The Application of Digital Technology in the Design of Cultural And Creative Products in Qufu ——The Integration and Innovation of AR/VR, Blockchain, and Big Data

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Abstract: With the rapid development of digital technology, AR/VR, blockchain, and big data are redefining the design and experience of cultural and creative products. This paper focuses on the application of these technologies in the design of cultural and creative products in Qufu, aiming to explore how these digital technologies can enhance the interactivity, educational value, and market value of cultural and creative products while maintaining respect for and the inheritance of Qufu's rich cultural heritage.

Keywords: Qufu, cultural and creative products, digital technology, AR/VR, blockchain, big data

1 Introduction

In the digital era of the 21st century, advanced digital technologies such as AR/VR (Augmented Reality/Virtual Reality), blockchain, and big data are profoundly changing people's lifestyles and consumption habits, with a particularly significant impact on the cultural and creative industry.These technologies not only provide new forms of expression and means of dissemination for cultural and creative products but also greatly expand the market potential and consumer experience of cultural products. Especially in the protection and dissemination of traditional cultural heritage, digital technologies offer unprecedented possibilities, allowing cultural heritage to be presented to the public in a more vivid and interactive manner, thereby enhancing its appeal and educational value[1].

Qufu, as the birthplace of ancient Chinese Confucianism, possesses a rich cultural heritage. Applying digital technology to the design of cultural and creative products in Qufu not only innovates the ways in which cultural heritage is disseminated but also promotes the diversified development of cultural and creative products, injecting new vitality into traditional culture. Through this approach, Qufu's cultural heritage can be effectively protected and inherited, and its international influence can be enhanced in the context of globalization. Therefore, researching the application of digital technology in the design of cultural and creative products in Qufu holds not only significant academic value but also profound social and economic significance.

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2 Overview of Digital Technologies

Digital technologies, especially AR/VR (Augmented Reality/Virtual Reality), blockchain, and big data technologies, are driving the fusion of traditional culture and modern technology in the cultural and creative industry, bringing revolutionary changes to the design and experience of cultural and creative products.

AR/VR technology, as a form of immersive technology, provides users with a brand-new interactive experience by creating virtual environments or overlaying virtual information in the real world. In the realm of cultural and creative products, AR technology can overlay virtual information on actual cultural sites or artifacts, allowing audiences to see reconstructions of historical scenes or detailed explanations on devices such as smartphones or glasses, greatly enriching the forms and content of cultural dissemination. VR technology, by creating completely virtual environments, allows users to experience cultural scenes from another time and space as if they were there, such as a virtual tour of the ancient city of Qufu, enhancing the immersive feeling and educational value of cultural experiences.

Blockchain technology, with its unique characteristics of decentralization, immutability, and full transparency, provides strong technical support for the authenticity verification and copyright protection of cultural and creative products. By recording the creation, publication, and circulation information of cultural and creative products on the blockchain, each product can have a unique identity and ownership record, effectively preventing the issues of piracy and counterfeit goods, and safeguarding the rights and interests of creators and consumers[2].

Big data technology, by analyzing massive amounts of user data, can reveal consumer preferences and behavior patterns, providing a scientific basis for the design and market positioning of cultural and creative products. Big data can help designers understand which cultural elements are more popular and which product forms are more readily accepted by the market, thus guiding product development and innovation. Additionally, big data can optimize marketing strategies, effectively delivering cultural and creative products to target consumers through precise recommendations and advertising.

In summary, AR/VR technology provides immersive experiences, blockchain technology ensures product originality and copyright protection, and big data technology precisely analyzes consumer needs. Together, these digital technologies offer new possibilities for the design, protection, and promotion of cultural and creative products, greatly advancing the innovative development of the cultural industry.

3 The Integration of Qufu Cultural Heritage and Digital Technologies

Qufu, located in Shandong Province, China, is the birthplace of ancient Confucianism and is most famous for the three major sites: the former residence of Confucius, the Temple of Confucius, and the Cemetery of Confucius, which have been listed as World Cultural Heritage sites by UNESCO. It not only carries a rich heritage of Confucian culture but also gathers a large number of ancient buildings, artifacts, and documents, serving as an important symbol of Chinese traditional culture and philosophical thought. The unique cultural background and

rich cultural resources of Qufu provide endless inspiration and material for the design of cultural and creative products.

The integration of digital technologies such as AR/VR, blockchain, and big data with Qufu's cultural heritage aims to protect, inherit, and innovate this unique cultural legacy through modern technological means. AR/VR technology can be used to develop virtual museums and interactive tour applications, allowing users, regardless of their location, to deeply experience Qufu's historical and cultural essence through virtual reality technology. For example, visitors can tour the Temple of Confucius using VR devices, or see scenes of Confucius teaching recreated through AR technology. Such applications not only increase the interest and interaction in cultural dissemination but also make cultural education more vivid and intuitive[3].

The application of blockchain technology is primarily reflected in the copyright protection and authenticity verification of cultural and creative products. By establishing a blockchain-based authentication system for cultural and creative products, each product inspired by Qufu's cultural heritage can have a unique digital identity, ensuring the originality and uniqueness of the product, while also providing consumers with a basis for distinguishing between genuine and counterfeit items.

The use of big data technology leans more towards market analysis and product optimization. By collecting and analyzing data related to searches, discussions, and consumer behavior concerning Qufu's cultural heritage, insights into consumer preference trends for cultural and creative products can be gained. This helps designers and businesses to develop products and position them in the market more accurately, thereby enhancing the product's competitive edge in the market[4].

Integrating these technologies into the design process of Qufu's cultural and creative products faces challenges including the acceptance of technology, cost control, and how to maintain the authenticity of the culture. However, the opportunities are equally significant. This integration can not only enhance the appeal and educational significance of cultural products but also promote the international dissemination of Qufu and even Chinese culture, providing a new window for global audiences to deeply understand Chinese traditional culture.for an example see Table 1. [1]

Table 1. The integration diagram of Qufu cultural heritage and digital technologies.

Technology	Application Case	Function
AR/VR	Virtual Temple of Confucius Tou	Users can comfortably experience entering the Temple of Confucius via VR headsets, vividly presenting every detail from the sacrificial hall to the lecture halls. Stories about Confucius and teachings of Confucian classics are presented in interactive texts and animations, making users feel as if they have traveled back to ancient times and personally experienced the profoundness of Confucian culture, thereby enhancing the educational experience with greater vividness and appeal.
Blockchain	Digital Certificate	The creation time, author, and ownership of cultural and creative products are recorded on the blockchain.

	System	Consumers can scan the QR code on the product to verify the originality and authenticity of each cultural and creative product.
Big Data	Product Design-Driven	Through analyzing big data, it was discovered that there is a high demand among consumers for educational and interactive cultural and creative products. Based on this insight, the company launched a series of interactive books and video games themed around Confucian classics. Through gamified learning, users can learn about Confucian culture while being entertained.

4 Case Study

In the design and promotion of cultural and creative products in Qufu, the application of digital technologies has provided innovative pathways and methods. Below are some specific case studies that demonstrate how AR/VR, blockchain, and big data have been utilized in practice.

AR/VR Technology Application Example: "Virtual Confucius Temple Tour" Developed with VR Technology. Users can experience the feeling of entering the Confucius Temple at home through VR helmets, from the sacrificial hall to the lecture room, every detail is vividly presented, as if they have traveled back to ancient times and personally experienced the profoundness of Confucian culture. Furthermore, the Nishan Sacred Land in Qufu has introduced activities such as "Phoenix Dance in Nishan," "Traveling Through the Nations," and "The Analects of Confucius Scroll," integrating tradition with technology to bring awe-inspiring experiences to tourists. The "Three Confucian Temples" scenic spot in Qufu leads the trend by introducing an MR (Mixed Reality) scenic spot experience project, which combines the actual scenery of the scenic spot with big data and mobile intelligent devices. By utilizing diversified presentation methods, including AI-powered narrations and panoramic interactive challenges, it creates an immersive and interactive experience space for tourists. The Confucius Museum utilizes cutting-edge technology to revive the long-forgotten cultural relics through immersive and interactive forms, making them come alive.

Blockchain Technology Application Case: An important application of blockchain technology in Qufu's cultural and creative products is the creation of a "digital certificate" system to verify the originality and authenticity of each cultural and creative product. Whenever a cultural and creative product is created and sold, its information, including the creation time, author, and ownership, is recorded on the blockchain. Consumers can access this information by scanning a QR code on the product, ensuring the uniqueness and authenticity of the purchased cultural and creative product. This not only enhances consumer trust but also protects the rights of artists and designers.

Big Data-Driven Product Design Case: A cultural and creative enterprise in Qufu, through analyzing big data, discovered that there was a high demand among consumers for educational and interactive cultural and creative products. Based on this insight, the company launched a series of interactive books and video games themed around Confucian classics. Through gamified learning, users could learn about Confucian culture while being entertained. These

products achieved tremendous success in the market, not only because they met consumer needs but also because the analysis of big data ensured precise product design and positioning.

These case studies demonstrate that AR/VR, blockchain, and big data are not merely technological tools; they have become bridges connecting traditional culture with modern consumers, driving the innovation of cultural and creative products and the inheritance of cultural heritage[5] .Through the application of these technologies, Qufu's cultural heritage and cultural and creative products are presented to the world in new ways, sparking interest and respect for Chinese traditional culture. for an example see Table 2. [2]

Table 2. The digital technology application in Qufu's cultural and creative products.

Technology	Application Case	Function
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Big Data	Product Design-Driven	Through analyzing big data, it was discovered that there is a high demand among consumers for educational and interactive cultural and creative products. Based on this insight, the company launched a series of interactive books and video games themed around Confucian classics. Through gamified learning, users can learn about Confucian culture while being entertained.

5 Challenges and Strategies

In applying digital technologies to the design and promotion of cultural and creative products in Qufu, although innovative paths have been opened, multiple challenges are also faced. Among these, the high cost of technology, varying degrees of user acceptance, and how to maintain the authenticity of cultural inheritance are particularly prominent issues.

Firstly, the cost of technology poses a significant challenge. Especially, the development of AR/VR equipment and blockchain technology requires a high level of investment, which represents a considerable expense for many cultural and creative enterprises. One strategy to address this is to seek support and funding from the government and industry associations, reducing the burden on individual enterprises through resource sharing and technology

platforms. Additionally, enterprises can consider partnering with technology companies to utilize existing technological solutions to reduce development costs.

Secondly, users of different ages and backgrounds have varying levels of acceptance for new technologies, particularly older individuals and those less familiar with technology who may find it challenging to use high-tech products like AR/VR. Strategies to address this include designing simple user interfaces and interactive experiences, as well as conducting user education activities, such as organizing experience workshops, releasing instructional videos, etc., to enhance users' technological acceptance and user experience.

Furthermore, maintaining the authenticity of cultural heritage in the application of technology is also a significant challenge. Over-reliance on technology may lead to a loss of focus on the depth and details of culture, and could even distort or oversimplify cultural connotations. A strategy to address this is to ensure that cultural experts and historians play a central role in the development process of cultural and creative products, using technology to showcase rather than replace culture itself[5]. At the same time, it is important to develop products with an educational purpose, focusing on conveying the deep meanings of culture, rather than merely surface visual effects. for an example see Table 3. [3]

Table 3. Challenges and Strategies

Challenges	Response Strategies
High cost of technology	Seeking government support, resource sharing, and collaborating with technology companies to reduce costs
Varying levels of user acceptance	Designing simple user interfaces and conducting user education activities to enhance technological acceptance
Maintaining the authenticity of cultural heritage	Ensuring the involvement of cultural experts and focusing on the deep meanings of culture with an educational purpose

In summary, although the application of digital technologies in promoting cultural and creative products in Qufu presents many challenges, these can be overcome through effective strategies such as cost control, user education, and maintaining a balance between culture and technology. The ultimate goal is to use technological means to better inherit and promote the traditional culture of Qufu and China, while also providing users with a richer and more interactive cultural experience.

6 Conclusion and Recommendations

This study, through analyzing the application of digital technology in the design of cultural and creative products in Qufu, emphasizes the importance of technologies such as AR/VR, blockchain, and big data in enhancing the design of cultural and creative products and user experience. Through specific case studies, we see how these technologies help cultural and creative products better convey the rich cultural heritage of Qufu, while also pointing out the challenges faced in the implementation process and the strategies to address them. Overall, the

use of digital technology not only can enhance the appeal and market competitiveness of cultural and creative products but also can provide new pathways for the inheritance and innovation of traditional culture.

In light of the continuous development of the cultural and creative industry in Qufu, the author proposes the following recommendations:

For developers and designers of cultural and creative products: Encourage continuous exploration and experimentation with the application of new technologies, not limited to AR/VR, blockchain, and big data, but also paying attention to cutting-edge technologies such as artificial intelligence and the Internet of Things. At the same time, prioritize user experience design to ensure that the application of technology truly meets user needs, enhancing the interactivity and educational significance of the cultural experience.

For policymakers: It is recommended that government departments offer more support, including financial investment, policy guidance, and the construction of technology platforms, to promote the integrated development of the cultural and creative industry with digital technology. Additionally, strengthen copyright protection and optimize the market environment to provide favorable external conditions for the innovation and development of cultural and creative products.

Training and Education: Enhance the training of professionals in the cultural and creative industry, especially in the application of new technologies, to improve their technical proficiency and innovation capacity. At the same time, by educating the public, raise awareness of the value of traditional culture and cultural and creative products, promoting the healthy development of the cultural consumption market.

Through the implementation of these recommendations, we anticipate that Qufu and the entire cultural and creative industry will be able to seize more opportunities in the wave of digital transformation, achieve a harmonious coexistence of traditional culture and modern technology, and promote the healthy and sustainable development of the cultural industry.for an example see Figure 1. [1]

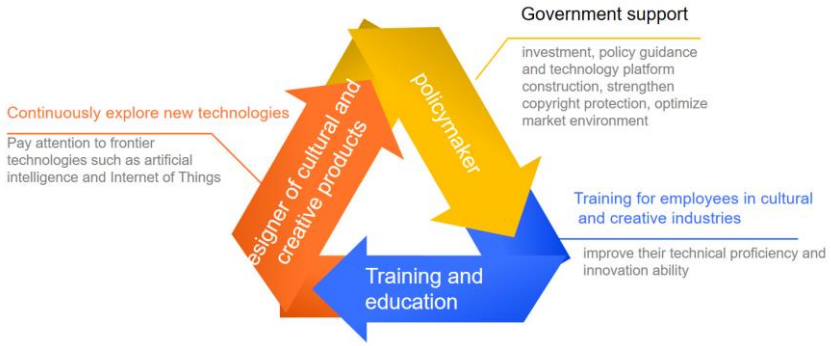

Fig. 1. Suggested map of cultural and creative industry in Qufu

References

[1] Kim, J., & Lee, H. (2020). "The impact of AR and VR on cultural heritage preservation and tourism marketing: A case study of South Korea." Tourism Management Perspectives, 35, 100672. https://doi.org/10.1016/j.tmp.2020.100672

[2] Zhang, Y., & Liu, C. (2019). "Blockchain technology in cultural and creative industry: A case study of China." International Journal of Information Management, 49, 228-241. https://doi.org/10.1016/j.ijinfomgt.2019.03.012

[3]Smith, L. (2021). "Virtual reality and augmented reality in historical and cultural tourism: A review and prospective." Journal of Heritage Tourism, 16(2), 123-139. https://doi.org/10.1080/1743873X.2020.1714272

[4] Rossi, M., & Taisch, M. (2018). "Big data and analytics in cultural heritage: Opportunities and challenges in Italy." Procedia Manufacturing, 21, 522-529. https://doi.org/10.1016/j.promfg.2018.02.147

[5] Müller, J., & Schmücker, D. (2019). "The effects of virtual reality on destination image formation." International Journal of Tourism Research, 21(1), 1-12. https://doi.org/10.1002/jtr.2244