PROTECTION AND INHERITANCE OF TRADITIONAL INTANGIBLE CULTURAL HERITAGE BASED ON BIG DATA TECHNOLOGY: A CASE STUDY IN GUANGXI REGION

Hailu Wan[1,2] , Sakchai Sikka[1], YiHan Ke[1]

1 Faculty of Fine-Applied Arts and Cultural Science, Mahasarakham University, Kantharawichai, Maha Sarakham 44150, Thailand.
2 Guangxi Technological College of Machinery and Electricity, Nanning, Guangxi 530007, China.
Correspondence should be addressed to Hailu Wan;63010662004@msu.ac.th
Hailu Wan ORCID:0000-0002-8763-7156

Abstract: Situated as a precious treasure within the vast tapestry of Chinese history, the intangible cultural heritage projects in Guangxi Province hold significant cultural importance by virtue of the diverse symbolic inheritance across different regions. However, in the era of continuous technological advancements and information technology proliferation, big data has emerged as an indispensable facet of people's daily lives and productivity. Leveraging big data technology for the preservation and perpetuation of traditional intangible cultural heritage techniques not only addresses the shortcomings of conventional preservation efforts, but also engenders wider participation in safeguarding and inheriting these invaluable cultural traditions.

Presently, traditional Chinese intangible cultural heritage techniques face a mounting challenge from the influence of popular culture, placing their survival at risk. The objective of this study is to explore the potential application of traditional intangible cultural heritage techniques in the context of big data, while considering the existing state of preservation and inheritance practices in Guangxi. By harnessing big data technology, this study aims to devise strategies for safeguarding and passing down traditional intangible cultural heritage techniques in Guangxi, thereby contributing to the advancement of traditional Chinese intangible cultural heritage culture and facilitating the digital preservation of these techniques.

To advance the cause of digital preservation and inheritance of traditional intangible cultural heritage techniques, and to make substantial contributions to the development of Chinese traditional intangible cultural heritage culture, this study will undertake an in-depth examination of the preservation and inheritance of traditional intangible cultural heritage techniques in Guangxi. Furthermore, based on the utilization of big data technology, this study will propose viable strategies for the protection and perpetuation of these cultural treasures.

Keywords: big data; Guangxi; traditional intangible cultural heritage techniques.

1 Introduction

With the rapid advancement of artificial intelligence, the Internet of Things, and various mobile devices, coupled with the widespread dissemination and establishment of global digital information systems, big data has become an integral part of our daily lives. In the context of the big data era, effectively harnessing various information technologies and data to safeguard and transmit traditional intangible cultural heritage techniques within a given region not only enhances protection efficiency, but also holds significant practical implications for leveraging the potential of big data technology [1]. Traditional intangible cultural heritage techniques represent a specific form of expression developed by labor collectives to fulfill their spiritual needs in addition to their productive and social endeavors. Over thousands of years, these traditional intangible cultural heritage techniques have gradually evolved into a pivotal component of the local cultural fabric [1]. Taking China's Guangxi Autonomous Region as a case study, the diverse range of traditional intangible cultural heritage techniques in the region has become a crucial part of China's broader traditional intangible cultural heritage, encompassing traditional arts, music, opera, acrobatics, and folk customs.

According to data released by the Guangxi Autonomous Region government, as of 2011, a total of 40 projects in Guangxi have been designated as the "Hometown of Chinese Folk Culture and Crafts" . Additionally, Guangxi holds the highest number of evaluations among all ethnic minority autonomous regions in China. The integration of big data technology into the preservation and transmission of these traditional intangible cultural heritage techniques represents an inevitable trend in contemporary social development, serving as a vital means of cultural self-evolution and effectively adapting to the digitization demands of the cultural industry [2]. Thus, this paper focuses on investigating the protection and transmission of traditional intangible cultural heritage techniques in Guangxi within the context of the big data era. With the aim of discovering novel approaches for cultural heritage transmission and revitalizing rural spaces, this study presents strategic methods to fully exploit the advantages of big data technology in safeguarding intangible cultural heritage techniques.

2 Intangible Cultural Heritage Techniques in Guangxi

2.1 The Essence of Intangible Cultural Heritage Techniques

The intangible cultural heritage techniques in the Guangxi region represent the collective wisdom accumulated by its diverse ethnic groups over an extended period in their daily lives and production activities. They embody the rich and vibrant cultural connotations and ethnic characteristics specific to Guangxi. The intangible cultural heritage techniques in Guangxi encompass a wide range of forms, including singing and dancing, music, traditional Chinese opera, folk crafts, and folk literature. These artistic expressions not only convey people's emotions and ways of life but also reflect the historical, cultural, and social transformations within the Guangxi region.

The intangible cultural heritage techniques in Guangxi possess profound cultural implications, distinctive local features, and are deeply rooted in the Luoyue cultural traditions [3]. In terms of music, the distinctive musical instruments of ethnic groups such as the Zhuang, Yao, and Miao in Guangxi exhibit unique musical styles and modes of expression. Regarding opera, local forms such as "Zhuang Opera," "Flower Lantern Opera," and "Liu Sanjie's Ballad"

in Guangxi possess rich cultural heritage and distinct local characteristics. In the realm of folk crafts, traditional practices like silver jewelry making, Zhuang brocade weaving, and Maonan ethnic bamboo hat crafting serve as reflections of the historical and cultural traditions of Guangxi.

In essence, the intangible cultural heritage techniques in Guangxi epitomize both the local and ethnic characteristics and stand as a significant manifestation of cultural diversity and ethnic integration within the Guangxi region [4]. When considering skill design, it is crucial to explore the roots and identify the distinctive thinking advantages and unique ethnic cultures rooted in the Luoyue

2.2 Period of Integrated Development

As the most renowned traditional folk art form, the singing, dancing, and entertainment encompassed within Guangxi's traditional intangible cultural heritage have given rise to distinctive artistic genres in various regions of Guangxi. Owing to its geographical position at the confluence of the Central Plains, South China, and Southwest China, Guangxi has witnessed prolonged coexistence and continuous exchange and integration among diverse ethnic groups, resulting in a multifaceted cultural ambiance . Singing folk songs holds great significance among all ethnic minorities in Guangxi. Folk songs are characterized by high and melodious tones, conveying an unrestrained and liberated sentiment. The content of folk songs encompasses narrative and lyrical themes, featuring flexible and diverse expression techniques. They embody a high level of folk culture and artistry, constituting the most representative regional intangible cultural heritage techniques and culture.

Traditional intangible cultural heritage techniques in Guangxi predominantly encompass traditional arts, bronze drum culture, music and dance, traditional Chinese opera, acrobatics, and folk customs. After centuries of development, these techniques have become integral elements of the region's contemporary culture, assuming distinct regional cultural characteristics [5]. Presently, various regions within Guangxi have organically integrated their traditional intangible cultural heritage techniques, harnessing the power of traditional culture to promote rural revitalization and facilitating the seamless integration of exceptional folk cultural techniques into society, daily life, and industry, yielding fruitful outcomes.

2.3 Big Data Technology and Intangible Cultural Heritage Techniques

In tandem with the continuous advancement of information technology in China, big data technology has been increasingly applied to intangible cultural heritage techniques. Big data primarily refers to a data collection approach that captures, manages, and processes content and data through database software tools, ultimately culminating in the creation of a big data ecosystem. Big data technology comprises a comprehensive set of theories and practices rooted in vast data sets, encompassing the organization, analysis, and mining of data to achieve valuable outcomes. Big data technology exhibits distinctive features, including massive data processing capacity, diverse data types, low data value density, fast processing speed, and high processing authenticity [6]. Currently, big data has found extensive applications in daily life and production, particularly in domains such as commercial activities, logistics circulation, biomedicine, urban management, and security protection, continually showcasing its advantages. In the era of big data, all data information and network information possess the

characteristic of shareability, enabling individuals to directly share data with computers via the Internet.

Big data technology can contribute to the protection and transmission of intangible cultural heritage and finds applicability in the following scenarios:

Digital preservation of intangible cultural heritage: Digital technology allows for the recording of intangible cultural heritage information, ensuring its preservation and sustainability. Digitization involves transforming audio, video, images, and text into digital formats, enabling the utilization of big data technology for future management and analysis of this information.

Establishment of an intangible cultural heritage database and knowledge graph: Big data technology facilitates the storage of digitized intangible cultural heritage information within databases and the creation of knowledge graphs to document the relationships and connections between such information [7]. This aids researchers in gaining a better understanding of the history and evolution of intangible cultural heritage and in transmitting this knowledge to future generations.

Development of intelligent strategies for the protection and transmission of intangible cultural heritage: Big data technology can analyze data pertaining to intangible cultural heritage to formulate more intelligent and effective protection and transmission strategies. For instance, it can be employed to analyze the inheritance of intangible cultural heritage across different regions, identifying areas that require greater protection and support[4].

Utilization of virtual reality and augmented reality technology to enhance the preservation of intangible cultural heritage: Virtual reality and augmented reality technologies enable individuals to comprehend.
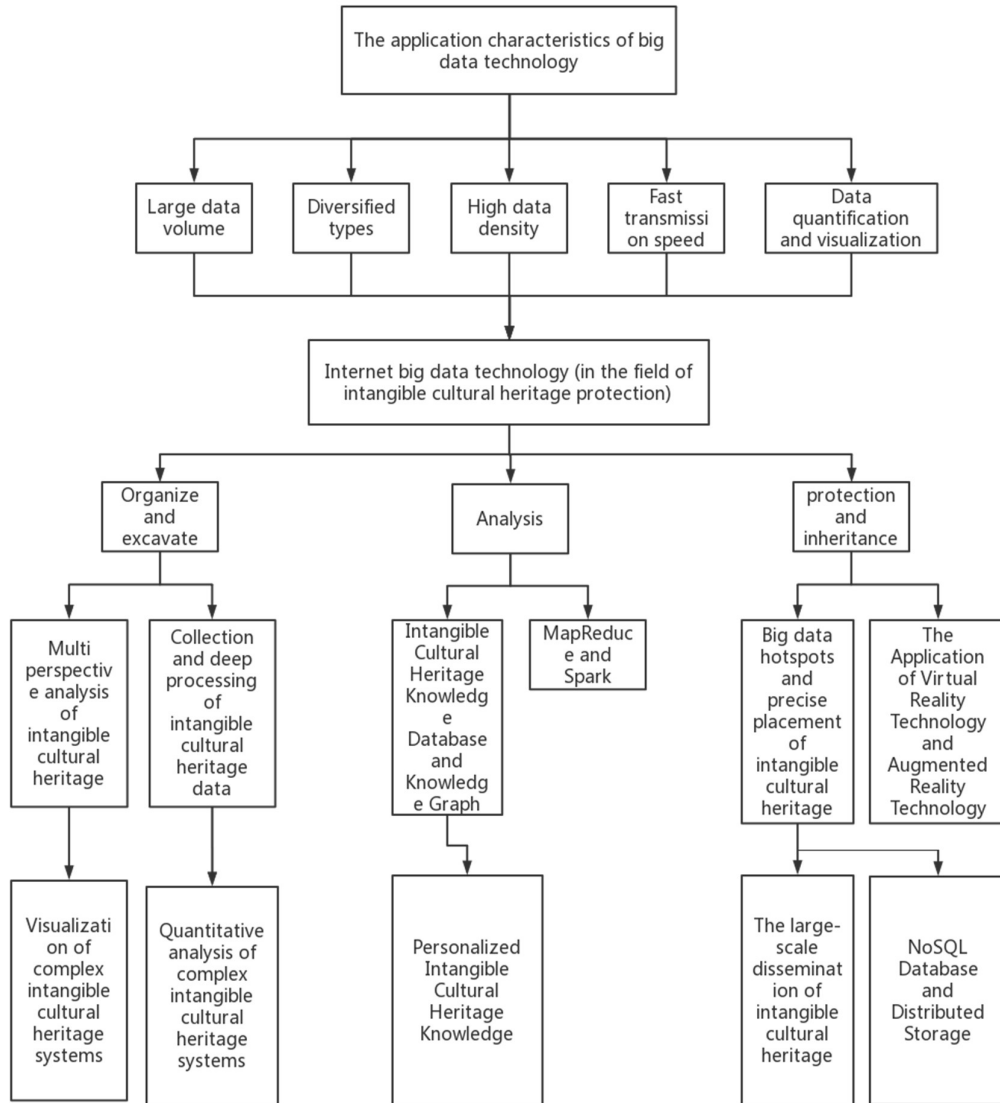
Figure 1 Characteristics of Big Data Technology and Intangible Cultural Heritage

3 The Advantages of Big Data Technology in Traditional Intangible Cultural Heritage Techniques

Amidst the rapid economic development in China, the influence of foreign cultures on people's lifestyles and beliefs has resulted in a diminished emphasis on the preservation and transmission of traditional intangible cultural heritage techniques. Surveys conducted by relevant authorities reveal the alarming disappearance of numerous folk handicrafts, textile tools, and modes of transportation in China each year. These trends indicate that the protection and transmission of traditional intangible cultural heritage techniques face unprecedented threats. Without timely measures to safeguard and preserve the traditional intangible cultural heritage techniques of the region, Chinese traditional culture will be significantly impacted.

However, in the era of big data, various industries in China have encountered significant opportunities. The continuous advancement of data processing and storage technologies allows for the protection and transmission of traditional intangible cultural heritage techniques. The

application of big data technology in the preservation and inheritance of traditional intangible cultural heritage techniques not only effectively addresses existing challenges in traditional preservation and transmission but also provides a more secure environment for the storage and utilization of various data due to the superior functions of data information, such as confidentiality, compared to traditional computer hard disk data storage. Additionally, it offers greater convenience for subsequent management tasks.[8]

4 The Application of Big Data in Traditional Intangible Cultural Heritage Techniques in the Guangxi Region

The advent of the big data era has deepened China's research and development of big data technology. The expanding development and application scenarios of data processing and storage technologies within big data hold significant implications for the protection and transmission of traditional Chinese intangible cultural heritage techniques. Thus, in the context of the big data era, to address the shortcomings in the preservation and transmission of traditional techniques more effectively and promote the sustainable development of China's intangible cultural heritage, it becomes essential to analyze the strategies for protecting and inheriting traditional intangible cultural heritage techniques in the Guangxi region. The application strategy of big data in traditional intangible cultural heritage techniques in Guangxi is illustrated in Figure 2.
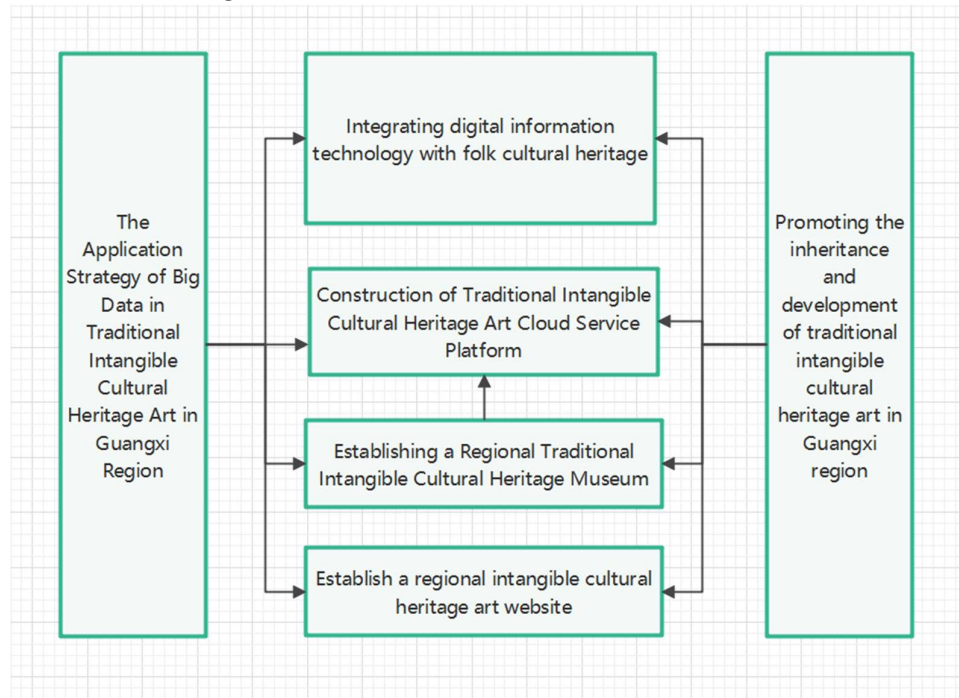

Figure 2 Application Strategy of Big Data in Traditional Intangible Cultural Heritage Techniques in Guangxi Region

4.1 Integrating Digital Information Technology with Folk Cultural Heritage

In the era of mobile internet, the integration of culture and technology has become extensive and profound, forming an inseparable symbiotic relationship[9]. Digital information technology, recognized as the "primary productive force," acts as a revolutionary force propelling the development and evolution of the cultural industry. According to data released by the National Bureau of Statistics, China's cultural industry is expected to undergo significant

changes during the implementation of the 13th Five Year Plan for Economic and Social Development of the People's Republic of China. With the impetus of digital technology[10], the protection and transmission of traditional intangible cultural heritage techniques will increasingly embrace digital information technology, leading to further development. Therefore, the preservation and transmission of traditional intangible cultural heritage techniques in Guangxi must prioritize the utilization of digital information technology.

The effective integration of digital information technology and traditional intangible cultural heritage techniques has disrupted the traditional methods of recording and collecting such techniques. It enables convenient and efficient integration, collection, and recording of intangible cultural heritage techniques. Moreover, it saves labor and time costs in safeguarding intangible cultural heritage techniques.

The application of digital information technology in the transformation and upgrading of traditional intangible cultural heritage techniques can enhance the efficiency of retrieval and display, providing a superior experience for the audience. Additionally, digital information technology can be employed to develop auxiliary design systems for intangible cultural heritage artworks. Technicians can consult and analyze traditional intangible cultural heritage technology elements in Guangxi and incorporate them into their own cultural and creative product designs. This approach not only better reflects regional cultural characteristics but also enhances the economic benefits of the region.

As depicted in the figure below, the Maonan ethnic group in Huanjiang County utilized big data live streaming during the Guangxi Zhuang Folk Song Festival, successfully selling goods through this platform. This approach significantly reduced costs compared to traditional sales models and increased the sales volume of local agricultural products. Within this context, the TikTok big data platform adjusts advertising strategies through real-time data monitoring and analysis, continually optimizing advertising effectiveness. The platform monitors and analyzes indicators such as display volume, click-through rate, and conversion rate to refine delivery strategies based on data feedback, thus improving advertising effectiveness. In essence, the principle of TikTok big data accurate advertising lies in achieving precise targeting and matching of target users through the mining and analysis of user data, thereby enhancing advertising effectiveness and user experience.

Figure 3:Live sales of agricultural products on online media platforms during the Guangxi Zhuang Folk Song Festival   Image source: Huanjiang Rongchuang Media

For instance, in the case of Qinzhou Nixing pottery in Guangxi, digital information technology can be leveraged to extract elements and integrate them effectively, resulting in the creation of more innovative Nixing pottery works for tourists to choose from. Additionally, the application of 5G and AI artificial intelligence technology to the protection and inheritance of traditional intangible cultural heritage techniques in the region can enhance the viewing experience and reputation of tourists from multiple dimensions. In the context of AI technology applied to the protection and inheritance of traditional intangible cultural heritage techniques, digital information technology can be employed to showcase the intricate manual steps involved in shadow puppetry, creating exquisite, vivid, and lively new elements. Designers can also incorporate modifications based on current preferences, infusing traditional intangible cultural heritage with modern popular elements to cater to the diverse spiritual needs of individuals at different levels.

4.2 Construction of a Cloud Service Platform for Traditional Intangible Cultural Heritage Techniques

A key focus is on developing a cloud service platform equipped with functions such as cloud storage, cloud computing, cloud analysis, and big data. Based on the specific circumstances of traditional intangible cultural heritage techniques in Guangxi, big data technology is applied to analyze the construction of cloud service platforms, leading to the establishment of a tailored cloud system. The designed cloud system primarily encompasses the uploading and management of intangible cultural heritage technology resources. The system allows various types of files, including ordinary files, images, audio, video, and other formats, to be uploaded, accompanied by relevant attribute descriptions. Through the cloud service platform, managers can directly categorize and manage all the collected regional traditional techniques using clustered applications, grid technology, and distributed file systems within the system. To mitigate the risk of data theft by malicious actors, the system only provides storage and external data file access windows for authorized users.

Simultaneously, the system can store and organize highly intelligent data for practical use. When users access specified files and data through their mobile user terminals, the system automatically calculates and adopts the optimal access path, offering customers more convenient retrieval services. Furthermore, while constructing a technology cloud service platform, cultural capital, economic capital, and commercial capital can be effectively leveraged to cultivate a conducive environment for the inheritance and protection of intangible cultural heritage techniques. Please refer to Figure 4 for a visual representation of its protection and inheritance aspects.
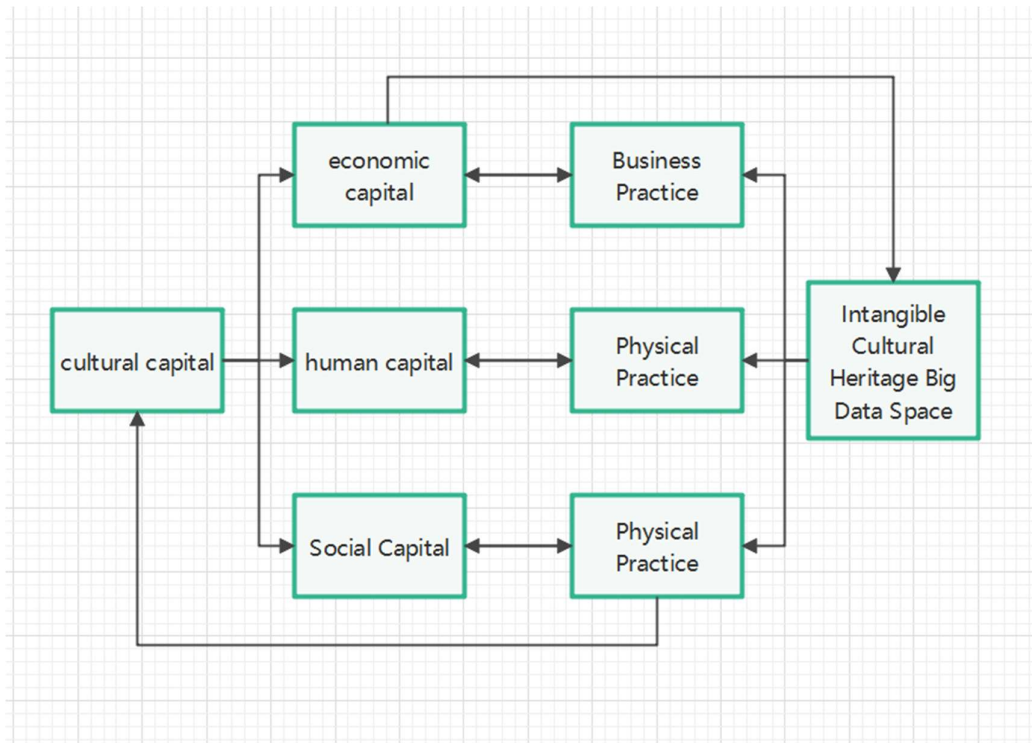
Figure 4 Protection and Inheritance Mode

4.3 Establishing a Regional Museum of Traditional Intangible Cultural Heritage Techniques

In the era of big data, the effective application of big data technology can yield positive outcomes in promoting the protection and inheritance of traditional intangible cultural heritage techniques in the region. Alongside the establishment of digital information technology and cloud service platforms, a centralized display of representative traditional intangible cultural heritage artifacts can be achieved through the creation of an intangible cultural heritage art museum. This museum would showcase products with distinctive regional and ethnic characteristics in Guangxi. Furthermore, leveraging the advancements in self-media technology, official accounts can be set up on popular social media platforms such as TikTok, Weibo, and WeChat to regularly share intangible cultural heritage artworks with a broad audience. This approach increases public awareness and understanding of intangible cultural heritage techniques and arts, infusing them with renewed vitality. Innovative forms such as "cloud exhibition halls," "digital cultural relics," and "digital museums" can inject fresh impetus into the protection and inheritance of traditional intangible cultural heritage techniques. Technologies such as virtual reality (VR), augmented reality (AR), and 3D scanning can be employed to create museums dedicated to traditional intangible cultural heritage techniques, presenting their stories and captivating scenery to visitors. These novel technologies and applications breathe life into cultural heritage, offering tourists an immersive and transformative experience.

4.4 Establishing a Website for Regional Intangible Cultural Heritage Techniques

The establishment of an intangible cultural heritage technology website can effectively integrate intangible cultural heritage techniques with the current economic market and provide a platform for artists involved in intangible cultural heritage handicrafts to enter the market,

thereby enhancing the protection and inheritance of traditional intangible cultural heritage techniques. Research indicates that there is currently no comprehensive website in China dedicated to discussing intangible cultural heritage techniques. Consequently, many consumers and local residents can only learn about traditional intangible cultural heritage techniques through physical visits and surveys, posing significant challenges for their protection and inheritance. To address this situation, the advantages of big data can be harnessed to comprehensively classify representative traditional intangible cultural heritage techniques in Guangxi based on their region, product characteristics, and forms. This approach fosters an environment conducive to the preservation and safeguarding of intangible cultural heritage techniques.

Moreover, while establishing websites dedicated to intangible cultural heritage technology and art, the advantages of private capital can be leveraged to drive spatial revitalization from within. This entails implementing diverse cultural and educational initiatives to enhance the local residents' understanding and appreciation of traditional intangible cultural heritage techniques. Strengthening the cognitive ability to protect space through techniques enables the presentation of rich, authentic, complete, and valuable cultural information. Particular attention should be given to promoting and preserving traditional intangible cultural heritage techniques within traditional villages in the Guangxi region. In tandem with the establishment of an intangible cultural heritage website, emphasis should also be placed on the education of local residents. Sound education serves as a vital catalyst for the revitalization of intangible cultural heritage techniques and culture, as well as an important means of enhancing the cultural cultivation of villagers. Therefore, efforts should be made to enrich school curricula, integrate regional cultural education, and ensure equitable distribution of educational resources, thus achieving a balanced development of intangible cultural heritage techniques education. In the educational process, the advantages offered by big data technology should be effectively harnessed to address the limitations of traditional education and promote the inheritance of traditional techniques and skills. The specific path of educational inheritance is illustrated in Figure 5.
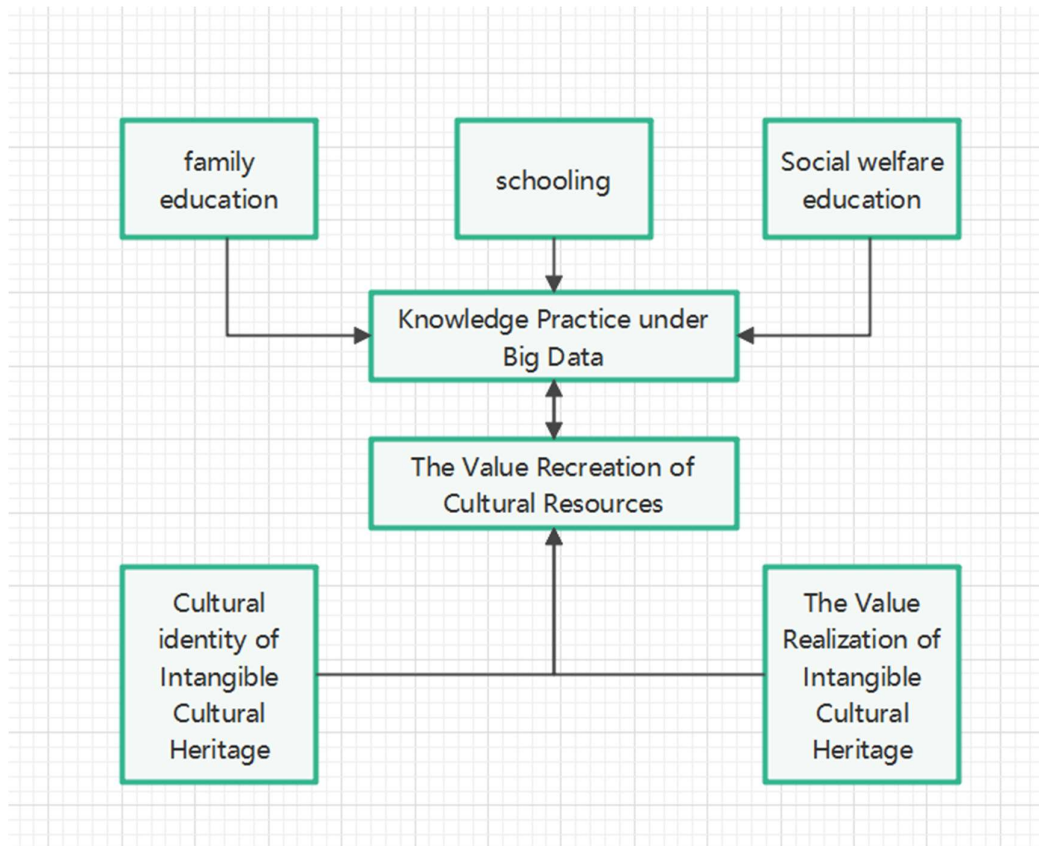
Figure 5 Education Inheritance Approaches

4.5 Case Study: Flower Bamboo Hats of the Maonan Ethnic Group

The flower bamboo hats of the Maonan ethnic group have garnered global attention due to their exquisite weaving techniques and symbolic significance as love tokens. As a prominent craft within the realm of Chinese bamboo hats, flower bamboo hats possess distinct cultural characteristics originating from local ethnic minorities in Guangxi. However, the establishment of the People's Republic of China and the subsequent periods of reform and opening up have placed the cultural and artistic techniques associated with flower and bamboo hats at risk of being lost. Throughout the history of modern Chinese craftsmanship and societal changes, the Maonan ethnic group has made efforts to revitalize Maonan culture through various means, ensuring the preservation and inheritance of flower and bamboo hat techniques.

In the future development of flower bamboo hats, it is imperative to effectively leverage new technologies and materials. By integrating traditional flower bamboo hat elements with innovative technologies and incorporating practical design enhancements, the cultural essence of flower bamboo hats can be authentically represented. Furthermore, the utilization of big data can facilitate the combination of innovative technology with contemporary fashion trends, thereby augmenting the comprehensive ornamental and practical value of flower bamboo hats. This approach enables the effective promotion and inheritance of flower bamboo hat techniques [11]. Concurrently, it has the potential to enhance the tourism and economic landscape of Huanjiang County by stimulating consumer interest in purchasing flower bamboo hat products. Please refer to the figure below for an illustration of this concept.

Figure 6: Maonan nationality operation blogger on Tiktok platform

TikTok's precise video delivery is achieved through its robust data analysis capabilities and algorithmic models. By analyzing and mining user behavior, interests, geographical location, and other relevant data, TikTok can accurately identify and target its users. This is accomplished by thoroughly examining users' viewing history, interaction records, and search queries to gain insights into their interests, needs, and purchasing behaviors. Subsequently, users are segmented into various tags and groups based on information such as gender, age, geographical location, occupation, preferences, and consumption capacity. Through the application of algorithmic models, these data are analyzed and utilized to facilitate precise matching between video creators and their intended target audience.

Serial Number	Index	Describe	Data
1	Number of Representative Intangible Cultural Heritage Items	Record the number of items included in the national and provincial intangible cultural heritage lists	More than 100,000 items
2	Intangible cultural heritage protection funds	The amount of funds invested by the government and social organizations in the protection of intangible	7 billion yuan from (China government website□Party and government organs http://www.gov.cn/xinwen/2019-10/18/content_5442019.htm)

		cultural heritage in 2019	
3	Number of non-heritage inheritors	Record the number of personnel engaged in intangible heritage work	More than 164,000 people (from the 2021 Cultural and Tourism Development Statistical Bulletin: Ministry of Culture and Tourism of the People's Republic of China July 2021)
4	Number of non-genetic inheritance activities	Record the number of intangible cultural inheritance activities organized and carried out	There will be more than 4,100 online and offline activities for the publicity and display of intangible cultural heritage held in various provinces, autonomous regions and municipalities in China. (From the 2021 "Cultural and Natural Heritage Day" campaign)
5	Intangible cultural heritage popularity	Internet search engines, etc. record the degree of dissemination of intangible cultural heritage items	The search volume of "intangible cultural heritage and other related words" in Internet search engines is 546,000 times per day (data from Baidu Index. May 8, 2023)
6	The contribution of intangible cultural heritage in the cultural and creative industry	Record the value of intangible cultural heritage items in the cultural and creative industries at the end of 2018	In 2019, the total output value of cultural and creative industries related to intangible cultural heritage projects was 1.4 trillion yuan (from the "Annual Research Report on China's Intangible Cultural Heritage and Its Industrial Development [2018-2019]" edited by Ximu)
7	Degree of digitalization of intangible cultural heritage	Document the degree of digital development and application of intangible cultural heritage	The degree of digitalization is 80% (data from "Cultural and Natural Heritage Day, 2021 data on the event website)
8	Number of online display platforms for intangible	Record the number of display platforms of national intangible	There are 7 national-level display platforms, displaying a total of 1,372 national-level intangible cultural heritage items and 3,145 sub-items (Cultural Tourism China Hundred Cities Hundred Arts-Xue Shuai)

	cultural heritage	cultural heritage on the Internet	
9	Number of intangible cultural heritage digital resources	Record the number of digital resources of intangible cultural heritage	The number of digital resources is more than 6,200 non-heritage display films (from "Cultural and Natural Heritage Day, event website, 2021 data)
10	Number of digital performances of intangible cultural heritage	Various intangible cultural heritage protection institutions across the country hold performances	Held 59,716 performances, an increase of 6.4% over 2020. Held 59,716 performances, an increase of 6.4% over the previous year (from the 2021 Cultural and Tourism Development Statistical Bulletin: Ministry of Culture and Tourism of the People's Republic of China, July 2021)
11	Digital display of intangible cultural heritage	Record the amount of display of intangible cultural heritage on digital platforms	The number of videos related to national intangible cultural heritage items on Douyin exceeds 140 million, covering 97.4% of national intangible cultural heritage items (Douyin will release a report on intangible cultural heritage data in June 2021)

Table 1: Information Table of Intangible Cultural Heritage Projects under Big Data Technology

5 Recommendation

In the era of big data, the protection and inheritance of traditional intangible cultural heritage techniques in the Guangxi region face substantial challenges. To address these challenges and ensure the effective preservation of these cultural assets, it is essential to analyze and investigate the existing issues in their inheritance and leverage big data technology to facilitate their protection and inheritance.

The researcher proposes several recommendations to address these challenges. Firstly, the integration of digital information technology with folk cultural heritage should be pursued. This can be achieved through the establishment of a comprehensive cloud service platform system that enables the storage, organization, and dissemination of intangible cultural heritage knowledge. Additionally, the creation of intangible cultural heritage art museums and dedicated art websites can provide centralized platforms for the exhibition and promotion of traditional intangible cultural heritage artifacts. These platforms can leverage precise customer video placement to enhance public engagement and appreciation of these cultural treasures.

Furthermore, the use of big data technology is crucial in collecting, integrating, analyzing, and visualizing data related to intangible cultural heritage. This approach can help identify existing challenges and issues in the inheritance process, leading to the formulation of targeted policies and measures to address them effectively. Moreover, fostering collaboration between

the field of intangible cultural heritage and other domains can result in the development of innovative and practical products and services.

To ensure wider public awareness and understanding of intangible cultural heritage, it is recommended to employ big data technology to uncover inheritance and development trends across different regions and demographic groups. Based on these insights, education and popularization plans can be devised to facilitate broader knowledge dissemination and engagement with intangible cultural heritage. Throughout this process, safeguarding personal privacy and sensitive information is paramount to prevent any infringement on personal rights and interests.

By implementing these recommendations, the protection and inheritance of traditional intangible cultural heritage techniques in the Guangxi region can be enhanced, enabling their preservation for future generations while promoting cultural diversity and appreciation.

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