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International Conference on Emerging Media & Communication**RESEARCH ON THE LIVING INTELLIGENT COMMUNICATION
OF CHINESE TRADITIONAL HANDMADE PAPER**

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Abstract

With the development of intelligent media technology, the inheritance, protection and dissemination of intangible cultural heritage will inevitably be given a new paradigm in terms of the subject, information forms, and media environment. The research collects and combines the technique, process flow, inheritors, historical evolution and communication status of Chinese intangible cultural heritage traditional handmade paper to outline the development of synchronized culture of Chinese Traditional Handmade Paper (CTHP) in the north and south of China by using online cyberspace research, fieldwork, big data visualization technology, etc. At the same time, the research explores the modern digital inheritance method, extract and establish reusable digital material library to try to improve internal power deficiency for contemporary "regeneration" of CTHP, the "fragmentation" and "rigidity" of modern inheritance and development, and the limitations of mass communication. At the same time, the research explores the modern digital inheritance method, extract and establish reusable digital material library to activated intangible cultural heritage for the problems of CTHP in terms of the internal power deficiency for contemporary "regeneration", the "fragmentation" and "rigidity" of modern inheritance and development, and the limitations of mass communication, through developing intelligent living experience of human-computer interaction, intelligent adaptation of algorithm models, intelligent regeneration methods base on deep learning, and optimizing and designing the path of inheritance and communication of CTHP in contemporary life to inherit, innovate and effectively disseminate the CTHP.

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Keywords: Intangible cultural heritage, Chinese traditional handmade paper, living inheritance, intelligent communication, smart media



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1. Introduction

Economic reforms and social progress, to some extent, are increasingly shaping the social and natural environment on which intangible cultural heritage relies. Since many intangible cultural heritages lack written records or live merely in the oral tradition, they are disappearing at an alarming rate, especially under the impact of modern digital technology, information technology, and network technology, and their survival and development have become an important issue of all mankind.

However, from another perspective, the emergence of digital technology has also brought new life to what that is on the verge of extinction, and provided new ideas for the inheritance and development of intangible cultural heritage. Wang (2013) proposed the concept of “digitization of cultural heritage”, aiming to transform and reproduce intangible cultural heritage in a shareable and interpretable digital form through digital collection, storage, and display technologies (Huang & Tan, 2012), and innovatively preserve and disseminate them based on contemporary needs. Subsequent research also confirmed this point of view, believing that libraries, museums, cultural centers and other intangible cultural carriers, gathering places or communities should utilize digital recording methods (Yang, 2011) to record and protect traditions, knowledge, customs, etc. (Dowding, 2014).

In discussing digital inheritance of intangible cultural heritage, scholars at home and abroad indicate that “living” inheritance of “intangible cultural heritage” is not equivalent to static protection of “tangible cultural heritage”. Their difference lies in that the former stresses the “liveness” rather than a static state. Bowdler (1988) argued in his article “Repainting Australian Rock Art” that “in the study of aboriginal culture, the active continuation of living culture is more important than the preservation of a few relics” (p. 517). “Living” inheritance of intangible cultural heritage refers to its protection and inheritance in the environment where it is generated and developed, and in the process of people’s production and life, thus achieving the ultimate goal of protecting intangible cultural heritage (Wang, 2013). On “living inheritance”, academic circles possess different views. First of all, intangible cultural heritage essentially features in the living expression of its performance and inheritance (Hu, 2005), thus its living process must be inherited. Secondly, inheritors play a central role in the inheritance. “The inheritance of intangible cultural heritage is the transmission of ‘spiritual culture’, and the inheritance process, through interpersonal spiritual communication, that is, by oral narration, body demonstration, concepts or psychological accumulation, etc., is abstract and intangible” (Song, 2006). Inheritors also unknowingly make corresponding adjustments and innovations to intangible culture. Thirdly, intangible cultural heritage is constantly changing (Zhao, 2019), and factors that cause it to change should be explored for the regeneration of intangible cultural heritage. As Gao (2019) stated, “to protect culture’s vitality is to protect the culture’s reality and growth. The so-called living inheritance is not simply to preserve the original characteristics, but to protect and cultivate the growth mechanism and protect the continuation and expression of the vitality of cultural groups”. Intangible cultural heritage should “live” in the contemporary era, and “live” in people’s current cultural life.

In the new era of intelligent media, driven by intelligent technologies such as artificial intelligence, big data, and VR/AR, intangible cultural heritage has been given a brand-new context of intelligent inheritance and communication. Researchers believe that a deep understanding of possible connections,

aggregations and functions of various elements of intelligent media will help make the intelligent media an important means to promote the inheritance and development of intangible cultural heritage (Jia, 2020).

Many scholars have conducted in-depth research on one of the intangible cultural heritages, traditional handmade paper, also the research subject of this paper. Tiangong Kaiwu: Chinese Technology in the Seventeenth Century, written by Song Yingxing, a scientist in the Ming Dynasty (1368-1644), provided a model for later papermaking techniques (Song et al., 1997); contemporary scholar Pan Jixing sorted out and categorized ancient traditional handmade paper (Pan, 2007); Xie (2014) launched an in-depth research on the traditional bamboo paper in Jiajiang (a county in Leshan City, Sichuan Province) and discussed the feasibility of the sustainable development of the paper. All in all, scholars' research focuses are mostly on the development process, techniques, and materials of traditional handmade paper in specific regions and types. But studies on the elements of "living" inheritance of traditional handmade paper in the north and south of China, and its protection and dissemination through contemporary intelligent media are rarely conducted.

2. Problem Statement

This research will investigate and sort out the status quo and dilemma of the "living" inheritance and communication status of traditional handmade paper. How to build the communication model. In addition, what is the development path of the communication of Chinese traditional handmade paper under the background of smart media.

3. Research Questions

At present, systematic qualitative and empirical research on traditional Chinese handmade paper is inadequate in academic circles. However, to explore the way of carrying out the "living" inheritance and protection of traditional Chinese handmade paper through digital and intelligent media, empirical research on the elements of "liveness" of traditional Chinese handmade paper should be conducted first.

Therefore, this research, based on the previous studies of scholars at home and abroad, with three "living" elements of intangible cultural heritage: liveness, inheritors, and recreation as the research objects, investigates and sorts out different types of traditional handmade paper in northern and southern China. Besides, by using the SMCR model of communication, the paper also discusses the "living" inheritance and communication status of traditional handmade paper, and explores how to use intelligent media and digital technologies to "lively" protect, transform, reproduce, share and disseminate traditional handmade paper.

4. Purpose of the Study

This article is dedicated to discussing the historical evolution and communication status of Chinese traditional handmade paper in China's intangible cultural heritage. Through literature review, network research, field research, and interview, collecting and analysis the development history, other elements and current status of inheritors of Chinese traditional handmade paper, and discuss the "living" inheritance and communication of traditional handmade paper. At the same time, based on the background of

contemporary intelligent media, this article aims at explores the path of modern digital inheritance, and constructs the communication theory model of traditional Chinese handmade paper.

5. Research Methods

5.1. Literature Review Method

This paper applies the literature review method to trace the history of traditional handmade paper and discuss its types and differences in the north and south of China (Min-zhong, 2005). The evolution of traditional handmade paper can be divided into three stages: the initial stage of papermaking technology exploration; the middle stage of innovations in papermaking technology, raw materials and paper varieties; the third stage of the establishment and maturity of papermaking techniques (Pan, 2007). What's more, geographic differences (Li, 1990) can also cause differences in raw materials for papermaking in the north and south of China (see Table 1). Nevertheless, in the Ming Dynasty, after Tiangong Kaiwu was written, the papermaking techniques in the north and south of China were quite similar, and followed a predictable pattern (see Table 1).

Table 1. History of CTHP

Period	Main process and characteristics	The main purpose	Main papermaking raw materials in northern China	Main paper varieties in northern China	Main papermaking raw materials in the South	Main paper varieties in the South
Initial stage Eastern Han Dynasty—Sui Dynasty	Cai Lun invented paper with rags, fishing nets, and hemp materials. The paper has larger fiber particles, and the paper is not white enough.	Record: Books etc. Cultural: Sacrifice etc.	Hemp pulp Ramie pulp	Yellow jute paper Pale yellow jute paper	Hemp	No clear evidence
Interim Sui Dynasty—Ming Dynasty	1. Animal glue is added to the pulp, and the toughness of the paper is increased. 2. Large-scale papermaking curtains; the size of the paper becomes larger. 3. Paper medicine is a kind of plant medicine that does not cause the paper fibers to stick to each other.	Books, memorials, notes, scriptures, etc. Cultural paper: calligraphy and painting, sacrificial paper Craft paper: paper fan, paper umbrella, kite, paper cut, etc. Tissue paper: toilet paper, medical packing paper	Castor flax Abutilon Kenaf Chuan Bark Mulberry Bark	White linen paper Oily linen paper Paper Mulberry Paper Extra clean leather	Qingtian leather Vine Bark Rui Xiangpi Ci bamboo Yellow bamboo Green bamboo	Paper mulberry paper Green sandalwood paper Jiajiang paper Lian Shi Zhi Yuan paper
Late stage Ming Dynasty—Qing dynasty	The book of " Chinese Technology in the Seventeenth Century" determines the papermaking process of traditional Chinese handmade paper.	Recording paper: books, memorials, notes, scriptures, letters, etc. Cultural paper: calligraphy and painting, sacrificial offerings, Craft paper: paper fan, paper umbrella, kite, paper cut, etc. Tissue paper: toilet paper, medical paper.	Jute Paper mulberry Mulberry Bark	Cotton material Xuan paper; Net leather paper; Cloud Xuan Paper; Paper mulberry paper;	Paper mulberry; Qingtian leather; Bamboo; Bitter Bamboo;	Paper mulberry paper; Green sandalwood paper Jiajiang paper Lian Shi Zhi Yuan paper

5.2. Field Research Method

This research also adopts the six-step fieldwork method proposed by Blommaert and Jie (2010). From 2018 to 2019, the research team went to Guanzhong area and the southern region of Shaanxi Province, Jiayang County in Sichuan Province, Leiyang City in Hunan Province, Fuyang District in Hangzhou City, Zhejiang Province, Fuzhou City in Fujian Province, Taipei City and Changhua County in Taiwan, China, and other traditional papermaking areas to study papermaking techniques, visit traditional handmade paper museums, local “intangible cultural heritage” training institutes, local government cultural departments and other communities, organizations and institutions, as well as 8 inheritors and their families (see Table 2).

Table 2. Field Research On CTHP

Museum	Sichuan Jiayang Handmade Paper Museum	Cailun Museum, Yang County, Hanzhong City	Fuzhou Strait Paper Museum	Taiwan Shuhuo Memorial Paper Museum
Training School	Cultural Center of Chang'an District, Xi'an	Xi'an Beizhang Village Cultural and Papermaking Institute	Cai Lun Memorial Park, Hunan Province	Taipei Songshan Cultural and Creative Park
Government sector	Cultural Bureau of Chang'an District, Xi'an City	Hanzhong Municipal Bureau of Culture	Sichuan Jiayang Cultural Bureau	
Inheritor	Fengsong Zhang	RenShui YU	Ma Dong	Fengxue Zhang Shi Li Wang

6. Findings

Intangible cultural heritage communication is diverse and complex, and it is affected by many factors. This research, focusing on the investigation of “living” elements of traditional handmade paper and using the SMCR model of communication, explores the status quo and predicaments of the “living” inheritance and communication of traditional Chinese handmade paper.

6.1. Source

The communication source of a message is the initiator and controller of the entire communication process (Brondi et al., 2021). It determines the content and quantity of messages entering the message channel. In the development process of traditional Chinese handmade paper, inheritors are the main sources of traditional handmade paper to be inherited and communicated. During the investigation, papermaking craftsmen in the paper workshop employed the ancient methods and used their own experience to teach their apprentices throughout the papermaking process, so that these apprentices could better understand and acquire papermaking techniques. From this perspective, this method is more suitable for clans in which families are related to each other. The Traveling Diary of Papermaking in the Qing Dynasty wrote that “at that time, 3000 households with the surname of Cao in Daling and Xiaoling areas (in Jing

County, Xuancheng City, Anhui Province. The two areas are famous for papermaking.) work on papermaking (Ling, 2009).

Till now, the communication sources of traditional handmade paper can be seen in handmade paper museums, protection centers of “intangible cultural heritage”, and cultural departments in many regions, but most sources are static messages including finished paper, process flow charts, texts and pictures. Moreover, inheritors, the most important source of messages, are facing a crisis and predicaments of no successor and inheritance dislocation due to the extremely limited number of apprentices under traditional teaching model, the high cost and low return of learning, and the lack of market vitality for handmade paper (See Table 3).

Table 3. CTHP Successor interview

Why engage in CTHP?	Who taught you CTHP?	What difficulties have you face?	CTHP's main markets and uses	Difficulties in the inheritance of CTHP
Fengsong Zhang	Father	Because of the working environment, I suffered from arthritis and lumbar disc herniation when I was 66 years old.	Painting, calligraphy	Paper profits are low, young people like to work in big cities, and fewer people want to learn
RenShui YU	Relative	Obtain papermaking raw materials	Writing calligraphy; painting Chinese painting; Chinese medicine packaging; food packaging	Too hard, fewer and fewer people are learning papermaking
Fengxue Zhang	Father	Tolerate loneliness, stay patient and keep learning	Writing calligraphy, painting, offering sacrifices	Profits are too small, and fewer people learn

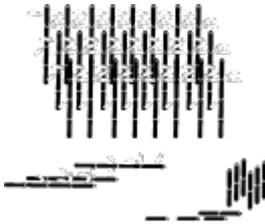
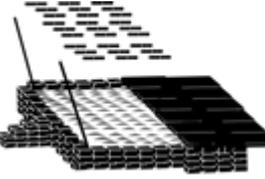
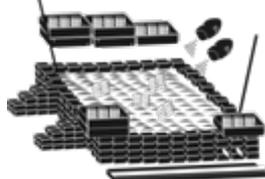
6.2. Message

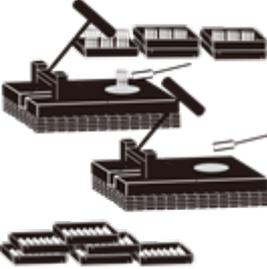
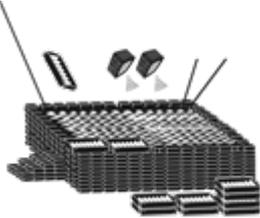
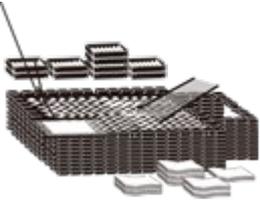
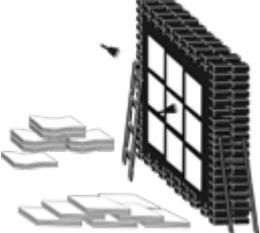
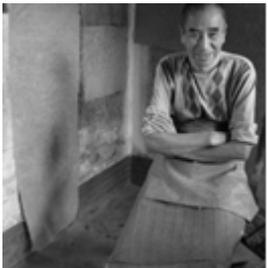
Message is the object of communication (Muchiri et al., 2021). The content, composition, processing, structure, and symbol coding of a message all affect the communication of the message. Messages of traditional Chinese handmade paper that satisfy the liveness and recreation of the “living” elements mainly focus on manufacturing techniques, and the materials and textures of different types of paper.

(1) Manufacturing techniques of traditional handmade paper

The research results show that different natural conditions in the north and south of China can produce different papermaking materials, but contemporary papermaking techniques which inherit the ancient ones, have no big difference with the later. Take the traditional southern bamboo papermaking technology as an example (see Table 4).

Table 4. CTHP Papermaking technology process

Serial Number	Step	Specific technical process	Visual restoration design of ancient papermaking processing	Field research on contemporary papermaking processing
1	Obtain Material	<p>1. Cutting bamboo material in late spring; 2. Remove leaves and branches; 3. Segmented, broken down into short sections.</p>		
2	Steeping	<p>The bamboo joints are completely submerged and soaked in water, and thoroughly stirred to soften the bamboo joints. The appropriate time is 20 days in spring and summer, and 40 days in autumn and winter.</p>		
3	Remove the green husk	<p>The green skin on the surface of the bamboo joint is soaked to yellow, the purpose is to remove the blue color of the bamboo surface. Then beat the main ingredients repeatedly to remove excess rot and shed fibers.</p>		
4	Soak in a lime pool	<p>Prepare the lime emulsion in the ash pond, and place the ratio of 1 (lime) to 2 (raw material), and then place the bamboo section after beating and selecting the material in the ash pond. After the bamboo material is full of the mortar, take it out and dry it for 10 days.</p>		
5	Stewing	<p>It is steamed in a Huangpan, which has a wood-stone structure, a barrel shape, a height of about one foot, and a diameter of about eight feet. Start a fire and cook for 6 to 7 days and nights.</p>		
6.	Cleaning materials	<p>When washing the material, hold the bamboo bundle in long running water or river water and wash it 5 to 6 times repeatedly until the lime is removed.</p>		

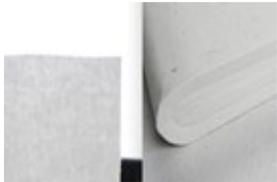
7	Second stewing	<p>The second stewing is to make the bamboo material whiter and softer. After stewing, it will cool down to one day.</p>		
8	Pound	<p>Pounding, that is pounding paper material, refers to cutting off the piled paper material, pour it into the material bowl, remove impurities, pedal the stone mortar head connected with the wooden pole, repeatedly pound the paper material completely broken into pieces.</p>		
9	In a paper medicine	<p>Put clean water in the pool and add appropriate paper. The paper medicine generally uses hollyhock powder, the purpose of which is to make the adhesion of the pulp fibers better. Then pound the mashed bamboo material, add the bamboo material to the pool and stir well, and let it stand for one day.</p>		
10	Handsheet	<p>The floating fibers are picked up from the paper trough to remove the moisture, and the interwoven fibers are left on the paper curtain to form thin pages.</p>		
11	Remove Moisture	<p>After the wet paper is copied and piled up to about 1,000 sheets, it can be pressed and dehydrated. Stack the picked up wet paper on the paper press, cover it with a cover, and place long and short pieces of wood on the cover to press water.</p>		
12	Drying	<p>Stick the paper on the high temperature wall for drying</p>		

In the research, it is found that traditional Chinese papermaking technology is currently facing the following predicaments: the inheritance relying on blood relations is gradually broken by capital employing labor, and traditional family inheritance is broken by short-term training of factories, thus systematic inheritance of papermaking techniques is gradually disappearing; traditional papermaking techniques lack systematic digital records, and since the one-to-one traditional inheritance model is complex and has no standards, so that messages of papermaking techniques are gradually in a state of dislocation and fragmentation.

(2) Materials of traditional handmade paper

In order to explore the advantages of traditional handmade paper, the research team investigated the finished handmade paper of different types in the north and south of China, and continuously sampled and analyzed the raw materials, texture, colour and texture characteristics of the paper (see Table 5).

Table 5. Traditional handmade paper analysis of finished paper

Serial Number	Name	Raw material	Photograph	Texture and color	The texture of semantic
Bark paper as the main paper in North China					
Mulberry (bark) paper		Mulberry		Fiber length; Paper toughness; Yellow color; ;	Strong; Weight; Strong;
Paper mulberry		Paper mulberry		Tight texture; Plant fiber gap less; The color is slightly yellow;	Nature; Primitive simplicity. Durable;
Jingpi paper		Wingceltis Straw		Texture cotton tough; Beautiful texture; Light but not slippery; Color white and elegant;	Moderate; Smooth; Simple but elegant.
Bamboo paper is the main paper in southern China					
Jiajiang paper		Yellow bamboo Green bamboo Moso bamboo		Fine fiber; Cotton, tough and smooth; White soft;	Natural; Flat; Classical;

Lianshi paper	Moso bamboo Bitter bamboo		Exquisite texture; Smooth; The paper color is slightly green;	Flexible ; Exquisite; Warm;
Xiegong paper	Fresh Bamboo		The material is light and thin; Similar to silk; Color is light yellow ;	Lightly; Soft; Pure and fresh;

The investigation results indicate that the finished traditional Chinese handmade paper is rich in color, diverse and unique in texture, and each piece of handmade paper is unique and environmentally friendly, highlighting traditional Chinese culture. These advantages and characteristics can be combined with modern design and applied for “regeneration” and recreation of traditional handmade paper in the contemporary era, and have become an important message for regional cultural communication.

6.3. Channel

A channel is an intermediary that communicates messages from the source to the receiver. Choosing an appropriate channel will make the message reach the receiver smoothly. Results show that initial communication of traditional Chinese handmade paper message is through interpersonal communication. This communication channel has advantages like powerful influence and timely information feedback, but also has disadvantages such as small communication scope and low efficiency due the limitations of many factors such as time, location, money, and manpower.

With the development of technology and the reform of media, the communication channels of “intangible cultural heritage” have gradually included books and literature, newspapers and periodicals, radio, television, etc. However, there are still problems remaining to be solved: (1) Historical works are limited. Craftsmen have recorded papermaking techniques that they have learned during the process of papermaking, but only Shaqing (Paper, the 18th scroll of Tiangong Kaiwu), Sansheng Bianfang Beilan (A Survey of Border Defense of Three Provinces) and Zaozhishuo (On Papermaking) are relatively complete. (2) As a communication channel of traditional handmade paper (see Table 6), newspapers cover a limited number of reports, and are homogenized in content, serious in pattern, and outdated in format. (3) Though television communication in the forms of documentary films and TV news, movies, TV series, etc. directly leaves the audience a vivid impression through dynamic presentation of images and sounds, it fails to help the audience gain a deep recognition and put it into practice to protect and promote traditional papermaking techniques due to the lack of interaction and filtration of messages in the TV programs. (4) Online communication channels such as WeChat, Weibo, short video platforms, and live broadcasts, with adequate immediacy and interaction, and humanization and personalization, have redrawn the time and space boundaries of “word of mouth”, but also have shortcomings such as decreased influence, less cultural connotations, and fragmented information (Bell et al., 2021).

Table 6. Newspaper information with "traditional handmade paper" as the key word in the National Digital Library of China

Serial Number	Newspaper name	Report content	Times
1	Yunnan Economic Daily	Related news reports	1
2	Guangdong Science and Technology News	Inheritance Protection Publicity	1
3	Art critic	Problem analysis	1
4	China Cultural Relics News	Inheritance Protection Publicity	5
5	Dali daily	Inheritance Protection Publicity	1
6	China Green Times	Related news reports	1
7	Hangzhou daily.	Inheritance and protection publicity, related news reports	4
8	Qianxinan Daily	Inheritance Protection Publicity	1
9	China Culture Daily	Inheritance Protection Publicity	3
10	China Guomen Times	Inheritance Protection Publicity	1
11	Public science and technology newspaper	Related news reports	1
12	Nanning Daily	Inheritance Protection Publicity	1
13	Xinhua Daily Telegraph	Inheritance Publicity	1
14	Guangzhou daily	Inheritance Protection Publicity	1
15	China Packaging News	Trend analysis	1
16	Henan daily	Trend analysis	1
17	Luoyang daily.	Inheritance Protection Publicity	1
18	Luoyang daily.	Inheritance Protection Publicity	1

6.4. Receiver

The receiver is not only the person who receives and decodes the message (Schramm, 2021), but also the person who sends feedback to the source. Results show that the audience who pay attention to traditional Chinese handmade paper are quite complex, including the surrounding people of the inheritors, scholars who study traditional handmade paper, staff of relevant cultural departments and others. Besides, their differences in attitudes, knowledge, and social and cultural background directly lead to the differences in their decoding process of the communicated message, the effectiveness of the feedback, and the communication effect. Since the above-mentioned forms, channels, and contents of the “living” inheritance and communication of traditional handmade paper are fixed, narrow and general, the audience cannot be precisely positioned and gives no timely feedback, thus reducing the communication effect.

7. Conclusion

It can be seen from the above findings that the inheritance and communication of traditional Chinese handmade paper to some extent still have difficulties. In recent years, though rapid development of digital communication renders data acquisition more intelligent and efficient, and offers comprehensive

interpretation and protection to the documents, images, connotations and other elements of intangible cultural heritage, there are still some urgent challenges remaining to be solved: lack of effective interaction between digital resources and the audience; massive but unstructured or semi-structured resource data with a long history but not being systematic; separation of recording and utilization; lack of effective combination of techniques, “living” elements or cultural contexts, and market application.

Today, artificial intelligence technology continues to shape and reconstruct the communication pattern of traditional media, and the emergence of intelligent media has also brought intangible cultural heritage a new communication context. Taking a comprehensive look at the current situation of all walks of life in terms of intelligent communication of intangible cultural heritage, this research attempts to propose the following paths for optimizing the intelligent “living” inheritance and communication of traditional handmade paper in view of its characteristics and present predicaments.

7.1. Promote Cooperation in Sharing Sources of Message by Establishing an Intelligent Platform for Message Collection and Sharing

Communication sources of traditional Chinese handmade paper have gradually changed from inheritors as the main source to multi-sources including handmade paper museums, “intangible cultural heritage” protection centers, local cultural departments and other institutions, and they share different work and information. Therefore, an intelligent platform for message collection and sharing can be established, with cultural departments as the lead. This platform can guide and coordinate archives, institutions protection centers, museums and inheritors of “intangible cultural heritage” to input massive original “living” messages covering the historical evolution of traditional handmade paper, in-depth interpretation of intangible cultural heritage, handmade paper craftsmanship with the “five senses” of sight, hearing, touch, taste and smell, and the characteristics of finished paper, and then employ rule reasoning algorithm of artificial intelligence to process structured, semi-structured, and unstructured digital resources, thus building an intelligent map system of traditional Chinese handmade paper which is similar to the traffic map system. In this system, boring digital text information can be transformed into interactive information in situational modes, and the information is of profound traditional Chinese culture, connotations, and logic. Besides, messages in this system can be extracted, used and shared at any time.

7.2. Construct Intelligent and Interactive “Living” Messages based on Human-Computer Interaction and Deep Learning

1. The highly interactive digital virtual reality technologies generated by computer systems have developed rapidly since the era of new media. Nowadays, people can receive immersive “five-sense” information via VR/AR/MR technologies and wearable devices. Regarding the current issues of traditional Chinese papermaking technology, such as message dislocation and fragmentation, insufficient combination of traditional handmade paper and contemporary paper, virtualized processing of papermaking technology and the texture of different types of finished handmade paper can be carried out to make the originally boring written materials and unpopular “word-of-mouth” technical details “live” in front of the audience, so that both inheritors and communicators can appreciate the life and cultural essence of traditional Chinese handmade paper from a more real personal perspective.

2. An important point in the living inheritance and communication of intangible cultural heritage is the renewable creativity when it is combined with contemporary elements. In the era of new media, it is necessary to effectively combine intangible cultural resources with modern intelligent technology by utilizing massive data processing of artificial intelligence, information mining and analyzing, deep iterative learning and other technologies to establish an intelligent platform of deep learning for the regeneration of intangible cultural heritage that can be participated by multiple sources. Through data analysis and modeling of the quality, color, texture and other elements of different types of handmade paper such as hemp paper, vellum, and bamboo paper and by using statistical machine learning algorithms to train and optimize the resulting model, people can build a system which can independently create cultural and creative products with modern characteristics such as contemporary books, furniture, daily necessities, etc. based on users' needs and integrating design elements. In this way, traditional Chinese handmade paper can gain regeneration and the handmade paper market can also be more diversified.

7.3. Create Three-dimensional Communication Channels and Adapt Intelligent Scenes

The widespread communication of intangible cultural heritage is inseparable from the synthetic utilization of “online” and “offline” comprehensive three-dimensional communication channels. “Online” communication applies a variety of new and traditional media forms such as WeChat, Weibo, short video platforms and live broadcasts to display the full-dimensional information of traditional handmade paper in all channels. “Offline” communication, with the help of the aforementioned virtual reality interactive technology, allows users to wear interactive devices and experience the immersing historical scenes of traditional handmade paper that have been passed down for thousands of years by themselves, which enables the audience to obtain a deep understanding of thinking.

At the same time, in the era of smart media, American scholar Scoble and Israel (2014) believe that with the rapid development of five major technical forces (or “five forces of the scene”), namely big data, mobile devices, social media, sensors, and positioning systems, human society is entering the era of scene dissemination. In other words, the user's context can be perceived by the media channel of information distribution through sensors and positioning systems. Based on big-data analysis, the user's personal cognitive map can be promptly identified and analyzed, and the required content or service can be matched and pushed intelligently.

7.4. Conduct Intelligent Audience Feedback and Oriented by Audience Need

In order to achieve the best effect of the “living” inheritance and communication of traditional Chinese handmade paper, the most concern is the accuracy of communication to the audience. Big data should be used in the analysis of the audience's occupation type, income, age structure, educational background, etc. Besides, the focuses, emotions, attitudes, and effective changes in behaviors related to traditional Chinese handmade paper should be analyzed, so as to obtain a perceptible and measurable communication effect evaluation system and carry out more accurate information pushes.

However, in the era of smart media, when audiences wear bio-sensing technology offline to interact with virtual scenes, the sensor of human motion data and physiological index can be used to collect the audience's physiological and psychological data, thus generating the most direct and true feedback of the

users. These initial physiological data can provide guidance in the production of media content, thereby forming a benign closed loop between content production and audience feedback.

According to the results of this research, it is proved that currently many problems can be found in traditional Chinese handmade paper, including non-concentration of main sources, dislocation of inheritors, information fragmentation of paper-making techniques, lack of internal power for regeneration of handmade paper, and solidification and generalization of communication channels and content. Therefore, it is urgent to deal with those problems from the whole process of "living" inheritance and dissemination. The possibility of effectively solving this crisis comes with the development of new media, big data, artificial intelligence technology, etc. In this paper, practical solutions are proposed to solve the problems, including establishing an Intelligent Platform for Message Collection and Sharing, constructing Intelligent and Interactive "Living" Messages based on Human-Computer Interaction and Deep Learning, opening three-dimensional intelligent communication channels, targeting at audiences accurately for information dissemination and feedback, which is conducive to promoting the intelligent "living" inheritance and protection of traditional Chinese handmade paper.

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