

## **Pathways for the Protection and Inheritance of Aquatic Horsehair Embroidery Intangible Cultural Heritage Under the perspective of Technological Integration**

**Xiuhua Cheng<sup>1</sup>, Jinglei Guo<sup>1</sup>, Xiuli Cheng<sup>2</sup>**

<sup>1</sup>*Communication University of China Nanjing, Nanjing, Jiangsu, China*

<sup>2</sup>*Shandong Huayu University of Technology, Dezhou, Shandong, China*

**Abstract:** As an intangible cultural heritage, aquatic horsehair embroidery represents the crystallization of the wisdom of the Shui ethnic group, and its protection and inheritance are of great significance. To effectively safeguard and pass on this heritage, exploring pathways that integrate technology is essential to meet the demands of contemporary development. This study analyzes the current state of cultural preservation and inheritance of aquatic horsehair embroidery, identifies existing challenges, and elaborates on specific technology-driven measures for its protection and transmission. The aim is to achieve effective preservation and inheritance, thereby providing diversified and comprehensive insights for the safeguarding and continuation of intangible cultural heritage among ethnic minorities.

**Keywords:** Intangible Cultural Heritage; Technological Integration; Digitalization; Inheritance Pathways.

### **1. The Current Situation of the Horsetail Embroidery Intangible Cultural Heritage**

Recent research on the intangible cultural heritage (ICH) of ethnic minorities indicates that the application of "digital technology" has become a prominent focus of academic inquiry [1]. Current ICH preservation efforts have now entered a "post-listing era," where work must deepen—shifting from merely establishing a "inventory system" to focusing more on comprehensive, efficient and specialized digital preservation. Not only does digital technology hold an absolute advantage in restoring the original appearance of ICH, but the digital display method is also more vivid and intuitive [2]. Furthermore, digital resources are more conducive to the development and reuse of ICH. Therefore, within the context of the digital age,

exploring the digital protection and inheritance of traditional skills such as Horsehair Embroidery, which are constrained by regional limitations, is highly significant. This approach not only provides scientific and rational protection for traditional skills but can also promote local economic development, transmit ethnic culture, and strengthen cultural confidence.

Aquatic Horsehair Embroidery is an ancient embroidery technique unique to the Shui ethnic group [3]. Typically, three to four strands of horsehair are used as the core, around which white silk thread is wound to form the outline of the pattern. This is then filled in with colorful silk threads.

The embroidery works made by aquatic women are elegant in design, three-dimensional in effect, and highly durable. Traditionally, the craft was mainly passed down through hands-on instruction and oral transmission by skilled women within the villages [4]. However, in recent years, the out-migration of many Shui youth for work has led to a disruption in this inheritance chain, resulting in a decline in the quality of Horsehair Embroidery pieces. In response, local authorities have implemented various measures to strengthen the protection and inheritance of this heritage. These include vigorously supporting related industries, organizing diverse technical training programs to cultivate new practitioners, and establishing a comprehensive protection and inheritance base—the "Horsehair Embroidery Heritage Protection and Exhibition Center"—in Sandu Shui Autonomous County, Guizhou [5]. This center integrates exhibition, training, and sales functions. Furthermore, Aquatic Horsehair Embroidery has stepped beyond its local boundaries, making frequent appearances at major expos and trade fairs. These measures have not only raised the profile of Aquatic Horsehair embroidery but also positively

contributed to its continuity. Nevertheless, in this rapidly evolving information age, there is a pressing need to explore more efficient models for the preservation and inheritance. Currently, leveraging technological means has become an urgent priority for safeguarding and perpetuating this traditional craft.

## **2. Problems and Challenges of the Horsetail Embroidery Intangible Cultural Heritage**

### **2.1 Inadequate Exploration of the Cultural Connotations of Horsehair Embroidery and Lack of an Informational Database**

As a "living fossil" of embroidery, aquatic horsehair embroidery boasts a millennium-long history. Its value is manifested in the application of patterns and colors, where each design represents a form of totemic worship conceived by the imagination of Shui women. Every pattern carries specific cultural significance, endowing the craft with immense heritage value and providing precious material for researching Shui ethnic culture. However, the absence of a comprehensive database for Horsehair Embroidery resources hinders in-depth exploration of its cultural worth. Current research predominantly focuses on the patterns and motif design, with a notable lack of investigation into ethnic history and profound cultural connotations embedded within the craft [6].

### **2.2 Insufficient Promotion of Horsehair Embroidery Resources and a Lack of Online Information-based Promotion Methods**

While the "Horsehair Embroidery Inheritance and Protection Exhibition Center" has been established, its function remains largely confined to the display of handicrafts and the provision of technical training. Its remote location results in a limited number of visitors. Moreover, the absence of a dedicated official website means there is no centralized platform offering a systematic and comprehensive introduction to the craft [7]. As a result, public understanding of Shui Horsehair Embroidery remains fragmented and superficial, which significantly hinders effective promotion and impedes its broader dissemination.

### **2.3 Outdated Inheritance Methods and Monotonous Creative Forms**

Currently, the transmission of Aquatic Horsehair

Embroidery remains confined to traditional methods such as visiting workshops and attending training classes. While these approaches utilize displays of images, physical artifacts, and guided explanations to present the embroidery, they primarily engage only the senses of sight and hearing [8]. This constitutes a superficial, externally-focused experience that offers limited interactivity and failing to leave a lasting impression on audiences. Consequently, the cultural impact and appeal of Aquatic Horsehair Embroidery are significantly weakened. Furthermore, these conventional transmission channels have a narrow reach.

A widespread lack of understanding and interest in their own ethnic culture among most young people significantly hinders the inheritance and dissemination of Shui Horsehair Embroidery as an intangible cultural heritage.

### **2.4 Insufficient Development of Horsehair Embroidery Resources and Monotonous Presentation Forms**

This unique traditional folk craft is primarily practiced in Shui villages within townships such as Sandong, Zhonghe, Tingpai, Tangzhou, and Shuilong, located in Sandu Shui Autonomous County, Qiannan Buyi and Miao Autonomous Prefecture. Most of these villages are located in remote areas. Due to constraints in funding and technology [9], the collection and consolidation of Shui Horsehair Embroidery resources rely heavily on a limited number of inheritors. Furthermore, the absence of systematic and scientific methods has resulted in incomplete and suboptimal development of these resources. In the digital age, intangible cultural heritage is increasingly being showcased through information technology, as exemplified by initiatives for the Dunhuang Murals and the "Palace Museum in Your Phone" project. In contrast, the application of digital technology for presenting Horsehair Embroidery remains in its nascent stage.

## **3. Solutions and Suggestions for Integrating Horsehair Embroidery Intangible Cultural Heritage with Technology**

The digital protection and inheritance of horsehair embroidery primarily employ digital storage technology, digital interaction technology, digital media technology, and digital communication technology to address issues such as the limitations in obtaining

traditional intangible cultural heritage resources, the monotony of intangible cultural heritage display, and the constraints on its dissemination. While protecting and inheriting the intangible cultural heritage, these measures enable it to allow it to regain vitality in the information age. The specific measures for the digital protection and inheritance of aquatic horsehair embroidery mainly include establishing a resource database, building a digital website, producing digital media works, creating 3D models of horsehair embroidery handicrafts, designing cultural and creative products, constructing digital exhibition centers, and utilizing new media technologies for dissemination [10].

### **3.1 Establish a Horsehair Embroidery Resource Database**

The collection and integration of horsehair embroidery resources are crucial tasks for its preservation and inheritance. By integrating the collaborative efforts of local governments, universities, and libraries, materials related to horsehair embroidery, such as historical stories, production techniques, works, and inheritor information, can be gathered to establish a comprehensive horsehair embroidery database. This enables the scientific management of aquatic horsehair embroidery resources. The resource database is technically based on a "data warehouse + data mining" architecture and consists of four main modules: Literature Collection, Multimedia Information Collection, Information Retrieval Service, and Data Mining. The Literature Collection primarily includes historical research literature and local chronicles related to Horsehair Embroidery [11]. The Multimedia Information Collection encompasses details about inheritors, image resources, and detailed explanations of artifacts. The Information Retrieval Service provides data sources for other services, facilitating the search and supplementation of Horsehair Embroidery materials. The Data Mining module is designed to explore the cultural connotations of Shui Horsehair Embroidery and leverage its social utility. By establishing a database, the physical resources of horsehair embroidery are transformed into permanent digital assets, ensuring both the preservation and utilization of its informational resources [12].

### **3.2 Build a Digital Website**

The creation of a dedicated digital platform is a

prerequisite for expanding the reach of Aquatic Horsehair Embroidery. This initiative leverages the internet's inherent characteristics—connectivity, interactivity, openness, and resource sharing—to deeply integrate this intangible cultural heritage with the digital realm, thereby facilitating its effective promotion. A professional "Aquatic Horsehair Embroidery" website would significantly enhance its public visibility and broaden its dissemination. Firstly, as a display platform, the website would allow the public to learn about the craft's cultural origins, inheritance stories, and historical materials, thereby deepening their understanding. Secondly, as an education and employment portal, it could publish training opportunities, studio information, and other relevant knowledge, while also providing job information for Shui youth. Furthermore, it would serve as an e-commerce platform for various Horsehair Embroidery workshops to sell their crafts online, expanding their sales channels. Lastly, the website should function as a service platform, providing the public with services such as consultation, reviews, transactions, and custom orders. This facilitates interaction and communication with the public, encouraging their active participation in the inheritance and dissemination of horsehair embroidery.

### **3.3 Producing Digital Media Works**

Traditional inheritance channels, such as books, newspapers, and museum displays, often offer only a superficial engagement and possess limited public appeal. Protecting and inheriting horsehair embroidery requires innovating the carriers of this heritage, infusing its dissemination with new vitality through digital media technology. Applying digital media technologies to the collection, recording, storage, and dissemination of horsehair embroidery resources can significantly enhance both its communicating impact and the effectiveness of its inheritance. Specific applications include producing documentaries, films, and short videos. For example, hiring professional teams to produce high-quality documentaries that authentically record the origins, development, and historical changes of Horsehair Embroidery can serve dual purposes: these works act as promotional material and also become valuable educational resources for schools in ethnic regions. This can inspire younger generations to

appreciate their ethnic culture and motivate them to actively participate in its preservation and continuation. Furthermore, creating films or series based on the lives of master embroiderers, using artistic storytelling to depict their dedication and passion for the craft, is another powerful approach. Through these digital media works, we can more effectively inherit, promote, and disseminate the unique cultural heritage of Horsehair Embroidery and the distinct culture of the Shui ethnic minority.

### **3.4 Establishing a Digital Exhibition Center**

The current "Horsehair Embroidery Protection and Inheritance Exhibition Center" located in the Intangible Cultural Heritage Street of Sandu County, still uses traditional physical display methods, significantly limiting its effectiveness as a heritage base. To address this, a digital exhibition center for Horsehair Embroidery can be established utilizing advanced technologies such as artificial intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR). By adopting digital displays and immersive experiences, the center can recreate the historical development of the craft and present the embroidery works in a more dynamic and vivid manner. This approach is expected to greatly enhance public understanding and appreciation of Shui ethnic culture.

## **4. Conclusion**

Aquatic Horsehair Embroidery, a unique ancient craft of the Shui ethnic group, bears a millennium of historical memory and cultural identity, standing as a resplendent jewel within the treasure trove of Chinese intangible cultural heritage. However, in this rapidly evolving information age, the preservation and transmission of this heritage is confronting unprecedented challenges. Only by conducting a thorough analysis of its current status, existing problems, and these challenges, and integrating practical explorations in technological integration, can we identify a new, sustainable path forward where tradition and modernity.

### **4.1 Technology Empowerment: The Key to Breaking the Dilemma of Protection and Inheritance**

Confronting core issues such as the insufficient exploration of the cultural connotations of Horsehair Embroidery and the lack of information-based promotion methods, the

introduction of technological means has become crucial for resolving the predicament. By establishing a comprehensive Horsehair Embroidery resource database and utilizing digital technology to systematically organize and classify patterns, motifs, colors, and production techniques, we not only provide data support for in-depth cultural analysis but also enable resource sharing and utilization. This lays a solid foundation for the innovation and development of Horsehair Embroidery. Simultaneously, enhancing online informational-based promotion—leveraging the internet and social media platforms to expand its reach—allows more people to appreciate and understand Horsehair Embroidery up close, effectively boosting its visibility and market competitiveness.

In the practice of technology integration, the development of digital products for Horsehair Embroidery has become a prominent highlight. Through Virtual Reality (VR) and Augmented Reality (AR) technologies, users can personally experience the production process and cultural connotations of Horsehair Embroidery. This immersive experience not only enhances users' sense of engagement and experience but also breathes new life into the traditional craft. In addition, cultivating digital talents for Horsehair Embroidery represents another crucial aspect of technology integration. By collaborating with higher education institutions and research organizations, we can develop interdisciplinary professionals who are proficient in both Horsehair Embroidery techniques and digital technology, thereby providing a strong talent support for the digital preservation and transmission of this heritage.

### **4.2 Industry Convergence: Expanding New Frontiers for Inheritance and Development**

Promoting the integrated development of Horsehair Embroidery with the tourism industry serves as a crucial pathway for expanding its inheritance and development space. Establishing dedicated Horsehair Embroidery exhibition areas at tourist attractions allows visitors to appreciate and purchase these artifacts up close. This not only enriches the cultural value of tourism products but also enhances the market value of Horsehair Embroidery. Simultaneously, developing themed tourist routes centered on Horsehair Embroidery enables visitors to gain an in-depth understanding of its production



process and cultural connotations. This form of cultural and experiential tourism not only attracts more tourists but also fosters the wider dissemination and inheritance of Horsehair Embroidery culture.

In the process of industrial integration, it is crucial to pay attention to the combination of creative design with market demands. By introducing modern design concepts and integrating traditional elements with contemporary aesthetics, we have developed cultural and creative products based on Horsehair Embroidery that carry cultural connotations while meeting market demands, such as digital paintings and digital clothing. This approach not only expands the market space of Horsehair Embroidery but also enhances its brand value and market competitiveness. Meanwhile, strengthening cooperation with e-commerce platforms and utilizing online sales channels to broaden market coverage, enabling Horsehair Embroidery to go beyond the mountains and reach the whole country and even the whole world.

#### **4.3 Cultural Confidence: The Inner Drive for Inheritance and Innovation**

Driven by the integration of technology and industry, the preservation and inheritance of Aquatic Horsehair Embroidery represents not only the safeguarding of traditional craftsmanship but also the confidence and inheritance of national culture. By deeply exploring into the cultural connotations of Horsehair Embroidery and integrating it with modern society, this traditional craft has been rejuvenated with new vitality. This not only strengthens the cultural confidence of the Shui people but also makes a valuable contribute to the cultural diversity of the Chinese nation.

In the process of inheritance and innovation, maintaining a balance between cultural preservation and development is crucial. It is essential to preserve the traditional craftsmanship and cultural characteristics of Horsehair Embroidery while also pursuing innovation and development aligned with market demands. Through measures such as organizing training courses and establishing protection and inheritance bases, we can cultivate more inheritors of Horsehair Embroidery, thus ensuring the continuous transmission of the craft from generation to

generation. At the same time, we should encourage inheritors to explore innovative approaches by combining traditional craftsmanship with modern design, thereby developing more Horsehair Embroidery products with contemporary features to meet the needs of diverse consumers.

#### **4.4 Future Prospects: Continuous Exploration and Innovation**

Looking ahead, the preservation and inheritance of Aquatic Horsehair Embroidery as intangible cultural heritage still require continuous exploration and innovation. With the ongoing advancement of technology and continuous adjustments in industrial structures, this heritage will encounter new opportunities and challenges. We need to consistently update our conservation concepts and methods, strengthen the integration of technology and industry, and promote the sustainable development of Aquatic Horsehair Embroidery.

In terms of technology, we can further explore the application of new technologies such as artificial intelligence and big data in the preservation and inheritance of the intangible cultural heritage of Horsehair Embroidery. For instance, leveraging AI technology for intelligent analysis and design of Horsehair Embroidery patterns can enhance design efficiency and quality. Utilizing big data technology enables precise analysis of market demands, providing data-driven support for the development of Horsehair Embroidery products. In the industrial sector, the application fields and market space of horsehair embroidery can be further expanded. For instance, integrating the elements of Horsehair Embroidery into areas such as home decoration and clothing design can develop more products with cultural connotations and practical value. Strengthening collaborations with cultural institutions domestically and internationally will promote the international dissemination and exchange of Horsehair Embroidery culture.

#### **4.5 Conclusion Remarks**

The protection and transmission of Aquatic Horsehair Embroidery is a long-term and arduous task that requires the joint efforts of multiple stakeholders, including the government, society, and inheritors. Through the deep integration of technology and industry, we can not only overcome the current difficulties in

protecting and inheriting this heritage but also drive its innovative development, allowing this ancient craft to radiate new vitality in the new era. Let us join hands and work together to protect this precious cultural heritage of Aquatic Horsehair Embroidery, contributing to the cultural diversity of the Chinese nation.

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