

Study on the Path of Innovative Transformation of Yan'an Red Cultural Resources Empowered by Digitization

Yingxuan Bao ¹, Yue Lv ², Jinling Wang ¹

¹School of Languages and Media, Anhui University of Finance & Economics, Bengbu Anhui 233030, China;

²School of School of Life Sciences, Anhui Agricultural University, Hefei Anhui 230036, China.

Abstract

With the rapid development of digital technology, its application in cultural heritage protection and innovation has become an important research field. Yan'an, as an important city in China's revolutionary history, has rich red cultural resources. This article aims to explore how to empower the innovative transformation of Yan'an's red cultural resources through digital technology in order to enhance the educational value and social influence of these resources. The article first reviews the relevant literature and outlines the current status and trends of digitalization in the global cultural heritage field. Then, a theoretical framework including cultural resource management theories and technology acceptance models is constructed to analyze the potential impact of digitization on resource management and dissemination of Yan'an red cultural resources. The study focuses on three main digital empowerment paths: digital archiving, the application of virtual reality and augmented reality technologies, and the development of interactive platforms. These technologies not only effectively preserve historical materials, but also engage a wider public by creating immersive experiences and interactive opportunities. The article also points out the challenges that may be encountered in the implementation of these technologies, such as financial investment, technical standards, and stakeholder cooperation, and puts forward corresponding policy recommendations. The purpose of this study is to provide strategic guidance for the future digital transformation of Yan'an red cultural resources and to promote their innovative development in the context of the new era.

Keywords

Digital transformation, red culture, cultural heritage preservation, interactive technology.

1. Introduction

1.1. Background of the study

Yan'an is not only the holy land of the Chinese revolution, but also an important landmark of China's red culture. The city has a special place in the history of the Communist Party of China (CPC), being the seat of the Party Central Committee during the War of Resistance Against Japanese Aggression and the War of Liberation, and carries a rich revolutionary history and cultural heritage. The old revolutionary sites in Yan'an, such as Baota Mountain, Yangjialing and Zaoyuan, bear witness to the historical progress of the CPC from hardship to victory. These red cultural resources not only have important historical value and educational significance, but also continue to inspire countless people in the new era. However, with the passage of time and the influence of the natural environment, these precious cultural heritages are facing the challenge of protection and inheritance. Traditional preservation methods are no longer able to cope with the new demands of modern society for the utilization and dissemination of

cultural heritage. The rapid development of digital technology provides unprecedented opportunities for the protection and innovation of Yan'an red cultural resources. Through digital means, we can efficiently preserve historical materials, enhance the accessibility of cultural resources, and allow more people to understand and pass on Yan'an's red culture through interactive and immersive experiences.

1.2. Significance of the study

Globally, the digital transformation of cultural heritage has become an irreversible trend. The application of digital technology can not only enhance the protection of cultural heritage, but also substantially improve its dissemination and educational functions. For the red cultural resources of Yan'an, digital transformation is particularly significant. Firstly, digital technology can solve the limitations of physical protection, and through high-precision digital archiving and virtual display, realize the permanent preservation and wide dissemination of cultural resources. Second, through virtual reality (VR), augmented reality (AR) and other technologies, historical scenes can be reproduced to enhance the audience's sense of immersion and interactive experience, so that the red cultural education is more vivid and in-depth. In addition, digitization can also break the limitations of geography and time, allowing Yan'an's red cultural resources to cross the spatial limitations and face the global audience, enhancing its international influence and appeal. Therefore, studying how to empower the innovative transformation of Yan'an's red cultural resources through digital technology is not only an innovation in the method of cultural heritage protection, but also a revolutionary enhancement of the form of cultural communication.

2. Literature review

2.1. Relevant studies on digital empowerment

Regarding the research on "digital empowerment", Li Xiaoyu (2018) points out that digital empowerment is the empowerment of specific groups through digital tools such as big data, blockchain artificial intelligence, and other digital tools to promote the acquisition of appropriate life skills and survival ability of these groups; Costa Climent Ricardo (2021) points out that the digital technology use can create and appropriate value for businesses. Shao Yunfei (2022) summarizes and refines the concepts of data empowerment, technology empowerment, and big data empowerment, unifies them into digital empowerment, and points out that the essence of digital empowerment is to use technological means to help the target of empowerment to have the ability that they did not have in the past or to achieve the enhancement of the ability. Second, the application field of digital empowerment. In the field of rural governance, digital technology can reshape the structure of rural governance, transform the way of rural governance, and reconfigure the content of rural governance (Ding Bo, 2022); in the field of social governance, digital technology can, to a certain extent, reshape the relationship between the government, the society, and the market, and form a governance mechanism of "multi-span synergy" among multiple subjects (Yu Jianxing, 2022); in the field of digital culture industry, blockchain reshapes the value expression of digital culture industry, the trust mechanism of multiple subjects, and the business model of commercial organizations; in the field of manufacturing transformation, digital technology can empower the quality change, efficiency change and organizational change of the manufacturing industry, and provide technological support for making the manufacturing industry bigger and stronger and promoting the development of the real economy (Zhu Xiaoyan, 2022). Alsarraf Hani A (2023) believes that digital technology can effectively improve the quality of public services to enhance citizen satisfaction.

2.2. Relevant studies on digital empowerment of red culture

Along with the in-depth development of digital technology in the field of economic, social and cultural development, how to use digital technology to make the excellent red cultural resources "come alive" has become the focus of attention and exploration in the academic community. Machidon et al. (2018) pointed out that the main purpose of cultural heritage VR and AR is to rebuild and restore the disappearing heritage, and the main advantage lies in the interaction, participation and interactive experience. advantage lies in the sense of interactivity, participation, and interactive experience. Georg (2019) mentioned that 3D scanning, visual regeneration, and 3D virtual reconstruction are becoming common means of digitization of cultural heritage sites. The current academic research focuses on the following three aspects. Deng Lu (2021) points out that digital technology provides technical support for the immersive, three-dimensional, multi-dimensional display and dissemination of red cultural resources. Xu Li (2021) further points out that digital technology provides a new development direction for the protection and development of red cultural resources, which is an important means to enhance cultural soft power, help cultural construction and promote economic development. Li Bohua (2022) believes that the digital protection technology integrating 5G communication, big data, cloud computing, AI intelligence, VR virtual as well as intelligent communication can provide multi-dimensional technical guarantee for the digital protection, development, utilization and inheritance of red cultural resources.

3. Path analysis of digital empowerment Yan'an red cultural resources innovation transformation

3.1. Digital archiving

Digital archiving is the high-precision recording and storage of physical cultural resources through digital technology to ensure their integrity and sustainable accessibility. Digital archiving can play a crucial role in the protection and innovation of Yan'an's red cultural resources. Using 3D scanning, high-definition photography and multispectral imaging technologies, a full range of digital records of former Yan'an revolutionary sites, cultural relics and historical materials can be made. These digital archives can not only be used as high-fidelity replicas for display and education, but also provide a reference for restoration when the original artifacts are damaged or lost. In addition, the establishment of a comprehensive digital archive management system can realize systematic management of cultural resources, including classification, retrieval and sharing. This digital archiving method can effectively enhance the accessibility of red cultural resources, enabling global users to view and study these precious historical materials through the Internet, breaking the geographical and time constraints.

3.2. Virtual Reality (VR) and Augmented Reality (AR)

Virtual Reality (VR) and Augmented Reality (AR) technologies offer brand new possibilities for the display and education of cultural resources. Through VR technology, it is possible to create immersive virtual museums or reproductions of historical scenes, allowing users to feel as if they were in the revolutionary period of Yan'an, experiencing the life and battle scenes of the time first-hand. For example, users can visit Yangjialing or Zaoyuan in a virtual environment through a VR headset and interact with virtualized historical figures to learn about their stories and contributions. This immersive experience not only enhances the audience's sense of participation and depth of memory, but also improves the educational effect through interactive learning. AR technology, on the other hand, can superimpose digital information in the real environment to provide site visitors with rich background information and dynamic displays. For example, when visiting the former site of the Yan'an Revolution, tourists can use

AR equipment to see the superimposition of historical photos and images with the real scene, obtaining relevant information and explanations in real time, enhancing the visiting experience and learning effect.

3.3. Interactive platforms

Interactive websites and mobile applications are important tools for engaging a wider audience and enhancing educational outreach. These platforms can integrate a variety of digital content and functions, such as online exhibitions, virtual tours, interactive games and learning resource libraries, to attract user participation through rich interaction. For example, the Yan'an Red Culture interactive website can provide a virtual tour function, allowing users to experience a panoramic view of the former Yan'an Revolutionary sites online and obtain detailed historical background and cultural relics information by clicking on hotspots. Mobile applications, on the other hand, can provide personalized learning plans and interactive games that motivate users to learn more about red culture through tasks and reward mechanisms. Social media integration is also an important aspect. Through sharing buttons, users can share their learning outcomes and experiences to major social platforms, further expanding the scope of dissemination. In addition, the interactive platform can also organize online seminars, live lectures and thematic discussions, providing a community for global users to communicate and learn. These interactive features not only enhance audience participation and learning effects, but also enable data analysis to understand user needs and continuously optimize content and services.

4. Research

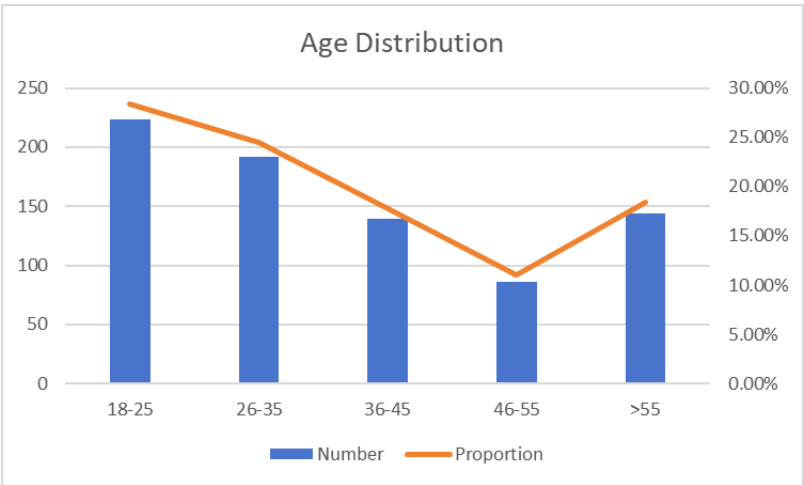
4.1. Data statistics

4.1.1. Personal information

A total of 800 questionnaires were collected and the valid questionnaires were 784 questionnaires. Of these, 367 were collected offline and 417 online.

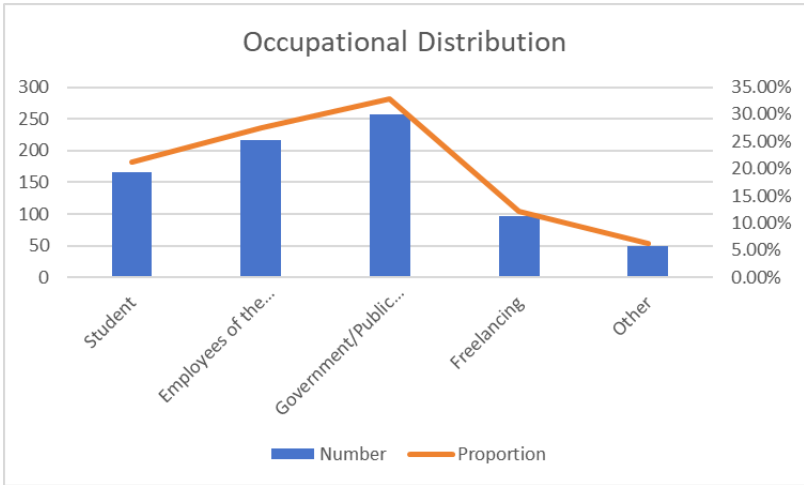
Age distribution: 28.4% 18-25 years old, 24.5% 26-35 years old, 17.7% 36-45 years old, 11% 46-55 years old and 18.4% over 55 years old.

Table 1: Age Distribution



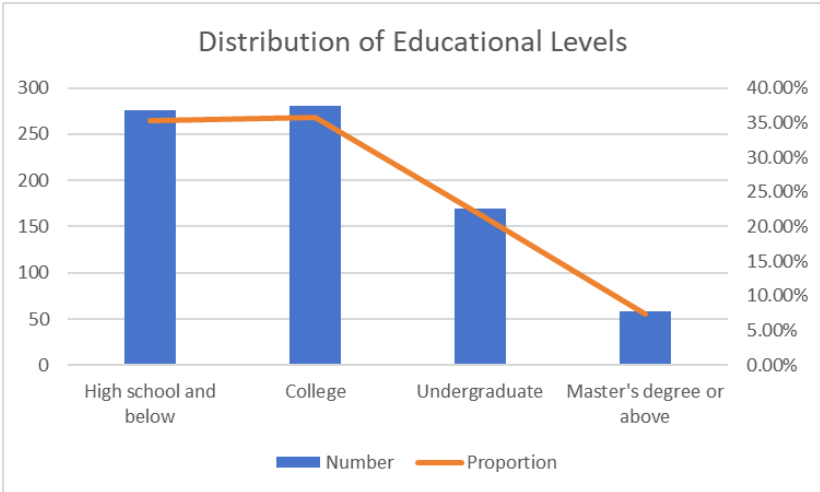
Occupational distribution: 21.2% students, 27.6% corporate employees, 32.8% government/institution workers, 12.2% freelancers, 6.3% others.

Table 2: Occupational Distribution



Distribution of education level: 35.2% high school and below, 35.7% junior college, 21.7% bachelor's degree, 7.4% master's degree and above.

Table 3: Distribution of Educational Levels



4.1.2. Knowledge of Yan'an red culture

Very well known by 23.4%, fairly well known by 33.2%, less well known by 34.5% and hardly known by 8.9%.

Among the ways of understanding, school education accounted for 36.7%, visits to revolutionary memorials/sites accounted for 86.7%, films/literature accounted for 67.4%, online media accounted for 68.3%, and others accounted for 16.4%.

4.1.3. Contact between digital technology and Yan'an red culture

Frequent use of digital platforms to learn about Yan'an red culture accounted for 35.6%, occasional use accounted for 40.1%, seldom use accounted for 22.1%, and never used accounted for 2.2%.

Regarding the digital platforms used, the official red culture tourism APP accounted for 34.2%, the Yan'an red culture section in the comprehensive tourism platform accounted for 37.8%, red culture accounts on social media platforms accounted for 23.4%, and others accounted for 4.6%.

Among the advantages of digital platforms, rich and comprehensive information accounted for 43.6%, diverse forms accounted for 36.9%, strong interactivity accounted for 46.8%, convenience accounted for 68.9%, personalized recommendations accounted for 25.4%, and others accounted for 10.7%.

Among the problems of digital platforms, inaccurate information accounted for 16.2%, untimely content update accounted for 13.5%, unfriendly interface design accounted for 17.1%, too many advertisements accounted for 46.8%, lack of in-depth interpretation accounted for 35.2%, and others accounted for 12.2%.

4.1.4. Perception of digital empowerment Yan'an red cultural resources innovation transformation

It is considered that digital technology is very important to the inheritance and development of Yan'an's red cultural resources accounting for 54.1%, more important accounting for 33.6%, generally important accounting for 8.8%, and not too important accounting for 3.5%.

Those who experienced the application of digital technology in red cultural tourism accounted for 47.5%, of which 78.4% were impressed and 21.6% felt average.

Among the digital technology applications experienced, VR/AR immersive experience accounted for 22.5%, intelligent guiding devices accounted for 64.3%, digital exhibitions accounted for 12.7%, and others accounted for 0.5%.

In the evaluation of the application of digital technology in red cultural tourism, 57.8% is to enhance the fun and attractiveness, 48.9% is to help understand the connotation, 35.7% is to improve the quality of service, 28.9% is to improve the stability of technology, 31.4% is not rich enough in the application scene, and 8.6% is other.

4.1.5. Expectations for digital empowerment of Yan'an red cultural resources innovation and transformation

Developing digital cultural products accounted for 35.7%, expanding applications in the field of education accounted for 48.6%, utilizing big data analysis accounted for 54.6%, strengthening platform construction and promotion accounted for 32.6%, promoting integration with the creative industry accounted for 43.7%, and others accounted for 12.6%.

4.2. Research findings

4.2.1. Cognitive situation

Most of the respondents have a certain degree of understanding of Yan'an red culture, but there are still some people who know less about it and need to further strengthen publicity and promotion. Online media has become one of the important ways to understand, complementing traditional school education and field visits.

4.2.2. Digital technology exposure and evaluation

Although digital platforms have been used to a certain extent in disseminating Yan'an red culture, the frequency of use needs to be improved. The digital platforms that have been used have certain advantages in the form of information presentation and other aspects, but there are also many problems, such as the accuracy of information, the timeliness of updating and in-depth interpretation, which need to be improved. The application of digital technology in red cultural tourism has a certain audience base and has been partially recognized in enhancing the tourism experience, but the technical stability and the richness of the application scene still need to be optimized.

4.2.3. Perceptions and expectations of innovation transformation

Respondents generally recognized the importance of digital technology for the inheritance and development of Yan'an red cultural resources. For future innovation and transformation, the development of digital cultural products, expansion of educational applications, utilization of big data, as well as the strengthening of platform construction and the promotion of industrial integration are subject to high expectations. The government should play a leading role in policy guidance, resource integration and infrastructure construction; enterprises should actively participate in the development of digital cultural products, tourism service

enhancement and marketing; and the public should support the innovative transformation of Yan'an red cultural resources empowered by digital through participation in the experience, dissemination and sharing.

5. Implementation Strategy of Innovative Transformation of Yan'an Red Cultural Resources Empowered by Digitalization

5.1. Stakeholder participation

In the process of digital empowerment of Yan'an's red cultural resources, extensive stakeholder participation is crucial. First, cooperation with local communities can ensure the cultural and historical authenticity of digital content. As the inheritors and witnesses of red culture, local residents possess valuable oral history and traditional knowledge, and their participation can provide rich materials and unique perspectives for the digitization project. Second, the participation of historians and experts can ensure the academic rigor and accuracy of the digital content. Historians can provide professional analysis of the historical background and verification of artifacts to ensure the accuracy of the digital content in terms of historical details. Technical experts can provide advanced digital technology solutions to ensure the high quality of the technical realization of the digitization project. Through multi-party cooperation and the formation of an interdisciplinary and cross-field collaborative network, the relevance and accuracy of the digitized content can be effectively enhanced to ensure that the digital transformation of Yan'an's red cultural resources not only has depth and breadth, but also is widely recognized and accepted.

5.2. Policy support

Digital empowerment of Yan'an's red cultural resources requires strong policy support. First, the government should develop a clear policy framework to encourage the integration of cultural innovation and technology and promote digitization projects. This includes providing financial support, tax incentives, and funding for technological research and development to alleviate the financial pressure on digitization projects and to motivate more enterprises and institutions to participate in the digital transformation of red cultural resources. Second, policies should focus on respect for cultural content and ethical use, and formulate relevant laws and regulations to ensure that the digitization process does not infringe on the originality of historical artifacts and the integrity of cultural heritage. For example, strict digitization standards and norms should be introduced to prevent over-commercialization and misuse of digital content and to protect the spiritual value and historical significance of cultural resources. Through policy support, a healthy development environment can be provided for digital empowerment programs to promote the sustainable and innovative transformation of Yan'an's red cultural resources.

5.3. Sustainability considerations

In order to ensure the long-term sustainability of digital empowerment projects, strategic planning is needed in terms of both funding models and technological upgrading. First, a diversified funding model should be established, including government grants, corporate sponsorship, social donations and user fees, to ensure that the project has stable financial support at different stages of development. For example, a self-circulating funding mechanism can be formed by setting up a cultural fund to attract investment from social capital, or by developing high-quality digital content to attract users to pay for subscriptions. Second, digitization projects require constant technological updating and maintenance to ensure the long-term validity and sophistication of the content. With the rapid development of technology, regular updating of digitization equipment and software to enhance the expressiveness and interactivity of digital content is the key to ensuring the sustainability of the project. By

collaborating with universities and research institutions and introducing the latest research results and technological innovations, the technical solutions of the Digital Empowerment Project can be continuously optimized to maintain its cutting-edge position in the field of cultural communication and education. Through diversified financial support and continuous technological updates, we can ensure that the digital transformation of Yan'an's red cultural resources is not only sustainable, but also innovative, meeting the needs of the times and users.

6. Conclusion

6.1. Summary of research findings

Through an in-depth analysis of the digital empowerment path of Yan'an red cultural resources, this study proposes several effective strategies and methods. First, digital archiving technology can record and preserve historical artifacts and scenes with high precision, ensure the integrity and accessibility of cultural resources, and lay the foundation for subsequent display and education. Second, the application of Virtual Reality (VR) and Augmented Reality (AR) technologies can create immersive experiences that bring historical situations and stories to life, enhancing the sense of audience interaction and participation. Interactive platforms, on the other hand, appeal to a wider audience by integrating a wide range of digital content and functions, enhancing the dissemination effect and educational value of cultural resources. In addition, the study highlights the importance of stakeholder engagement, policy support and sustainability considerations, pointing out the critical role of these factors in ensuring the successful implementation of digitization projects. Through the combined use of these strategies, the effective protection and innovative transformation of Yanan's red cultural resources can be realized.

6.2. Practical implications

The findings of this study provide important practical guidance for the digital transformation of cultural heritage. First, the application of digital archiving, VR and AR technologies, and interactive platforms opens up new paths for the preservation, display, and education of cultural heritage. These technologies not only enhance the quality of preservation and breadth of dissemination of cultural resources, but also increase the influence and appeal of red culture by attracting younger generations and global audiences through innovative display methods. Secondly, extensive stakeholder participation and policy support ensure the accuracy, legality and ethics of digitization projects, avoiding distortion and misuse of cultural content. Finally, through diversified financial support and continuous technological updating, the long-term sustainability of digitization projects can be ensured, forming a virtuous circle and promoting the protection and transmission of cultural heritage to move forward. Therefore, these research insights not only have theoretical value, but also provide practical strategies and suggestions for the actual digital transformation of Yan'an's red cultural resources, and offer useful reference for the digital preservation and innovation of other cultural heritage sites.

Acknowledgements

This work is supported by Innovation and Entrepreneurship Training Project for College Students of Anhui University of Finance and Economics in 2024, Project number: 202410378209.

References

- [1] CHEN Xiaofeng, CHEN Ruixu, PEI Wenxia. Connotation, Mechanism and Path Selection of Digital Technology Enabling High-Quality Development of Rural Cultural Industry[J]. Journal of Party

- School of Fujian Provincial Committee of the Communist Party of China (Fujian Administrative College), 1-8.
- [2] Shao Minghua,Gao Yang. How digital technology empowers Chinese-style modernized cultural forms: Based on the perspective of cultural industry[J]. Journal of Shenzhen University (Humanities and Social Sciences Edition),2024,41(04):56-64.
- [3] Wen Feng'an. How New Quality Productivity Helps Cultural Governance[J]. Social Science Research,2024,(04):67-75.
- [4] Cao Yinshan,Zhang Jianyu. Research on the Logical Mechanism of Digital Enabling High-Quality Development of Rural Public Culture[J]. New Century Library,2024,(06):46-53+97.
- [5] HU Bo Xiang,HOU Shi Wei. Analysis of the value of informatization-enabled dissemination of revolutionary cultural resources[J]. Journal of Jiangxi Normal University (Philosophy and Social Science Edition),2024,57(03):3-15.
- [6] Wu Wenxin,Zhang Ruixin. Exploring the Practice of Cultural Sharing Empowered by Digital Intelligence Technology[J]. Journal of Xi'an Jiaotong University (Social Science Edition),1-15.
- [7] Liu Yanfeng. New Quality Productivity Enabling Rural Digital Library Construction: Role Mechanisms, Realistic Obstacles and Practical Paths[J]. Library Theory and Practice,1-8.
- [8] Liu Feng. A preliminary study on the mechanism of digital empowerment to enhance urban tourism performance[J]. Journal of Yunnan University (Social Science Edition),2024,23(03):120-134.
- [9] ZHOU Jin,CAO Luna. Social Network Enabling Deep Integration of Culture and Tourism: Development Characteristics, Role Mechanism and Promotion Path[J]. Nanjing Social Science,2024,(03):151-162.
- [10] Hu Yuche. Concept, case, revelation: threefold thinking of red cultural resources empowering reading promotion in colleges and universities[J]. New Century Library,2024,(01):12-18.
- [11] Song Yifei. The reshaping of cultural consumption scene in the context of cultural digitization[J]. Young Journalist,2023,(22):109-111.
- [12] HUANG Zhenfang, ZHANG Ziang, LI Tao, HOU Guolin, JIN Cheng,ZHANG Chen. Theoretical Logic and Research Framework of Digital Enabled Deep Integration of Culture and Tourism[J]. Tourism Science,2024,38(01):1-16.
- [13] Liu Yuping,Wen Yuyuan. Digital Renminbi Enabling Rural Revitalization: Theoretical Mechanism and Practical Approach[J]. Southern Finance,2023,(09):3-14.
- [14] Sun Yanfei,Liu Siyuan. The Logic and Orientation of Digitization Enabling the Construction of Yangtze River National Cultural Park[J]. Nanjing Social Science,2023,(10):161-168.
- [15] Yuan Yuan,Fan Jianhua. Exploring the internal logic and path of digitalization to promote the high-quality development of rural cultural industry[J]. Theory Monthly,2023,(08):83-92.
- [16] Chen Wenhui,Wang Jingqian. Research on the strategy of digital economy empowering the development of fashion industry--Taking Beijing as an example[J]. Price Theory and Practice,2023,(04):190-193+211.
- [17] Xing Lei. Exploring the Practice Mode and Path of Reading Promotion in Townships Empowered by Social Organizations--Taking Chongzhou City as an Example[J]. Research in Librarianship, 2023,(05):79-84+101.
- [18] Tang Zilan. Digitally empowered co-production: a new paradigm for public cultural service provision[J]. New Century Library, 2023,(05):5-9+76.
- [19] MING Qingzhong,LI Zhifei,XU Hong,LU Lin,LI Yanqin,SUN Jiuxia,LI Junyi,ZHANG Jinhe,ZHOU Guohua,LI Tongsheng,ZHANG Yuangang. Theoretical cognition and application innovation of rural tourism resources in China under the goal of common wealth[J]. Journal of Natural Resources,2023,38(02):286-304.
- [20] Tie Zhong, Xia Cuijuan,Huang Wei. Innovative design and practice of red cultural information resource dataization under the perspective of cultural and tourism integration[J]. Journal of Information Resources Management,2021,11(04):33-39+59.