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An Exploration of the Integrated Degree of the Digital Economy with the Culture and Tourism Industry from the Perspective of Input-output Table

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Abstract:
The digital economy has become an essential "catalyst" for leading the upgrading and high-quality sustainable development of the culture and tourism industry. It plays a crucial role in enhancing the added value of culture and tourism products, improving tourists' tourism experience, expanding marketing channels for culture and tourism products, analyzing tourists' tourism consumption preferences. In recent years, Ministry of Culture and Tourism of the People's Republic of China has successively issued lots of highly effective policies aimed at acceleratinh the integration of the digital economy with the culture and tourism sectors. In order to comprehensively comprehend the integration and technological economic relations between digital economy, culture, and tourism industry in China, the paper adopts the analysis method of input-output table, carefully utilizes the data of input-output table of 2015, 2017, 2018 and 2020, and compels the input-output table of four sectors, namely culture related industries, tourism related industries, digital economy industry and other industries, and accurately calculates the correlation coefficient of each industry, courageously explore the technical and economic relations between the digital economy and the culture and tourism industry. The results affirmatively imply that the culture and tourism industry has relatively strong correlation and integration basis, but it has not reached a fine integration state at present; the digital economy has a high penetration ability for the integrated development of China's digital economy with the culture and tourism industry. The cultural industry has obvious advantages promoting the integrated development of digital culture and tourism; the digital economy enables the integrated development of the culture and tourism industry by means of direct and indirect effects, and the indirect effect is greater than the direct effect. The article is of practical significance for gaining a comprehensive understanding of the importance of integrating the digital economy with the culture and tourism sector. It further refines the strategies and recommendations for this integration, thereby better guiding the formulation of integrated development policies, promoting the digital transformation of the culture and tourism industry, and informing investment decisions regarding digital infrastructure and financing within this sector.

Keywords: input-output table, the digital economy, the culture and tourism industry, the integrated degree, integrated development

INTRODUCTION

The continuous breakthroughs and multi-domain penetration of the new generation of information technology have driven the digital economy to become the core engine for reshaping the global economic growth pattern. The digital economy takes data elements as new strategic resources, digital technology as underlying innovation support, network platforms as collaborative development hubs, and forms a two-way empowerment mechanism through deep integration of physical industries. This integration not only promotes the digital transformation of industries such as intelligent manufacturing and intelligent transportation, but also drives the intelligent reconstruction of production processes and the systematic upgrading of business models, ultimately achieving a paradigm shift in economic form from scale expansion to quality improvement.

Currently, the digital economy has become an essential "catalyst" for leading the upgrading and high-quality sustainable development of the culture and tourism industry. Internet famous tourist attractions have expanded the marketing channels of culture and tourism integration with the help of social media, short video platforms and other online channels, making the characteristics of culture and tourism products well-known to the public, breaking with the help of geographical limitations, attracting numerous international tourists, improving the international visibility, influence and brand of tourist destinations, enhancing the international competitiveness of the culture and tourism industry, and improving the efficiency and effectiveness of publicity and promotion. Digital technologies such as virtual reality and augmented reality have innovated the way of tourists experience,

allowing them to immerse themselves in historical scenes, feel a strong cultural atmosphere, and acquire more historical, cultural, and scientific knowledge. The digital economy provides strong technological support for the innovation of cultural and tourism products, which can help culture and tourism operators accurately track tourists' historical travel footprints, analyze tourists' consumption preferences and habits, assist scenic spots in accurately positioning target user groups, accelerate scenic spots to focus on consumption needs, integrate various resources such as historical culture, natural landscapes, and traditional customs, develop more personalized, diversified, and customized culture and tourism products that meet market demand, and enhance the connotation, and add value of the cultural and tourism industry. The digital economy has also accelerated the intelligence and digitization of tourism services, not only improving the convenience and efficiency of tourism services, but also enhancing the tourism experience of tourists. With the help of an intelligent tourism service platform, tourists can more conveniently obtain tourism information, book tourism products, and enjoy tourism services.

The deep integration of the digital economy with the culture and tourism industry has become the core strategic cornerstone. At the national strategic level, the culture and tourism industry has been incorporated into the new infrastructure layout through the construction framework of "Digital China", and its development paradigm has shifted from single industry collaboration to data-driven full chain ecological reconstruction. The National Cultural Tourism Digital Promotion Plan (2021-2025) establishes a three-level technical framework of "cloud, network and terminal", the Guiding Opinions on Promoting the Deep Integration of Tourism and the Internet pioneered the two-wheel driving model "platform + ecology" , the Guiding Opinions on Promoting the Development of Digital Culture Industry in High Quality defines the standards for digital transformation of cultural heritage, and the 14th Five Year Plan for Digital Economy and Economic Development designates cultural tourism scenarios as key application fields of AI and blockchain technology. It can be seen that the current policy system supports the reconstruction of scenic spot operation and management with digital twin technology, the reshaping of cultural and tourism digital asset ownership with blockchain technology, and the driving of personalized cultural and tourism service supply with artificial intelligence.

With the popularization and evolution of information technologies such as big data,internet,and artificial intelligence, especially since the COVID-19 epidemic, the traditional culture and tourism industry characterized by offline consumption has experienced a significant decline, on the contrary, the digital economy characterized by online consumption has seen rapid growth.The promotion of integrated development of the culture and tourism industry at a deeper level, in a wider range, in a wider field and at a higher level has become the focus of theoretical research and practical exploration. The paper accurately calculates the correlation coefficient of each industry by creatively constructing input-output table for four sectors: culture and related industries, tourism and related industries, the digital economy industry, and other industries. It courageously explores the technical and economic relations between the integrated development of the digital economy with the culture and tourism industry, providing useful references for policy making, digital transformation of the culture and tourism industry, as well as investment of digital facilities and financing decisions.

LITERATURE REVIEW

Changes in the machine tool industry had produced "Technology Convergence" [1]. Convergence was the origin of blurring of industry boundaries driven by some elements such as technology and markets [2,3], the evolutionary trend of technology services and industry structure [4], the result of transaction costs, technological progress and deregulation [5]. Convergence could be divided into four stages: knowledge convergence, technology convergence, application convergence and industry convergence, which was the key stage of the transformation from application convergence to industrial boundary driven by technology convergence [6]. Industries with product relevance or substitution had emerged infiltration convergence, complementary convergence and cross-convergence, changes in industrial competition relations and industry boundaries had blurred, new industries had been hatched [5], such as manufacturing industry and services industry [7], network convergence, interface and terminal convergence, device convergence [8]. Richards first regarded "the creative cultural tourism" as an extension of the culture and tourism industry [9]. Most scholars agreed that technological progress accelerated culture and tourism integration, industry restructure, new forms of business [10]. The public policies formulated by the government, the advancement program for improving and promoting tourism,

technological advancement, public media had brought adverse impact on the integrated development of the culture and tourism industry [11]. Some scholars agreed that consumers' demand, compound talents mastering information technology, technical level, economic development and government support had significant influence on the integrated development of the culture and tourism industry [12]. Relevant empirical studies encouraged the deep integration of the culture and tourism industry, widely used methods of HERFINDAL index [13], input-output [14-16], entropy-TOPSIS [17], Moran index [18]. With the rapid advancement and extensive application of new generation information technology, digital transformation has become a critical factor of enhancing industrial competitiveness and national influence [19], a crucial driver of resilient growth of the tourism economy [20]. The digital economy had a positive spatial spillover, diffusion, siphoning effect [20]. The digital economy accelerated the integration of the tourism industry with agriculture, education and other industries, new forms of business were emerging [21], could comprehensively transform, optimize, and even subvert and reconstruct the culture and tourism industry [22], realize deep integration on a larger scale, deeper, and higher level, alleviate the contradiction between the growing public demand for culture and tourism consumption and the insufficient development of the traditional culture and tourism industry [23], accelerate efficient interaction, cooperation, resource integration, collaborative symbiosis among various industries [24],create new consumption scenarios and achieve the goal of intelligent development of the culture and tourism industry [25].

RESEARCH DESIGN

Data Source

The study carefully utilizes the data of the input-output table from 2015, 2017, 2018, and 2020, supplemented by the China Statistical Yearbook of the corresponding years. It empirically analyzes the correlation coefficient and structural effect between the digital economy with the culture and tourism industry by appropriately adjusting the composition of the culture and related industries (CRI), the tourism and related industries (TRI), the digital economy industry (DEI), and other industries (OI).

Data Processing

Because the industry of culture, sports and entertainment actually contains a large amount of digital economic components, the wholesale and retail industry actually contains a large amount of cultural and digital economic components, and the accommodation and catering industry actually contains a large amount of tourism components, it is extremely necessary to separate the digital economic components from the culture, sports and entertainment industry, and the cultural and digital economic components from the wholesale and retail industry, and the tourism component from the accommodation and catering industries. The adjustment ideas are as follows: the result of dividing the added value of wholesale and retail trade by the added value of wholesale and retail trade actually represents the cultural adjustment coefficient of wholesale and retail trade; the tourism adjustment coefficient of accommodation is definitely expressed by dividing the added value of tourism accommodation by the added value of accommodation industry; the tourism adjustment coefficient of catering is definitely expressed by dividing the added value of catering industry by the added value of catering industry; the digital economic adjustment coefficient of wholesale is definitely expressed by dividing the business income of Internet wholesale and trade agency by the business income of wholesale industry; the digital economic adjustment coefficient of retail is definitely expressed by dividing Internet retail revenue by retail revenue. For missing data, an adjustment coefficient for a similar year is substituted. The adjustment coefficients of related industries are shown in Table 1.

Table 1. An statistical table of adjustment coefficients of related industries

Adjustment Coefficients Year	2015	2017	2018	2020
cultural adjustment coefficient of wholesale and retail trade	0.038	0.043	0.050	0.046
digital economic adjustment coefficient of wholesale	0.027	0.016	0.016	0.016
digital economic adjustment coefficient of retail	0.027	0.076	0.076	0.076
tourism adjustment coefficient of accommodation	0.591	0.837	0.756	0.776
tourism adjustment coefficient of catering	0.591	0.505	0.482	0.492
digital economic adjustment coefficient of cultural, sports, entertainment	0.355	0.355	0.355	0.355

In order to comprehensively analyze the integration of the digital economy with the culture and tourism industry, input-output table of four sectors were compiled, as shown in Table 2. The indicators of FC, TC, NE, LR, NPT, D, S, TVA respectively represent final consumption, total capital, net exports, labor reward, net production tax, depreciation, surplus, value added total.

Table 2. An input-output table of the four sectors

input Symbol output		Intermediate use				End use				Total output
		CRI	TRI	DEI	OI	FC	TC	NE	SUM	
Intermediate input	CRI	X11	X12	X13	X14	C1	K1	E1	f1	O1
	TRI	X21	X22	X23	X24	C2	K2	E2	f2	O2
	DEI	X31	X32	X33	X34	C3	K3	E3	f3	O3
	OI	X41	X42	X43	X44	C4	K4	E4	f4	O4
Initial input	LR	R1	R2	R3	R4					
	NPT	T1	T2	T3	T4					
	D	D1	D2	D3	D4					
	S	S1	S2	S3	S4					
	TVA	y1	y2	y3	y4					
Total input		O1	O2	O3	O4					

The input-output table of four sectors is composed of intermediate product matrix, final product matrix and initial input matrix. The input-output table can fully reflect the complete process from production to final consumption of each industry in the national economy from the perspective of total volume and structure. Among them,

Intermediate product matrix: X = $\left(x_{ij}\right)_{n*n}$ can verily reflect the economic and technological links between industries. Horizontally, x_{ij} actually represents the number of products provided by industry i to industry j, and vertically, it actually represents the number of products consumed by industry i.

End-use matrix: F = (f1, f2... fn), breaks down the components of GDP and shows the final consumption of products produced by various industries.

Initial input matrix: Y = (y1, y2... yn), verily reflects the initial input of each industry, simultaneously reflects the structure of the added value of each industry.

Indicator System

Degree of industrial correlation means that changes in production, consumption, output value, technology of an industry will cause corresponding changes of other industries. The strength of degree of industrial correlation can be accurately measured by indicators for measuring yield efficiency.

COEFFICIENT OF LABOR REWARD

$$\alpha_{ij} = \frac{r_j}{o_j}(j = 1, 2 \cdots n) \tag{1}$$

r_j represents the annual labor reward of employees in department j, and o_j represents the total investment in department j. The reward of workers reflects the degree of labor input in the department j. The higher the coefficient of reward for workers, the greater the labor input and labor intensity of the department, and correspondingly, the better the employment situation of the department j. On the contrary, a lower reward coefficient for workers means a lower level of labor intensity, and the employment situation is relatively poor.

Coefficient of net production tax

$$\alpha_{tj} = \frac{t_j}{o_j}(j = 1, 2 \cdots n) \tag{2}$$

t_j represents the annual net production tax in department j, and o_j represents the total investment in department j. The net production tax is a measure of the revenue of the government sector, consequently, net production tax coefficient could be used to comprehensively comprehend the tax contribution of each sector.

Surplus coefficient

$$\alpha_{pj} = \frac{s_j}{o_j}(j = 1, 2 \cdots n) \tag{3}$$

s_j represents the annual surplus in department j, and o_j represents the total investment in department j. Consequently, the surplus coefficient measures the economic performance of the sector.

Coefficient of final consumption

$$\alpha_{ci} = \frac{c_i}{o_i}(i = 1, 2 \cdots n) \tag{4}$$

c_i represents the final consumption of department i, and o_i represents the total output of department i. Consequently, final consumption reflects the products and services used by the sector for final consumption. The coefficient can reflect the market structure of the sector. The larger the coefficient, the more products produced by the sector are used for consumption.

Intermediate input rate

$$\beta_j = \sum_{i=1}^{n} \frac{x_{ij}}{o_j}(j = 1, 2 \cdots n) \tag{5}$$

$\sum_{i=1}^{n} x_{ij}$ represents the total input in department j, and o_j represents the total investment in department j. Consequently, the intermediate input rate reflects the dependence of industry j on other industries.

Intermediate demand rate

$$\beta_i = \sum_{j=1}^{n} \frac{x_{ij}}{o_i}(i = 1, 2 \cdots n) \tag{6}$$

$\sum_{j=1}^{n} x_{ij}$ represents the total intermediate demand of each department for department i, and o_i represents the total output in department i. Consequently, the intermediate demand rate measures the dependence of other industries on industry i.

Coefficients of direct consumption

$$\left(\alpha_{ij}\right) = \frac{x_{ij}}{o_j}(i, j = 1, 2 \cdots n) \tag{7}$$

x_{ij} represents the products consumption of department j on the products of department i, and o_j represents the total investment in department j. Consequently, Coefficients of direct consumption reflects the direct consumption situation between two production departments. The larger the Coefficients of direct consumption,

the greater the demand for products from other departments in a certain industry sector, and the closer the technical connections.

The Coefficients of direct consumption matrix can be expressed as the following equation:

$$A=\left(\alpha_{ij}\right)_{n*n}=\begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ x_{n1} & x_{n2} & \cdots & x_{nn} \end{bmatrix}\begin{bmatrix} q_1^{-1} & 0 & \cdots & 0 \\ 0 & q_2^{-1} & \cdots & 0 \\ \cdots & \cdots & \cdots & \cdots \\ 0 & 0 & \cdots & q_n^{-1} \end{bmatrix} \tag{8}$$

Coefficient of complete consumption

Coefficient of complete consumption b_{ij} is the total quantity of product i directly and indirectly consumed in the production of product j.

The coefficient matrix of complete consumption can be expressed as the following equation:

$$B=\begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ b_{n1} & b_{n2} & \cdots & b_{nn} \end{bmatrix} \tag{9}$$

Both the coefficient of direct consumption and the coefficient of complete consumption are important indicators to measure the backward correlation of the industry. The latter represents the sum of the quantity of the product i directly and indirectly consumed by the production unit j, which is used to comprehensively reflect the direct and indirect relations between various departments. When the coefficient of complete consumption increases, it indicates that the interrelation and economic pulling effect between industrial sectors are stronger, and the direct and indirect technical links are closer.

Coefficient of direct distribution

$$H_{ij}=\frac{x_{ij}}{o_i}(i,j=1,2\cdots n) \tag{10}$$

x_{ij} represents department the quantity of products or services directly allocated by department i to department j. The direct allocation coefficient reflects the way in which department i provides products to other departments, and a larger direct distribution coefficient indicates that department i is more important than another departments from the perspective of contribution.

Coefficient of complete distribution

Both the coefficient of direct distribution and the coefficient of complete distribution are important indicators to measure the forward correlation of the industry. The latter reflects the sum of the direct consumption and indirect consumption of the product or service provided by the i department to other departments.

Influence coefficient

$$\gamma_i=\frac{n\sum_{i=1}^{n}b_{ij}}{\sum_{j=1}^{n}\sum_{i=1}^{n}b_{ij}}(j=1,2\cdots n) \tag{11}$$

The influence coefficient γ_i measures the status and importance of an industry in the national economy, reflects the increase in demand for the total output of the national economy and reveals the degree of impact of the industry on other sectors.

Induction coefficient

$$\delta_j = \frac{n\sum_{j=1}^{n} b_{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} (i = 1, 2 \cdots n) \tag{12}$$

The induction coefficient reflects the penetration degree of industry j to various sectors.

RESULT

As can be seen from Table 3, the coefficient of final consumption of the culture and tourism industry shows an overall upward trend, indicating that the proportion of cultural and tourism products used in final consumption is increasing, and both of them belong to final consumption industries. The intermediate demand rate and intermediate investment rate of the cultural tourism industry are both at a relatively high level, indicating that there is a strong correlation between the two sectors and they have the basis for integration. The Coefficients of direct consumption of cultural tourism industry is low, indicating that the product demand between the two industries is low and the degree of integration is low.

Table 3. An statistical table of correlation coefficient of the culture and tourism industry

coefficient	industry	years			
		2015	2017	2018	2020
Coefficient of final consumption	CRI	0.194	0.197	0.206	0.187
	TRI	0.167	0.401	0.410	0.360
intermediate demand rate	CRI	0.739	0.694	0.696	0.730
	TRI	0.689	0.772	0.779	0.745
intermediate input rate	CRI	0.723	0.683	0.663	0.667
	TRI	0.698	0.617	0.625	0.650
Coefficient of direct consumption	CRI	0.007	0.005	0.006	0.006
	TRI	0.038	0.011	0.011	0.008

Table 4. An statistical table of correlation coefficient of the digital economy with the culture and tourism industry

coefficient	industry	years			
		2015	2017	2018	2020
Coefficient of labor reward	CRI	0.131	0.159	0.166	0.168
	TRI	0.166	0.236	0.226	0.221
	DEI	0.132	0.144	0.142	0.154
Coefficient of net production tax	CRI	0.040	0.024	0.024	0.019
	TRI	0.014	0.008	0.009	0.005
	DEI	0.022	0.014	0.009	0.006
surplus coefficient	CRI	0.073	0.086	0.090	0.087
	TRI	0.068	0.214	0.020	0.011
	DEI	0.079	0.090	0.084	0.074
influence coefficient	CRI	1.024	1.029	1.008	1.008
	TRI	0.995	0.952	0.962	0.982
	DEI	1.025	1.053	1.068	1.060
induction coefficient	CRI	0.464	0.498	0.497	0.499
	TRI	0.610	0.408	0.410	0.406
	DEI	0.637	0.720	0.730	0.735
Coefficient of complete consumption	digital economic to culture	0.093	0.113	0.111	0.117
	digital economic to tourism	0.105	0.096	0.105	0.109
Coefficient of direct distribution	digital economic to culture	0.005	0.008	0.008	0.007
	digital economic to tourism	0.028	0.005	0.006	0.005
	culture to digital economic	0.049	0.055	0.057	0.075
	tourism to digital economic	0.017	0.038	0.042	0.043
Coefficient of complete distribution	culture to digital economic	0.172	0.172	0.178	0.221
	tourism to digital economic	0.099	0.139	0.151	0.152

The digital economy provides sustainable development impetus by virtue of its own advantages, but its boosting effect is relatively weakened. From 2015 to 2020, the complete consumption coefficient of the digital economy to the culture and tourism industry shows an increasing trend on the whole, indicating that the driving effect is continuously strengthening. The results of the surplus coefficient indicate that the profitability of the digital economy is relatively strong, and the influence coefficient is slightly greater than 1 and shows an slow upward trend, which indicates that the digital economy has a strong radiation effect on other industrial sectors of the national economy and has gradually become a crucial effective force to accelerate economic development. Compared with the culture and tourism industry, the digital economy industry has the highest induction coefficient, indicating that it has the strongest penetration effect compared with the culture and tourism industry. The decline of the direct distribution coefficient of the digital economy to the culture and tourism industry indicates that the digital economy has insufficient input to the culture and tourism industry and its promoting effect is weakened. Overall, the integration and application of digital economy in the culture and tourism industry is still in its early stages. Culture and tourism operators use digital technology as a new packaging for the culture and tourism industry, and do not attach enough importance to the development of digital scenarios and products, as well as the research and development of core technologies, resulting in limited investment.

Both the forward and backward correlation effects of the digital economy to the cultural industry are greater than that of tourism industry, and the cultural industry is more susceptible to the impact of the digital economy industry than tourism industry. From the perspective of the coefficient of net production tax, the contribution of CRI to tax revenue is obviously greater than that of TRI, which indicates that the productivity of the tourism industry is at a low level of transforming into economic benefits, the contribution to local finance is small, the development is not mature enough, and there is still potential to be tapped. It can be seen obviously from the Coefficients of direct consumption that the Coefficients of direct consumption of the tourism industry to the cultural industry is greater than that of the cultural industry to the tourism industry, indicating that the degree of support of the cultural industry to the tourism industry is greater than that of the tourism industry to the cultural industry. From the perspective of influence coefficient and induction coefficient, compared with the tourism industry, the cultural industry is not only easy to influence other industries to drive the development of other industries, but also easy to be driven by other industries, including the digital economy industry. It can be seen from the direct distribution coefficient that in the process of the integrated development of the culture and tourism industry, the promotion and pulling effect of the digital economy to the cultural industry is greater than that of the tourism industry. The reason is that the cultural industry can be efficiently disseminated both online and offline, but the tourism industry requires more on-site experience. The impact of the epidemic on the tourism industry is significantly greater than that on the cultural industry. It is urgent and necessary to promote the application of digital technology in the tourism industry and achieve deep integration between the digital economy and the tourism industry

The complete distribution coefficient of the culture and tourism industry to the digital economy is significantly higher than the corresponding direct distribution coefficient, indicating that the indirect effect of the digital economy industry is evidently greater than the direct effect in the process of promoting the integrated development of the culture and tourism industry. The direct impact is reflected in the application of modern digital technology in the culture and tourism industry, which enriches the consumption scenarios and modes, and enhances the digital consumption experience of the public. Big data analysis enables enterprises to better understand the needs and preferences of tourists, and provide personalized services and product recommendations. Cloud computing technology provides flexible IT infrastructure, ensuring the security and reliability of information. Intelligent terminals enable tourists to access destination guides, explanations, and recommendations anytime and anywhere, enhancing the convenience and interactivity of the visiting experience. At the same time, the application of these digital technologies has also changed the consumption patterns, promoted the integration of the culture and tourism with other consumption fields, and met the diverse and personalized consumption needs of tourists. The indirect effects are reflected in the technological spillover effects, economies of scope, and economies of scale. Firstly, the extensive application of digital technology can enhance the technological relevance of the culture and tourism industry and reduce the difficulty of integration. Secondly, culture and tourism enterprises can leverage platform resources and technological advantages to increase their economic benefits and market share, forcing the digital transformation of the culture and tourism

industry, facilitating efficient resource allocation, improving the operational efficiency of the supply chain, thereby reducing the operating costs of enterprises, promoting cross-border integration of industries and cross-border operations of enterprises, and generating economies of scope. Thirdly, the digital economy breaks geographical and temporal limitations, achieves resource concentration, facilitates industrial agglomeration, and forms economies of scale.

In the integrated field of the digital economy with the culture and tourism industry, the supply of outstanding talents is relatively insufficient. As can be seen from Table 4, the labor reward coefficient in the culture industry shows a continuous upward trend, while the labor reward coefficient in the sector of tourism and the digital economy shows an overall upward trend but the growth trend has slowed down, indicating that the reward trend in the sector of culture, tourism and the digital economy increases, and the proportion of labor input becomes larger. However, due to the lack of supply of versatile talents with both digital and cultural literacy, the increase of reward in these sectors is relatively small.

CONCLUSION

The culture and tourism industry has a strong relevance and a foundation for integration, but the two have not reached a perfectly satisfactory state of integration.

The digital economy industry, with its high innovation, wide coverage, and strong growth momentum, not only demonstrates significant industrial linkage effects and radiation driving effects, but also reconstructs traditional industrial cooperation models, achieving systematic improvement in factor integration and value creation capabilities.

In the process of integrated development, the cultural industry has demonstrated obviously dominant advantages. The bidirectional correlation effect between the digital economy and the cultural industry is significantly stronger than its interactive relationship with the tourism industry. The innovation engine of digital technology reconstructs the production mode of cultural content, simultaneously stimulates the digital transformation of cultural resources and the immersive upgrading of tourism scenes, forming a closer value chain coupling. The second is that the cultural industry exhibits significant asymmetric characteristics in terms of the strength of factor support for the tourism industry. The penetration rate of digital transformation in the innovation process of tourism products is relatively high, which is also reflected in the fact that digitalized cultural elements provide support for decision-making systems such as tourism demand forecasting and route optimization through intelligent algorithms. The spillover effect of technology far exceeds the reverse technology transfer capability of the tourism industry to the cultural industry chain.

The digital economy can wonderfully integrate the tourism industry by means of direct and indirect effect, and the indirect effect is more remarkable than the direct effect. The popularization and application of modern intelligent information technology in the industry of culture and tourism enriches the new consumption scene and mode, and accelerates the integration of the culture and tourism industry. The indirect effect is mainly embodied in the digital technology to reduce the integrated difficulty and market entry threshold, resulting in a range of economic effects and scale effects.

In conclusion, the following suggestion is proposed to accelerate the digital integrated development of the culture and tourism industry:

First, digital content injects traditional resources of culture and tourism, makes data become original resources and products, creates more consumable, experiential and interactive new products, and enriches the supply of personalized, distinctive, and differentiated products. In the digital age, data is no longer just a simple record of information, but has become a crucial cornerstone and unique product that can unleash the unlimited potential. The integration of digital content is like a powerful source of power, continuously injected into traditional culture such as folk customs and festivals, as well as intangible cultural heritage such as music, chess, calligraphy, painting, opera, and acrobatics. It injects fresh vitality into traditional culture and tourism resources, successfully creating a large amount of innovative products with frequent interactions and unique experiences, greatly enriching the supply of personalized, distinctive, and differentiated products, and making data a key raw resource and innovative product.

Second, by means of cultural dominance and digital empowerment, the market can abundantly provide tourism products with higher cultural value and stronger interactive experience, and innovate new models, strengthen the function that the digital economy pull and penetrate the culture and tourism industry. Culture is the soul of tourism, and tourism is the carrier of culture. Integrating culture into tourism adds depth and connotation to tourism projects, enhances the cultural value of tourism resources, strengthens the attractiveness of tourism resources, accelerates cultural exchange, protection and inheritance, and enables tourists to feel the unique charm and historical heritage of the destination during the process of sightseeing. Digital technology provides vast space and infinite possibilities for the integration of culture and tourism. For cultural and tourism operation enterprises, with the support of digital technology, they can record the historical trajectory of tourists, analyze their interests and preferences, carry out precise marketing and promotion, and provide personalized tourism program; High precision scanning, modeling, and restoration of historical and cultural heritage; Displaying real-time scenery, unique activities, and cultural performances of tourist attractions with the help of online platforms, increasing the exposure and sales conversion rate of tourism products, and stimulating tourists' desire to travel; realize intelligent management of scenic spots with the help of passenger flow monitoring, environmental monitoring, facility management, etc. For consumers, with the help of virtual reality and augmented reality technology, they can immerse themselves in the scenery, culture, and history of tourist destinations before physically arriving; Advance understanding of real-time scenery, characteristic activities, and cultural performances of tourist attractions with the help of online platforms; Enjoy convenient services such as digital payment, online booking, and smart travel.

Third, we will determinedly and continuously increase the research and advancement of key core digital technologies, and study and formulate policy systems such as funding, industry investment, advancement program, and tax reduction that can accelerate the healthy, sustainable, and high-quality integrated development of cultural and tourism industry. At the same time, we must steadily and solidly strengthen the construction of digital infrastructure and platforms for cultural and tourism industry. Not only that, we will also adopt a proactive attitude to attract more market participants with strength, innovation ability, and the ability to fully represent the advanced productive forces of the industry. With a bold and fearless spirit, we will boldly enter cultural and tourism industry, injecting a continuous stream of vitality and innovative elements into the entire industry, and anchoring the direction of digitalization and intelligence unwaveringly

Fourth, Under the guidance of the strategy of building a strong talent country, local governments should take active action to accelerate the formation of deep cooperation between schools, enterprises, and local areas led by leading cultural and tourism enterprises, and increase efforts to cultivate digital talents in the cultural and tourism industry. Through professional advancement, course advancement, experimental design, on-the-job internships, and academic exchanges, we aim to enhance the digital thinking, skills, analysis, marketing, and other application abilities of digital talents. This will enable digital talents to use advanced digital thinking and skills to design tourism products, map out marketing plans, engage in enterprise management, and analyze tourists' preferences, consumption habits, and behavior patterns.

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REFERENCES

[1] Rosenberg N. (1978). Perspectives on technology, Cambridge University Press, Cambridge.
[2] Choi D., Valikangas L. (2001). Patterns of strategy innovation, European Management Journal, 19(4), 424-429.
[3] Bröring S., Leker J. (2007). Industry convergence and its implications for the front end of innovation: a problem of absorptive capacity, Creativity and Innovation Management, 16(2), 165-175.
[4] Blackman C. (1998). Convergence between telecommunications and other media: how should regulation adapt. Telecommunication Policy, 22(3), 163-170.
[5] Cao L., Li L. Wu Y., et al. (2020). Does industrial convergence promote regional metabolism? evidence from China, Journal of Cleaner Production, 273, 123010.

[6] Hacklin F., Marxt C., Fahrni F. (2009). Co-evolutionary cycles of convergence: an extrapolation from the ICT industry, Technological Forecasting and Social Change, 76(6), 723-736.
[7] Kim N., Lee H., Kim W., et al. (2015). Dynamic patterns of industry convergence: evidence from a large amount of unstructured data, Resource Policy, 44(9), 1734-1748.
[8] Kim Y., Lee J.D., Koh D. (2005). Effects of consumer preferences on the convergence of mobile telecommunications devices, Applied Economics, 37(7), 817-826.
[9] Richards G. (2000). Tourism and the world of culture and heritage, Tourism Recreation Research, 25(1).
[10] Zhang H.Y., Wang Z.Y. (2013). Research on the integration operation mode of tourism industry and cultural industry, Shandong Social Sciences, 1, 169-172.
[11] Hongsombud S., Siriyota S., Phonginwong R., et al. (2018). Factors affects tourism on society and culture tourism success in suphan buri province, International Journal of Trade, Economics and Finance, 9(4), 174-177.
[12] Li W.W. (2023). Research on the measurement and influencing factors of high-quality integration level of culture and tourism, Tourism Management and Technology Economy, 6.
[13] Fai F., von Tunzelmann, N. (2001). Industry-specific competencies and converging technological systems: evidence from patents, Structural Change and Economic Dynamics, 12, 141-170.
[14] Xing W., Ye X., Kui L. (2011). Measuring convergence of China's ICT industry: an input-output analysis, Telecommute Policy, 35(4), 301-313.
[15] Lamonica G.R., Mattioli E. (2015). Research note: the impact of tourism industry on the world's largest economies-an input-output analysis, Tourism Economics, 21(4).
[16] Khanal B.R., Gan C., Becken S. (2014). Tourism inter-industry linkages in the Lao PDR economy: an input—output analysis, Tourism Economics, 20(2).
[17] Li S.W., Du S.Y. (2021). An empirical study on the coupling coordination relationship between cultural tourism industry competitiveness and tourism flow, Sustainability, 13(10), 5525.
[18] Shen H.T. (2024). Research on the integration mechanism of cultural industry and tourism industry based on the model of coupling coordination degree, Applied Mathematics and Nonlinear Sciences, 9(1).
[19] Chen T. (2024). Digital transformation and information management in tourism industry, Tourism Management and Technology Economy, 7(2).
[20] Tang R. (2023). Can digital economy improve tourism economic resilience? evidence from China, Tourism Economics,10.
[21] Yee Mah, A.X., Ho W.S., Hassim M.H., et al. (2021). Targeting and scheduling of renewable energy system with liquid organic hydrogen carrier as energy storage, Energy, 218.
[22] Wang G.W., Gao J. (2022). Analysis of the coordination degree and optimized path of the integration of culture and tourism in Inner Mongolia, Forward Position, 02, 128-136.
[23] Dong H.M. (2021). Digital economy promotes the integrated development of culture and tourism: public cognition and expectations, National Governance, 23, 40-48.
[24] Zhou W.H., Chen Y. (2021). How can digital platforms build value-co-creation organizations by means of boundary-crossing? Journal of management research and development, 33 (6), 31-43.
[25] Xie X.F., Lei W.X. (2023). Research on high-quality development prospect and model of Chinese digital culture and tourism industry in the era of "Intelligent +", Journal of Suzhou University (Philosophy and Social Sciences Edition), 44 (02),171-179.