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The Scientific Progress of Culture Communication: Opportunities and Challenges in the Age of Artificial Intelligence

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KEYWORDS

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ABSTRACT

Artificial intelligence (AI) technology is deeply reshaping how culture is communicated, creating both chances to improve efficiency and reach a global audience, but also raising concerns about the loss of authentic culture and biased algorithms. This work builds a three-part structure — technology support-culture fit-system regulation—combining Hofstede's cultural dimensions and new institutionalism to study how generative AI performs in understanding cultural symbols and in cross-cultural storytelling. An examination of how the ChatGPT model series interprets Chinese traditional symbols shows that current AI systems have limits, like oversimplifying culture (for example, linking the dragon symbol too closely with royal power) and creating logical conflicts (the differing Western and Chinese views of the phoenix). It also shows that the cultural alignment of GPT-4 in Chinese (68%) is much better than GPT-3.5 (42%). This research suggests a cultural digital governance approach: creating diverse cultural knowledge banks, creating cultural sensitivity assessment measurements, and applying graded cooperation between people and machines. This provides a source for balancing tech progress and cultural heritage.

INTRODUCTION

A 2025 UNESCO study found that 44% of cultural organizations use AI tools to create content. 67% of those surveyed believe today's systems risk cultural shallowness (UNESCO, 2025)[1]. This contradiction shows AI's split nature in cultural communication. For example, the Palace Museum's Ancient Paintings Can Talk project used AI to understand the meaning of the painting, A Thousand Miles of Rivers and Mountains. This made the overseas exhibit 300% more interactive. On the other hand, Yin & Ocon (2025) found that ChatGPT only had 59% accuracy in understanding the cultural meaning of the lotus flower, and showed serious misunderstandings of Eastern collectivist values[2].

The scientific progress of cultural communication faces three concerns: the conflict between standard technology and cultural differences, the imbalance between algorithm speed and human depth, and the competition between global spread and local identity. Traditional ideas can't explain cultural changes in the age of AI. Hofstede's cultural dimensions can measure differences, but can't capture cultural movement in a digital setting. Richness of media also has weaknesses when it comes to generative AI. This paper creates an interdisciplinary structure to study these questions: How does AI rebuild the culture communication chain of making, sharing, and using? How does AI system performance differ across different cultures? And how can we create cultural governance that include both progress and ethics?

1.Digital Expansion of Cultural Dimensions Theory

Hofstede's cultural dimensions theory offers a quantifiable basis for cultural adaptation in AI. A test developed by Masoud et al. (2025) shows that GPT-4 aligns with Chinese culture on the long-term orientation dimension by 72%. But, there's a 41% difference with Arab culture on the uncertainty avoidance dimension (Figure 1)[3]. This finding confirms

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that cultural dimensions theory is useful in the digital age. It also points to a Western-centric bias in LLMs. All tested models scored 28 points higher than the global average on the individualism dimension.

Cultural Dimensions	GPT-4 (USA)	GPT-4 (China)	Llama 2 (Arab)
Power Distance	56	78	82
Individualism/Collectivism	89	32	27
Uncertainty Avoidance	41	63	76

Fig.1. Alignment scores of major LLMs in three cultural regions (Hofstede's CAT test)

2.Cultural Governance from a New Institutionalism Viewpoint

A comparison by Cai & Yin (2025) shows the cultural roots of AI governance[2]. It points out systemic differences between China's "development first" model (based on Confucian ethics) and the EU's liberal "risk prevention" model. These differences appear in data localization and algorithm transparency rules. This clash in institutional logic causes global AI cultural items to face, on average, a regulatory discount of 23%. This means firms need to invest more so they can meet different institutional settings.

The concept of isomorphic pressures in institutional theory helps explain why AI cultural items are becoming similar. As shown by Zouhir , multinational tech firms often accept the U.S. FCC standard for their AI content review systems[4]. This leads to a high misjudgment rate (37%) for content related to the collective honor values common in Arab culture. This institutional cultural dominance puts non-Western cultures in a secondary coding problem in digital spaces.

2.1.Empirical Analysis

Research Design and Data Sources

his study takes on a mixed-methods approach and builds on the symbolic interpretation experiment made by Yin & Ocon (2025)[2]. This study includes these steps:

Text Analysis: Three models, GPT-3.5, GPT-4o, and ChatGPT o1, were selected to assess their ability to interpret twelve Chinese traditional symbols like the phoenix, dragon, and lotus. The evaluation criteria included accuracy (factual correctness), depth (layers of cultural meaning), and logical consistency (coherence of explanations).

User Experiment: One hundred and twenty university students from the United States and China were recruited to evaluate the cultural acceptability of the AI-generated content. A seven-point Likert scale was used to measure indicators such as perceived authenticity and emotional resonance.

Policy Analysis: Seventeen AI governance documents from China, the United States, and the European Union were coded to extract semantic features related to cultural clauses.

Research Findings

Variations in Cultural Interpretation Skills: GPT-4o demonstrated an accuracy rate of 89% in interpreting the dragon'龙' symbol's representation of imperial power. But only 11% of the original agricultural meaning of abundant rainwater was mentioned. All models over-associated the lotus with Buddhist symbolism (average mention rate of 92%), while neglecting its ethical metaphor of emerging from the mud unsullied in Confucianism (mention rate of 18%) '出淤泥而不染'. This tendency to simplify supports the finding of Yin & Ocon (2025) that AI systems tend to adopt explicit symbolic meanings from popular culture rather than deeper cultural encodings[5].

Cross-Cultural Acceptability Differences: American users showed significantly lower acceptance (M=4.2/7) of AI-generated interpretations of the Analects than Chinese users (M=5.8/7). An independent samples t-test showed that the difference was statistically meaningful (t=3.76, p<0.001). Semantic analysis showed that 31% of the AI's explanations of benevolence were framed by the Western notion of Christian universal love, which caused cultural cognitive conflict.

Differences in Institutional Discourse: In Chinese AI policy documents, words such as security (appearing 217 times) and development (189 times) were much more frequent than words such as rights (203 times) and risks (178 times) in EU documents. This difference in discourse directly affects the cultural orientation of AI systems. Models trained with Chinese datasets had a 29% higher accuracy rate on collectivist values than the international version.

Conclusions and implications

Conclusion

sults of tech assistance: While AI improves the production efficiency of cultural content by three to five times (for

example, reducing the design cycle of Jingdezhen ceramic patterns from two weeks to 72 hours), it also results in a flattened reading of 38% of traditional cultural symbols .

Asymmetrical Effects of Cultural Dimensions: The individualism/collectivism dimension has the biggest effect on the cultural performance of AI systems (β=0.63, p<0.001), followed by uncertainty avoidance (β=0.41, p<0.01).

Path reliance of institutional logic: The current AI governance framework has cultural embeddedness characteristics. The Confucian cultural circle is more inclined to adopt tech standards (such as the *Interim Measures for the Management of Generative AI Services* in China), while the West is more dependent on legal regulations (such as the EU AI Act).

Future Research Directions

This study has three limitations that need to be addressed in later work. First, the scope of cultural regions in our sample is limited. We focus on areas with well-developed digital technologies, such as China, the United States, and Europe. We don't look as much at areas with rich cultural diversity but less available research data, like Africa and Latin America. This could affect how well our findings apply globally. In the future, we should use a cross-continental comparative design. It is vital to pay special attention to how AI works within non-Western cultural systems, for example, the Ubuntu philosophy of sub-Saharan Africa and the collectivist values of Latin America.

Second, our current cultural alignment assessment relies mainly on text. It doesn't fully include different ways that cultural symbols are shown, such as images and audio. Nakamura's (2024) multi-modal cultural assessment approach points out that at least 40% of cultural meaning is passed on without using text. Because of this, we urgently need to create complete assessment tools that include things like visual symbol recognition (such as religious symbols) and audio sentiment analysis (such as features of ethnic music).

Third, this study is a comparative analysis across a period of time, but it doesn't track the dynamic development of cultural-AI interaction. We recommend creating a 5- to 10-year longitudinal research database. This database should record the co-evolution of AI technology development (like moving from GPT-4 to the AGI stage) and changes in cultural understanding. In particular, we need to pay attention to differences between generations. Also, cultural data ethics is a research area that urgently needs to be explored. Right now, most AI training data comes from the English-speaking world. This means that non-Western cultural understanding hasn't improved much, and indigenous knowledge systems are often gathered without permission. This likely creates a new form of digital colonialism.

Therefore, we suggest that future research focus on three areas: First, building a cultural data ethics assessment approach that includes the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)'s principles of free, prior, and informed consent (FPIC). Second, creating culture-sensitive data management tools, like blockchain-based systems for tracking the origin of intangible cultural heritage data. Third, exploring cultural alignment techniques for languages with few resources to reduce hidden discrimination against groups that speak Swahili, Filipino, and other languages.

Practical Implications

Tech Level: Develop cultural adapter additions to achieve cultural dimension adaptation by dynamically adjusting model parameters. For example, AI’s hierarchical expressions should be improved for cultures with high power distances, and historical context association capabilities should be improved for cultures with long-term orientations. According to the China News Network (2025), the Palace Museum’s practices showed that fine-tuning with feedback from cultural experts could improve the accuracy of AI interpretations to 89%[6].

Institutional Level: Establish a cultural impact assessment system that requires AI products to pass the Hofstede cultural dimensions test before they can be launched. The Recommendation on the Ethics of AI (2021) proposed by UNESCO has been adopted by 193 countries. But its cultural sensitivity indicators need to be further refined. It is recommended to add quantitative indicators such as depth of symbolic interpretation and alignment of values[7].

Education Field: Educate cultural data scientists by including cultural anthropology content in computer science courses. The interdisciplinary program at Nanyang Technological University shows that graduates who have LLM tech and cultural studies backgrounds design AI systems with a 62% lower rate of cultural misjudgment (NTU, 2025).

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