

A Case Study on the Development Path of Shandong's Cultural and Tourism Industry Empowered by Digital Economy

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Abstract: *This paper explores the current situation and problems of the integration development of cultural and tourism industries in Shandong Province empowered by the digital economy. Through the case study, it sorts out three typical cases, namely the "Digital Brain" in West Lake in Hangzhou, the "Digital Scripture Cave" in Dunhuang Grottoes, and The Grand Tang Mall in Xi'an city and summarizes their successful experiences. Specific implementation paths for promoting the high-quality integration development of cultural and tourism industries in Shandong Province through the digital economy are proposed from four aspects: digital governance based on "all-domain collaboration", deepening innovative applications of "technology empowerment", cultivating an industrial ecosystem of "digital-intelligent integration", and building an international communication platform for "cultural going global".*

Keywords: *Shandong Province; Digital Economy; Integration of Culture and Tourism; Case Analysis*

1. Introduction

In April 2021, the Ministry of Culture and Tourism released the *"14th Five-Year Plan for Cultural and Tourism Science and Technology Innovation"*, and in December 2021, The State Council issued the *"14th Five-Year Plan for the Development of the Tourism Industry"*, promoting the significant role of digitalization in upgrading traditional tourism model and driving the transformation of the tourism industry towards innovation-driven development. In 2021, the General Office of the Shandong Provincial Government also issued the *"Digital Shandong 2021 Action Plan"* and the *"Several Measures for Promoting High-Quality Development of the Cultural and Tourism Industry"*, proposing to accelerate the digital transformation of the cultural and tourism industry in Shandong Province. However, in the process of digital economy promoting the integration of culture and tourism in Shandong Province, there are still practical problems such as data security, and there is a lack of research on the internal mechanism and path of digital economy driving the integrated development of culture and tourism. To this end, by exploring the current situation and problems of the integration of culture and tourism in Shandong Province with the assistance of the digital economy, and analyzing and refining the relatively successful typical cases of the integration of culture and tourism with the assistance of the digital economy, the path for promoting the integrated development of culture and tourism through the digital economy is ultimately proposed. It is significantly practical and theoretical for promoting the high-quality development of the cultural and tourism industry in Shandong Province.

2. The Current Situation and Problems of Digital Economy Facilitating the Integration of Culture and Tourism in Shandong Province

2.1 The Current Development Status of the Integration of Culture and Tourism in Shandong Province facilitated by the Digital Economy

2.1.1 The Continuously Improved Policy System and the Clearly Defined Strategic Layout

Shandong Province has issued documents such as the *"Opinions on Promoting the Deep Integration of Culture and Tourism and Driving the High-Quality Development of the Tourism Industry"*, proposing a development pattern of "two metropolitan areas driving, three parks leading, four corridors and one line connecting, and eight regions supporting", and clearly setting goals such as building a integrated

development center of cultural and tourism virtual reality technology and improving the "Welcome to Shandong, Online Tourism of Qilu" smart platform by 2027. The "Implementation Opinions on Promoting High-Quality Development of Culture and Tourism in the Yellow River Basin of Shandong Province" released in 2025 further proposed smart cultural and tourism measures such as "One Mobile Phone Tour of the Yellow River", strengthening digital empowerment.

2.1.2 The Rich Application Scenarios of Digital Technology, and the Significantly Enhanced Level of Intelligence

The provincial "Hospitality Shandong and Online Tourism of Qilu" platform integrates data from 3A and above levels scenic spots and cultural and museum venues across the province, providing one-stop services including "food, accommodation, transportation, sightseeing, shopping and entertainment". Taian City has developed the "Smart Tour of Taishan" platform, forming a "1+3+N" smart service system, enabling "one mobile phone to freely explore Taian". In terms of immersive experience innovation, Taishan Scenic Area has introduced 5G fast lines and AI technology, deploying 50 5G gateways to build a camera network covering the entire scenic area, generating exclusive photo albums for tourists. The "Meet the Sea along the Yellow River" digital tram in Qingdao integrates 16K circular screen images, 4D special effects and AI algorithms to create an immersive Yellow River cultural experience. In terms of the digital activation of cultural relics, the Taishan Scenic Area has issued 22 blockchain digital collections in 6 phases. The Qingzhou Museum has developed cultural relic IPs through the "Qingbo Yoli" brand, promoting the integration of traditional cultural elements with modern design.

2.1.3 The industrial scale has continued to expand, and digital cultural tourism has become a new growth engine

In 2024, the province will receive 900 million domestic tourists, with tourism revenue exceeding 1 trillion yuan. The added value of the cultural tourism and related industries will account for 6.7% of the GDP. Driven by digital technology, new business forms have risen rapidly, such as the "Taishan Shenqi" cross-dimensional digital experience hall, AI Tour Guide System of the Qufu Three Confucian Sites, and the Qingdao SEA Palace U ·SEA Fantasy Sea World, all of which have an average daily flow of over a thousand people.

2.1.4 Digital Upgrade of Infrastructure and Public Services

The province is promoting 5G network coverage, and all 4A-level and above scenic spots have achieved 5G coverage. We need to build theme tourism scenic roads such as "Red Yimeng", and improve facilities like smart navigation and new energy charging. Yantai and Weihai have piloted the facilitation of entry payment, while cities like Jinan and Qingdao have advanced the "Welcome to Shandong - One Code Pass" program, integrating resident codes to achieve "one code for all" cultural and tourism services.

2.2 Existing Problems of Digital Economy Facilitating the Integration of Culture and Tourism in Shandong Province

2.2.1 Unbalanced regional development and insufficient resource coordination

There are significant differences between the north and the south. Cities like Jinan and Qingdao are leading in the development of digital culture and tourism. In 2023, Qingdao's tourism revenue was nearly 200 billion yuan, while that of Heze and Binzhou was less than 20 billion yuan, with a low coverage rate of digital projects. The resources are scattered and repetitive in construction. The cultural and tourism resources of the whole province are managed by multiple departments, lacking unified planning, and the phenomenon of homogenization is prominent. There are still cross-departmental data barriers. Data from departments such as culture and tourism, transportation, and meteorology have not been fully integrated. In the actual implementation, there are still problems such as incompatible interfaces and inconsistent standards. Insufficient application of enterprise data, weak digital capabilities of small and medium-sized cultural and tourism enterprises, and lack of data analysis tools make it difficult to accurately identify tourists' demands^[1].

2.2.2 The Depth of technology application is insufficient, and the innovation capacity needs to be enhanced

Digitalization remains superficial. Some scenic spots only offer basic digital displays and lack in-depth interactive experiences. For instance, a research conducted by the Political Consultative Conference of Taian City found that the local digital cultural tourism projects are highly homogeneous, the level of cultural and creative products is not high, and the construction of marketing platforms lags

behind^[2]. The application of cutting-edge technologies is limited. The application of technologies such as virtual reality and the metaverse is mostly concentrated in top scenic spots, and the content lacks innovation^[3]. For instance, some VR projects in scenic spots merely repeat the display of fixed scenes, lacking dynamic interaction and the exploration of cultural connotations.

2.2.3 Shortage of Talents Restricts Industrial Upgrading

There is a shortage of versatile talents. There is a serious shortage of talents who are proficient in both cultural tourism and digital technology^[4]. The 2023 provincial special job fair for cultural and tourism enterprises shows that there are 16,300 job demands both online and offline, with a particular shortage of talents in new positions such as tourism e-commerce and digital marketing. There is a disconnection between the training provided by colleges and universities and the demands of industries. The curriculums of cultural and tourism majors in colleges and universities in the province are outdated, and digital practical teaching is insufficient, resulting in graduates being unable to meet the demands of enterprises for skills such as digital content creation and data analysis.

2.2.4 Insufficient Development and International Promotion of Culture IPs

The value of IP has not been fully explored. The digital transformation of top cultural IPs such as Mount Tai and the Confucian Temple is insufficient, and most of the derivative products are traditional souvenirs, lacking creative design. For instance, the development of the "Three Confucian Sites" IP in Qufu still mainly focuses on tickets and books, and the issuance of digital collections is limited. The international communication capacity is weak. The international expression of cultural and tourism content is insufficient, and the overseas marketing channels are single. Although Shandong launched the "Hometown of Confucius" IP at the Hong Kong International Licensing Show, its international market influence still lags behind that of similar cultural brands such as Xi'an and Dunhuang.

2.2.5 The Insufficient Coordination between Policy Support and Market Mechanisms

The implementation effect of the policy needs to be improved. Some policies have the problem of "emphasizing planning but neglecting implementation". For instance, the utilization of the cultural and tourism development fund is inefficient, and the average budget execution rate of central and provincial cultural relics protection funds in 2021 was less than 65%. Insufficient vitality of market entities. The integration of state-owned cultural and tourism enterprises lags behind. The assets of Shandong Cultural and Tourism Group are only 13.1 billion yuan, which does not match its status as a major tourism province. Private small and medium-sized enterprises face difficulties in financing and lack financial support for digital transformation^[5].

3. Analysis of Classic Cases of Digital Economy Facilitating the Integrated Development of Culture and Tourism

3.1 "Digital Brain" in West Lake in Hangzhou: A Benchmark Practice for Smart Scenic Spots

West Lake in Hangzhou has built a "digital brain" through technologies such as the Internet of Things, artificial intelligence, and big data, achieving an all-round digital upgrade from management to service.

3.1.1 Resource Protection and Ecological Environment Monitoring

In terms of intelligent monitoring of water quality in the West Lake, the West Lake Water Area Management Office has carried out automatic monitoring at key points such as the Lake Center Pavilion, Taiziwan, and Shengtang Weir. It uses intelligent facilities to conduct various forms of water quality monitoring on the West Lake water surface, water body, and important locations around the scenic area^{[6][7]}. In terms of vegetation protection and monitoring, Internet of Things (IoT) technology is applied to conduct real-time monitoring of ancient and famous trees and other vegetation within the West Lake scenic area, including their growth environment and pest and disease conditions. Once any abnormality is detected, relevant departments are promptly notified for handling, achieving precise protection of vegetation resources.

3.1.2 Traffic Management

In terms of addressing illegal parking of vehicles, intelligent platforms such as the Huagang Vehicle Illegal Parking Governance Platform have been established. Machine vision is used to replace human vision for the management of illegal parking of vehicles. It can automatically identify, track and magnify, and recognize license plates for the illegal parking of motor vehicles and non-motor vehicles, accurately

and quickly collect evidence, issue warnings to persuade people to leave, and remind tourists to park legally, reducing the risk of illegal parking tickets. Multiple intelligent platforms are adopted to monitor the dynamic changes of traffic flow in real time and analyze and warn of road congestion.

3.1.3 Passenger Flow Management

For the monitoring and early warning of tourist flow at popular scenic spots, intelligent platforms for tourist flow control have been built at popular scenic spots such as the West Lake Broken Bridge, North Peak, and Musical Fountain. With the help of artificial intelligence technology, the number of tourists can be automatically identified, and the real-time changing trends of tourist flow can be dynamically detected and analyzed. Through the "Cloud West Lake" mini-program, the comfort level of each scenic spot is displayed in three colors: red, yellow and green, reminding citizens and tourists to visit the scenic spots during off-peak hours. This enables tourists to understand the congestion level of the scenic spots in advance and plan their trips reasonably.

3.1.4 Tourist Services

The "Cloud West Lake" mini-program provides tourists with "full-process, one-stop and personalized" public information services for tourism. The scenic area also has an AR intelligent digital platform, has developed a variety of AR series cultural and creative products, and introduced AR explanations to create a richer and more vivid guided tour service for tourists. When tourists stroll along the West Lake, the AR explanations can provide detailed introductions to the scenic spots and tell historical stories and cultural legends.

3.1.5 Scenic Area Management

The comprehensive intelligent control platform assists law enforcement. Taking the "Comprehensive Intelligent Control Platform" of Huagang Management Office as an example, it can adopt an efficient facial monitoring and comparison system to issue early warnings, helping managers of scenic area identify wild guides in the first place, providing strong evidence of intelligent decision-making and business closed-loop management, based on massive data, achieve fully intelligent management in all links of scenic area event monitoring, data analysis, risk early warning, decision generation, problem handling, and result feedback, improving the quality and efficiency of business closed-loop disposal.

3.1.6 Intelligent Marketing

The West Lake has launched the West Lake Integrated AR intelligent Digital Platform and developed a series of AR cultural and creative products such as the AR Pandar fan co-branded with Hangzhou Zoo and the "One Card, One Fortune" AR card game. It launched the "AI+ West Lake in Hangzhou Music Fountain AR Show Project" titled "The Man is refined and handsome, the Talented Man Painted Blue and White", and at the same time, introduced a brand-new Chinese-style figurine of Zhou Tongxue to convey the "city cultural Tourism business card" to the target user group, exploring a new model of integrated development of "culture + business + tourism" for city cultural tourism. When tourists "touch" the smart blue ring of the Broken Bridge with Unmelted Snow, it can trigger the real-person voice explanation of the virtual tour guide "Hang Xiaoyi", simultaneously presenting the poetic atmosphere of "Broken Bridge with Unmelted Snow" described by the literati of the Song Dynasty, and recommending relevant routes or photography spots based on the current weather.

3.2 Dunhuang Grottoes "Digital Caves of the Thousand Buddhas": Global Sharing of Cultural Heritage

Through nearly 30 years of digital exploration, the Dunhuang Academy has completed the collection of murals from 295 caves, the image stitching from 186 caves, and the 3D reconstruction of 45 painted sculptures, generating over 300TB of digital resources. By 2025, Gansu Province raised 23.76 million yuan to obtain over 100,000 high-definition pictures of Dunhuang cultural relics from overseas collections, and built a "Digital Caves of the Thousand Buddhas" database for global sharing.

3.2.1 Exploring Dunhuang - Digital Dunhuang Immersive Exhibition

The "Seeking Dunhuang" project created by the Dunhuang Academy, taking Cave 285 of the Mogao Caves as its prototype, has achieved a 1:1 digital restoration of the caves by applying technologies such as VR, 3D modeling, and physical rendering with game engines. After wearing VR glasses, tourists can freely zoom in and out of the details of the murals, and even "fly" into the cave ceiling to observe the brushstrokes and color gradients. At the same time, they can interact with characters such as "Thunder God" in the murals through eye-tracking and gesture recognition technology. The project is also equipped

with an online mini-program, offering knowledge explanations and AR group photo functions. After the visit, visitors can generate commemorative videos interacting with virtual characters in the XR virtual studio, meeting the needs of social sharing. This project also extends cultural experiences online through technological means. Global users can access over 6,500 high-definition resources through the "Digital Dunhuang - Open Material Library", achieving the sharing and secondary creation of cultural resources.

3.2.2 Mogao Grottoes Digital Exhibition Center

The Digital Exhibition Center was put into use in 2014, pioneering a smart tourism model that combines digital exhibitions with on-site visits. Visitors need to watch the films "Thousand-Year Mogao" and "Dreamy Buddha Palace" first, allowing them to closely observe details such as flying apsaras and sutra transformation paintings in a virtual space. After watching the film, tourists were diverted to 12 on-site visiting routes, each of which included 8 caves. The guides provided in-depth interpretations in combination with digital content. This model has increased the daily visitor capacity of the Mogao Caves from 3,000 to 6,000. The time tourists stay in the caves has been reduced by 40%, but the amount of information they obtain has increased by more than three times.

3.2.3 Digital Caves of the Scriptures - Trans-Temporal Museum of Samadhi

The "Digital Caves of the Thousand Buddhas" project utilizes game engines and cloud gaming technology to replicate the original appearance of Caves 16 and 17 of the Mogao Caves and the Caves of the Thousand Buddhas with millimeter-level precision. Users can enter the virtual space through the "Cloud Tour of Dunhuang" mini-program, have conversations with historical figures such as Master Hong Bian, and explore the historical background of over 60,000 cultural relics inside the caves. The project also integrates digital resources of 21 cultural relics from overseas institutions such as the British Library and the Guime Museum in France. Users can compare scriptures and silk paintings from different periods online. Through cloud gaming technology, users can enjoy a film-quality visual experience without downloading large software. After its launch, the global visit volume exceeded 22 million.

3.2.4 Preventive Protection Monitoring and Early Warning System

The Dunhuang Academy has deployed over 600 sensors in the Mogao Caves to collect real-time data such as temperature, humidity, carbon dioxide concentration and visitor flow in the caves, and dynamically adjust the visiting routes through big data analysis. When the environmental indicators of a certain cave approach the threshold, the system automatically issues a warning, suspends opening and ventilation until the indicators return to normal, and at the same time guides tourists to other caves. In addition, the scenic area has introduced a cloud terminal access control system, which supports multiple entry methods such as QR codes, ID cards, and facial recognition, and enables multiple entries with one ticket, reducing the queuing time for tourists.

3.2.5 Digital Sponsors: Cultural Relics Protection Practices involving the participation of all citizens

Through the "Digital Sponsor" project initiated by the Tencent Charity platform, users can become "Digital Sponsors" by donating 0.9 yuan, receive exclusive "Smart Capsules", and participate in the digital protection of the murals in Cave 55 of the Mogao Caves. The interactive Dunhuang Future Museum launched by the project simulates the weathering process of murals, allowing users to directly experience the fragility of cultural relics and thereby stimulating their awareness of protection. As of 2020, the project has raised over 1.9 million yuan in donations, completed the digital collection of Cave 55, and made the results available for public viewing. Combined with the "Cloud Tour of Dunhuang" mini-program, users can also obtain the stories of murals every day, customize personalized content, and form a closed loop of online learning - offline experience - public welfare participation.

3.3 The Grand Tang Mall in Xi'an city: The Secret of Chasing more Video Views for Immersive Cultural Tourism

The Grand Tang Mall in Xi'an city takes "Prosperous Tang culture" as its core and integrates VR, AR, digital performances and other technologies to create immersive experience scenes. The block combines traditional culture with modern consumption scenarios through forms such as Hanfu rental, digital light and shadow shows, and NPC interactions. In 2024, it received 74.75 million tourists, with over 75% of them coming from outside the province, making it a phenomenon-level IP of "national trend cultural tourism".

3.3.1 Intelligent Navigation and Services

The Grand Tang Mall in Xi'an city has launched a digital cultural, commercial and tourism mini-

program, with the AI virtual character "Tang Xiaobao" at its core, providing comprehensive services for tourists. The intelligent facilities are integrated. Multiple 5G base stations have been built in the block to achieve full coverage of 5G signals. High-density probe-type wireless Wi-Fi is also adopted to ensure smooth network access for tourists. Meanwhile, it integrates functions such as wireless Wi-Fi, music broadcasting, video surveillance, and facial recognition, providing convenience for tourists. Tourists can also shop easily and conveniently by "face scanning" anytime and anywhere.

3.3.2 Upgrade of Cultural Experience

The "Dayan Pagoda Flowing Light" immersive AR show takes the Dayan Pagoda as its temporal and spatial background, superimposing virtual digital content onto the real space. Through AR glasses, visitors can enjoy multi-dimensional audio-visual experiences and appreciate the past and present of the Dayan Pagoda as well as the prosperous scenes of the Tang Dynasty. In order to obtain Tang Chao Ren Series Folding Fan AR Experience, people need to open the dedicated mini-program, scan the folding fan with their phone's camera, and people can experience Li Bai reciting familiar poems. The construction of the VR Experience Center of The Grand Tang Mall features projects such as the Dark Chariot and the Enjoying Light Wheel, allowing citizens and tourists to travel through time and space and immerse themselves in a magical world of the unknown and science fiction.

3.3.3 Smart Security and Management

The establishment of a smart security command center, based on actual conditions, attempts to control lights and provide immersive experiences. When the density of people in the scenic area is too high, emergency plans can be activated, etc., providing guarantees for the safety and convenience of tourists. The scenic area has installed over 170 multi-functional integrated poles, 420 sets of surveillance cameras and 263 sets of broadcasting facilities in the main streets, enabling one-click emergency calls. It has also created a large data screen for monitoring, analyzing and perceiving the flow of visitors. Through the 5G network environment, 4K high-resolution video surveillance has been widely applied, allowing for a comprehensive understanding of the situation within the streets.

3.3.4 Smart Consumption Scenarios

The Grand Tang Mall is the first digital RMB characteristic demonstration street in Xi'an city. It has fully implemented the facial recognition payment system. Most of the shops in the street are equipped with facial recognition devices, and the proportion of facial payment is over 90%, providing tourists with a convenient shopping and payment experience. Unmanned convenience stores of smart facilities have been set up in the block, allowing tourists to shop by themselves. This further enhances the convenience of the shopping experience and meets the consumption demands of tourists during their visit.

4. The Path for the Integration of Culture and Tourism in Shandong Province Facilitated by the Digital Economy

4.1 Building a Digital Governance Path of "All-domain Collaboration"

4.1.1 Regional Coordinated Development

With the core of breaking down regional barriers and promoting resource integration, a layout of "the whole province as one chessboard" should be achieved. We need to establish a spatial pattern of "dual core leadership of Jinan and Qingdao, linkage of the Yellow River Cultural and tourism belt, and supplementation of the cultural and tourism circle in southern Shandong", and connect core resources such as Mount Tai, the Three Confucian Sites, and the Yellow River estuary through digital technology to create cross-regional theme tourism routes (such as the "Digital Experience Corridor of Confucian Culture" and the "Digital Ecological Belt of Yellow River Culture"). We need to implement the "Digital Cultural Tourism Assistance Program", encouraging Jinan and Qingdao to export technology, talents and operational experience to regions such as Heze and Binzhou, and reduce regional development gaps through the joint construction and sharing of smart platforms.

4.1.2 Cross-departmental Collaborative Governance

We need to establish a provincial leading group for the integration of digital culture and tourism, coordinate resources from departments such as culture and tourism, transportation, science and technology, and big data, and set up a "monthly dispatch and quarterly assessment" mechanism to promote policy implementation and project coordination. We need to formulate the "Cultural and Tourism Data Sharing Management Measures of Shandong Province", clearly defining data ownership,

sharing standards and security norms, and achieve data interface intercommunication among 12 departments including culture and tourism, meteorology and transportation by 2026.

4.2 Deepening the innovative application path of "Technology Empowerment"

4.2.1 Digital Activation of Cultural Resources

With the core of penetrating application of technology, we need to promote the upgrade of cultural and tourism integration from "digital display" to "intelligent experience". We should implement the "Shandong Cultural IP Digital Rebirth Plan", conduct 3D modeling and immersive transformation of the Taishan Fengshan culture, Qufu Confucian culture, Yimeng Red Culture, etc., develop projects such as "Metaverse Taishan" and "Digital Three Confucian Sites", and achieve the perception, interaction and dissemination of cultural scenes. We need to establish a provincial digital database of cultural heritage, integrate the collection resources of museums such as Qingzhou Museum and Shandong Museum, and provide open apis for enterprises to develop digital cultural and creative products.

4.2.2 Full-Chain Upgrade of Smart Services

The "Hospitality Shandong Online Tourism of Qilu" platform has been upgraded to a "one-stop smart cultural and tourism hub", adding new functions such as "AI Itinerary Planning", "Real-time Flow Warning", and "Cross-border Payment Facilitation". By the end of 2025, data from over 80% of 4A-level scenic spots and cultural and museum venues across the province will be connected. We need to promote the "One Code Pass" service, integrate scenarios such as ticket reservation, transportation connection, and consumption payment, and realize "one mobile phone tour of Shandong". It refers to lightweight applications such as "face recognition payment" and "intelligent tour guide" in the Grand Tang Mall to lower the threshold for tourists to use it.

4.3 Cultivating an Industrial Ecosystem Path of "Digital and Intelligent Integration"

4.3.1 Innovation in Digital Business Models

In market-oriented manner, we need to promote the integration of digital technology with the entire chain of the cultural and tourism industry to give rise to new business forms and models. Integrated business forms such as "culture and tourism + e-sports", "intangible cultural heritage + live streaming", and "scenic spots + murder mystery games", for instance, are all developed. We need to develop an AR real-scene murder mystery game in Taierzhuang Ancient Town, and create an immersive plot by combining the history of the War of Resistance against Japanese Aggression. The "AI Ceramic Master" system has been launched in Zibo Ceramic Town to generate personalized ceramic design plans for tourists. We need to support leading enterprises in building digital cultural tourism industrial parks, introduce supporting enterprises such as VR/AR content production, digital marketing, and big data analysis, and form a closed loop of "creation - production - distribution - consumption".

4.3.2 Digital Transformation of Small and Medium-Sized Enterprises

We need to implement the "Digital Cultural Tourism Partnership Program", where the government purchases services to provide lightweight digital tools (such as intelligent ticketing systems and short video marketing templates) for small and medium-sized scenic spots and homestays. By 2026, the digital coverage rate of small and medium-sized cultural tourism enterprises in the province should exceed 60%.

4.4 Creating an International Communication Path for "Cultural Export"

4.4.1 International Development of Digital IP

With the goal of enhancing cultural influence, we should promote the global expression of Shandong's cultural and tourism IPs. Focusing on core IPs such as Confucius culture and Mount Tai culture, we collaborate with overseas institutions to develop multilingual versions of digital collectibles and VR documentaries (such as the VR experience of "Confucius' Travels Around the States"), and reach global users through platforms like Steam. The "Digital Shandong Cultural Tourism Exhibition" will be held in the countries along the "Belt and Road", using technologies such as holographic projection and interactive installations to showcase the Yellow River culture and Marine culture, and establishing overseas dissemination nodes of "Confucius Institute + Digital Cultural Tourism Experience Center".

4.4.2 Cross-border Marketing Innovation

In collaboration with platforms such as TikTok and YouTube, we launched the "Check-in in Digital Shandong" challenge, inviting overseas bloggers to experience Shandong's digital cultural and tourism projects (such as VR live streaming of Qingdao Underwater World and AI tour guides of Mount Tai), thus creating a social viral spread.

5. Conclusion

Shandong Province has achieved phased results in the integration of digital economy and cultural tourism, but it still needs to break through bottlenecks such as regional coordination, data sharing, technological innovation, and talent supply. In the future, it is necessary to strengthen top-level design, promote resource integration and cross-departmental collaboration. We should strengthen technological research and development and application innovation to enhance the digital transformation capacity of cultural IPs. We need to improve the talent cultivation system, optimize policy support and market mechanisms, so as to achieve in-depth and coordinated development of the digital economy and cultural tourism integration, and promote the high-quality development of the cultural tourism industry in Shandong Province.

Acknowledgement

Research Project on Culture and Tourism of Shandong Province: "Research on the Internal Mechanism and Realization Path of Digital Economy Facilitating the Integration of Culture and Tourism in Shandong Province"(22WL (Y) 257); Taian Science and Technology Innovation Development Project (Policy Guidance Category): "Research on the Evaluation and Improvement Strategy of Barrier-free Tourism Experience in Mount Tai Scenic Area"(2024ZC042).

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