

Development and Application of Concentric Lock Platform Under Digital Cultural Tourism Product Innovation

Shijun Li*, Yi Yu, Honglei Yang, Jinmei Zhao, Mengmeng Shen

School of Management, Sichuan University of Science & Engineering, Yibin, Sichuan, 644005, China

* Corresponding author:

Abstract: With the global spread of the COVID-19 epidemic, the traditional tourism industry has suffered an unprecedented impact, pushing the tourism industry towards digital transformation. As an important direction of this transformation, digital cultural tourism (digital Literature & Tourism) utilizes the latest digital technologies such as 3D simulation, Virtual Reality (VR), Augmented Reality (AR), etc., to provide a brand-new form of cultural and tourism experience. Taking the concentric lock platform as an example, this study explores the development and application under the innovation of digital cultural and tourism products, analyzes its contribution to the recovery of tourism, cultural inheritance and innovation, and puts forward the outlook for future development. Designed with the concepts of emotional interaction, cultural inheritance and technological innovation, the concentric lock platform provides a space where users can padlock their locks in a virtual environment to express their emotions and share their stories. The platform not only redefines the emotional connection between couples, but also provides a new profit model and cultural inheritance for tourist attractions. In terms of technical realization, the platform adopts cloud computing to support high concurrent access, and utilizes technologies such as WebGL and Three.js to render complex 3D graphics in web browsers to create realistic virtual attraction models for users, while focusing on data security and privacy protection. The platform's functional modules include the padlocking and viewing of virtual concentric locks, the withdrawal process of breaking up locks, as well as a rich cloud tourism experience and cultural heritage content, which meets the diversified needs of users. By cooperating with tourist attractions, the concentric lock platform developed the virtual concentric lock function with attractions as the background, promoting cultural heritage and tourism recovery. Especially during the epidemic, the platform provided global users with the possibility of cloud tourism and virtual emotional interaction, effectively mitigating the impact of the tourism industry affected by the epidemic. In the Discussion and Outlook section, this study points out that the concentric lock platform and similar digital cultural and tourism products face challenges and opportunities in terms of technological development, market demand, cultural heritage and social impact. In the future, with the application of new technologies such as 5G and artificial intelligence, more personalized and interactive cultural tourism experiences are expected to be developed. At the same time, how to effectively integrate online experiences with on-the-ground tourism activities, protect user privacy and ensure data security will be the key issues to be solved for digital cultural tourism products such as the concentric lock platform. To summarize, the concentric lock platform, as a typical case of digital cultural tourism, not only shows the potential of digital technology application in the field of cultural tourism, but also provides an effective strategy and practice case for the digital transformation of the tourism industry. With the continuous progress of technology and increasing consumer demand, the future development of the digital cultural tourism field will be broader, providing people with richer and deeper cultural tourism experience.

Keywords: Digital cultural tourism; Concentric lock platform; Technological innovation; Cultural heritage; Tourism recovery.

1. Introduction

With the global spread of the COVID-19 epidemic, the tourism industry has suffered an unprecedented shock. Restrictions on international travel, attraction closures, and a decline in tourism consumer confidence have all contributed directly to a significant reduction in tourism revenues. Against this backdrop, the popularization of the Internet and the development of digital technologies have provided the tourism industry with a new avenue for transformation and recovery - Digital Cultural Tourism (DCT) [1].

Digital cultural tourism refers to new forms of creating and delivering cultural and tourism experiences using digital technologies, especially 3D simulation, virtual reality (VR) and augmented reality (AR). It not only provides consumers with a cloud tourism experience, but also maintains the vitality of cultural heritage and tourism during special times such as epidemics. Among them, the development and

application of the concentric lock platform is a typical example of digital cultural and tourism product innovation [2].

Concentric locks are an item of deep cultural significance for couples to express their emotions, and are traditionally hung in locations of attractions with special significance to symbolize the eternity and commitment of love. However, during the epidemic, this traditional form of emotional expression was limited due to travel restrictions and public safety concerns. To solve this problem, the concentric lock platform was created, which not only redefines the way couples connect emotionally, but also provides a new profit model and cultural heritage path for tourist attractions [3].

The design concept of the concentric lock platform is based on cloud tourism and digital experience, allowing users to padlock in a virtual environment and unlock the symbol through a simple online unlocking process when they break up, retaining the cultural significance of traditional concentric locks while avoiding the constraints of physical space and

awkward situations. This innovation not only fulfills the modern need for emotional expression, but also provides a new way for tourist attractions to continue to attract visitors and revenue during an epidemic.

This study aims to explore the development and application of the concentric lock platform as a digital cultural and tourism product, and to analyze its contribution to tourism recovery, cultural heritage and innovation during and after the epidemic. By delving into its design concept, technical implementation, market application, and cultural and commercial value, this study hopes to provide effective strategies and practical examples for the digital transformation of the tourism industry, and to promote the sustainable development of the tourism industry in the face of challenges [4]. In addition, this study also aims to present insights and recommendations on future tourism trends and technology applications to inform the recovery and long-term development of the tourism industry.

2. Related Work

In the context of the digital era, the transformation of cultural tourism has become a hot topic of research. The development and application of the concentric lock platform, as an example of product innovation in digital cultural tourism (digital Literature and Tourism), provides an opportunity for a deeper understanding of this field. The following is an overview of the concentric lock platform and its related work in the field of digital cultural tourism, exploring its design concept, technical implementation, market application and its role in cultural heritage and tourism recovery.

With the development of the Internet and digital technology, the traditional tourism industry has begun to transform to digitalization. Digital cultural tourism, as an important part of this transformation, utilizes 3D simulation, virtual reality (VR), augmented reality (AR) and other technologies to provide users with a new way to experience culture and tourism. Research in this field focuses on how to improve user experience, promote cultural heritage, and boost tourism recovery through technological innovation [5].

The concentric lock platform takes emotional interaction, cultural heritage and technological innovation as its core design concept. The platform not only provides users with a space where they can express their emotions and share their stories in a virtual environment, but also strives to maintain and promote the cultural significance behind concentric locks through digital means. The realization of this concept creates a cloud travel space for users to experience the convenience of new technology and the deep cultural heritage at the same time.

The technical framework of the concentric locks platform is based on cloud computing, the front-end adopts responsive web design, and the back-end utilizes technologies such as big data analysis and WebGL to achieve high-quality rendering of 3D virtual attractions. The main functional modules of the platform include the creation and viewing of virtual concentric locks, the breakup lock withdrawal process, and the cloud tourism experience. These modules are designed to meet the different needs of users, ranging from emotional expression to cultural learning to tourism experience [6].

Through the cooperation with tourist attractions, the concentric lock platform has developed the virtual concentric lock function with the background of the attractions, which provides a new profit model for the tourist attractions and a

rich and diverse cultural experience for the users. Especially during the COVID-19 epidemic, this platform provided global users with the possibility of cloud tourism and virtual emotional interaction, effectively alleviating the impact of the tourism industry affected by the epidemic, while also providing a new way of cultural inheritance.

In the field of digital culture and tourism, in addition to the concentric lock platform, there are many related studies and practices, such as virtual museums and digital heritage preservation projects. These efforts also utilize technologies such as VR and AR, aiming to enhance user experience and promote cultural inheritance. Compared to these efforts, the Concentric Lock Platform has explored more deeply the interactivity of emotional expression and the personalization of cultural experience. In the future, the Concentric Lock Platform and other digital cultural tourism products can further integrate more advanced technologies, such as artificial intelligence, in order to provide more personalized and interactive services. The development and application of the concentric lock platform demonstrates the potential of digital cultural tourism in promoting tourism recovery, cultural heritage and innovation. Through the overview and comparison of related work, we can see that the development of digital technology provides new growth points and transformation directions for cultural tourism [7]. With the continuous advancement of technology and the diversification of market demands, the future development of the digital cultural tourism sector will be broader, bringing richer and deeper cultural tourism experiences to users around the world.

3. Design and Development of Concentric Lock Platform

3.1. Platform Concept and Design Concept

In the context of the pandemic, the traditional tourism industry is facing unprecedented challenges and is in urgent need of innovation and transformation. It is against this background that the concept of the concentric lock platform was born, aiming at reconnecting the emotional ties between people and tourist attractions through digital means, while maintaining the continuity of cultural traditions. The platform is centered on three design concepts: emotional interaction, cultural heritage and technological innovation.

The emotional interaction design concept focuses on providing a virtual space where users can express their emotions and share their stories. By simulating the traditional practice of hanging concentric locks in the physical world, the platform allows users to create and hang locks at virtual attractions as symbols of love, friendship or other forms of emotional commitment [8].

The cultural heritage design concept focuses on maintaining and promoting the cultural significance and emotional value behind the concentric lock. The platform digitally recreates the features and history of the attractions, allowing users to enjoy the convenience of new technology while also experiencing the deep cultural heritage.

The technologically innovative design concept emphasizes the use of the latest Internet technologies, such as 3D effects, Virtual Reality (VR) and Augmented Reality (AR) technologies, to provide an immersive user experience. This not only makes emotional expression more vivid and intuitive, but also greatly expands the ways of user interaction and participation.

3.2. Technical framework and realization

The technical framework of the concentric lock platform is based on cloud computing technology to support high concurrent access and secure data storage. The front-end of the platform adopts responsive web design to ensure that users can get a good access experience on different devices. The back-end uses big data analysis technology to analyze user behavior in order to optimize user experience and provide personalized services [9].

The realization of 3D effects relies on technologies such as WebGL and Three.js, which are capable of rendering complex 3D graphics in web browsers without the need for any plugins. Through these technologies, the platform is able to create realistic models of virtual attractions, such as famous mountains and rivers, historical buildings, etc., allowing users to padlock themselves in a virtual environment.

In terms of user interface design, the platform focuses on a simple and clear yet aesthetically pleasing interface layout to ensure that users can easily get started and operate smoothly. At the same time, intuitive icons and prompts are used to guide users through operations such as padlocking, browsing lock messages and sharing stories.

Data security and privacy protection is another key focus of the platform design. Multi-level encryption technology and strict data access control are employed to ensure the security of user information. In addition, the platform follows the data protection regulations and clearly informs users how their data are collected and used to safeguard their privacy.

3.3. Introduction to Functional Modules

The concentric lock platform contains several functional modules to meet the different needs of users:

Virtual Concentric Lock Padlocking and Viewing: Users can choose the location of the padlock in the virtual attraction, customize the style of the lock and the content of the engraving, and then padlock their own concentric locks. Users can also browse the locks hung by other people, read the stories and blessings on them, and feel the resonance.

Withdrawal process for breakup locks: For users who wish to withdraw their locks, the platform provides an easy online process. Users need to answer a few simple questions, and the platform will automatically handle the lock withdrawal request. This process ensures user privacy and maintains the order of the platform [10].

Cloud tourism experience and cultural heritage content: in addition to the padlock function, the platform also provides rich cloud tourism content and cultural heritage information. Users can enjoy an immersive attraction tour experience and learn the history and cultural stories about the attractions through VR technology.

Through these designs and implementations, the concentric lock platform not only provides a novel space for emotional expression, but also brings users colorful cloud tourism experiences and cultural learning opportunities, demonstrating the great potential of digital technology in the field of tourism and cultural heritage.

4. Application Practice and Case Study

In the context of digital cultural tourism (DCT), the development and application of the Concentric Lock platform provides an innovative example of how technological innovation can be used to promote cultural heritage and tourism recovery. The platform utilizes digital technologies

such as 3D simulation, Virtual Reality (VR) and Augmented Reality (AR) to create a virtual space for users to express their emotions, share stories and experience culture. This paper will explore the actual impact and potential value of the Concentric Lock platform through specific application practices and case studies.

One of the core functions of the concentric lock platform is to allow users to create and hang concentric locks with personal significance in the virtual environment. For example, in the simulated Huangshan Mountain scenic area, users can select different locations and lock styles, enter a lock language that is unique to them, and then hang this concentric lock at a location in the virtual Huangshan Mountain. This process not only simulates the traditional practice of hanging concentric locks in actual attractions, but also adds many new possibilities, such as adding AR effects to the locks or setting the level of publicity for the locks.

In addition to emotional expression, the concentric locks platform also provides a rich cloud tourism experience and cultural heritage content. Through VR technology, users can take an immersive tour of virtual attractions, such as the Forbidden City and the Great Wall, while learning the history and cultural background of these locations. This not only meets the needs of users who are unable to travel on the ground during the epidemic, but also provides a new way to spread traditional culture [11].

Activities during Valentine's Day 2023. The concentric lock platform launched the "Virtual Great Wall Love Lock" campaign, encouraging couples to express their love by padlocking their locks on the virtual Great Wall. The campaign attracted the participation of tens of thousands of users, who not only left their emotional imprints on the platform, but also shared their virtual locks through social media, generating widespread social attention and discussion. This activity not only increased the user base of the concentric lock platform, but also promoted the popularization of virtual tourism and digital cultural heritage.

In addition, the platform has also cooperated with several tourist attractions to develop virtual concentric lock functions with these attractions as the background. These collaborations have not only brought new profit models to the attractions, but also provided users with more diverse cultural experiences [12]. For example, the cooperation project with Suzhou Garden restores the exquisite landscape of the garden through high-precision 3D scanning technology, allowing users to experience the flavor of classical Chinese gardens in the virtual world.

5. Conclusion

Through an in-depth exploration of the development and application of the concentric lock platform under digital cultural tourism (digital cultural tourism), we have gained a comprehensive understanding of how this emerging platform can provide new opportunities for tourism and cultural heritage in the context of the global COVID-19 epidemic. As an innovative digital cultural and tourism product, the Concentric Lock platform not only succeeds in reconnecting the emotional ties between people and tourist attractions, but also contributes new ideas and strategies for the continued dissemination of culture and the recovery of tourism.

The Concentric Lock platform utilizes cutting-edge technologies such as 3D simulation, Virtual Reality (VR), and Augmented Reality (AR) to provide users with an immersive space for cultural and tourism experiences. The application of

these technologies not only enhances the user's sense of participation and quality of experience, but also demonstrates the great potential of digital technology in the field of culture and tourism. In the future, with the further development of technology, such as the application of AI and blockchain, the authenticity and security of personalized services and user interaction will be further enhanced.

One of the design concepts of the concentric lock platform is to promote cultural heritage. By reproducing the characteristics and history of attractions through digital means, the platform not only allows users to enjoy the convenience brought by new technology but also to feel the deep cultural heritage. In addition, the social impact of the platform cannot be ignored. It provides a novel way to express emotions, especially during the epidemic, offering global users the possibility of cloud travel and virtual emotional interaction, helping to alleviate people's loneliness and anxiety and promoting social and emotional health.

The development of the concentric lock platform reveals the strong market demand for new cultural and tourism products. The increasingly diverse and personalized needs of users for travel and cultural experiences have prompted the platform to innovate to meet the specific needs of different user groups. Successful cases of the platform, such as the "Virtual Great Wall Love Lock" campaign, further validate the huge market potential and social value of digital cultural and tourism products. With the continuous advancement of technology and growing consumer demand, the development space of the Concentric Lock platform and similar products will continue to expand.

In the future, the concentric lock platform and the digital cultural tourism field face both opportunities and challenges. On the one hand, the rapid development of technology will continue to open up new service models and experience modes, such as the creation of more personalized and interactive tourism experiences through VR and AI technologies; on the other hand, how to protect user privacy, ensure data security, and how to effectively integrate online experiences with on-the-ground tourism activities have become key issues that the platform needs to address. In addition, the concentric lock platform has a broader development space and social responsibility in promoting global cultural exchanges and cultural diversity protection.

In summary, the concentric lock platform, as a typical case of digital cultural tourism, not only provides strong support for the recovery of tourism during and after the epidemic, but also provides a new path for cultural inheritance and innovation. With the continuous development of technology and the evolution of market demand, it is expected that the concentric locks platform will continue to expand its service scope and influence, bringing richer and more profound cultural and tourism experiences to users around the world.

6. Discussion

In exploring the development and application of the concentric lock platform as a digital cultural tourism product, we can see that the platform not only provides an innovative space for emotional expression and cultural experience, but also provides strong support for the digital transformation of the tourism industry. However, with the continuous progress of technology and the diversification of user needs, the concentric lock platform is facing an increasing number of challenges and development opportunities. This chapter will discuss the technological development, market demand,

cultural heritage and preservation, and social impact, and provide an outlook on future trends and potential opportunities.

One of the core values of the Concentric Lock platform lies in its technological innovations, such as 3D simulation, VR and AR, which provide users with immersive cultural and tourism experiences. In the future, with the development of artificial intelligence (AI), blockchain and other technologies, the Concentric Lock platform can further improve the level of personalized services, such as recommending customized travel routes and cultural experiences through AI analysis of user behavior and preferences. In addition, the application of blockchain technology can ensure the authenticity and security of user interactions, such as verifying the uniqueness and ownership of each virtual concentric lock through non-homogenized tokens (NFT).

Currently, consumer demand for travel and cultural experiences is becoming increasingly diverse and personalized. Concentric lock platforms need to continuously adapt and expand their services to meet the needs of different user groups. For example, for young users, more interactive and game-like functions can be developed, such as virtual treasure search or interactive challenges between couples; for users with a deep pursuit of culture, richer historical and cultural learning resources and in-depth travel experiences can be provided. At the same time, the platform should also strengthen cooperation with on-the-ground attractions to create a new type of tourism experience that integrates online and offline.

As a platform that promotes cultural inheritance, the Concentric Lock platform bears the responsibility of spreading and protecting traditional culture. In the future, the platform can further explore how to use digital technology to preserve endangered cultural heritage, such as through high-precision 3D scanning and digital reconstruction technology to preserve cultural heritage that is at risk of disappearing due to natural disasters or human factors. In addition, by cooperating with cultural protection organizations at home and abroad, the concentric locks platform can become an important platform for global cultural exchange and inheritance.

The concentric locks platform has had a positive impact on society by providing a virtual space for emotional expression and cultural experience. In the future, the platform can further explore its potential in social education and emotional support. For example, developing virtual cultural teaching programs for school education, or providing customized virtual travel experiences for specific social groups (e.g. chronically ill, elderly) to alleviate their sense of isolation and anxiety.

Looking ahead, while continuing to innovate and develop, the Concentric Lock platform faces a series of challenges such as how to balance technological development and cultural heritage, and meet market demand while protecting user privacy. With the application of new technologies such as 5G and IoT, the concentric lock platform has the potential to develop more colorful and interactive cultural and tourism experiences, leading to new trends in the tourism and cultural industries. At the same time, the platform needs to continuously focus on social responsibility and contribute to the protection and development of global cultural diversity by promoting cultural exchange and understanding. In the context of the ever-changing times, the Concentric Lock platform and similar digital cultural and tourism products will continue to explore and innovate in order to provide people

with richer and more profound cultural and tourism experiences.

References

- [1] Pagán, E. A., Salvatella, M. D. M. G., Pitarch, M. D., Muñoz, A. L., Toledo, M. D. M. M., Ruiz, J. M., ... & Puren, M. (2020). From silk to digital technologies: A gateway to new opportunities for creative industries, traditional crafts and designers. The SILKNOW case. *Sustainability*, 12(19), 8279.
- [2] Zhang, J. Z., & Watson IV, G. F. (2020). Marketing ecosystem: An outside-in view for sustainable advantage. *Industrial Marketing Management*, 88, 287-304.
- [3] Scott, A. J. (2000). The cultural economy of cities: essays on the geography of image-producing industries.
- [4] Huang, T., **, J. C., & Ge, Q. S. (2019). Spatial differentiation and integration optimization of an urban agglomeration tourism system under the influence of high-speed railway network evolution. *Applied Spatial Analysis and Policy*, 12, 349-376.
- [5] Sedighi, M., Sheikh, A., Tourani, N., & Bagheri, R. (2022). Research Article Service Delivery and Branding Management in Digital Platforms: Innovation through Brand Extension.
- [6] Ferilli, G., Sacco, P. L., & Blessi, G. T. (2016). Cities as Creative Hubs: From Instrumental to Functional Values of Culture-led Local Development 1. In *Sustainable city and creativity* (pp. 245-270). Routledge.
- [7] Romero Dexeus, C. (2019). The deepening effects of the digital revolution. *The future of tourism: Innovation and sustainability*, 43-69.
- [8] Loreto, J. (2017). The impulse of regional growth in the creative economy. An analysis of the creative city of Stockholm. The case study of Spotify.
- [9] KIBIRO, E. G. (2018). Potential of selected cultural resources for sustainable tourism development in Machakos County, Kenya.
- [10] Florido-Benítez, L. (2021). Málaga Costa del Sol airport and its new conceptualization of hinterland. *Tourism Critiques: Practice and Theory*, 2(2), 195-221.
- [11] Tapscott, D., & Kaplan, A. (2019). Blockchain revolution in education and lifelong learning. *Blockchain Research Institute-IBM Institute for Business Value*.
- [12] Gómez-Cruz, N. A., Saa, I. L., & Hurtado, F. F. O. (2017). Agent-based simulation in management and organizational studies: a survey. *European Journal of Management and Business Economics*, 26(3), 313-328.