



## **An innovative development model for the living inheritance of intangible cultural heritage rice paper skills empowered by the digital transformation of cultural heritage**

*Hong Zhao<sup>1,\*</sup>, Qiong Luo<sup>1</sup> and Yawei Wang<sup>2</sup>*

<sup>1</sup> School of Art and Design, Anhui Institute of Technology, Wuhu 241100, Anhui, China

<sup>2</sup> School of Art and Design, Anhui Business College, Wuhu 241000, Anhui, China

**SUMMARY:** *intangible cultural heritage rice paper technology is a representative traditional Chinese handmade papermaking skill that has accumulated thousands of years of cultural genes and handicraft wisdom, and its living inheritance is essential for preserving the vitality and cultural continuity of this skill. However, with the development of modern production methods, an aging population in the inheritance group and limited channels for information dissemination have led to defects in the living inheritance of rice paper technology. Based on the above reasons, the digital transformation of cultural heritage can provide new ways for the living inheritance of intangible cultural heritage. Using digital technology, high-precision collection, cross-domain spread, interactive experiences and industrial applications of skills have been achieved to break the time and space constraints of traditional inheritance and stimulate the vitality of skills in contemporary society. Based on the theory of living inheritance, cultural capital theory and media integration theory, this paper first analyzes the current situation and core dilemma of the living inheritance of rice paper technology, then studies the empowerment mechanism of digital transformation in the inheritance of rice paper technology, and finally builds a five-in-one innovative development model of digital preservation, multi-dimensional dissemination, immersive education, market-oriented linkage and community participation, along with the corresponding implementation path and guarantee system. It provides theoretical support and practical models for the living inheritance of intangible cultural heritage handicraft skills.*

**KEYWORDS:** *Digitalization of Cultural Heritage; Intangible Cultural Heritage; Rice Paper Skills; Activated Inheritance; Innovative Model*

## **1 Introduction**

### **1.1 W Background**

Intangible cultural heritage refers to the living relics of human civilization and is characterised by its life-force vitality. Through the practice of inheritors, the involvement of the community, and combination with life scenes, the intergenerational inheritance of skills and culture has been realised [1]. As the first batch of national intangible cultural heritage, rice paper technology was selected in 2006 from Jing County, Anhui Province, and has become an important carrier of Chinese calligraphy and painting art with the characteristics of a paper life of thousands of years and ever-changing ink rhyme. The five links in its production process are material

\*18055311044@163.com

<https://doi.org/10.65102/is2026950>

selection, pulping, paper fishing, paper drying and paper-cutting, with a total of 108 sub-steps, and each step is based on the accumulated experience and handicraft wisdom of the inheritors, making it a typical living cultural heritage [2]. With the start of industrialisation and the information age, the living inheritance of rice paper skills has faced many problems. On the one hand, with the development of modern papermaking technology, the traditional market for rice paper has been squeezed out by the advantages of low cost and high efficiency, leading to some inheritance bases transitioning to large-scale production, and the handicraft essence of skills is gradually being lost. On the other hand, the inheritor population is showing characteristics of aging; from the actual situation of the industry, the age structure of the core inheritors is aging, the proportion of young inheritors is low, and the young group lacks the willingness to inherit due to factors such as a long learning cycle and unstable economic income. In addition, the traditional inheritance model is mainly based on the oral transmission of masters and apprentices, its scope of dissemination is limited to a certain area, and the public's cognition of rice paper skills is still at the level of calligraphy and painting paper, without fully exploring the cultural connotations and handicraft values behind it. Therefore, the digitalisation of cultural heritage has gradually started to address this problem of inheritance [3]. Different from the old style of static protection, the collection of cultural relics and document records is now done digitally; high-definition images, three-dimensional models, databases, online platforms and other technical measures are used to record, spread and interact with the dynamic process of rice paper technology as digital resources. It can keep the detailed contents accurately and break free from the constraints of time and space to reach more people for learning about or taking part in the inheritance of rice paper skills. However, the current digital practices of rice paper technology mainly focus on the level of technical documentation, such as process documentaries produced by some enterprises, and lack a systematic digital inheritance system; thus, they have not fully utilized the enabling role of digitalisation for activation. Therefore, the construction of a scientific and feasible digital innovation development model is to be done to promote the active inheritance of rice paper technology.

## 1.2 Research Status at Home and Abroad

In the 1990s, foreign scholars began to study the digitalisation of cultural heritage; at that time, the focus was on preserving ancient buildings and cultural relics in digital form, as shown by the UNESCO Memory of the World Project, which has gradually broadened its scope to include intangible cultural heritage in recent years. In terms of digital preservation technology, Italian scholar Forte and others proposed the idea of digital archaeology in 2018 to record the operation details of traditional handicraft skills through 3D laser scanning technology and ensure the reproducibility of the skills; In 2020, American scholar Hoffman took traditional Mexican textile skills as his research subject and used 4K ultra-high-definition image and motion capture technology to quantitatively analyze hand movements and force control in the textile process, providing an accurate digital reference for the inheritance of skills [4]. In 2021, the Japanese scholar Tanaka created a digital archive of traditional crafts that collects data on the production process, tools and materials of washi paper, etc., and establishes an organized database for systematic management of technical resources [5]. MacDonald, a British scholar, put forward the idea of a digital cultural community in 2019 and believed that an exchange community for enthusiasts of intangible cultural heritage skills could be constructed via online platforms to promote cross-regional dissemination and user participation in these skills. In 2022, the Australian scholar Smith found that by converting indigenous weaving skills into interactive digital manuals, the interest and awareness of young people in intangible cultural heritage can be effectively increased, thus providing a model for the digital education of rice paper skills. Generally speaking, foreign research has focused on the breakthrough of digital technology in

terms of the accuracy of skill recording and user participation, but due to differences in cultural background, the emotional connection and cultural connotation of people and skills in the living inheritance of intangible cultural heritage are lacking, and it is difficult to directly apply them to the practice of intangible cultural heritage in China.

Research on the digitalisation of intangible cultural heritage started in the early 21st century, and with the progress of the national cultural digitalisation strategy, relevant studies have gradually deepened; therefore, research focusing on rice paper technology can be divided into three categories: technical protection and recording, digital communication path, and digitalisation and industrial integration. In terms of the direction of technical protection and recording, the team led by Professor Wang Tingxin at Anhui University conducted a digital protection project of rice paper technology in 2017, and with the help of high-definition cameras and VR technology, recorded key processes such as paper fishing and paper drying to build the first batch of a digital image library for rice paper technology [6]. In 2019, Professor Li Lixin of Nanjing University of the Arts put forward the idea of digital hierarchical preservation of skills, proposing that given the different levels of complexity in rice paper technology, digital recording should be carried out at three levels: core processes, auxiliary processes, and cultural connotations, thus avoiding the waste of resources [7]. Professor Liu Guanzhong of Tsinghua University pointed out in 2020 that in the direction of the digital communication path, the digital communication of rice paper technology needs to break through the documentary-style one-way output and should be combined with social media and short video platforms to create scenario-based communication content; Professor Zhang Li of Anhui Normal University found through a questionnaire survey in 2022 that short videos of rice paper skills on platforms such as Douyin and Xiaohongshu can significantly increase the public's awareness of rice paper culture, but the content is mostly focused on skill display and lacks in-depth cultural interpretation [8]. Domestic research has integrated the cultural features of rice paper technology to establish a certain theoretical and practical foundation; however, there are still shortcomings: first, digital practice is mainly concentrated in a single link of preservation or dissemination, and a systematic inheritance system has not been built; second, there has been little research on how digitalisation can promote the endogenous power of living inheritance, such as how to promote the communication among inheritors through digitalisation and enhance the willingness of young people to inherit.

### 1.3 Research Significance

This paper combines digital transformation with the living inheritance of rice paper technology, explores the internal logic of technology-enabled living inheritance, overcomes the limitations of the traditional static protection theory, and provides a new research direction for the theory of living inheritance of intangible cultural heritage. Improving the Digital Theory of Cultural Heritage: Most of the existing digital theory focuses on the application of technology, and this paper expands the connotation and scope of the digital theory of cultural heritage by constructing a five-in-one model that integrates technology, culture, people and industry under the same framework.

The digital innovation model put forward in this paper can directly guide the practice of rice paper enterprises and inheritance bases in Jingxian County to solve practical problems such as the aging and lack of communication among inheritance populations [9]. Offer a model for other intangible cultural heritage handicrafts: As a representative of traditional handicrafts, the digital inheritance experience of rice paper technology can be applied to similar intangible cultural heritage projects such as Suzhou embroidery, celadon and guqin to promote the all-round development of China's intangible cultural heritage. Assisting in the Implementation of the Cultural Digitalisation Strategy: The research results of this paper meet the requirements

set by the national cultural digitalisation strategy, provide a basis for decision-making at the local level in formulating policies for the digitalisation of intangible cultural heritage, and promote the integrated development of cultural heritage protection and the digital economy.

#### **1.4 Research Methods Literature Review Method**

By organising the relevant literature on the digitisation of intangible cultural heritage and the inheritance of rice paper skills at home and abroad, the current state and theoretical foundation of this study will be understood, and research deficiencies will be identified. At the same time, refer to the official materials mentioned above, such as the "Yearbook of China's Intangible Cultural Heritage" and the "Jingxian Rice Paper Industry Development Report", for the latest information on the inheritance of rice paper skills. Field research method: Go to Jing County, Anhui Province, conduct field research, visit local representative rice paper enterprises and inheritance bases, observe the on-site process of skill inheritance, and collect related information on digital practice; at the same time, a questionnaire survey was carried out with local residents and tourists in Jing County to analyze the public's perception and expectations of the digitalisation of rice paper technology. Case Analysis Method: Select successful cases of domestic intangible cultural heritage digitalisation, such as the digital embroiderer platform for Suzhou embroidery and the digital ceramic museum for Jingdezhen ceramics, analyse the strengths and weaknesses of their digital models, extract learnable experiences, and offer references for building a model of rice paper technology. Written consultation method: Collect opinions from experts in the fields of cultural heritage protection, digital technology and intangible cultural heritage research via email and written questionnaires, etc., and present the five-in-one model constructed to ensure the scientific and feasible basis of the model.

## **2 Current Situation and Core Dilemma of the Living Inheritance of Intangible Cultural Heritage Rice Paper Skills**

### **2.1 The Present State of Living Inheritance for Rice Paper Technology**

The living heritage of rice paper technology is based on the coordinated promotion of the inheritor group, core skills, cultural connotations and industrial development, and the current inheritance status can be analyzed in three dimensions. The proportion of the elderly population is increasing, and fewer young people are taking on the responsibility of inheritance. The inheritance of rice paper skills is mainly in the form of master-apprentice transmission, and the structure of the inheritance group shows a clear age-related problem. From the perspective of the current situation in the industry, the scale of skilled personnel involved in rice paper production in the county is relatively small, the number of inheritors who have mastered the core processes of paper fishing and paper drying is low, and the age structure is ageing, with a significantly low proportion of young inheritors. From the perspective of inheritance willingness, young people have a low acceptance of rice paper skills, and a survey of local youth groups shows that the proportion of young people willing to learn rice paper skills is low, mainly due to the following reasons: first, the learning cycle is long, and it takes many years to master the core process; second, the economic income is unstable, and the income of junior technicians is lower than the local average wage level; third, the sense of professional identity is weak, and some young people believe that handmade papermaking is manual labour and lacks social recognition. In addition, the monopoly on the skills of inheritors also restricts the inheritance of these skills, and some old artists are unwilling to fully teach core experiences,

such as the proportion of paper and medicine blending ratio and the strength of paper fishing, due to the tradition of keeping their skills secret; thus, there is a risk of breaking the chain of skill inheritance. The main mode of inheritance is still oral, and digital participation is relatively low. At present, the inheritance model of rice paper skills is still based on the oral teaching of masters and apprentices, supplemented by two additional forms of internal training and school cooperative education, and the application of digital technology is relatively low. For example, in the paper fishing process, the master needs to teach the disciples how to control the force and speed of the bamboo curtain steps step by step to ensure that the thickness of the paper is uniform. Large local rice paper companies regularly organise new employees to take part in technical training and invite experienced artists to give lectures; however, most of the training content focuses on the basic process, and core skills still need to be acquired through the inheritance of masters and apprentices. Furthermore, most of the training is in the form of a combination of on-site demonstrations and text manuals, and no digital teaching tools are used, thus limiting the training effect. In terms of school cooperative education, some rice paper companies have collaborated with Anhui Normal University, Xuancheng Vocational and Technical College and other colleges to offer rice paper technology elective courses, but most of these courses are based on combining theoretical explanations with factory visits; students lack practical operating experience, and the coverage rate of the courses is low, thus preventing the formation of a large-scale inheritance effect. From the perspective of digital applications, only a few large rice paper companies have been able to create technical documentaries for corporate publicity or tourist visits, and these have not been added to the inheritance teaching system. Only a few enterprises have built simple digital exhibition halls for rice paper technology, but the content update is slow, access is restricted, and the empowering role of digitalisation in inheritance has yet to be realized. Development in the field of culture has not yet produced new economic benefits. The rice paper industry is one of the core industries in Jing County, and although its industrial scale is relatively large, there is a problem of a disconnect between cultural values and economic benefits in industrial development, thus endangering the continuity of living heritage. The product structure is relatively simple; most of the rice paper products are calligraphy and painting papers, the proportion of cultural and creative products and customised products is relatively low, the market demand for calligraphy and painting paper has been greatly influenced by the calligraphy and painting industry, and its growth rate has slowed down in recent years; thus, some small and medium-sized enterprises face operating pressure and are unable to invest funds in skill inheritance. The cultural connotation behind it, such as the connection between rice paper and literati paintings, and the ecological concept in the production of rice paper are not explored; as a result, the added value of the products is low, price competitiveness is weak, and the added value of ordinary rice paper is also low. To improve efficiency, some enterprises have introduced modern equipment for the production of rice paper; although costs have fallen, the demand for handmade rice paper skills in the market has also dropped. At the same time, the cooperation between enterprises and inheritors is mainly in the form of employment, and there has been no incentive mechanism for skill inheritance; as a result, inheritors lack the motivation to engage in industrial innovation, and thus a virtuous circle of inheritance, industry, and re-inheritance has not been formed.

## **2.2 The Fundamental Problem of the Living Inheritance of Rice Paper Technology**

Based on the above analysis of the current situation, the three main dilemmas in the active inheritance of rice paper technology are: the subject of inheritance, the path of inheritance, and the power of inheritance. The first is a defect in the core of the inheritance, and therefore the technical experience cannot be extended. On the one hand, the physical condition of the older

artists is deteriorating day by day, and some fundamental skills, such as paper medicine production and the regulation of heat during paper drying, are now known only to a few elderly artists. At the same time, young people are not eager to join the inheritance team due to high learning expenses, low economic rewards and a weaker sense of purpose, so intergenerational skill inheritance cannot be achieved. Another problem is the difficulty of quantifying experience in the inheritance of the skill; since rice paper skills are based on the accumulation of experience, aspects such as the angle of tilt for fishing paper, temperature control of water during pulping, and other subtle details rely on a sense of touch and sight that are difficult to describe precisely in words; the traditional method of oral transmission is unable to pass on these implicit know-hows, and even if young inheritors learn the basic steps, they are far from the level of the old masters. The second problem is that there is only one way to inherit, and thus the effect of communication and education is reduced. The time and place constraints of the traditional inheritance system have limited the scope of spread and educational coverage for rice paper technology, and thus failed to build a broad cultural identity. At the level of communication, most of the traditional ways are offline exhibitions, factory tours and paper documents; they are geographically limited and can only reach people in Jing County and its surrounding areas [10]. In addition, the communication content is mainly a display of the technical process, lacking interactive and in-depth interpretation; thus, the public can only see the skills but cannot understand the cultural values embedded in these skills and is thus unable to feel an emotional connection. At the level of education, both school education and enterprise training have the problem of placing too much emphasis on theory rather than practice, and thus fail to equip students and new employees with core skills through the current education model. At the same time, the educational content does not integrate the cognitive habits of young people, is uninteresting and unappealing, and thus fails to motivate them to learn. The third problem is that the inheritance motivation is weak, and thus the cultural value has not been converted into an economic benefit. The sustainability of living inheritance depends on economic support, and the cultural value of rice paper technology has not been converted into economic benefits effectively; thus, there is a lack of internal motivation for inheritance. Besides professional calligraphy and painting artists and collectors, ordinary consumers are more likely to choose machine-made rice paper, thus reducing the market demand for handmade rice paper and increasing the operating pressure on the inheritance base. The innovation in cultural and creative products is lacking, and most of the existing cultural and creative products remain in the shallow design of rice paper and packaging. There is a lack of combination with modern life scenes, such as underdeveloped rice paper hanging ornaments suitable for home decoration and rice paper notebooks for office life, etc., which are difficult to attract young consumers. At the same time, the marketing channels for cultural and creative products are also limited, relying mainly on offline stores, and do not use digital platforms to extend the market. There is a lack of an incentive mechanism, and the government and enterprises' incentives for inheritors are mainly honorary commendations, such as selecting intangible cultural heritage inheritors, and insufficient economic incentives. Without establishing a reward mechanism for skill innovation, the inheritors are not motivated to combine their skills with modern needs, and it is difficult to promote the living innovation of skills.

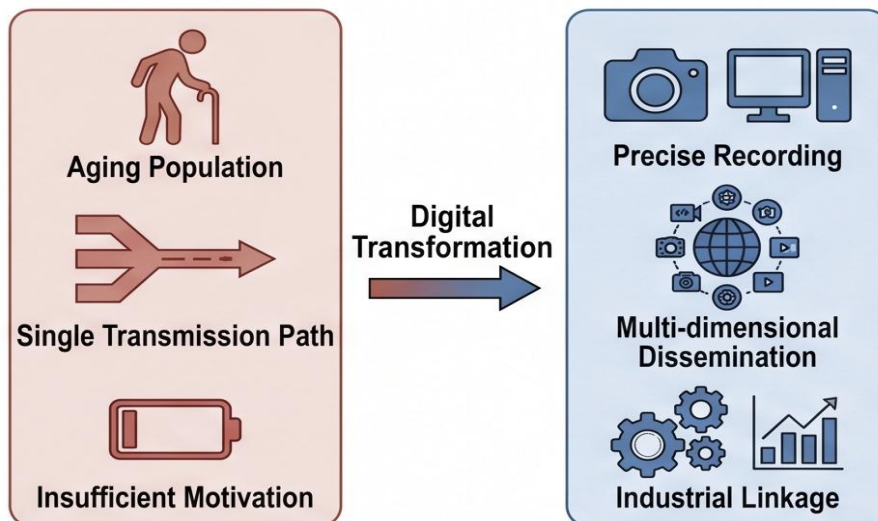


Figure 1: Comparison of Traditional Inheritance Dilemmas and Digital Transformation Solutions.

### 3 Empowerment Mechanism for Digital Transformation of Cultural Heritage in the Living Inheritance of Rice Paper Skills.

#### 3.1 Preservation of Digital Empowerment Skills

The preservation of digitally enabled skills mainly refers to the accurate recording of implicit experience to prevent a break in skills. Digital technology has a high precision and reproducibility; therefore, the problem of not being able to record the hidden experience of rice paper technology can be solved, and skills can be permanently preserved and accurately transmitted. For example, in the recording of the paper fishing process, motion capture technology can acquire the trajectory and changes in strength of the inheritor's hand movement, and through thermal imaging technology, the temperature distribution during paper drying can be recorded; tacit knowledge, such as the feeling of the hand and sight, can also be converted into data-based and visual information to ensure that young inheritors can learn accurately. In terms of hierarchical and classified digital storage, a digital resource library for rice paper technology has been built, and the digital resources are organised according to the four levels of core processes, auxiliary processes, cultural connotations, and tool raw materials. The paper medicine uses a combination of three-dimensional modelling and material analysis for recording to ensure the accuracy of core skill recording and prevent resource waste [11]. Dynamically update and restore, the digital resource library can be dynamically updated in response to the innovation of the inheritor's skills and the application of new tools; for instance, when the inheritor develops a new paper medicine formula, relevant images and data can be added at the same time; at the same time, through digital restoration technology, the clarity and colour of old rice paper technical pictures can be enhanced to ensure the permanence of skill records. Through digital preservation, the implicit experience of rice paper skills can be turned into digital resources that are passed on and learned, thus avoiding the risk of death and loss of art, providing an accurate reference for young inheritors' learning, and solving the core problem of the fault of the inheritance subject.

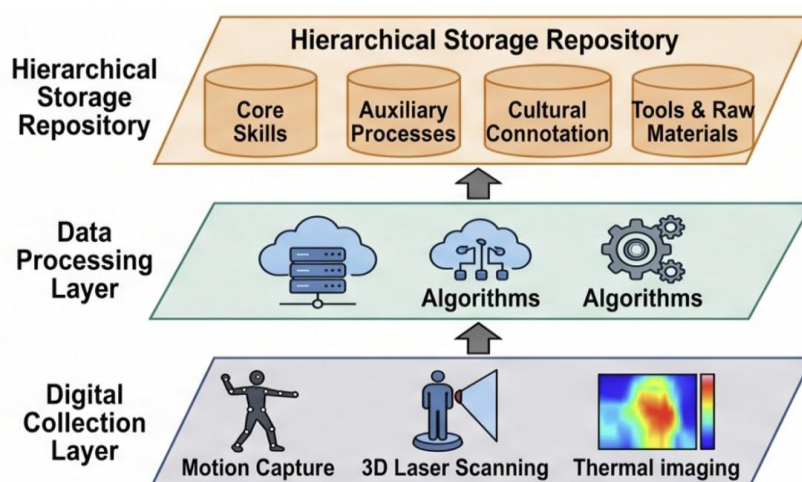


Figure 2: Architecture of Digital Collection and Hierarchical Storage for Tacit Experiences in Rice Paper Skills.

### 3.2 Multi-dimensional Communication for Digital Empowerment

Digital empowerment of multi-dimensional communication primarily refers to breaking the constraints of time and space and strengthening cultural identity. Digital technology has broken the time- and space-bound constraints of traditional communication, enabling the broad dissemination and deep study of rice paper technology, and strengthening the cultural identity of the people. In terms of scenario-based communication on multiple platforms, based on the characteristics of different digital platforms, scenario-based communication content is created, and a short video of learning the rice paper process is produced in 1 minute for the short video platform to demonstrate the visual effect of skills; publish the story of rice paper and literati paintings, rice paper DIY handicrafts, etc. on social media platforms such as Xiaohongshu and Weibo to strengthen the interpretation of cultural connotations; produce in-depth documentaries on rice paper skills on long-video platforms such as Bilibili and Tencent Video, detailing the historical development and technical details of the technique to meet the needs of different audiences. For the interactive digital exhibition hall, an online rice paper technology digital exhibition hall will be built using VR/AR technology to create an immersive experience scene; people can walk into the digital rice paper factory through their mobile phones or VR equipment, watch the 360° process of paper fishing and drying, and click on the screen for more detailed interpretations of the process and an interview video with the inheritor; at the same time, interactive links such as skill questions and answers and rice paper knowledge tests will be set up to improve the sense of participation for the audience and allow the public to shift from passive viewing to active learning [12].

In terms of cross-border joint communication, it has cooperated with cultural digital platforms such as the Digital Exhibition Hall of the Palace Museum and NetEase Cloud Music to conduct cross-border communication; for example, it has collaborated with the Palace Museum to launch a digital topic on rice paper and ancient painting restoration to introduce the application of rice paper in ancient painting restoration, and partnered with NetEase Cloud Music to release a sound album of rice paper production that includes the sound of fishing paper and beating raw materials, creating an auditory culture of rice paper and extending the boundaries of communication. Through digital communication, the scope of dissemination for rice paper technology has expanded from the local area of Jing County to all over the country and even the world, and the content of communication has deepened from skill demonstration to cultural interpretation; thereby, the public's cognition and recognition of rice paper culture

have been improved, and a broad social foundation for living inheritance has been provided.

### 3.3 Digitalisation Promotes Immersive Education

Digital empowerment of immersive education is mainly shown in new teaching models and stimulates the will to inherit. Digital technology has the advantages of being immersive and personalised; therefore, new models for education in rice-paper technology can be developed to overcome the limitations of traditional education and inspire more interest among young people.

Digital immersive education can help students learn better and remember more of what they have learned. According to the idea of the memory retention curve, the skill-mastery function after digital intervention can be expressed as:

$$S(t) = S_0 \cdot e^{-\lambda t} + \int_0^t \eta \cdot D(x) dx \quad (1)$$

where  $S(t)$  is the skill mastery level at time  $t$ , and  $S_0$  is the initial baseline skill level. The term  $e^{-\lambda t}$  represents the natural forgetting curve of traditional learning, with  $\lambda$  as the decay rate. The integral part represents the continuous enhancement brought by the digital VR system, where  $D(x)$  is the frequency of digital interactive practice and  $\eta$  is the digital conversion efficiency coefficient.

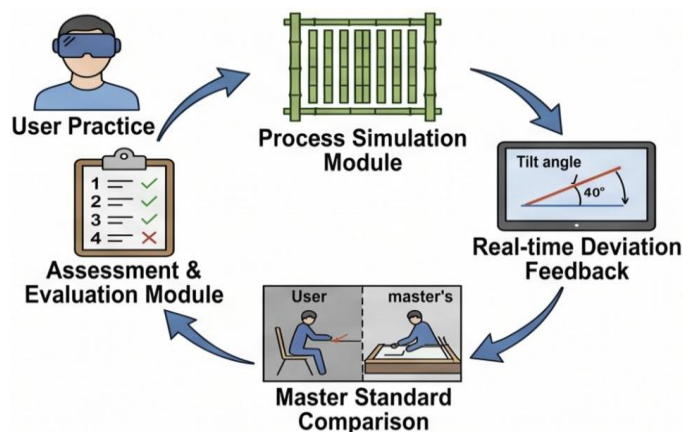


Figure 3: Operational mechanism and closed-loop feedback of the VR immersive education system.

In terms of immersive practical teaching, a VR teaching system for rice paper skills can be developed to simulate the operation scenarios of core processes such as fishing paper and pulping. Students can wear VR equipment and operate a bamboo curtain in a virtual environment, control the temperature of the pulping water, and the system will provide real-time feedback based on the accuracy of operation, such as alerting them that the bamboo curtain tilt angle is too large or the paper is too thin, and offering a standard operation image comparison with an old artist. Thus, students can learn the essential points of the skills through practice; this mode breaks through the scale limitation of on-site teaching, allowing one teacher to guide many students simultaneously, and students can repeat practice to reduce learning costs. According to the digital resource library of rice paper skills, personalised learning paths are customised for different groups of learners, and three-tier paths for theoretical study, virtual practice and practical application have been designed for college students [13]. For social enthusiasts, design a path of interest entry, skill experience and in-depth learning, starting with the online course for rice paper DIY handicrafts and gradually strengthening core skill training.

In terms of online teaching by inheritors, an online classroom platform for rice paper inheritors has been constructed, and national and provincial inheritors are invited to hold regular live lectures; the course adopts a combined demonstration and Q&A format, and the inheritors show the details of their skills via high-definition cameras, while the audience can ask questions in real time, such as how to control the speed of bamboo curtains when fishing for paper, and the inheritors can answer them on the spot. At the same time, the course can be recorded and uploaded to the platform for students to watch and learn multiple times, thus solving the problems of time and space constraints in the inheritance of master and apprentice. Through digital education, the model of teaching rice paper technology has moved away from simplified and passive to personalised and active; as a result, both teaching efficiency has increased and the learning enthusiasm of young people and new generations of inheritors has been stimulated.

### 3.4 Market-oriented Linkage for Digital Empowerment

The market-oriented link of digital empowerment mainly refers to the change in cultural values and the strengthening of inheritance momentum. Connectivity and intelligence of digital technology can promote the accurate matching of rice paper technology with market demand, enable the transformation of cultural value into economic value, and strengthen the endogenous driving force for inheritance. In terms of digital cultural and creative design, build a rice paper cultural and creative digital design platform that integrates resources from designers, inheritors and enterprises, and allows designers to obtain digital resources of rice paper skills through the platform, such as process images, cultural stories, and develop cultural and creative products in combination with modern design concepts; inheritors can put forward technical requirements on the platform to ensure that cultural and creative products meet the cultural characteristics of rice paper technology; for example, designers can design rice paper hanging ornaments for paper-drying scenes according to the digital images of the paper-drying process, and thus reflect the characteristics of the technique while also meeting the demands for modern decoration. In terms of intelligent market docking, big data analysis technology can be employed to explore changes in consumer demand and market trends; thus, we will drive innovation in rice paper products based on these analyses and learn about consumers' tastes in rice paper products from the sales data of e-commerce platforms. By examining topic data on social media, we can identify hot spots in the market, integrate rice paper products with national tide trends, and create culturally rich and creative rice paper under the theme of national tides.

The first purpose of the market-oriented link is to promote the economic transformation of cultural values. The model for the generation of economic value under digital marketing can be expressed as:

$$V_{econ} = \sum_{i=1}^n (W_{ci} \times P_i) \times (1 + R_{digital}) \quad (2)$$

where  $V_{econ}$  is the total economic value,  $P_i$  represents the basic market price of the  $i$ -th type of rice paper product, and  $W_{ci}$  is the cultural premium weight attached to the product through digital design.  $R_{digital}$  denotes the conversion rate of digital marketing channels (e.g., e-commerce, digital exhibition halls).

In terms of digital marketing channels, expand the online and offline integrated marketing system, build an online e-commerce platform for the rice paper culture, and in addition to selling rice paper products, set up digital exhibition halls, inheritor stories, and other sections so that consumers can learn about rice paper culture during their shopping; Offline rice paper digital experience areas will be built in museums and cultural and creative stores, with QR code scanning for technical images and VR experiences, and then purchase products via online platforms to achieve a closed-loop system of experience, cognition, and purchase. Through the

connection with the industry, the cultural value of rice paper technology has been transformed into economic value; thus, the operating efficiency of enterprises has improved and economic support for inheritance has been provided. At the same time, the inheritors have gained more economic benefits and professional recognition by participating in cultural and creative design and market docking, which has increased their enthusiasm for inheritance.

### **3.5 Digitalisation Empowers Community Participation**

Digital empowerment of community participation mainly refers to the construction of inheritance communities and the activation of living ecology. The social and co-creative attributes of digital technology can build a communication community for rice paper technology enthusiasts, form an inheritance ecology involving the participation of inheritors, enthusiasts and consumers, and promote the sustainable development of living inheritance [14]. In terms of the construction of online inheritance communities, rice paper skills communities are built on platforms, and these communities are divided according to the inheritor group, the enthusiast group, and the consumer group. The inheritance community is used for skill exchange and experience sharing among inheritors, such as discussing improvements to paper medicine formulas; the enthusiast community is used to share rice paper DIY works and exchange learning experiences; and the consumer community is used to give feedback on product demand and put forward suggestions for cultural and creative design. Regularly, online activities are organised by the community, such as live Q&A sessions with inheritors and selection of enthusiasts' works, to strengthen the cohesion of the community. In terms of the linkage of offline community activities with online communities, offline activities are organized in conjunction with online communities to achieve the integration of online communication and offline interaction, such as regularly holding rice paper skills experience camps in Jing County, inviting enthusiasts of online communities to participate, and having inheritors demonstrate paper fishing and paper-cutting practice on the spot; organise rice paper culture salons in cities, invite community members to share stories of rice paper culture, exhibit cultural and creative works, and expand the influence of the community.

In terms of co-creation community participation, the Rice Paper Technology Co-creation Program was launched to invite community members to participate in technical innovation and cultural dissemination, such as holding the Rice Paper Cultural and Creative Design Competition in My Heart, asking community members to submit cultural and creative design plans, and having inheritors and enterprises select outstanding solutions for production and designer receive product revenue sharing. A rice paper culture dissemination plan was also released to motivate community members to create short videos of rice paper skills, write cultural articles, and spread them on social media, with outstanding content being rewarded by the platform. Through community participation, the inheritance of rice paper skills has shifted from being the responsibility of a single inheritor to a multi-party joint undertaking, thus forming a living ecosystem of inheritance, exchange, innovation and dissemination. At the same time, community members have increased their sense of belonging to rice paper culture through participation in co-creation and have become a folk force for living inheritance.

## 4 Construction of a Digital Innovation and Development Model for the Living Inheritance of Intangible Cultural Heritage Rice Paper Skills.

### 4.1 Model Framework and Core Connotation

To measure the general effectiveness of the five-in-one innovative model quantitatively, we have built an all-encompassing evaluation index function:

$$E_{total} = \alpha \cdot D_{pres} + \beta \cdot M_{comm} + \gamma \cdot I_{edu} + \delta \cdot M_{link} + \varepsilon \cdot C_{part} \quad (3)$$

where  $E_{total}$  represents the total empowerment efficacy of the living inheritance. The variables  $D_{pres}$ ,  $M_{comm}$ ,  $I_{edu}$ ,  $M_{link}$ , and  $C_{part}$  represent the quantitative scores of Digital preservation, Multi-dimensional communication, Immersive education, Market-oriented linkage, and Community participation, respectively. The coefficients  $\alpha, \beta, \gamma, \delta, \varepsilon$  are the weight factors for each dimension, satisfying  $\alpha + \beta + \gamma + \delta + \varepsilon = 1$ , which can be determined by the Analytic Hierarchy Process (AHP).

The core of the framework of the five-in-one innovation model is technology-enabled living inheritance, and the five dimensions correspond to the basic guarantee, social foundation, talent foundation, economic foundation, and ecological foundation of rice paper technology inheritance, and the specific connotations are as follows: Digital preservation of skills is the basic guarantee of the model; Through high-precision digital recording and hierarchical storage, achieve the permanent preservation and accurate transmission of rice paper skills, and solve the problem of technology generation. Multi-dimensional communication is the social foundation of the model; Through multiple platforms and interactive communication, increase the public's awareness and recognition of rice paper culture, and create a good social atmosphere for living inheritance. Immersive education is the talent foundation of the model; Through innovative education models, cultivate young inheritors, and solve the problem of inheritance main faults. Market-oriented linkage is the economic foundation of the model; By integrating digitalization and industry, transform cultural value into economic value, and provide economic support for living inheritance [15]. Community participation is the ecological foundation of the model, and by building an inheritance community, a living ecology of multi-party participation has been established to promote the sustainable development of inheritance. The synergy of the five dimensions is shown in the following way: Digital preservation of skills provides digital resources for multi-dimensional communication and immersive education; multi-dimensional communication attracts audiences through immersive education and market-oriented linkage; immersive education is market-oriented linkage and community-based participation in cultivating talents; market-oriented linkage provides funds for the digital preservation of skills and community participation; community participation provides content and demand for multi-dimensional communication and market-oriented linkage, forming a closed loop of resources, audiences, talents, funds, and ecology.

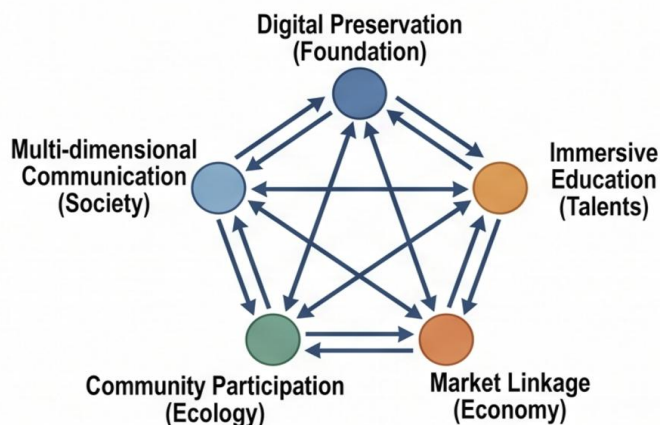


Figure 4: The Five-in-One Innovative Development Model Framework for the Living Inheritance of Rice Paper Skills.

## 4.2 Key points of Implementation in each Dimension

The Digital Preservation dimension of skills requires the construction of a high-precision and hierarchical digital resource library. For the selection of technology, a 4K ultra-high-definition camera and motion capture technology will be employed in the core process; high-definition camera technology will be used for the auxiliary process; text, audio and picture technology will be applied to capture cultural connotations; and 3D modeling and material analysis technology will be used in the tool raw material stage to achieve a good balance of recording accuracy and resource practicality. Resource collection will be carried out by a joint collection team of governments, universities, enterprises and inheritors, and the government will take the lead in overall coordination; universities will provide technical support, enterprises will provide venues and funds, and inheritors will be responsible for skill demonstration and experience sharing.

The entire collection process should be recorded to ensure the authenticity and integrity of the resources; for example, in the collection of paper-fishing processes, differences in the operation of inheritors under different seasons and with different raw materials need to be recorded. In terms of resource management, a digital resource management platform for rice paper technology has been built with the functions of resource classification, retrieval, update and sharing; an authority management module has been established, core skills resources are only available to inheritors and university researchers, and basic resources are open to the public; periodically invite inheritors and experts to review and update resources to ensure the accuracy and timeliness of the resources.

The multi-dimensional communication needs to build a multi-platform and interactive communication matrix. In terms of content planning, the three clues of cultural storyline, skill demonstration and experience interaction are used as a guide, and the cultural storyline focuses on the relationship between rice paper and literati culture and history, such as Wang Xizhi and rice paper; the skill demonstration section details the core process of production, such as the making of paper medicine; and the interactive experience area provides content that can be participated in by the public, such as rice paper DIY tutorials [16]. Platform Operation: Regularly post short videos on short-video platforms with different rhythms and depths of content; use suspenseful beginnings, in-depth details, and cultural interpretation structures (e.g., starting by asking why rice paper can be preserved for thousands of years, showing the pulping process in the middle, and interpreting the material characteristics at the end); regularly release in-depth documentaries to explore the connotations of skills in detail; regularly post cultural

articles on the public account and plan theme content in combination with solar terms and traditional festivals, such as writing Spring Festival couplets on rice paper during the Spring Festival. In terms of interactive design, the online digital exhibition hall has set up skill check-in and knowledge breakthrough activities, and the audience can obtain rice paper cultural badges by completing the check-in or breaking through the level; The short video platform has launched the My Story Topic Challenge with Rice Paper to motivate users to shoot videos related to Rice Paper, and excellent works can receive Rice Paper Cultural and Creative Gifts; Regularly organize online rice paper culture lectures, invite experts and inheritors to broadcast live, and hold interactive Q&A sessions. The size of the immersive education should be an individualised and feasible educational system. In terms of the hierarchical education objects, the education content is designed for the three types of objects of professional inheritors, college students, and social enthusiasts; the education of professional inheritors focuses on the improvement of core skills, opens advanced seminars for inheritors, simulates complex process operations through VR systems, and invites old artists to answer questions online; college student education focuses on the combination of theory and practice, incorporates rice paper skills into elective courses for art design and cultural industry management, and sets up a credit system that combines online theoretical learning, VR virtual practice, and on-site practice. Social enthusiast education aims to arouse interest in the public and organises online courses teaching simple paper-cutting and rice paper decoration. In terms of teaching resource development, a VR teaching system for rice paper technology has been developed with three modules: process simulation, experience-based learning, and assessment and evaluation, and the process simulation module has introduced virtual operation scenarios. The experience library module contains the user's own difficulties in using the skill and how they solved them, such as dealing with wet paper in the rain; the assessment and evaluation module automatically scores based on the accuracy of the user's operations and provides optimisation suggestions. At the same time, digital textbooks for rice paper skills have been compiled, combined with images and data from the digital resource library, to form a three-dimensional textbook that integrates text and QR codes, and you can watch related skills videos by scanning the code. In terms of the mechanism of educational cooperation, build a cooperative education model involving universities, enterprises and inheritors; the universities will be responsible for curriculum design and theoretical teaching, the enterprises will provide VR equipment and on-site practice venues, and the inheritors will lead practical guidance and experience sharing. For example, Anhui Normal University worked with local rice paper enterprises to open a rice paper skills training base, and students can learn in the VR teaching system and then be guided by the inheritor to operate on-site [17].

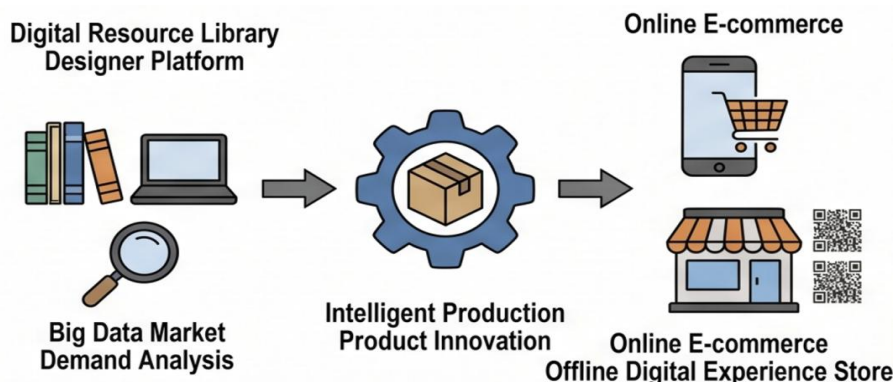


Figure 5: Digital Integration Chain of Cultural and Creative Design, Intelligent Production and Marketing.

The market-oriented linkage dimension needs to build a digital chain of design, production and sales. A rice paper cultural and creative digital design platform has been built for the construction of the cultural and creative design platform, and four sections have been set up: a resource library, a design area, a display area and a docking area; the resource library provides digital resources for rice paper technology; the design area is for designers to upload their works and set up an inheritor comment function; the exhibition area displays excellent design works for public voting; the docking area facilitates cooperation between enterprises and designers to achieve rapid transformation of design solutions, and the platform regularly organizes cultural and creative design competitions to draw in domestic and foreign designers. Enterprise intelligence production docking uses big data to study changes in consumer demand and set production directions for cultural and creative products; for example, by analyzing data from an e-commerce platform showing a high demand for rice paper notebooks, the company rapidly adjusted its production plan to produce notebooks in various sizes and cover designs, and monitored the progress of production through an intelligent digital system. In terms of the integration of online and offline marketing, we will build a rice paper cultural e-commerce platform online, integrate the resources of high-quality rice paper enterprises in Jing County, and provide one-stop services for product sales, cultural experiences and skill learning; set up an inheritor store section where the inheritor personally recommends products, tells the story behind the skill of the product, and increases the appeal of the product. Offline rice paper digital experience stores have been established in museums and cultural and creative stores in several key cities across the country, equipped with VR equipment and digital touch screens to offer consumers an immersive experience of skills and culture; at the same time, these stores can link to the online platform for product purchase via code scanning and work with express delivery companies to optimize logistics services and improve consumer experience.

The dimensions of the demand for community participation need to build a diverse, co-creation and inheritance community. Establish community rules to promote the sharing of good deeds and forbid advertisement swiping; regularly hold activities, such as a weekly skills class, a monthly work selection, and a quarterly offline experience camp. In terms of co-creation project initiation, the rice paper technology co-creation plan has been released, and among the three sub-projects are cultural and creative design co-creation, cultural communication co-creation, and technical innovation co-creation. Cultural communication co-creation encourages members to shoot short videos and write articles about rice paper, publish them on social media, live-stream inheritances with various topics, and good content can be supported by platform traffic, cultural and creative gifts; Technical innovation co-creation invites members to put forward suggestions for skill improvement, such as tool upgrades and process optimisation, and a cash reward will be given for adopted suggestions. A points and level incentive system has been built for the community incentive mechanism; members can earn points by taking part in community activities, sharing content, and submitting co-creations, and these points can be exchanged for rice paper products and experience camp seats. Four levels have been set up based on the number of accumulated points: novice, enthusiast, expert, and inheritor assistant, and high-level members are eligible to join activities such as offline lectures by inheritors and cultural and creative product reviews to strengthen their sense of belonging and participation.

## **5 Implementation Path and Guarantee System for the Digital Living Inheritance of Intangible Cultural Heritage Rice Paper Skills**

### **5.1 Implementation Path**

The application of the five-in-one innovation model should be promoted in stages, in accordance with the actual conditions of the inheritance of rice paper skills in Jing County, and the implementation path of the three stages of pilot, promotion and optimisation should be designed to ensure the effectiveness of the model. The first stage is the pilot stage (1-2 years), aiming to complete the collection of core resources for digital preservation of skills, build an initial communication and education platform, pilot community operation, and verify the feasibility of the model.

The main tasks are as follows: Select 2-3 leading rice paper enterprises as the pilot sites, collect digital resources for the three core processes of papermaking, pulping and paper drying, build a preliminary digital resource library, build a communication platform on Douyin and WeChat public accounts, regularly post content, gradually accumulate fan groups, and increase the popularity of visits to online digital exhibition halls, cooperate with Anhui Normal University and Xuancheng Vocational and Technical College to pilot the opening of rice paper skills VR courses and ensure that the courses cover a certain number of students, build 1-2 core communities, form core communities, and regularly organise offline experience activities, summarize the pilot experience and adjust the details of the model, such as optimising content types based on dissemination data and improving the VR teaching system according to student feedback.

The second stage is the promotion stage (2-3 years), aiming to expand the digital resource library, extend the scope of communication and education, achieve a scale of market-oriented linkage and community participation, and start to show an initial effect of the model. The main tasks are: to complete the collection of digital resources for all processes, cultural connotations, tools and raw materials of rice paper technology; to improve the digital resource management platform; and to realize the classification, retrieval and sharing of resources. Expand the communication platform to the Internet platform, build a multi-platform communication matrix, extend the coverage of communication, and boost the influence of online platforms. Work with many universities and rice paper companies to promote VR courses and cooperative education mechanisms for rice paper skills, expand the scope of educational cooperation, and cultivate more young inheritors; build a rice paper cultural and creative digital design platform and a rice paper cultural e-commerce platform to attract a number of enterprises to set up online operations, add more diverse cultural and creative products, and increase the proportion of online sales.

The third stage is the optimisation period (years 3-5), and the goal is to realise stable operation of the five-in-one model; at this time, the endogenous power of the living inheritance of rice paper technology will have been substantially increased and serves as a model for the digital inheritance of intangible cultural heritage. The first is to continuously expand the digital resource library, introduce intelligent technologies to achieve intelligent retrieval and recommendation of resources, and provide related images, experience interpretations, teaching videos, etc., when users search for paper. The second is to use personalized push content based on big data analysis of user preferences to recommend suitable content for different users, such as recommending rice paper and calligraphy and painting creation-related content for calligraphy and painting enthusiasts, and recommending rice paper cultural and creative content for young consumers. Finally, standardize the education system and formulate the "Digital Education Standard for Rice Paper Skills", and clarify the curriculum, teaching methods and

evaluation systems, promote them in colleges and universities and vocational colleges across the country. Market-oriented linkage to promote branding, build several culturally rich and creative rice paper brands with national influence, stimulate market demand for handmade rice paper, and raise the income of inheritors; community participation realizes ecology, achieves large-scale development of the community, enhances the supporting role of community co-creation for enterprises, and forms a living ecology of harmonious interaction among inheritors, enthusiasts and consumers.

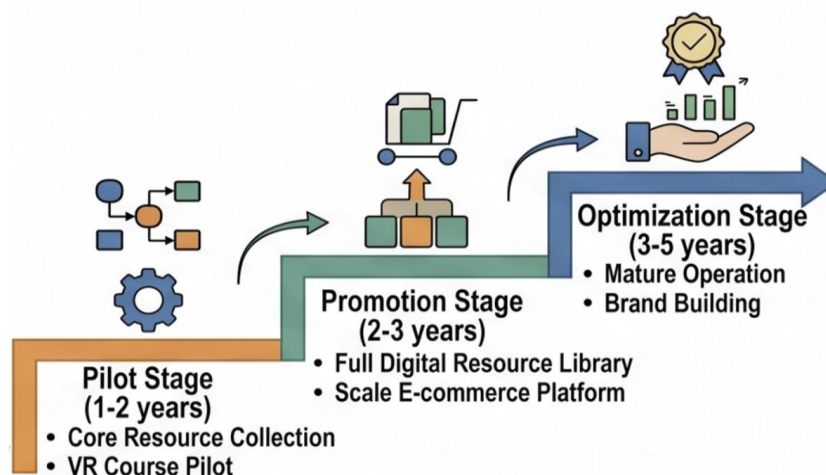


Figure 6: Three-Stage Implementation Roadmap and Ecological Evolution Trajectory.

## 5.2 System Guarantees

To ensure the normal operation of the five-in-one model, a guarantee system based on the four dimensions of policy, technology, talent and capital needs to be built, and a collaborative mechanism of government leadership, enterprise leading, university support and social participation should be constructed. Strengthen government leading forces and support for the policy guarantee dimension. The Anhui Provincial Government, the Xuancheng City Government and the Jingxian County Government should issue special policies to promote the digital inheritance of rice paper technology, clarify development goals, key tasks and safeguard measures, and incorporate the digital inheritance of rice paper technology into the implementation plan of Anhui Province's cultural digitalisation strategy and provide project support; tax exemptions and financial subsidies will be granted to enterprises that carry out digital preservation, education and industrial linkage [18]. A leading group for the digital inheritance of rice paper technology has been established to build a coordination mechanism, with the county government as the leader and members from the heads of the Cultural Affairs Bureau, the Education Bureau, the Economic and Information Bureau, the Finance Bureau and other departments, as well as university experts, enterprise representatives and inheritors.

The leading group has organised regular meetings to coordinate and address problems in the implementation of the model, such as site coordination for resource collection and credit recognition in educational cooperation. Strengthen supervision and assessment by establishing an evaluation system for the digital inheritance of rice paper skills, set five dimensions of evaluation, and specify the evaluation indicators as follows: accuracy of skill preservation, communication effect, quality of education, industrial benefit, and community activity (e.g., number of resources in the digital resource library, proportion of increase in public awareness, number of young inheritors, sales of cultural and creative products, and growth rate of community members); hire a third-party organization to conduct annual evaluations, and use the evaluation results to support enterprises in obtaining policy support to ensure the

effectiveness of model implementation. Strengthen the technical support function and enhance its technical support ability. In terms of the construction of the technical team, the computer and digital media professional teams at Anhui University, Hefei University of Technology, and other universities will collaborate with local science and technology enterprises in Jingxian County to establish a digital technical support team for rice paper technology, which will be responsible for digital resource collection, platform development and technical maintenance; regular technical training will be organised to ensure that the team members are proficient in the latest VR/AR, big data and motion capture technologies. In terms of constructing a technical platform, we will build a digital technology platform for rice paper technology, integrate a digital resource management system, a VR teaching system, a cultural and creative design system, an e-commerce sales system, and a community management system to achieve data sharing and system linkage; for example, the excellent solution of the cultural and creative design system can be automatically synchronized with the e-commerce sales system, and the demand feedback of community members can be automatically synchronized to the big data analysis system. Strengthen the technical maintenance of the platform by setting up an emergency response mechanism for technical failures, and the technical team must respond to and resolve platform failures within 24 hours. Regularly carry out security tests of the digital resource library and online platform to prevent data loss or unauthorised access, and sign a long-term maintenance agreement with the technical equipment supplier to ensure the stable operation of VR equipment, scanning equipment and other hardware.

Cultivate a compound talent team in the dimension of talent guarantee. In the cultivation of technical talents, colleges and universities should establish majors related to the digitalisation of cultural heritage, add courses such as intangible cultural heritage digital technology and digital protection of traditional crafts in computers, digital media, cultural industry management, and other majors, and foster compound technical talents who are both proficient in digital technology and have a deep understanding of rice paper culture. Enterprises can work with universities to organise order-based training and customise talent training programmes according to their own requirements, thereby providing highly specialised technical talents. To cultivate inheritance talents, a support plan for young inheritors has been introduced: living subsidies and tuition fee reductions or exemptions are provided for young people learning rice paper skills; experienced artists are encouraged to teach apprentices and receive suitable rewards for fostering good young inheritors; digital skills have been added to the assessment criteria for young inheritors, and basic skills such as using digital resource libraries and operating VR teaching systems need to be mastered. Through the talent introduction plan, professionals in the fields of cultural and creative design, digital marketing and community operation will be brought in from first-tier cities. Offer housing subsidies, children's education discounts and other benefits for talent attraction, and retain talented individuals for a long time to serve the digital inheritance of rice paper skills.

Expand the dimension of capital security and increase the sources of funds. In terms of government financial support, we will try to obtain special funds from the national cultural digitalisation strategy and special funds for the protection of intangible cultural heritage for the construction of digital resource libraries and technology platforms; the Jing County Government will set aside special financial funds annually to support young inheritors and subsidise community activities. In terms of capital investment by the enterprise, promote the increase in digital investment by rice paper enterprises and include digital construction costs in production cost accounting; support funds for enterprises to be raised through equity financing, bond financing, etc., for example, large local rice paper companies can raise funds for digital transformation through the issuance of corporate bonds. In terms of social fund participation, build a public welfare donation platform for rice paper culture, and encourage all sectors of

society and caring enterprises to donate funds for the digital protection and education of rice paper technology; set up a digital inheritance fund for rice paper skills, and the proceeds of the fund will be used to support the training of young inheritors and the organization of cultural and creative design competitions. Explore the cultural crowdfunding model to raise funds for the development of VR teaching systems and digital exhibition halls via crowdfunding platforms, and offer rewards such as rice paper cultural and creative products and experience camp places to crowdfunding participants.

## **6 Conclusions and Prospects**

### **6.1 Research Results**

The main conclusions of this paper are as follows: First, the active inheritance of rice paper technology currently faces three core dilemmas: a defect in the inheritance subject, a single-path inheritance model, and a lack of inheritance motivation; fundamentally, it is the mismatch between the traditional inheritance model and the needs of modern society, and digital transformation can solve this dilemma in five dimensions: preservation, dissemination, education, industry, and community through technical characteristics. Second, the empowerment mechanism of digitalisation for the living inheritance of rice paper skills shows multi-dimensional synergistic characteristics: digital preservation of skills addresses the problem of implicit experience retention, multi-dimensional communication overcomes the limitations of time and space in communication, immersive education innovates talent training models, market-oriented linkage realizes the transformation of cultural value, and community participation in the construction of a living inheritance ecology, and the five support each other to form a closed loop. Third, the five-in-one innovation model based on the empowerment mechanism specifies the implementation points and synergistic logic of each dimension, offering a systematic solution for the living inheritance of rice paper skills.

### **6.2 Insufficient Research**

There are still two shortcomings in this study: first, in terms of specific details of digital technology application, the adaptation differences among various technologies (such as VR and 3D modelling) in technical records have not been deeply investigated, and the cost-benefit analysis of technology application needs to be strengthened; second, in terms of model verification, although expert opinions have been obtained through written consultation, there is a lack of long-term follow-up empirical data support, and the effectiveness of the model needs to be further verified in combination with pilot practice in the future.

### **6.3 Future Prospects**

Future research can be promoted in three ways: first, technical adaptability research can be conducted in combination with the characteristics of different processes in rice paper technology to explore differentiated digital technology solutions, such as the use of motion capture technology for the dynamics of the paper-fishing process and the use of three-dimensional modeling technology for the static attributes of tool raw materials to enhance the accuracy and economy of technology application; second, cross-regional comparative research can be carried out by comparing the digital inheritance experience of other intangible cultural heritage handicrafts to refine common laws and individual differences, thereby enriching the theoretical system of digital inheritance of intangible cultural heritage; and third, the long-term mechanism can be studied by focusing on ethical issues in the process of digital inheritance and

the cultivation of cultural identity in intergenerational inheritance to promote the in-depth evolution of the digital inheritance of rice paper skills from technical empowerment to cultural empowerment and achieve the sustainable development of living inheritance.

## Funding

1. This work was supported by Anhui Provincial Colleges and Universities Scientific Research Project (Humanities and Social Sciences) "Digital Innovation Research on the Intangible Cultural Heritage of Xuan Paper Skills in Jing County under the Background of Cultural and Tourism Integration" (Project No.: 2024AH052569)

2. The university-level research team "Digital Intangible Cultural Heritage Team" of Anhui Institute of Technology (Project Number: 25kytdlj001)

## About the Author

Hong Zhao was born in Wuhu, Anhui Province, China, in 1981. She graduated from Anhui Normal University with a master's degree. Her main research areas are visual communication design and regional cultural design. E-mail: 18055311044@163.com

Qiong Luo was born in Ma'anshan, Anhui Province, China, in 1985. She graduated from Anhui Engineering University with a master's degree. She is currently studying at the Fashion and Art Design College of Donghua University. Her research interest covers clothing and apparel design. E-mail: luoqiong@mail.dhu.edu.cn

Yawei Wang was born in Xuancheng, Anhui Province, China, in 1992. She graduated from Anhui Polytechnic University with a master's degree. Her research focus is on the digital protection and inheritance of intangible cultural heritage traditional techniques. E-mail: 496099366@qq.com

## References

- [1] Zhang, B., & Li, Z. (2021). The "Digital Narrative-driven" Collection Utilization Model of Library, Document and Museum Institutions. *Library Forum*, 41(05), 30–39.
- [2] Zheng, A., Zheng, J., & Wang, X. (2021). The Practical Challenges and Promotion Directions of Digital Dissemination of Sports Intangible Cultural Heritage in the Post-Pandemic Era. *Journal of Guangzhou Sport University*, 41(01), 57–61.
- [3] Qi, T. (2022). From Historical Archives to Historical Big Data: An Exploration Based on the Ten-Year Path of the Venice Time Machine. *Journal of Library Science in China*, 48(05), 116–129.
- [4] Zhou, W., Huang, S., Chen, S., Zhong, R., & Ai, Q. (2021). The Digital Transformation Picture of Public Cultural Services in Global National Archives and Its Implications. *Archives and Construction*, (10), 45–50.
- [5] Luo, R., Chen, Y., & Zheng, X. (2021). Characteristics and Implications of the Functional Positioning of Foreign Archives. *Zhejiang Archives*, (05), 17–23.
- [6] Wang, W. (2019). Research on the Impact of Music Book Publishing and Music Culture

Dissemination. Xi'an Conservatory of Music.

- [7] Long, J., Yao, J., & Wei, B. (2021). The Practice and Implications of the National Library and Archives of Canada (LAC) in Digital Government Construction. *Lantai World*, (01), 23–28.
- [8] Zeng, X. (2023). Research on the Digital Transformation of Cultural Heritage Tourism Destinations. Nanchang University.
- [9] He, T., Zhou, Y., & Yang, L. (2023). Research on Digital Transformation Strategies for Archival Institutions Oriented towards Cultural Digitalization: Insights from Europeana's "Strategy 2020-2025: Empowering Digital Transformation". *Shanxi Archives*, (02), 57, 68–74.
- [10] Hua, Z. (2025). The Development and Utilization of Intangible Cultural Heritage Archives: Recommended Reading of "Research on the Information Dissemination of Intangible Cultural Heritage Archives in China under the Background of Public Cultural Services". *Information Theory and Practice*, 48(04), 204.
- [11] Yin, T. (2023). The Significance and Path of Digital Construction of Cultural Heritage in the Suzhou Section of the Grand Canal. *Appreciation of Masterpieces*, (35), 118–120.
- [12] Xiong, X., & Tian, G. (2023). Strategies for Archival Institutions to Carry out Digital Heritage Protection Actions: Based on the Research of the "Towards National Treasures" Project. *Zhejiang Archives*, (06), 38–41.
- [13] Ma, B., & Xu, P. (2025). Exploration on Promoting the Digital Transformation of Henan's Characteristic Cultural Resources through Radio and Television. *Artist*, (06), 155–157.
- [14] Zhan, X. (2022). Research on the Inheritance and Development Countermeasures of China's Sports Intangible Cultural Heritage in the Digital Age. *Compilation of Abstracts of Written Exchanges at the 2022 China Sports Intangible Cultural Heritage Conference, Wushu and Traditional Ethnic Sports Branch of the Chinese Society of Sports Science, Ministry of Education's Base for Inheriting Excellent Traditional Chinese Culture (Wushu), National School Sports League (Chinese Wushu) Chinese Society of Sports Science*, 2.
- [15] Chen Y, Zhi F, (n.d.). Digital Transformation Actions of Archival Institutions Oriented Towards Data Space Construction: Analysis and Implications Based on Typical Foreign Cases. *Zhejiang Archives*, 1-8.
- [16] Shen, Y. (2025). Digital Inheritance of Lingnan Cantonese Opera Driven by AIGC. *Toy World*, (06), 137–139.
- [17] Tian, G., & Zhou, W. (2025). Research on the Application Strategies of Generative Artificial Intelligence in Cultural Heritage Protection Institutions: Insights from the "Towards National Treasures · Virtual Liverpool Biennale" Project. *Beijing Archives*, (02), 32–38.
- [18] Li, Z., & Fan, F. (2021). Research on Digital Transformation of NFSA Audio-Visual Archives: Characteristics and Implications. *Zhejiang Archives*, (07), 29–31.