operational skills. The traditional industrial development model also fails to attract high-end management talent, resulting in lagging brand building and market expansion. In addition, the existing talent cultivation system is limited to traditional techniques, with a lack of courses on digital technology applications and cultural and creative operations, weak industry-academia-research cooperation, and an inability to meet the needs of transformation.

Copyright protection faces the dual challenges of high incidence of infringement and difficulties in enforcing rights. Digital communication has made it cheap and quick to infringe on copyrights. Unauthorized commercial copying, pirated cultural and creative products, and infringing promotions are common on online platforms. The practice of arbitrarily reposting and altering attributions on social media has also exacerbated copyright disputes. Technically, digital works are easy to tamper with and difficult to trace, and in legal enforcement, infringements are hidden and cross-border, resulting in long and costly rights protection cycles and creating a vicious cycle of rights protection not offsetting losses, which dampens the enthusiasm of creators.

4 Innovative pathways

4.1 Integration of innovative technologies

4.1.1 Promotion of digital creation tools

Promoting the digital preservation of intangible cultural heritage can help expand its dissemination channels, improve dissemination efficiency, and increase public awareness and recognition of intangible cultural heritage. It also allows people to efficiently and conveniently appreciate the rich diversity of intangible cultural heritage and promotes the development of related industries^[3].

In the era of digital intelligence, the widespread use of digital painting software is key to promoting the innovative development of Huxian folk painting. Professional software such as Adobe Photoshop can simulate a variety of brush strokes and has powerful layer management functions, greatly improving creativity flexibility and efficiency. However, due to their limited educational background and computer skills, it is difficult for farmer painters to learn digital painting software. To this end, a systematic training system needs to be established. Training should begin with basic computer operations and gradually progress to the use of digital painting software. In digital tablet instruction, we thoroughly explain connection methods and pressure sensitivity settings. Software functionality instruction focuses on core features such as brushes, colors, and layers, combining case studies with practical exercises to teach advanced techniques. In addition, illustrated guides and short video tutorials are provided to aid learning, with each short video focusing on a single function to help painters quickly master the techniques.

Currently, most digital painting software on the market is of a general nature and lacks specialized functions tailored to the artistic characteristics of Huxian folk paintings. Therefore, technical personnel and art experts should be organized to develop specialized AI tools based on the artistic style and creative characteristics of Huxian folk paintings. These AI tools can be embedded into a color library featuring the distinctive colors of Huxian folk paintings, which includes vibrant color combinations commonly used in traditional works. They also come with a built-in pattern material package containing classic folk painting pattern elements. Additionally, they feature an intelligent composition assistance function that uses AI algorithms to analyze the compositional patterns of a large number of Huxian folk paintings, providing artists with creative inspiration and technical advice. Customized AI software will have a built-in regional culture database covering various elements such as Guanzhong folk customs, farming scenes, and traditional patterns. After the painter inputs keywords such as "wheat harvest" and "folk entertainment", the system will automatically generate multiple styles of sketch designs. For example, by entering "Guanzhong Temple Fair" into Dream AI, you can quickly generate a draft that blends traditional New Year painting colors with modern comic book compositions, which artists can then selectively draw inspiration from.

4.1.2 Smart display and experience technology

VR and AR technologies have revolutionized the display of Huxian folk paintings. VR technology uses 3D modeling to create virtual exhibition halls. Visitors can immerse themselves in the exhibition by wearing the relevant equipment. The combination of panoramic and close-up modes with audio guides allows visitors to see the details of the works and gain a deep understanding of their cultural significance. AR technology enables dynamic presentation of works. When viewers scan elements of the artwork, they come to life, creating an interactive experience that makes the works more interesting and appealing. The implementation of smart display technology requires collaboration among multiple parties. By bringing in a professional tech team to optimize algorithms and cut costs, we're working with companies to develop

devices that fit the style of farmers' paintings. We're also doing tech training and regular courses on how to use VR/AR devices and display software to help creators and staff get better at what they do so the displays look awesome.

4.2 Talent cultivation and recruitment

Building a tiered, progressive digital intelligence technology training system is key to improving the capabilities of farmer painters. This training system covers three major modules: digital painting basics, intelligent creative assistance, and VR/AR technology applications. It provides instruction on topics such as digital tablet and software operation, AI tool creative generation, and virtual scene construction, thereby helping painters master digital and intelligent creative skills. At the same time, we encourage senior painters and young creators to form partnerships, passing on traditional techniques and digital creation experience to young creators. Regularly hold creative workshops and cross-regional exchange activities, organize painters to visit cities at the forefront of digital art development to learn and observe excellent examples to broaden their creative horizons, and promote the deep integration of traditional techniques and modern technology.

Developing competitive talent policies is key to attracting professional talent. A special talent fund will be established to provide generous salaries and benefits for talent recruited in areas such as digital intelligence technology and operational management. High-end talent will also enjoy high annual salaries, bonuses, and subsidies for housing and transportation. Build a modern digital creation base equipped with high-end equipment and technical teams, set up professional studios and laboratories, and establish promotion channels to provide promotion opportunities for outstanding performers, thereby achieving the common development of individuals and the industry.

Deepening cooperation between schools and enterprises, and between enterprises, is an important way to attract external talent. Collaborate with universities to establish internship bases, such as partnering with Xi'an Academy of Fine Arts to set up a digital creation internship base for Huxian farmer paintings, attracting students majoring in digital media and cultural and creative design to participate in projects and retain outstanding graduates. Collaborate with technology companies to develop intelligent creation tools, and partner with cultural and creative enterprises to create popular IP, cultivating and attracting composite talents through project-based practice.

4.3 Innovative communication channels

4.3.1 Integration with the cultural and tourism

Cultural heritage has significant value for tourism development and is a fundamental element in the formation of cultural and tourism industry clusters. Cultural leisure tourism and cultural sightseeing tourism are common forms of tourism for tangible cultural heritage, as evidenced by tourist destinations such as the Ming Tombs, Dunhuang, and Wulingyuan^[4]. An integrated tourism route combining "exhibition + experience + study tour" can be developed, with the Farmers' Painting Exhibition Hall as the core, linking artists' studios, creative bases, and folk villages. Visitors can enjoy paintings in the exhibition hall and learn about the history and characteristics of folk paintings. They can also interact with artists in the studio, watch the creative process, and even try their hand at creating their own souvenirs, enhancing the interactive experience.

Hold a farmers' painting art festival at regular intervals, featuring a variety of activities such as art exhibitions, academic seminars, creative competitions, and folk performances. Showcasing a collection of farmer paintings that blend tradition and innovation, the event aims to fully stimulate the creative enthusiasm of farmer painters. It actively invites industry experts to discuss the development path of farmer paintings and pairs them with folk performances to expand the brand influence of farmer paintings, ultimately promoting local cultural dissemination and tourism consumption.

4.3.2 Other cross-border integration

Actively promote the deep integration of Huxian folk paintings with animation, film, television, and games to effectively extend the value of cultural IP. In the field of animation, the elements of Toka County farmers' paintings should be transformed into animated characters and scenes. For example, using the mythological stories depicted in the folk paintings of Huxian County as a blueprint, carefully create animated works that incorporate the vibrant colors, unique compositions, and rustic style of folk paintings into the animation, striving to create animated characters and storylines with Chinese characteristics. These anime works can not only be broadcast on television stations and online video platforms, but can also participate in various domestic and international anime festivals and exhibitions, thereby enhancing the popularity and influence of Huxian folk paintings. Specializing in the development of puzzle and role-playing games in the gaming industry, such as creating a puzzle game based on the folk paintings of Huxian County. Players must solve various puzzles to explore the world depicted in the folk paintings and gain an understanding of their cultural significance and historical context. Or develop a role-playing game where players can take on the role of a farmer

painter and experience the process of creating farmer paintings in the game, interact with other characters, and complete various tasks. By collaborating across industries, diverse consumption scenarios can be created to drive the high-quality development of the Huxian folk painting industry and achieve the mutual conversion of cultural and economic value.

5 Conclusions

In the midst of the surging tide of digital intelligence, the inheritance and innovation of Huxian folk paintings have ushered in opportunities brought about by technological innovation, while also posing deep challenges in terms of talent and industrial integration. From the popularization of digital tools and the empowerment of intelligent technology in the creative process, to the construction of VR/AR scenarios and full platform coverage in the dissemination chain, to the deepening of the value of cultural tourism integration and cross-border IP development in the industrial sector, each link requires the deep collision of traditional artistic genes and modern technological thinking. In the future, only by using technology as a pen and innovation as ink, while upholding the authenticity of folk art, can we build a digital and intelligent ecosystem that integrates “creation-dissemination-operation,” enabling the Huxian folk paintings—this artistic treasure rooted in the fertile soil of Guanzhong—to continue its legendary journey in the context of digital civilization. This is not only an innovative inheritance of regional culture but also provides a referenceable “Huxian model” for the transformation and development of traditional folk art in the digital age, enabling ancient art to thrive with eternal vitality under the empowerment of technology.

Funding

This paper is the research result of the Xi'an University of Posts and Telecommunications Innovation Fund Project "Research on the Rebirth Path and Communication Strategy of Huxian Folk Paintings under Digital Empowerment" (NO: CXJYW2024018)

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