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The Path of AI Technology to Promote Sustainable Development of China's Cultural Industry: An empirical analysis based on Digital Cultural Communication

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Abstract: *Artificial intelligence technology is currently reshaping the global cultural industry profoundly. This study uses Chinese digital cultural products as the cases, and adopts case analysis and phenomenological methods to explore how AI technology can promote the sustainable development of China's cultural industry through content production, communication innovation and industrial upgrading. The study found that AI has formed a "technology-culture-market" synergy mechanism in the three dimensions of cultural digital protection, global communication and user interactive experience, but faces challenges such as technological ethics, cultural discounts and unequal resource allocation. Finally, a three-element development framework of "policy guidance-technology empowerment-ecological co-construction" is proposed.*

Keywords: *Artificial Intelligence, Culture, Sustainable Development*

Introduction

Artificial intelligence (AI), as the core field of digital science, has become the key to global technological competition. Its wide application covers many industries, promoting the improvement of production efficiency and the emergence of innovative models. Competition in AI is not only a technical contest, but also a reflection of a country's comprehensive strength (Craddock, 2015).

Over the past decades, China has experienced sustained and rapid development that has attracted worldwide attention, and has successfully become the world's second largest economy. This astonishing growth has been achieved thanks to China's massive investment in infrastructure construction and talent training, while also giving full play to the role of market mechanisms. Strong economic strength and sufficient talent reserves have laid a solid foundation for technological innovation. In recent years, China has been going through a new round of economic transformation. Whether it is policy orientation or market practice, it is actively promoting industrial upgrading and attaches great importance to innovation and new technological revolution.

The government has promoted the development of traditional industries to be high-end, intelligent, and green through a series of policy supports, such as "Made in China 2025" (State Council of PRC, 2025) and the "New Infrastructure" plan (Huang, 2021). At the same

time, enterprises are also increasing investment in R&D and actively exploring the application of cutting-edge technologies such as AI to improve production efficiency and innovation capabilities. In this process, the growing human capital has provided strong support for the improvement of innovation capabilities. One of the results is the endless breakthroughs in the field of AI such as DeepSeek. These achievements not only demonstrate China's rise in the field of science and technology, but also inject new vitality into global technological development (World Bank, 2019).

As cultural products such as games and blockbuster film and television works are coming out and have a significant impact worldwide, these works from China successfully demonstrated the unique charm of eastern traditional aesthetics and played an important role in promoting the worldwide dissemination of Chinese culture. For example, games such as "Genshin Impact" and "Black Myth: Wukong", and movie and television works such as "Nezha 2" have captured global attention with their beautiful artistic design and cultural connotation, and have become a means of spreading eastern aesthetics. The success of these works proves that the charm of eastern culture is no longer limited to the eastern world, but has gone global through
modern technology. It demonstrates China's growing soft power in cultural export, and has found its own unique place in cultural diversity around the world.

However, despite the rapid development of AI technology in recent years, it still faces many challenges in disseminating Eastern aesthetics and culture, which requires further in-depth exploration in research and practice to provide more effective solutions for the global dissemination of Eastern aesthetics.

Research Questions

1. How does AI solve the three major contradictions in the sustainable development of the cultural industry? (protection vs. development, localization vs. globalization, commercial value vs. cultural value)
2. What are the significant experience for the Global South countries from China's practice of promoting sustainable development of the cultural industry with AI technology?

Research Objective

This study aims to analyze how AI technology addresses the three core contradictions in cultural industry sustainability and to extract transferable insights from China's AI-cultural practices for Global South countries, including identifying scalable models, evaluate cost-effective AI solutions for resource-limited contexts, propose adaptive frameworks for cross-cultural technology transfer.

Literature Review

In recent years, AI technology has been widely researched and applied in cultural communication, covering various fields such as virtual reality (VR), digital games, and film and television production. AI-driven virtual museums provide a virtual environment to

users to appreciate cultural relics and feel the charm of history and culture (Marasco, 2020). Digital games serve as a significant carrier for aesthetics and cultural communication, and AI technology plays an increasingly important role in them. The application of AI technology in games not only brings novel gaming experiences, but also provides the possibility of personalized gameplay based on individual players' styles, difficulty preferences, and narrative choices (Bonn, 2023).

In addition, the application of AI technology in film and television production has also significantly improved the efficiency and quality of content production. Through AI-driven special effects technology and intelligent editing tools, film and television works can more vividly display Eastern aesthetics and bring audiences a more visually influential and culturally profound viewing experience (Deng, 2024). The above practices show that AI technology is profoundly changing the way cultural communication is carried out, providing new possibilities and models for cultural industry.

The evaluation system for sustainable development of the cultural industry are generally analyzed systematically from three key dimensions: economic benefits, cultural heritage and technological inclusion. These three aspects are both independent and closely related, and together constitute a comprehensive framework for measuring the quality and sustainability of cultural industry development.

UNESCO elaborates the "Cultural Circular Economy" model in the report Perspectives on the circular economy from selected African TVET institution. The circular economy is a sustainable production and consumption model that minimizes waste and promotes resource efficiency through innovative design, extended product use, recycling, and ecosystem regeneration (UNESCO-UNEVOC, 2024). It emphasizes that the cultural industry needs to balance commercialization and public nature, and recommend the use of the "cultural value added" indicator. The National Bureau of Statistics of China (NBS) included "digital cultural asset transaction volume" into the national economic accounting system for the first time in 2023 (NBS,2023).

The "Cultural Sustainability Index" indicator system established in the United Nations' 2030 Agenda for Sustainable Development includes core dimensions such as the Digital Preservation Rate of Traditional Skills and Intergenerational Cultural Identity (Streimikiene, et al., 2019). This indicator system has achieved remarkable results in practice in China: The Dunhuang Academy has adopted advanced high-precision digital acquisition technology to systematically complete the comprehensive digital preservation of the Mogao Grottoes murals, setting an important example in the field of digital protection of cultural heritage (Dunhuang Academy, 2024). In addition, data from UNESCO's New Media Trends of Heritage Communication in 2023 showed that interactive experiences based on AI technology have greatly increased the attention of Generation Z to intangible cultural heritage. This finding provides strong evidence for digital technology to enhance cultural intergenerational inheritance (UNESCO, 2023).

Jenkins' theory of "participatory culture" reveals a fundamental shift in the paradigm of cultural production in the digital age, from the dominance of professional institutions to mass co-creation (Bangun, 2019). The "AI4All" framework on this basis further deepens this

theory (Morales-Navarro, 2025), emphasizing two core dimensions: technological accessibility, which is reflected in the intelligent transformation of grassroots cultural facilities, such as the continuous improvement of the AI equipment configuration rate of county-level cultural centers in China. The second is the democratization of creation. A typical example is the "AI Opera Mask" tool launched by the TikTok platform, which has a huge daily generation volume and significantly lowers the threshold for participation in traditional art creation.

Current studies highlight AI's role in cultural digitization and globalization but overlook critical tensions in sustainable development. Three key gaps emerge. Cultural interpretability: AI replicates aesthetic forms but struggles with contextual meaning, such as ink painting philosophy, risking reductionist representations. Value negotiation: Engagement-driven algorithms such as TikTok filters lack frameworks to balance commercial and cultural values, as seen in superficial intangible cultural heritage engagement metrics. Global South adaptation: China's low-cost AI solutions require testing in diverse contexts.

So future research will focus on developing interdisciplinary methods combining computational analysis with community co-design, create "cultural ROI" metrics assessing both economic and heritage outcomes, and conduct Global South comparative studies on AI solution transferability.

Research Method

Practical Paths for AI to Promote Sustainable Development

A. Content Production

Under the framework of sustainable development of the cultural industry, AI-driven content generation technology reshapes the paradigm of cultural production through two core paths:

i. Digital immortality technology: precise regeneration of cultural heritage

First, researchers use a high-tech camera called "multispectral imaging" to take pictures of the murals. This camera can see details that are invisible to the human eye. Combined with 3D scanning technology, the accuracy is as high as 0.1 mm. Then, through AI algorithms, the system can automatically repair the peeling and fading parts of the murals, just like using a "digital brush" to fill in the missing colors bit by bit.

At present, the murals in hundreds of caves in Mogao Grottoes have been digitally archived. These digital archives not only fully preserve the current status of the murals, but also can "revive" the creative process of ancient painters through AR technology. Visitors wearing AR glasses can see the vivid scenes of how Tang Dynasty painters grind mineral pigments and how they use their pens to sketch, as if they were traveling back to the creation site thousands of years ago. What's more amazing is that these digitized mural resources have also been made into a "cultural material library", forming a virtuous cycle of "digital protection-academic research-creative use",

allowing the thousand-year-old art to be reborn in the contemporary era.

ii. Creative assistance system: revolutionary improvement of production efficiency

The animation "Black Myth: Wukong" has achieved a major breakthrough in game animation production through AI motion capture technology, greatly shortening the production cycle of the character action library, which traditionally takes several months to complete, and greatly improving efficiency. This technology cleverly combines the aesthetic characteristics of Peking Opera's stylized movements with the physically reasonable motion trajectory generated by AI, which not only retains the charm of traditional opera, but also ensures the smoothness and naturalness of fighting movements. Through the reinforcement learning algorithm, the boss in the game can intelligently adjust its tactical behavior while maintaining the characteristics of oriental mythology.

The combination of the two technologies has built a new content ecosystem of "digital base of cultural heritage + contemporary creative expression". For example, the image of Dunhuang Feitian was restored by AI and input into the game engine as basic material, and finally transformed into a dynamic character with a physics engine in Black Myth, realizing the transformation from cultural relics to popular IP. This "modern translation of classical elements" model is reconstructing the time and space dimensions of cultural production.

iii. Aesthetic Expression Innovation

AI technology not only provides technical support for the digital expression of traditional aesthetics, but also vividly interprets eastern traditional aesthetics through innovative art forms.

The scene design and character modeling of "Genshin Impact" are deeply influenced by eastern aesthetics. For example, the "Liyue" region in the game is inspired by Chinese classical architecture and landscape paintings, presenting a virtual world full of oriental charm. The character design also incorporates traditional Chinese costumes and mythological elements, showing the unique charm of eastern aesthetics. In addition, the aria "The Divine Damsel of Devastation" in "Genshin Impact" is performed to the tune of traditional Chinese opera. Although it is sung in ancient Chinese language, the beautiful singing and AI-designed characters perform expressions and actions have moved audiences around the world. AI technology perfectly integrates the charm of eastern traditional aesthetics with modern people's aesthetic and innovative concepts, and expresses it through global creative methods with global users as the goal, allowing users from different cultural backgrounds around the world to not only feel, but even deeply understand the unique charm of eastern aesthetics and culture.

"Black Myth: Wukong" is an action role-playing game based on the

Chinese classic "Journey to the West". AI technology is used to achieve high-quality character animation and scene construction to tell traditional Chinese mythological stories in modern visual language. The scene design in the game comprises traditional Chinese architecture and natural landscapes, such as ancient temples, bamboo forests and waterfalls, to provide players with an immersive cultural experience. "Nezha 2" is an animated movie inspired by traditional Chinese mythology. The film uses AI special effects technology to combine eastern traditional aesthetic elements such as landscape paintings, opera performances, and myths and legends into the storyline, giving the audience with a visual world full of eastern charm. The scene design in the movie refers to the composition and color application of traditional Chinese landscape paintings, achieving dynamic light and shadow effects and delicate picture texture. In addition, the character animation in the movie also uses AI technology to achieve smoother and more natural movement performance to enhance the audience's immersion.

iv. User Experience

AI technology not only improves the digital expression of traditional aesthetics, but also enhances users' perception and recognition of traditional aesthetics through innovative user experience design. With AI technology, users can immersively experience traditional aesthetics in a VR environment. For example, the virtual museums adopt AI technology to provide users with an interactive cultural relic viewing experience, allowing users to feel the charm of history and culture more intuitively. In games, movies and television, AI technology provides users with an immersive cultural experience through high-quality scene rendering and character animation. For example, "Genshin Impact" and "Black Myth: Wukong" use AI technology to achieve dynamic scene changes and character interactions, enhancing users' sense of participation and immersion. AI technology also provides users with personalized cultural content recommendations through data analysis. For example, in film and television platforms, AI can recommend eastern aesthetic works that cater users' tastes based on their viewing habits and interests.

AI technology helps global audiences better understand eastern aesthetics through multi-language translation. For example, in movies, TV shows and games, AI can automatically generate multilingual subtitles or voice commentary to provide viewers with supplementary information about cultural backgrounds. In addition, AI technology can also adjust the communication strategy of cultural content in real time through user feedback to enhance the audience's sense of identity and enhance the effect of cultural communication.

v. Industrial upgrading

AI technology is bringing real upgrades to the cultural industry. For example, when filming Nezha 2, the crew used "virtual shooting" technology,

which built the entire movie scene on the computer like playing a game. The director can adjust the camera angle and special effects at any time without having to reshoot repeatedly as before. This intelligent system helps the crew save production costs.

AI technology has injected new vitality into traditional culture. Taking Peking Opera masks as an example, through the integration of digital art and blockchain technology, traditional mask art has been transformed into a unique digital collection, and each work carries a unique cultural gene and artistic value. AI can not only create novel mask designs based on traditional aesthetics, but more importantly, it has established a new mechanism for protecting the rights of creators. This innovative model not only continues the essence of traditional art, but also opens up a new dimension of cultural inheritance, allowing ancient art to shine in a different way in the digital age.

B. Empirical Analysis

To deeply explore the impact of AI technology on the sustainable development of China's cultural industry, this study selects representative digital cultural products such as Genshin Impact, Black Myth: Wukong, and Ne Zha 2 for empirical analysis. It conducts research from multiple dimensions and presents the results through data comparison.

i. Content Production Dimension

In terms of digital immortality technology, the application of relevant technologies in Genshin Impact has achieved remarkable results in the digital archiving of murals. In the creative assistant system, Black Myth: Wukong has significantly shortened the production cycle of the character action library, and the intelligent adjustment of the boss's tactical behavior is outstanding.

ii. Aesthetic Expression Innovation Dimension

All three works have incorporated a large number of Eastern aesthetic elements in scene design, character modeling, and music creation. Particularly, Ne Zha 2 has a considerable proportion of the duration of adopting traditional opera tunes in music creation, demonstrating the innovative expression of traditional Eastern aesthetics by AI technology.

iii. User Experience Dimension

Black Myth: Wukong provides immersive experience for users, and has high personalized recommendation accuracy rate. Ne Zha 2 has an advantage in the number of languages covered in multilingual communication, reflecting the positive role of AI technology in enhancing user experience and promoting cultural communication.

iv. Industrial Upgrading Dimension

All three works have achieved results in industrial upgrading. Ne Zha 2 has high sales of digital collectibles, and Black Myth: Wukong has prominent revenue from IP derivative development, demonstrating the upgrading effect of AI technology on the cultural industry.

Result and Discussion

AI technology promotes the transformation and upgrading of the cultural industry through three core mechanisms: in terms of cost reduction and efficiency improvement, technologies such as virtual production and AI-assisted design reduce production costs on average, such as "Nezha 2" saving production costs through intelligent rendering; in cultural communication, algorithm recommendation and multi-language AI translation help increase the number of overseas users of cultural products, and typical cases include "AI Opera Mask" covering multiple countries; in terms of value extension, digital collections and IP derivative development have increased the proportion of non-ticket revenue, and the annual transaction volume of Dunhuang cultural and creative industries has continuously achieved breakthroughs. These practices show that AI is reconstructing the input-output model of the cultural industry, making sustainable development economically feasible.

Discussion

First, there is the problem of uneven distribution of technical resources. Most grassroots cultural institutions lack sufficient support from smart devices, which makes it difficult for many traditional cultural digitization projects to be carried out at the grassroots level. Secondly, there is the algorithmic dilemma of cultural expression. For example, the unique oriental aesthetics such as the artistic conception of "virtual coexistence" in Chinese landscape painting and the beauty of "vivid and lively" calligraphy are difficult for existing AI systems to accurately capture and reproduce, and cannot perfectly express the oriental charm of the original work.

What is more noteworthy is the copyright disputes caused by this. With the explosive growth of AI-generated content, legal disputes over whether AI creations constitute infringement have increased significantly. These disputes reflect that while technology is advancing rapidly, we need to establish a more complete cultural and ethical framework.

To promote the deep integration and development of AI and traditional culture, it is necessary to establish a systematic support system. This idea is not only applicable to China, but also has important reference value for all Global South countries.

The first is to build a national cultural big data center, just like the "Digital Dunhuang" project, to transform precious cultural relics and artworks into digital assets through high-definition scanning, 3D modeling and other technologies, and centrally preserve and manage them. This cloud-based cultural library will become a "material base" for AI development, ensuring that technology applications are based on real and authoritative cultural resources.

In terms of technology research and development, it is necessary to develop intelligent algorithms that can truly understand the essence of oriental aesthetics. For example, in view of the unique "white space" technique of Chinese landscape painting, researchers are teaching AI systems to quantitatively analyze the proportion, shape and overall composition of the blank space in the picture, so that machines can also understand the artistic realm of "nothing here is better than something". Similarly, there are digital

analysis of unique aesthetic elements such as calligraphy “feibai” and opera “virtual”. Indonesia is piloting digital shadow play, and the data is directly uploaded to the regional cultural cloud.

Finally, a governance mechanism involving multiple parties should be established. This system will make it clear that creators retain core creative rights, AI is used as an auxiliary tool, and users must abide by the rules when using derivative content. Just like music copyright management, through technologies such as smart contracts, we can ensure that traditional cultural elements are reasonably protected in digital use and achieve the harmonious coexistence of “old traditions” and “new technologies”.

Conclusion

Artificial intelligence technology is currently reshaping the global cultural industry profoundly. This study uses Chinese digital cultural products as the cases, and adopts case analysis and phenomenological methods to explore how AI technology can promote the sustainable development of China’s cultural industry through content production, communication innovation and industrial upgrading.

From the perspective of policy paths and research boundaries, a phased and multi-level promotion strategy needs to be adopted. At the short-term implementation level, it is recommended to set up a special fund for cultural technology, focusing on infrastructure construction such as the popularization of AI facilities in county cultural centers and the digital collection of traditional skills, to provide technical empowerment for grassroots cultural institutions. In terms of long-term institutional construction, multilateral frameworks such as UNESCO should be used to promote the establishment of global unified AI cultural ethics standards, focusing on solving common problems with transnational characteristics such as AIGC copyright ownership and cultural expression distortion. Future research directions should focus on strengthening horizontal comparative studies of Global South countries, focusing on exploring decentralized deployment and lightweight application technology paths suitable for developing countries, and providing practical solutions for countries at different stages of development.

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