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APPLICATION AND INNOVATION OF DIGITAL EXHIBITION DESIGN IN THE DISSEMINATION OF CHINESE INTANGIBLE CULTURAL HERITAGE

Purpose. This paper explores the application and innovation of digital exhibition design in disseminating Chinese Intangible Cultural Heritage (ICH), with a focus on preserving aesthetic qualities such as color symbolism, spatial organization, and material authenticity. By prioritizing these aesthetic elements, the research demonstrates how digital technologies can enhance the visual and cultural fidelity of ICH, ensuring that traditional art forms are not only accessible but also artistically authentic in a digital context.

Methodology. The study adopts an integrative approach, utilizing Virtual Reality (VR), Augmented Reality (AR), and 3D modeling to create digital exhibitions for three representative ICH projects: Shadow Puppetry, Woodblock New Year Prints, and Traditional Chinese Medicine. The research process emphasizes aesthetic design principles, covering conceptual development, digital adaptation, and visual enhancement, to maintain the cultural essence of ICH in digital formats.

Results. The findings reveal that digital exhibitions can effectively preserve the aesthetic integrity of Chinese ICH by incorporating traditional elements like symmetry, color symbolism, and material authenticity into their design. The analysis highlights how these aesthetic elements enhance the cultural representation of ICH, demonstrating that digital technologies can function as artistic tools that convey cultural narratives faithfully, rather than solely focusing on interaction or accessibility.

Scientific novelty. This study contributes a new perspective by emphasizing aesthetic preservation in digital exhibition design for ICH. It offers a detailed analysis of how digital technologies can replicate visual and material qualities, addressing existing gaps in research regarding the balance between cultural authenticity and digital innovation in the preservation of intangible heritage.

Practical significance. The insights gained from this study are valuable for museum professionals, exhibition designers, and cultural heritage practitioners. By providing guidelines for integrating aesthetic elements into digital exhibition design, the study supports the creation of digital platforms that are not only interactive but also visually authentic, ensuring that ICH retains its cultural and artistic value in contemporary society.

Keywords: design, digital exhibition design, multimedia design, Chinese Intangible Cultural Heritage, aesthetic preservation, color symbolism, spatial organization, material authenticity, Virtual Reality, Augmented Reality.

Introduction. The preservation and dissemination of Chinese Intangible Cultural Heritage (ICH) have evolved significantly in the digital era, with a growing emphasis on aesthetic integrity. While digital technologies are often recognized for their potential to enhance interactivity, their role in maintaining the visual and material authenticity of cultural heritage is equally crucial. Digital exhibition design not only extends the reach of ICH but also offers opportunities to preserve its aesthetic elements, such as color symbolism,

spatial organization, and material authenticity, which are central to its cultural identity [7; 14].

Color symbolism, a key aspect of Chinese ICH, conveys cultural meanings that extend beyond visual appeal. For instance, red often represents auspiciousness, while white signifies purity, and green symbolizes harmony. When faithfully reproduced in digital exhibitions, these colors preserve cultural symbolism, enhancing the viewer's understanding of the underlying cultural narratives [9; 19]. Advanced digital technologies like VR and AR allow for more

precise and vibrant color reproduction, ensuring that the aesthetic and symbolic meanings of traditional art forms are preserved in the digital realm [21].

Spatial organization is another critical element in the design of digital exhibitions for ICH. Traditional Chinese art often emphasizes balance, symmetry, and rhythm, which contribute to its aesthetic and philosophical essence. Digital exhibitions can replicate these spatial arrangements, creating a sense of order that resonates with traditional cultural values. By maintaining traditional layouts, digital designs can effectively communicate the visual rhythm inherent in ICH, reinforcing both its artistic and cultural significance [2; 6].

Material authenticity is equally important in digital exhibitions, as the tactile qualities of traditional materials often contribute to the sensory experience of ICH. Digital technologies such as 3D modeling, photogrammetry, and augmented reality can simulate textures and materials like wood, silk, and clay, thereby preserving the material authenticity of ICH in digital formats [5; 22]. This approach ensures that viewers not only observe but also engage with digital representations in ways that evoke the original material experience, bridging the gap between digital and physical heritage [8].

This study aims to explore how digital exhibitions can be designed to prioritize the aesthetic representation of ICH. By focusing on color symbolism, spatial organization, and material authenticity, the research seeks to demonstrate how digital technologies can enhance, rather than overshadow, the cultural and artistic qualities of Chinese ICH [14]. Such an approach ensures that digital exhibitions function not merely as technological tools but as artistic extensions that preserve the essence of traditional heritage in a modern context.

Analysis of previous research. Research on the use of digital technologies, such as Virtual Reality (VR), Augmented Reality (AR), and 3D modeling, has highlighted their potential for enhancing the preservation and dissemination of Chinese Intangible Cultural

Heritage (ICH). These technologies offer innovative methods for creating immersive, interactive exhibitions that extend beyond traditional physical constraints, making cultural heritage more accessible and engaging to audiences [4; 7; 15; 21]. These digital tools have been particularly effective in replicating the interactive aspects of cultural heritage, allowing viewers to engage with artifacts and narratives in new ways, which supports both preservation and education [2; 9].

However, recent studies suggest that while digital tools enhance interactivity, they must be carefully integrated with aesthetic design principles to ensure that the visual and symbolic elements of ICH are preserved in digital formats [11; 17; 20]. Aesthetic factors, such as color symbolism, spatial organization, and material authenticity, play a central role in the cultural representation of Chinese ICH. For example, digital exhibitions that replicate traditional color schemes – like the use of red for prosperity or white for purity – help maintain cultural symbolism and enhance the viewer's experience [5; 10]. A significant challenge in digital exhibitions of ICH is ensuring that the visual and material elements accurately represent the original cultural artifacts, which often have rich symbolic meanings and unique aesthetic qualities. For instance, colors in traditional Chinese art carry symbolic meanings that are crucial to the cultural narratives, but achieving accurate color reproduction in digital formats remains a challenge due to technical limitations and varying display environments [3; 10].

Traditional Chinese art conveys balance, symmetry, and rhythm, which can be effectively translated into digital formats to maintain cultural authenticity. Digital exhibitions must replicate these spatial arrangements to preserve cultural meaning, yet this is often challenging due to differences in digital interface designs and user navigation patterns [7; 12]. Digital exhibitions that incorporate symmetrical layouts or circular designs can reflect traditional aesthetic

principles, creating a visual coherence that reinforces the cultural context of ICH [1; 12; 24]. The lack of alignment between digital spatial layouts and traditional aesthetic principles can lead to a diminished cultural experience for users [23].

Material authenticity is another aspect often overlooked in digital exhibition design. Material authenticity, which is critical to the tactile qualities of ICH artifacts, often gets lost in digital translations. Studies show that technologies like 3D modeling and photogrammetry can simulate the tactile qualities of traditional materials, such as wood, silk, or clay, in digital spaces. These techniques ensure that digital adaptations of ICH maintain a sensory dimension that connects viewers to the original material experience, bridging the gap between digital and physical cultural expressions [5; 18; 23]. Technologies like 3D modeling and digital texture mapping can help simulate material authenticity, but achieving a sensory experience that matches the original physical artifacts remains difficult [16; 26]. This presents a complex problem, as users' perceptions of authenticity are directly linked to their satisfaction and engagement with digital ICH exhibits [13].

In summary, previous research has established that digital technologies can be powerful tools for ICH preservation, but their effectiveness depends on their integration with aesthetic design principles. This approach not only preserves the interactive qualities of cultural heritage but also ensures that its visual, spatial, and material elements are faithfully represented in digital formats [20; 25]. This integration provides a theoretical foundation for the current study, which aims to explore how digital exhibition design can enhance the aesthetic representation of Chinese ICH.

Statement of the problem. The rapid advancement of digital technologies, including Virtual Reality (VR), Augmented Reality (AR), and 3D modeling, has significantly enhanced the dissemination of Chinese Intangible

Cultural Heritage (ICH) through digital exhibitions. While these technologies have improved user experience and accessibility, they often struggle to maintain the aesthetic authenticity of ICH, which is a crucial component of cultural preservation. The digital transformation of ICH needs to balance interactive features with the accurate representation of aesthetic elements, such as color symbolism, spatial organization, and material authenticity, which are deeply embedded in the cultural expressions of ICH. Thus, the core problem of this study is to explore how digital exhibitions can enhance the aesthetic representation of Chinese ICH while maintaining authenticity. This challenge not only involves technical improvements but also requires a deeper integration of aesthetic principles into digital design frameworks, aligning with the cultural essence of ICH.

The results of the research and their discussion. The study's findings reveal how digital exhibitions can effectively convey the aesthetic qualities of Chinese Intangible Cultural Heritage (ICH), integrating traditional design principles into a digital context. The chosen cases of Shadow Puppetry, Woodblock New Year Prints, and Traditional Chinese Medicine (TCM) collectively demonstrate how digital platforms can maintain the visual and cultural authenticity of ICH while adapting it for modern audiences.

The digital exhibition of Shadow Puppetry establishes a strong foundation for aesthetic representation in a digital format (Fig. 1). The symmetrical layout of the exhibition space aligns with the traditional structure of shadow puppet performances, where balance and rhythm play crucial roles. This layout not only creates a sense of order and harmony but also mirrors the structured, yet dynamic, nature of shadow play itself. The use of curved elements within the exhibition space emphasizes the flowing movements characteristic of shadow puppetry, enhancing the visual experience by echoing the physical art form's fluidity.



Fig. 1. Shadow Puppetry Digital Exhibition (Xie & He, 2024).

a – Series of Wonderful Performances – Shadow Puppet Show; b – Illuminated Shadow Wall; c – Light and Shadow Space

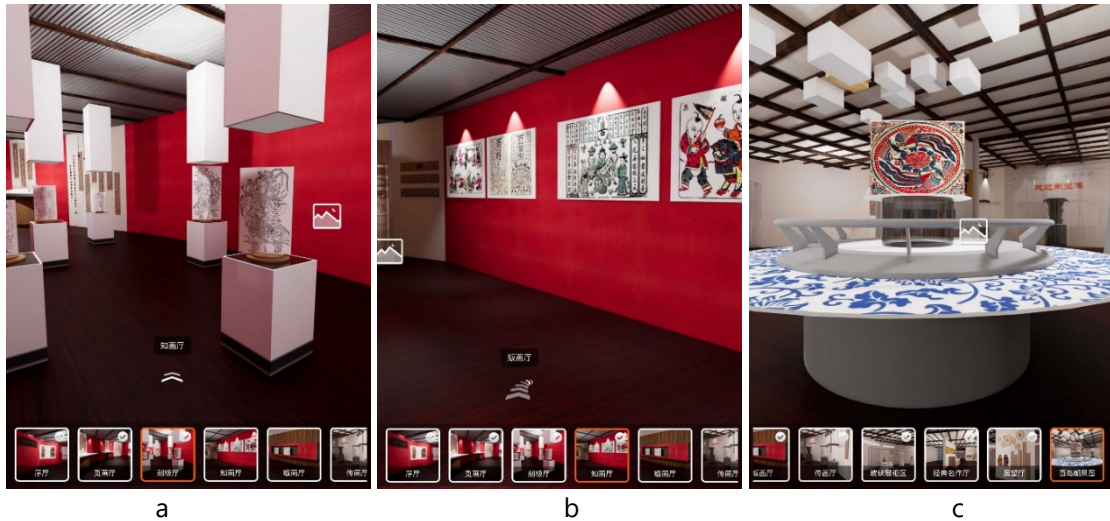


Fig. 2. Woodblock New Year Prints Digital Exhibition (Zhi & He, 2024).

a – Engraving Hall; b – Hall of Artistic Knowledge; c – Hundred Birds Paying Homage to the Phoenix

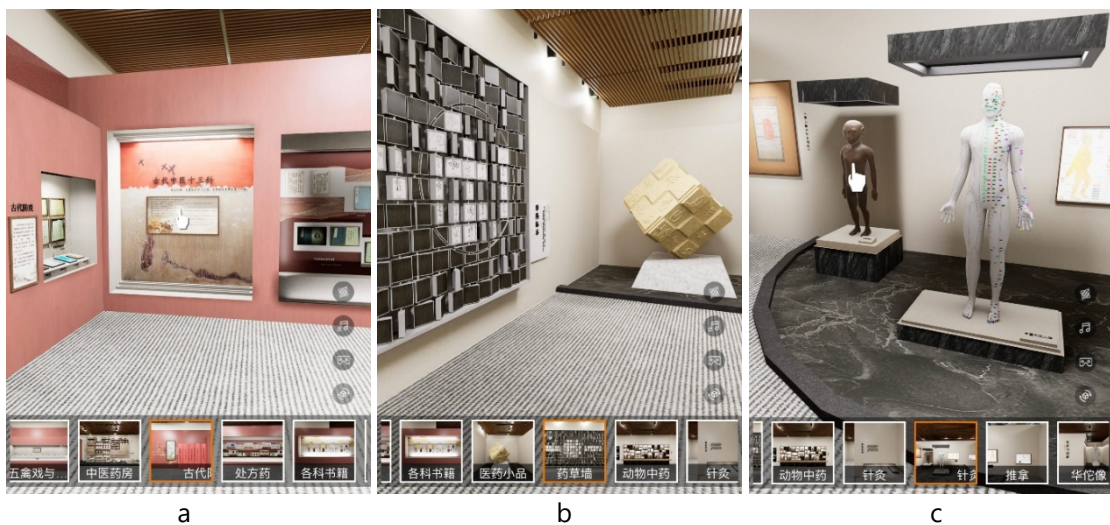


Fig. 3. Traditional Chinese Medicine Culture Digital Exhibition (Zhao & He, 2024).

a – Ancient Epidemic Prevention; b – Herbal Medicine Wall; c – Acupuncture Bronze Figurine

In addition to spatial design, the color scheme of red and white in this exhibition is central to its aesthetic appeal. Red symbolizes the vibrancy and passion inherent in shadow puppetry, while white represents clarity and purity, both of which are essential to the art's visual language. The color choices serve not only as aesthetic elements but also as cultural symbols, reinforcing the traditional essence of the art form. The integration of textured wooden panels and metal wires further enhances the tactile quality of the exhibition, reflecting the handcrafted nature of traditional puppets. These materials not only add to the sensory appeal but also ensure a high degree of cultural fidelity, bridging the gap between digital representation and traditional artistry.

The role of VR and AR technologies in this exhibition is designed to amplify the visual and aesthetic aspects of shadow puppetry, rather than merely providing interactive experiences. By focusing on the intricate details of puppet designs and the nuances of performance, these digital tools offer an immersive yet culturally faithful representation. The interaction is intentionally subtle, emphasizing the aesthetic features of the art form, such as the interplay of light and shadow, rather than shifting the focus to technological engagement. This approach ensures that the exhibition remains an artistic experience, rooted in the cultural symbolism and aesthetic qualities of shadow puppetry.

Transitioning from the fluid, symmetrical design of the Shadow Puppetry exhibition, the digital exhibition of Woodblock New Year Prints presents a different yet complementary aesthetic focus (Fig. 2). Here, the emphasis shifts towards a circular spatial arrangement, symbolizing the concept of "heavenly roundness" in Chinese culture. This design not only reflects the holistic and inclusive nature of the New Year celebration but also aligns with the circular motifs frequently found in traditional Feng Xiang woodblock prints. The circular layout guides the viewer's movement smoothly around the central artwork,

reinforcing the sense of completeness and unity that characterizes these festive prints.

The color palette of the exhibition is particularly significant in conveying the vibrant aesthetic of Woodblock New Year Prints. Dominated by red, white, and blue, the colors create a vivid, festive atmosphere that resonates with the celebratory nature of the prints. Red, symbolizing prosperity and good fortune, is the focal color, setting a joyous tone for the exhibition. White provides contrast and clarity, while blue adds depth, enriching the visual experience and preserving the authenticity of the original prints. This careful selection of colors ensures that the digital representation maintains a strong connection to the traditional aesthetics of the art form.

In addition to color, the use of natural wood materials in the exhibition's displays enhances the tactile authenticity of the digital experience. These materials not only evoke the craftsmanship of traditional woodblock carving but also contribute to a sensory environment that aligns with the cultural essence of the prints. The texture of the wood, combined with the visual elements, adds depth to the exhibition, making the digital adaptation feel more connected to its physical roots.

While digital tools such as interactive screens and AR overlays are integrated into the exhibition, they are designed to highlight the artistic processes behind woodblock printing, such as carving techniques, ink application, and color layering. This approach ensures that the focus remains on the visual characteristics of the prints – specifically, their bold lines, vibrant colors, and dynamic compositions. Rather than merely offering interactive experiences, the digital elements enhance the viewer's understanding of the aesthetic and symbolic qualities that define Feng Xiang woodblock prints. This creates a seamless blend of traditional artistry and modern technology, emphasizing the artistic rather than the technical aspects of the digital exhibition.

Building on the aesthetic continuity established in the previous exhibitions, the digital exhibition of Traditional Chinese Medicine (TCM) adopts a distinct yet complementary approach to visual representation (Fig. 3). While the transition from the circular arrangement of the Woodblock New Year Prints to the rectangular layout of the TCM exhibition represents a shift in thematic focus, it also reflects the structured and methodical nature of TCM practices. This linear spatial organization is not only a practical choice but also a deliberate aesthetic decision that aligns with the principles of order, stability, and harmony central to both TCM philosophy and broader Chinese culture.

The color scheme used in the TCM exhibition further enhances its cultural authenticity. Dominated by red and beige tones, the colors convey both the auspiciousness and natural simplicity associated with TCM. Red, a symbol of health and vitality, creates a warm, inviting atmosphere that aligns with the healing principles of TCM. Beige, on the other hand, represents earthiness and groundedness, emphasizing the natural origins of herbal medicine and the holistic nature of TCM practices. This careful use of color ensures that the digital representation resonates with the traditional aesthetics of TCM, creating an environment that feels both authentic and immersive.

The exhibition design incorporates traditional Chinese architectural elements,

such as wooden lattice ceilings and muted grey carpeting, to reinforce the cultural context. These materials not only enhance the tactile experience but also create a sensory continuity with the previous exhibitions. The use of natural wood in displays and design elements echoes the material authenticity found in both the Shadow Puppetry and Woodblock New Year Prints exhibitions, maintaining a cohesive aesthetic narrative across all three cases. This consistent emphasis on materiality helps bridge the gap between digital representation and physical heritage, ensuring that the digital adaptation of TCM remains true to its cultural roots.

Digital interactions in the TCM exhibition are designed to emphasize the aesthetic and symbolic representations of TCM practices. For instance, virtual herbal identification tools allow users to explore the detailed illustrations of medicinal herbs, while interactive acupuncture simulations highlight the precise positioning of acupuncture points, both of which are significant not only for their functional roles but also for their artistic depictions. The use of VR and AR technologies in this context is carefully moderated to avoid overwhelming the viewer, maintaining the focus on the visual storytelling of TCM's cultural heritage. By prioritizing the aesthetic qualities of TCM, the digital elements serve to deepen the viewer's understanding of its symbolic and philosophical essence rather than simply providing technical engagement.

Table 1

Key Aesthetic Elements Across Digital Exhibitions (He, 2024)

Exhibition	Symmetry	Color Symbolism	Material Authenticity
Shadow Puppetry	High	Red & White (Passion, Purity)	Textured Wood, Metal Wires
Woodblock New Year Prints	Moderate	Red, White, Blue (Prosperity, Clarity, Depth)	Natural Wood
Traditional Chinese Medicine	Moderate	Red & Beige (Health, Earthiness)	Wooden Lattice, Grey Carpeting

Collectively, these three exhibitions demonstrate how digital design principles can faithfully preserve the aesthetic integrity of Chinese Intangible Cultural Heritage. To provide a clearer comparative overview, the key aesthetic elements across these exhibitions are summarized in the table below.

This table highlights the consistency of aesthetic principles across the exhibitions, demonstrating how design elements such as symmetry, color symbolism, and material authenticity contribute to the preservation of cultural aesthetics in the digital realm. Each exhibition, while distinct, shares a commitment to visual authenticity, ensuring that digital adaptations serve as artistic expressions of traditional heritage rather than merely technical representations.

Conclusions. This study investigates the application and innovation of digital exhibition design in disseminating Chinese Intangible Cultural Heritage (ICH), with a particular emphasis on aesthetic qualities. By focusing on three representative projects – Shadow Puppetry, Woodblock New Year Prints, and Traditional Chinese Medicine – the research demonstrates how digital platforms can effectively preserve and convey the visual and cultural authenticity of traditional Chinese art forms. Rather than merely prioritizing technological features or user interaction, the digital exhibitions are designed to maintain

the aesthetic integrity of ICH, emphasizing elements such as symmetry, color symbolism, and material authenticity.

The results suggest that digital exhibitions, when properly designed, can serve as artistic expressions that facilitate the appreciation of cultural aesthetics, not merely as tools for interaction. For instance, the symmetry in Shadow Puppetry's spatial design, the color symbolism in Woodblock New Year Prints, and the material authenticity in TCM's exhibition all contribute to preserving the cultural essence in digital formats. This approach ensures that digital exhibitions function as cultural bridges, making traditional aesthetics accessible to contemporary audiences without compromising their historical context.

While this study presents valuable insights into integrating aesthetics into digital ICH exhibitions, it is limited to three specific cases and may not comprehensively represent the diverse range of Chinese ICH. Future research should explore a broader variety of cultural heritage projects, examining how digital technologies can be tailored to different aesthetic principles across various art forms. By addressing these limitations and expanding on the findings of this study, future research can enhance the development of digital exhibitions that prioritize cultural aesthetics.

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ЗАСТОСУВАННЯ ТА ІННОВАЦІЙНІСТЬ ЦИФРОВОГО ВИСТАВКОВОГО ДИЗАЙНУ У ПОШИРЕННІ КИТАЙСЬКОЇ НЕМАТЕРІАЛЬНОЇ КУЛЬТУРНОЇ СПАДЩИНИ

Мета. Ця стаття досліджує застосування та інновації дизайну цифрових виставок у розповсюдженні китайської нематеріальної культурної спадщини (НКС), зосереджуючись на збереженні естетичних якостей, таких як символіка кольорів, просторова організація та автентичність матеріалу. Визначаючи пріоритетність цих естетичних елементів, дослідження демонструє, як цифрові технології можуть підвищити візуальну та культурну точність відтворення НКС, гарантуючи, що традиційні форми мистецтва є не лише доступними, але й художньо автентичними в цифровому контексті.

Методологія. Дослідження використовує інтегративний підхід із використанням віртуальної реальності (VR), доповненої реальності (AR) і 3D-моделювання для створення цифрових виставок для трьох репрезентативних проектів НКС: Тіньовий ляльковий театр, Новорічна гравюра на дереві та Традиційна китайська медицина. Процес дослідження наголошує на принципах естетичного дизайну, охоплюючи концептуальний розвиток, цифрову адаптацію та візуальне покращення, щоб зберегти культурну сутність НКС у цифрових форматах.

Результати. Дослідження показує, що цифрові виставки можуть ефективно зберегти естетичну цілісність китайського НКС шляхом включення в дизайн традиційних елементів, таких як симетрія, колірна символіка та автентичність матеріалу. Аналіз підкреслює, як ці естетичні елементи покращують культурну репрезентацію НКС, демонструючи, що цифрові технології можуть функціонувати як художні інструменти, які правдиво передають культурні наративи, а не зосереджуються лише на взаємодії чи доступності.

Наукова новизна. Це дослідження сприяє новому погляду, наголошуючи на збереженні естетики в дизайні цифрових виставок для НКС. Воно пропонує детальний аналіз того, як цифрові технології можуть відтворювати візуальні та матеріальні якості, усуваючи наявні прогалини в дослідженнях щодо балансу між культурною автентичністю та цифровими інноваціями у збереженні нематеріальної спадщини.

Практична значущість. Уявлення, отримані в результаті цього дослідження, є цінними для музейних фахівців, дизайнерів виставок і практиків культурної спадщини. Надаючи вказівки щодо інтеграції естетичних елементів у дизайн цифрових виставок, дослідження підтримує створення цифрових платформ, які є не лише інтерактивними, але й візуально автентичними, гарантуючи, що НКС зберігає свою культурну та мистецьку цінність у сучасному суспільстві.

Ключові слова: дизайн, цифровий виставковий дизайн, мультимедійний дизайн, китайська нематеріальна культурна спадщина, естетичне збереження, колірна символіка, просторова організація, автентичність матеріалу, віртуальна реальність, доповнена реальність.

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