

# Digital Preservation Meets Cultural Heritage: A Comparative Analysis of Traditional and Digital Display Methods for Korean Ethnic Costume in China

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## Abstract

Despite the growing use of digital applications in cultural heritage preservation, limited research exists on the comparative effectiveness of digital versus traditional display methods for preserving ethnic costume heritage. This study investigates how digital technologies influence the perception of Korean traditional costumes among China's Korean ethnic minority (Chaoxianzu). Using CLO3D digital modelling and questionnaire surveys ( $n = 107$ ), we found that digital display methods excel in communicating costume characteristics through three-dimensional visualisation and multi-angle presentation, with particularly strong evaluations for intuitiveness (81.31%) and colour representation (76.64%). Digital methods significantly enhance cultural understanding (75.70%) and stimulate innovative applications (70.09%), especially among younger audiences (85% positive response rate). Our findings reveal that digital and physical display methods serve complementary rather than competing roles—digital methods excel in accessibility and spatial representation (87.85% preferred for multi-angle observation). In comparison, traditional approaches provide essential tactile experiences, which are valued for their material experience (89.72%). Statistical analysis identifies 360° multi-angle observation ( $\beta = 0.41$ ) and magnified detail observation ( $\beta = 0.35$ ) as the most critical technical factors affecting perception value. This research provides empirical evidence for developing integrated preservation strategies that combine digital technologies with traditional approaches to enhance the transmission and sustainable development of ethnic costume heritage.

*Keywords:* Korean traditional costume; digital heritage preservation; virtual display technology; cultural perception; ethnic minority heritage

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## 1 Introduction

Korean traditional costume, as a Chinese nationally recognised intangible cultural heritage [1], carries the historical memory and cultural identity of the Korean ethnic group, constituting an in-

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dispensable component of China's diverse ethnic cultural heritage system. This costume system, with its unique aesthetic design and colour language, demonstrates distinctive ethnic aesthetics, not only exhibiting significant artistic expressiveness but also containing rich socio-cultural symbolic meanings [2]. From the perspective of cultural heritage preservation and transmission, Korean traditional costume is both an important carrier of material culture and a key medium for intangible cultural expression [3]. Its protection and revitalisation in contemporary social environments have important theoretical and practical significance for maintaining ethnic cultural diversity and promoting sustainable cultural development.

The digital transformation of traditional costume heritage has become a rapidly growing research domain globally. Scholars worldwide have explored various approaches to digitally safeguarding cultural heritage, including textile heritage. Magnenat-Thalmann and Volino [4] developed pioneering methodologies for virtual clothing simulation, laying the groundwork for digital costume representation. The work by Lu et al. [5] on the digital archiving of Chinese traditional garments demonstrated how 3D scanning technologies can document the materiality of historical costumes, making them accessible to a wider audience.

With the acceleration of modernisation, Korean traditional costume faces challenges in cultural transmission. Traditional craftsmanship is lacking successors, and manufacturing skills face an extinction crisis; changes in modern aesthetic concepts have gradually eroded the cultural value of traditional costumes. The evolution of digital technologies presents new pathways for preserving cultural heritage [6], particularly through the application of CLO3D technology in the field of Korean traditional costume [7], which enhances audience participation and experience [8], and provides new dissemination channels for traditional costume display. This study discusses the impact of digital display on the perception of Korean traditional costume artistic value, analyzes the characteristics of Korean traditional costume; utilizes CLO3D technology for three-dimensional display of Korean traditional costume; and evaluates the impact and characteristics of digital display as a supplementary means to traditional display on the perception of Korean traditional costume value through questionnaire surveys.

Despite these technological advances, significant research gaps remain in understanding how digital display methods specifically affect the perception and appreciation of Korean traditional costumes. While previous studies have focused primarily on general audience engagement with digital heritage [9], limited research has examined the comparative effectiveness of digital versus traditional display methods for ethnic costume heritage, particularly regarding their impact on different demographic groups. As Styliani et al. [10] note in their comprehensive review of virtual museums, there remains insufficient empirical evidence regarding which specific digital presentation features most effectively convey the artistic and cultural values embedded in traditional costumes.

This investigation aims to address critical knowledge gaps by methodically examining how digital presentation technologies influence perceptions of Korean traditional costume heritage. Specifically, our objectives are to: (1) analyse the distinctive characteristics of Korean traditional costume that require special consideration in digital presentation; (2) develop and evaluate CLO3D-based three-dimensional models for Korean traditional costume display; (3) empirically assess audience perceptions of digital versus traditional display methods through quantitative surveys. Through this comprehensive approach, we seek to provide evidence-based recommendations for cultural heritage institutions seeking to leverage digital technologies while maintaining the authentic cultural essence of traditional Korean costume heritage.