

Research Article

Research on the Construction of a Collaborative AI-Assisted Design Model for Cultural Creativity

Shu Hsuan Chang* 

Cross-Strait Vocational Education Integration Development Research Center, Fujian Polytechnic of Information Technology, Fujian, China

Abstract

With the advancement of artificial intelligence technology, AI-assisted design has evolved from a functional tool to a collaborative partner in the creative process, enhancing design efficiency, broadening cultural interpretation, and transforming conventional design paradigms. Cultural creativity, as a design process, integrates cultural imagery, creative thinking, and technological innovation to translate cultural values into tangible design outcomes. While cultural elements are often incorporated into design through narrative and playful methods to accentuate historical and local identity, their interpretation and value assessment continue to rely substantially on designers' expertise. This study adopts a qualitative research approach, combining literature analysis, case studies, and conceptual modeling to examine the role of AI in cultural and creative design. A "Three-Layer Emotional Value System" and a "Five-Step Design Process" are proposed to systematically transform cultural symbols, meanings, and imagery into design language. Furthermore, a "Culture-AI-Innovation" translation model is constructed and empirically validated through three types of cultural creative products, illustrating the viability of a human-AI collaborative design framework. By integrating Leong's culture-based design model with the 3I innovation framework, the proposed approach addresses the issue of cultural homogenization prevalent in existing AI design tools. This research offers both theoretical insights and practical strategies for cultural creativity and design education, establishing a structured methodology for human-AI co-creation in culturally grounded product development.

Keywords

Cultural Creativity, Human-AI Collaboration, AI-Assisted Design, Emotional Value, Design Translation

1. Introduction

Cultural creativity represents a design process that integrates cultural imagery, creative thinking, and technological innovation to transform cultural values into tangible design applications. Designing culture is an act of creation; however, driven by market and commercial interests, cultural creative products often become mere visual decorations, failing to reflect the core needs of cultural transmission and life en-

hancement. For instance, current AI design tools exhibit significant cultural homogenization, with Western aesthetics dominating approximately 76% of generative outputs [2], thereby limiting the authentic representation of diverse cultural elements. Consequently, designers must possess profound humanistic competence and cultural sensitivity to effectively translate cultural values into tangible product ex-

*Corresponding author: mikejsc@gmail.com (Shu Hsuan Chang)

Received: 8 October 2025; **Accepted:** 26 October 2025; **Published:** 3 December 2025



Copyright: © The Author(s), 2025. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

pression. McDermott emphasized that future design should return to the core of humanistic aesthetics, framing design as the embodiment of cultural and social values [1].

With the rapid advancement of AI technology, artificial intelligence has become an essential tool in creative design. Nonetheless, it should be regarded as an assistive technology rather than a replacement for human creative leadership. This study specifically explores the application of a "human-AI collaboration" model in cultural creative design, examining the integration of human insight, technological capability, and innovative approaches in contemporary design practice.

Generative AI design tools, such as Generative Adversarial Networks (GANs), Adobe Firefly, and Midjourney, have demonstrated considerable efficacy in visual creation and prototype development. They enable the rapid generation of diverse design solutions while enhancing efficiency and creative extensibility in early design stages. Furthermore, AI supports designers in understanding consumer behavior and market trends through data analysis and prediction, helping to ensure that product designs align with market demands. This technological integration has profoundly shaped innovative product design, particularly within the cultural domain. By embedding cultural connotations into design thinking and leveraging AI's generative and analytical capabilities, design can evolve toward cross-disciplinary, in-depth, and culturally meaningful innovation. This study proposes a "Human-AI Collaborative Cultural Creative Design Model," which is analyzed and validated through specific cultural product development cases, with the aim of providing theoretical foundations and practical references for the field of cultural product design.

2. Literature Review

This literature review is structured around three foundational pillars of AI-assisted cultural creative design: culture-based design theories, human-AI collaboration frameworks in creative domains, and prevailing research gaps in culturally-grounded AI-assisted models.

2.1. Cultural Creativity Meets AI-Assisted Design

The deepening convergence of artificial intelligence and creative design makes it imperative to examine the interaction between cultural heritage and technological innovation. Grounded in a humanistic design perspective, this research examines the mechanisms by which generative AI can facilitate innovation in the cultural creative sector. It addresses a key challenge identified in the literature: the tendency of AI tools toward cultural homogenization, where, for example, Western aesthetics constitute about 76% of generative output [2], thus constraining the representation of cultural diversity. To counter this, the present study proposes a "Cultural Creativity and Human-AI Collaboration Framework," which aims

to fortify cultural value and advance cross-cultural innovation within the realm of AI-assisted design.

2.2. Cultural Creative Transformation in Product Design

With the rise of cultural product design, designers have begun to emphasize cultural connotations, narrative, and artistic value, while also considering users' reinterpretation and re-creation of products [3]. The core of cultural product design lies in translating traditional cultural meanings into new forms that meet contemporary needs, addressing spiritual value demands. Leong proposed culture-based design theory, arguing that if design is detached from cultural thinking, it may face cultural rejection even if functionally sound. Leong divided cultural space into three levels: tangible, behavioral, and spiritual, emphasizing that culturally integrated design should follow this framework [4]. According to this theory, design can be categorized into three levels: the external level (tangible and material culture), the intermediate level (usage behavior and rituals), and the internal level (intangible spirit and ideology). Design should consider three design attributes: (1) External level: color, texture, form, details, etc.; (2) Intermediate level: functionality, operability, safety, etc.; (3) Internal level: cultural meaning, storytelling, and emotion, as shown in Figure 1. These attributes can serve as the basis for cultural transformation and innovative design [5].

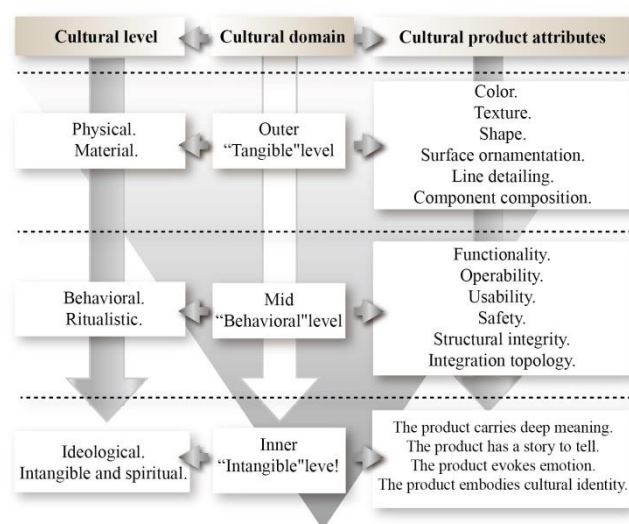


Figure 1. Attributes of cultural and creative product design, re-drawn in this study.

2.3. AI-Assisted Design Applications

With breakthroughs in AI technology, AI-assisted design is progressively enhancing traditional design models. AI is no longer merely a computational tool but is evolving into a creative design partner [6-8]. Research indicates that while AI excels at handling repetitive tasks, creativity and cultural

interpretation still heavily rely on human designers (Bentley, 2024). Furthermore, AI's understanding of physical laws and cultural contexts remains limited, with instances of structural failures and misuse of cultural symbols [9]. Therefore, human-AI collaboration models are still under exploration. The recently proposed "augmented intelligence" theory emphasizes that AI should act as an amplifier of human cognition rather than a complete substitute [10]. AI-assisted design has evolved from a "tool" to a "creative partner" as Table 1, but its future development still requires human designers to take the lead in cultural interpretation and design strategy.

Table 1. AI Tools for Product Design.

Design Stage	Common AI Software / Tools
Concept Ideation	MidJourney, Stable Diffusion, DALL·E, Runway
Sketch Generation	Adobe Firefly, Figma AI, Canva AI
3D Modeling	Fusion 360, SolidWorks, Rhino+Grasshopper, Blender
Rendering & Visualization	KeyShot AI, NVIDIA Omniverse, ZBrush, DreamTextures
Optimization & Simulation	Generative Design, nTopology, ANSYS

AI can assist in knowledge generation and solution validation, but final value judgments still depend on designers' thinking and value judgments. Tim Brown, CEO of IDEO, stated that the innovation process integrates human-centered methods with technical feasibility, business strategy, and user needs [11]. This process can be considered through the 3I innovation space: inspiration (uncovering potential needs from user demands or observations), ideation (generating and developing ideas), and implementation (bringing ideas to market). This approach applies designers' thinking and methods to the innovation of products, services, processes, and even strategies as shown in Figure 2. The "Double Diamond Model" proposed by the UK Design Council (2005) remains the foundation of current design processes. Dan Nessler (2016) advanced this model by strengthening the four stages—explore, define, develop, and deliver—and introducing continuous feedback and user participation, making design more aligned with needs and socially impactful as shown in Figure 3. This model integrates IDEO's human-centered design principles and Stanford's design thinking, emphasizing flexibility, multi-party collaboration, and empathetic research [12].

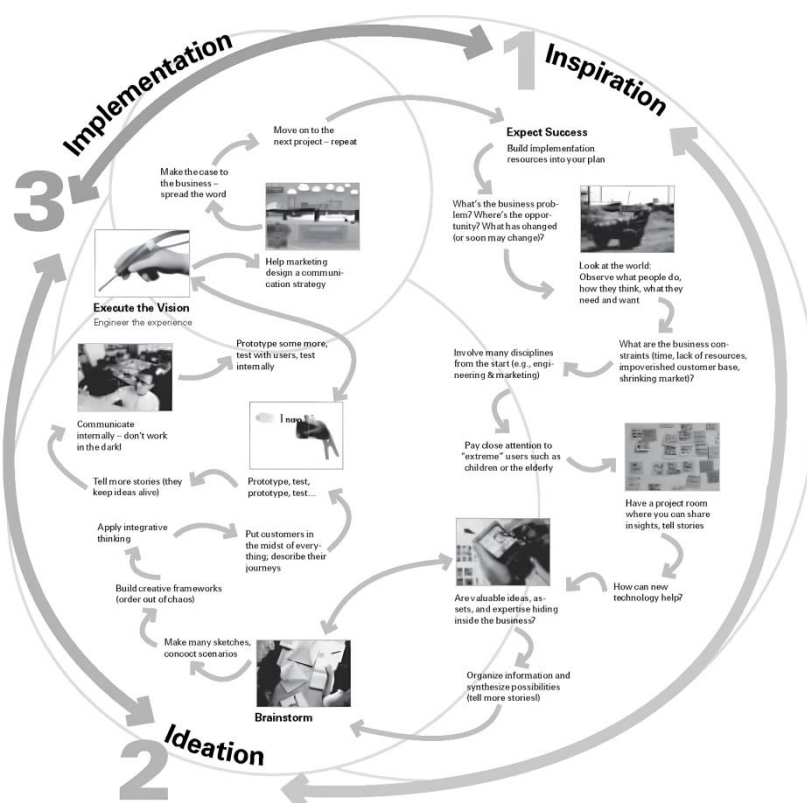


Figure 2. How Design Thinking Happens.

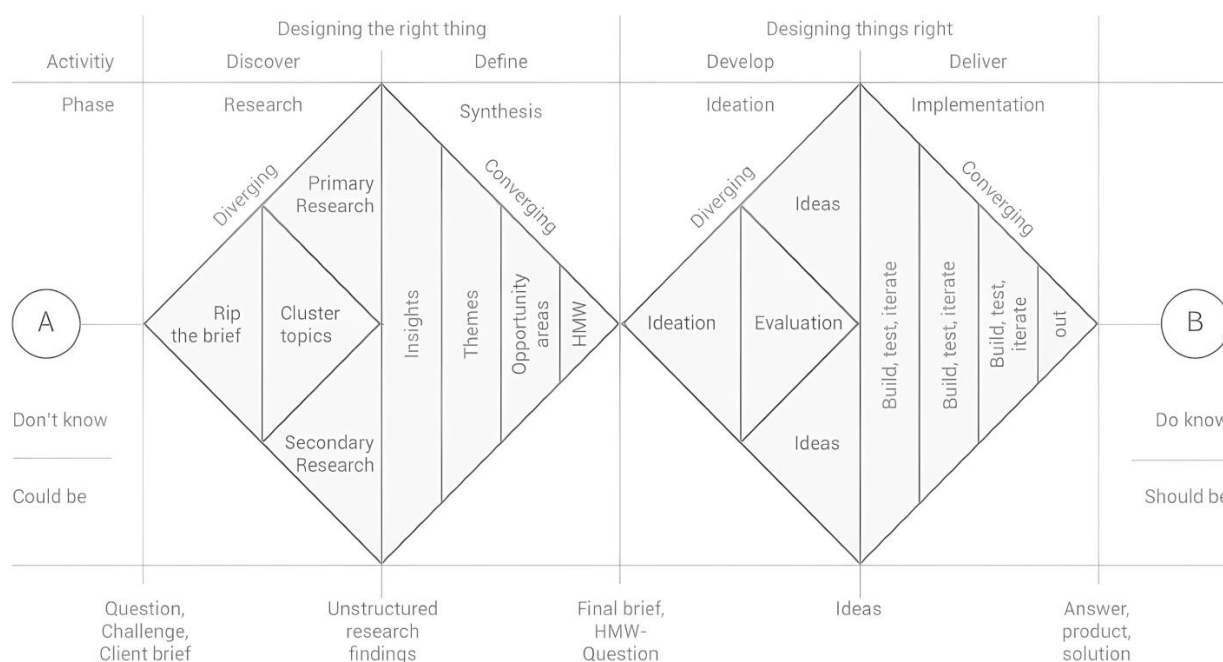


Figure 3. The Double Diamond revamped.

Based on the above literature, the design process for AI-assisted design applications in creativity and thinking can be divided into the following steps: (1) Exploration: Collect and analyze AI data to investigate market conditions; (2) Ideation: Integrate problems, brainstorm potential needs, and seek solutions; (3) Conceptualization: Based on cultural and

emotional needs, generate and develop design ideas, introducing AI into the innovation stage; (4) Implementation: Ensure alignment with human ethics and emotional needs, and conduct final review and validation procedures, as shown in Figure 4.

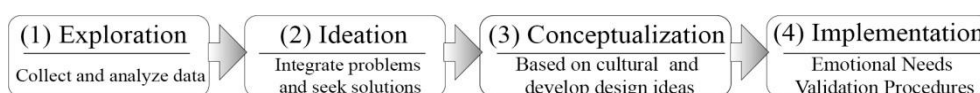


Figure 4. AI-Assisted Design Process. (Image source: Developed by this study).

2.4. AI-Assisted Design in Cultural Creative Products

Cultural creative design emphasizes the translation of historical, symbolic, and spiritual dimensions, which often transcend purely functional design. Research indicates that AI technology's application in this field is mainly manifested at three levels:

1. **Form and Visual Generation:** Generative models can quickly simulate the formal language of different cultural symbols, such as patterns, motifs, and color combinations, assisting designers in exploring diverse style variations in a short time (Liu et al., 2023) [13].

2. **Product Concept Development:** AI can provide design semantics assistance at the conceptual stage, forming preliminary product design drafts through language-image generation [14], effectively shortening the ideation process and enhancing the visualization efficiency of cultural element

translation.

3. **Human-AI Co-Creation and Cultural Interpretation:** The complementarity between AI and designers is most critical [10]. AI is responsible for providing data support and formal exploration, while designers take the lead in cultural interpretation, symbolic meaning, and aesthetic judgment.

AI's role in cultural creative design is gradually shifting from a "tool" to a "collaborator." Its value lies not only in accelerating the design process but also in co-creating the contemporary transformation of cultural symbols with designers, realizing a new design model of AI-Human Co-Creation.

3. Research Methodology

This study employs an integrated qualitative research methodology that systematically combines theoretical analysis with empirical validation through three methodical phas-

es:

Phase 1: Theoretical Foundation Establishment - A comprehensive literature analysis is conducted, encompassing cultural creative transformation, AI-assisted design applications, and human-AI collaboration frameworks. This foundational review identifies critical research gaps and establishes the theoretical basis for subsequent model development.

Phase 2: Integrated Model Construction - Based on the established theoretical framework, the "Three-Layer Emotional Value System" and "Five-Step Design Process" are developed through systematic model construction. This phase integrates cultural product design theory with metaphorical design methods to create a structured approach for cultural creative design.

Phase 3: Empirical Framework Validation - The proposed model undergoes rigorous validation through detailed case studies of Tang Dynasty cultural elements. The validation process implements specific AI tools and prompt engineering techniques to extract design characteristics, tests the "cultural product transformation design process" framework, and veri-

fies its practical applicability in cultural creative product development.

3.1. Exploration of Cultural Design Presentation

The Tang Dynasty (618-907), as an important period in Chinese culture, Court lady paintings are important visual symbols of the Tang Dynasty. The images of court ladies are plump and graceful, with natural postures, using figures like Yang Guifei (719-756, Tang Dynasty) as typical aesthetic symbols. For example, the dancer images in "The Screen of Musicians and Dancers" showcase detailed depictions of hairstyles, clothing, and expressions. Court lady paintings also depict scenes of noblewomen's daily lives, emphasizing decorativeness and status symbolism, as shown in Figures 5, 6. These stylistic features include elements such as color, patterns, silhouette, and accessories, providing rich cultural resources. This study develops product design with cultural depth and layered value through literature review.



Figure 5. "The Screen of Musicians and Dancers" (excavated from Astana Tomb 230, Turpan, Xinjiang). Source: He, G. S. (1995). Painting of the Sui, Tang and Five Dynasties. Taiwan: Art Book Company.



Figure 6. Court Ladies Adorning Their Hair with Flowers (Tang Dynasty, by Zhou Fang). Ink and color on silk. Source: He, G. S. (1995). Painting of the Sui, Tang and Five Dynasties. Taiwan: Art Book Company.

3.2. Cultural Product Transformation Design Process

Cultural product translation design emphasizes the key aspects of cultural understanding, analytical transformation, and element extraction. This study integrates historical narratives and product semantics through literature analysis, applying them to the cultural product design process. The design process combines cultural characteristic analysis and

expert practical experience to construct a cultural product transformation design process, divided into three emotional value levels and five design and AI-assisted application steps.

The cultural product transformation design process includes three emotional value levels:

- 1) Pleasure and Satisfaction Level
- 2) Emotional Resonance Level
- 3) Self-Actualization Level

These extend sequentially into five design steps:

- 1) Cultural Level

- 2) Cultural Product Attributes
- 3) Cultural Data Integration
- 4) Design Thinking Transformation
- 5) Cultural Product Design Concept

Finally, creative presentation is achieved. In this design system, AI technology and data analysis assist in collecting consumer preference information, improving the efficiency of cultural design translation, and combining computer AI-assisted design to ultimately complete the cultural creative product model. This study uses the "Tang Dynasty Cultural Product Design Concept" as a transformation framework illustration as shown in Figure 7.

3.3. Design Process Step Description

After multi-cultural level discussions, consumer expectation cognition is integrated into the design. Through three emotional value levels and five design steps, the design direction is established. This study takes "Tang Dynasty Cultural Product Design Concep" as an example, using a logical method to gradually transform Tang Dynasty cultural elements into specific design presentations, achieving the purpose of conveying cultural information through products. The specific steps are as follows see Figure 7.

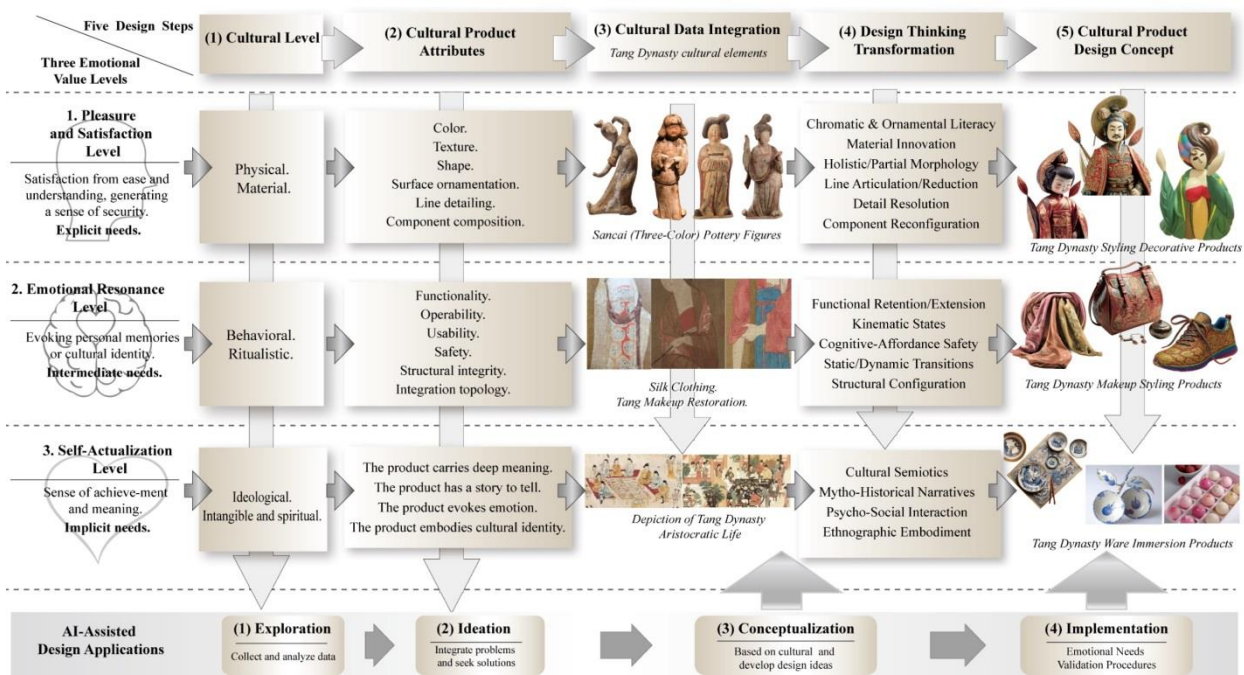


Figure 7. Cultural Product Transformation Design Process - Tang Dynasty Cultural Product Design Concept (Source: Developed and rendered by this study).

3.3.1. Three Emotional Value Levels

The cultural product design framework proposed by Leong [4] divides cultural space into three levels: tangible form, behavior, and psychology, constructing a theory of culturally integrated design. From the perspectives of linguistics, anthropology, and sociology, culture is the achievement of human civilization evolution, covering diverse aspects such as language, customs, religion, art, mode

of thinking, and living habits. Huang Wenxing and Chen Yongk undivided culture into three categories based on its nature: material culture (diet, clothing, housing, transportation, etc.), social culture (interpersonal relationships and social organization structures), and spiritual culture (covering art, religion, and belief systems) [15]. This classification provides an important reference for the operationalization of emotional value levels in cultural product design. Relevant details are shown in Table 2.

Table 2. Three Emotional Value Levels and Design Concept Ideation.

Three Emotional Value Levels	Core Characteristics	AI-Assisted Technology
1. Pleasure and Satisfaction Level	Satisfaction from ease and understanding, generating a sense of security. Explicit needs.	AI statistical data analysis, behavioral pattern learning

Three Emotional Value Levels	Core Characteristics	AI-Assisted Technology
2. Emotional Resonance Level	Evoking personal memories or cultural identity. Intermediate needs.	AI design assistance, vocabulary language emotion analysis
3. Self-Actualization Level	Sense of achievement and meaning. Implicit needs.	Human-led emotional value construction, AI-assisted applications

Source: Developed by this study

3.3.2. Five Design Steps

The five design steps of the cultural product transformation design process are: (1) Cultural Level, (2) Cultural Product Attributes, (3) Cultural Data Integration, (4) Design Thinking Transformation, and (5) Cultural Product Design Concept. Their design implications are described below.

(1) Cultural Level (2) Cultural Product Attributes

Before undertaking cultural creative product design, de-

signers need to deeply understand and investigate the expression and connotation of cultural characteristics. Systematic analysis of these levels helps designers more effectively identify, compare, and interpret cultural elements, thereby promoting their deep integration in product design. The cultural level is further explored as cultural attributes, with its structure built on the three major cultural level frameworks, extended to cultural products see [Table 3](#).

Table 3. Cultural Level Corresponding Cultural Product Attribute Analysis Correlation.

(1) Cultural Level	(2) Cultural Product Attributes	Description
Physical Form Level	Material Substantive Attributes	The appearance and structural characteristics of the product, such as color, texture, shape, surface patterns, line vocabulary, detail treatment, and component composition.
Usage Behavior Level	Social Meaningful Attributes	The functionality, operability, ease of use, safety, structure, and the relationship between components of the product, emphasizing the efficiency and experience during actual use.
Ideology and Spiritual Level	Spiritual Immersive Attributes	Focuses on the intangible values carried by the product, such as special meanings, narratives, emotional connections, and cultural symbols.

Source: Developed by this study

(3) Cultural Data Integration

To clearly define the cultural semantics of the target consumer group and user preference conditions, the correspondence between emotional value levels and cultural level analysis is an important stratification, helping to establish product functions, analyze their background and usage sce-

narios, and explore their life needs and cultural preferences from the user's perspective, serving as the basis for shaping cultural imagery and product vocabulary. Based on cultural translation theory, this study establishes a cultural extraction framework and systematically decodes the Tang Dynasty cultural information of the research case, as shown in [Table 4](#).

Table 4. Cultural Data Integration (Tang Dynasty Cultural Information) Corresponding to Three Emotional Value Levels.

Three Emotional Value Levels	(3) Cultural Data Integration
1. Pleasure and Satisfaction Level	Analyze Tang tri-color glazed pottery, pattern totems, and court lady painting basic design elements to extract recognizable decorative vocabulary.
2. Emotional Resonance Level	Use Tang makeup digital restoration information to deconstruct court lady painting makeup symbols and the aesthetic meaning of intermediate social classes.
3. Self-Actualization Level	Interpret Tang Dynasty poetry and murals (Chang'an Nightless City) to establish cultural

Three Emotional Value Levels**(3) Cultural Data Integration**

immersion perception and deep meaning.

Source: Developed by this study

(4) Design Thinking Transformation

In the process of cultural product design, design thinking needs to transform cultural imagery into specific product vocabulary, integrating form, function, and cultural connotation for innovative interpretation. The design thinking directions are as follows:

1. Transformation of Formal Vocabulary: Understanding and application of color and patterns, innovative attempts in material matching, extraction of overall or local shape characteristics, strengthening or simplification of line language, judgment on detail treatment, and the method of component reorganization and composition are all key design strategies for shaping cultural style.

2. Consideration of Functional Needs: Retention and extension of product functions, covering the user's actions and postures during the operation process, emphasizing intuitiveness, convenience, and safety; and observing the image and cultural trajectory displayed by the product in static and dynamic states, as well as the combination relationship of its structural form and component matching, to enhance the overall user experience.

3. Display of Cultural Depth: The deep meaning in cultural characteristics, incorporating narratable allusions and legends, strengthening the psychological feelings and emotional resonance generated by users during use, and reflecting the cultural display of people's lifestyles and values, achieving organic integration of design semantics and cultural heritage.

(5) Cultural Product Design Concept

In the implementation of cultural product design, designers synthesize the results accumulated in the ideation and conceptualization stages, integrate cultural attributes, product context, and design appeals, and carry out design development through the transformation method of product semantics. The design concept is gradually concretized through text descriptions and sketch drawings, eventually forming the final design solution. The design process needs to consider the multiple attributes of cultural products, deeply review and discuss product details and maturity, thereby enabling cultural characteristics to be presented and transformed through appropriate product forms.

Through the five design steps, master the historical background, cultural analysis, character images, and related allusions of the Tang Dynasty as the construction basis of cultural resources, and extract representative elements from them to

develop creative design directions. Use storytelling as a way of cultural transmission, initially hand-draw sketches for product styling ideation, set design conditions such as materials, colors, and decorative patterns, and incorporate consumer user groups and market positioning for planning. Finally, enter computer graphics to complete the design, and introduce AI-assisted design tools for generative creation to improve design efficiency and deepen the presentation and extension of Tang Dynasty cultural elements in the product.

The Tang Dynasty cultural creative products developed in this study, based on the three emotional value levels, cultural data integration, and design thinking transformation, are divided into the following three types:

1. Tang Dynasty Styling Decorative Products: Using Tang tri-color pottery figurine shapes and court lady painting totems as design elements, applied to decorative ornaments or home decor products, highlighting the visual aesthetics of Tang Dynasty character images and the translation of cultural memory.

2. Tang Dynasty Makeup Styling Products: Extending from the makeup imagery of pottery figurines and court lady paintings, integrating Tang Dynasty makeup styles with modern makeup products, developing practical products such as clothing and wearable accessories with dual characteristics of culture and fashion.

3. Tang Dynasty Ware Immersion Products: Inspired by Tang Dynasty daily life and dietary utensils, introducing story-experiential design concepts, developing immersive foods with cultural scenarios and imagery translation, promoting user interaction with historical culture.

4. Design Case Validation Analysis

This section provides detailed validation of the proposed model through specific case implementations, including granular technical specifications and AI tool applications to ensure reproducibility and practical utility. This study cites the series of works "Cultural Creative Product Design - Song of the Rainbow and Feathered Robe," which won the grand prize in the National College Creative Design Works Competition in Mainland China (Figure 8), as verification, emphasizing the co-creation practice model of AI-Human Co-Creation in the AI-assisted delivery stage.



Figure 8. Cultural Creative Product Design - Song of the Rainbow and Feathered Robe.

4.1. Cultural Product Design Cases

Through the following design creation cases, this article will gradually elaborate the procedure of cultural product design, including three emotional value levels and five design steps. The execution process of the creation cases generated through this design procedure will be described as follows

4.2. Tang Dynasty Styling Decorative Products

Using Tang tri-color pottery figurine shapes and court lady

paint-ing totems as core design elements, applied to decorative ornaments and household items, designed at the emotional value level of Pleasure and Satisfaction Level. the initial design concepts were generated using the following Midjourney, Adobe Firefly prompt: "Tang Dynasty court lady with elaborate hairstyle and traditional makeup, vibrant colors, intricate patterns, decorative ornament, photorealistic style --ar 3: 4 --v 6.0." to highlight the artistic beauty of Tang Dynasty character images and display the translation and reproduction of cultural story memory in cultural creative product design. The design step procedure is shown in Figure 9.

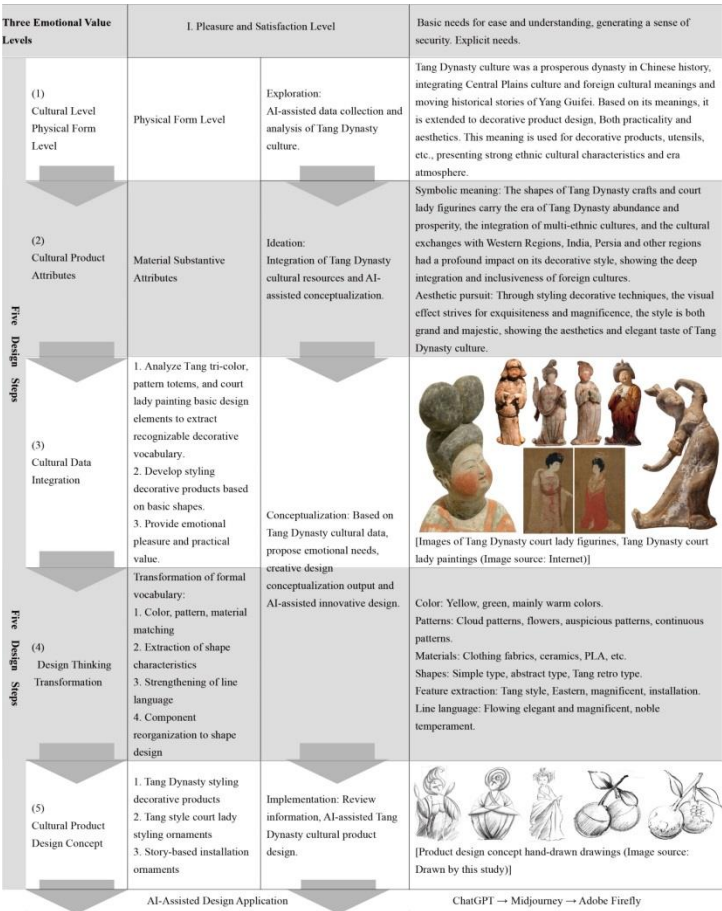




Figure 9. Tang Dynasty Styling Decorative Products.

4.3. Tang Dynasty Makeup Styling Products

By leveraging makeup motifs from Tang Dynasty pottery figurines and court lady paintings, this study developed designs that combine historical styles with modern makeup aesthetics, situated at the "Emotional Resonance Level." AI

generation tools were directed using prompts such as *"Tang Dynasty makeup elements combined with modern fashion accessories, cultural fusion style, detailed rendering,"* (using Midjourney and DALL-E) thereby creating a effective bridge between traditional aesthetics and contemporary design imperatives. The full design procedure is documented in [Figure 10](#).



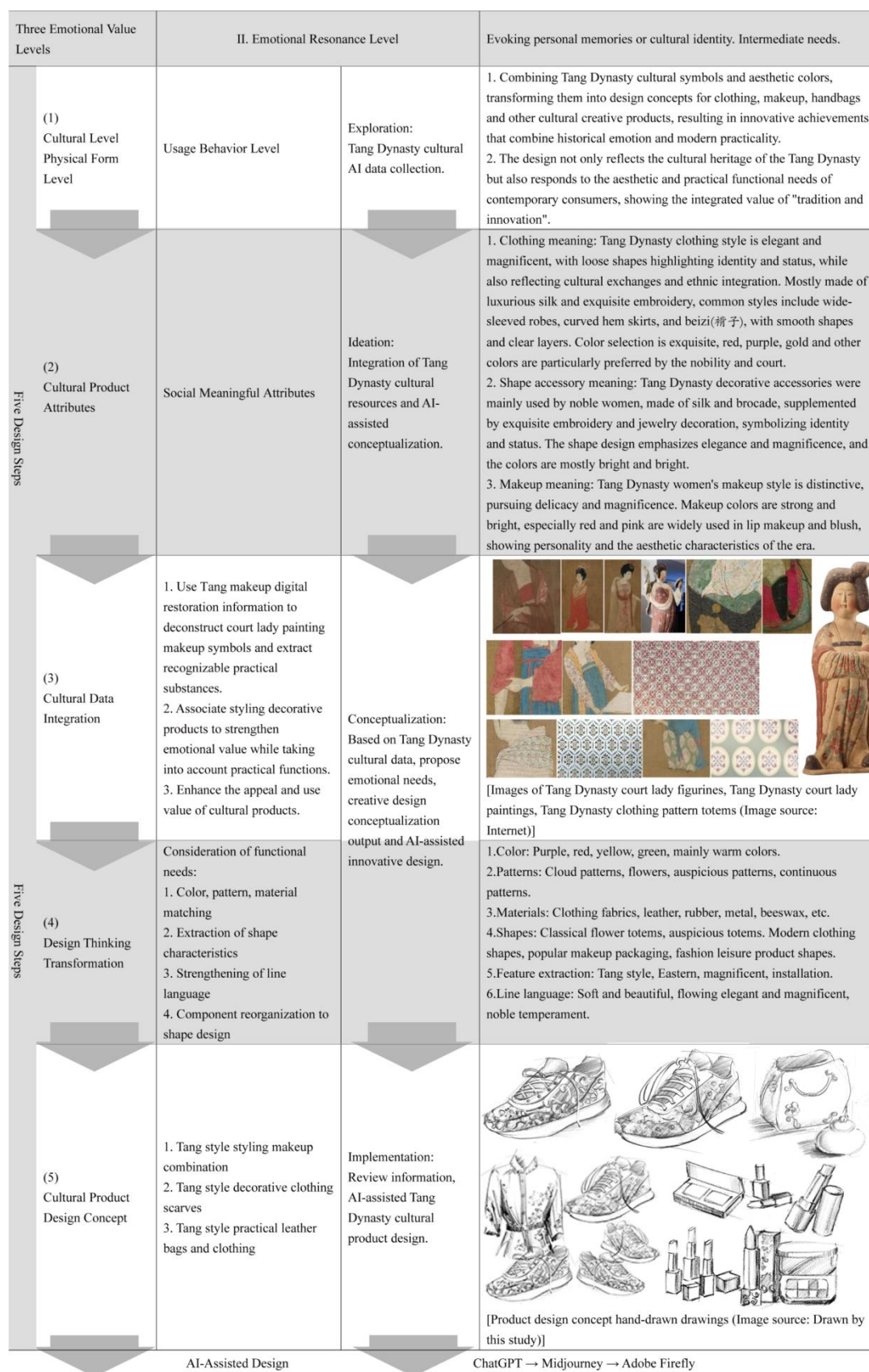


Figure 10. Tang Dynasty Cultural Creative Makeup Styling Products.

4.4. Tang Dynasty Ware Immersion Products

This section presents the development of immersive food products inspired by Tang Dynasty daily life and dietary utensils, employing a story-experiential design framework. The design process incorporated AI-assisted visualization, utilizing Midjourney prompts such as "Tang Dynasty culinary vessel with intricate patterns, filled with traditional

sweets, photorealistic style, cultural immersion scene" to generate initial conceptual renderings. This approach facilitated the creation of culturally-grounded food experiences that promote user interaction with historical culture, as illustrated in Figure 11.

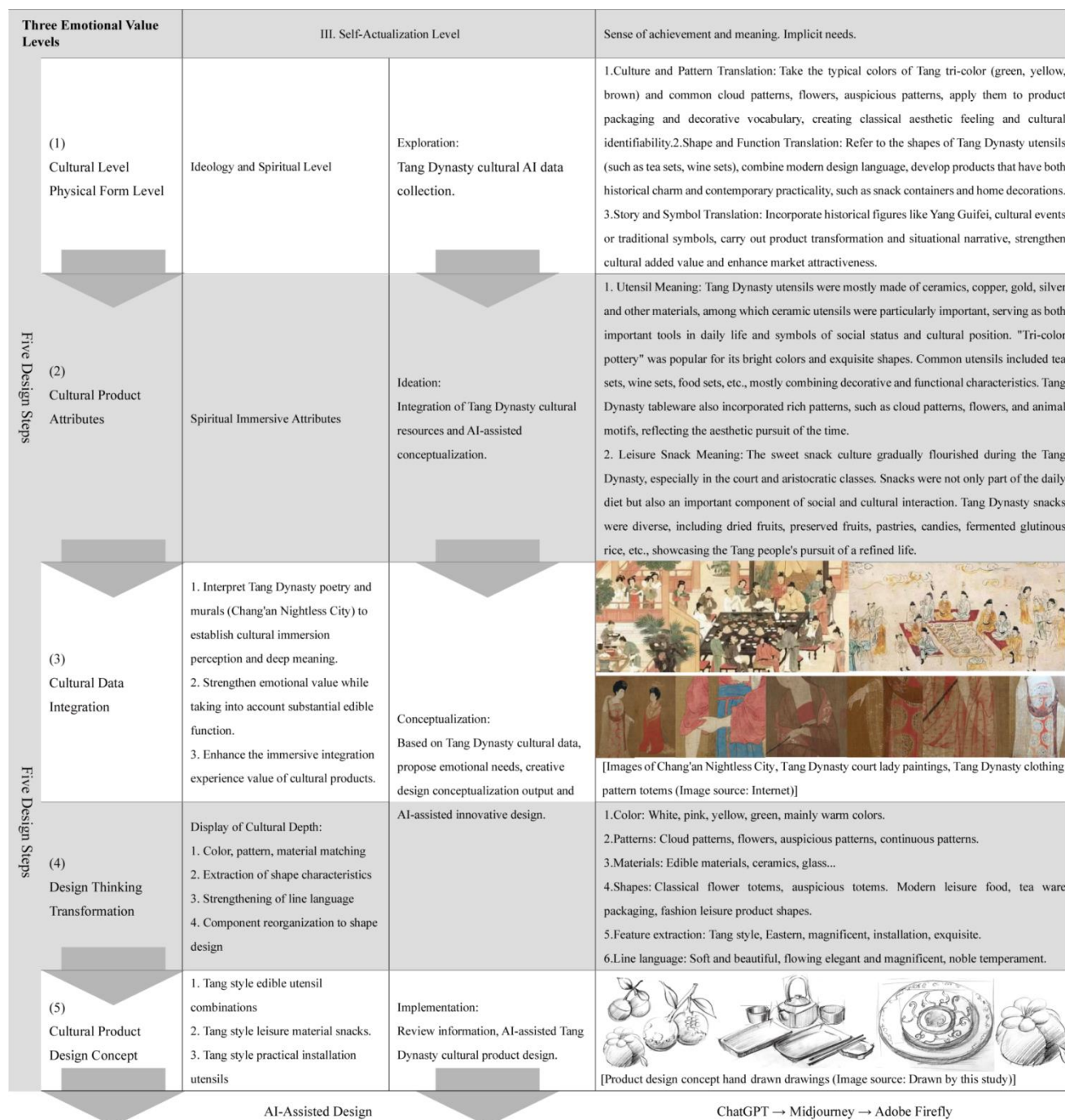




Figure 11. Tang Dynasty Cultural Creative Ware Immersion Products.

5. Discussion

This study addresses the design transformation process of cultural creative products and explores the practical feasibility of AI-assisted design in cultural innovation applications. AI technology, combined with information value-added, creative ideation, and design model construction, provides a translation path for the modernization and reconstruction of cultural assets [16, 17]. The following is the feasibility analysis of creative product design summarized by this study.

5.1. Advancing Cultural Design Theory and Practice

The empirical findings of this study contribute to both theory and practice by demonstrating how culturally grounded design can be operationalized within AI-assisted creative workflows.

1. this research results show a clear alignment between cultural depth and market demand: cultural elements that embody narrative and historical context satisfy contemporary consumers' desire for cultural identity and spiritual value. Products that successfully encode such depth can achieve market differentiation particularly in premium lifestyle categories (e.g., apparel, personal accessories, and domestic utensils) thereby enhancing brand equity and purchase intention.

2. the study confirms substantial potential for cultural diversity and cross-domain integration. Distinct Tang Dynasty

motifs (e.g., sancai glazes, court lady portraiture, and historical makeup conventions) can be productively recombined with contemporary design idioms to generate novel aesthetic languages. This hybridization addresses intergenerational and cross-segment preferences, improving both market acceptance and artistic value.

3. this research practice demonstrates a design orientation that balances creativity and contemporary fashionability. For example, translating Tang-era makeup aesthetics into modern cosmetic packaging conveys historical meaning while meeting functional and trend-driven imperatives of the contemporary beauty market. This dual focus — cultural authenticity plus market relevance — is critical for viable cultural production.

4. storytelling and immersive experience design emerged as key mechanisms for driving emotional engagement. Embedding historical personae and scenography (e.g., narratives related to Yang Guifei) establishes a cognitive-affective pathway—"cultural cognition → emotional resonance → consumption transformation"—that enhances user participation and identification with the product. This finding aligns with prior studies that link narrative design to enhanced consumer attachment and experience value [18].

5. the results indicate a realistic pathway toward sustainable commercial development. Cultural creative products naturally lend themselves to niche segmentation and strong brand identity, making them suitable for cultural tourism, creative markets, and museum retail. If a value chain combining AI-assisted innovation experiential value transmission → sustainable business model is implemented, cultural

products may achieve greater scalability and longer-term economic viability.

Importantly, the Three-Layer Emotional Value System proposed here operationalizes Leong's culture-based design perspective [4] by explicitly linking spiritual values, behavioral interactions, and physical form. This layered translation addresses a central limitation of many generative AI outputs—superficial stylistic replication by foregrounding semantic depth and contextual meaning, thereby counteracting the cultural homogenization observed in some AI-generated designs [2]. In sum, our approach advances cultural design theory by supplying an actionable mapping from cultural semantics to product attributes, and it offers practitioners concrete procedures for integrating cultural authenticity within AI-assisted workflows.

5.2. Methodological Contributions, Limitations, and Future Research Directions

This research demonstrates the conceptual validity of a human-AI co-creation framework through a targeted case study of Tang Dynasty cultural resources. The research design—combining literature synthesis, cultural layer analysis, attribute extraction, and AI-assisted prototyping—provides a transferable process model for culture-driven design practice.

However, several limitations warrant attention. First, the generalizability of the model remains to be empirically tested across diverse cultural contexts. Applying the framework to other historical periods, indigenous traditions, or contemporary digital subcultures would clarify boundary conditions and inform adaptations required for culturally distinct domains.

Second, while the present study relies primarily on qualitative validation (expert review, designer reflection, and concept evaluation), future research should incorporate quantitative and mixed-methods approaches to strengthen causal inference. For example, controlled experiments (e.g., A/B testing) could measure the model's impact on metrics such as design generation speed, perceived cultural authenticity, user engagement, and willingness to pay. Quantitative surveys and behavioral experiments would complement qualitative insights and provide more robust evidence of efficacy.

In conclusion, this study establishes a foundational framework for culturally informed human-AI co-creation and invites multidisciplinary follow-up: cross-cultural validation, mixed-methods empirical assessment, ethical standardization, and technical enhancement. Pursuing these directions will help transform the conceptual model into a rigorously validated, ethically grounded, and practically deployable methodology for cultural creativity and design education.

6. Conclusions

This study has established and validated an innovative de-

sign model for cultural creative products, centered on "cultural imagery translation" and supported by human-AI collaboration. Using Tang Dynasty culture as a verification case, we have demonstrated how the integration of a "Three-Layer Emotional Value System" with a structured "Five-Step Design Process" effectively transforms historical shapes, patterns, and narratives into commercially viable and culturally resonant products. This approach underscores that authentic cultural product design must engage with the full spectrum of cultural essence—spanning material, behavioral, and spiritual dimensions—and leverage design thinking to convert abstract cultural semantics into concrete product vocabulary.

A key finding is the distinct, complementary roles of human and artificial intelligence within this framework. While AI significantly enhances the process through information synthesis, trend forecasting, and generative ideation—boosting both efficiency and creative diversity—the core responsibilities of cultural interpretation and final aesthetic judgment must remain under human guidance. This balance is crucial for preserving cultural authenticity while harnessing technological power.

The "Cultural Product Transformation Design Process" introduced in this study provides a robust theoretical foundation and a practical methodology for the commercialization of cultural assets. It expands the application horizon of AI in cultural innovation and offers designers a structured, replicable process for identifying and translating cultural characteristics into contemporary design.

Looking forward, this research suggests three promising directions for future work:

- 1) Developing AI-assisted digital teaching models for cultural creative design education to enhance pedagogical effectiveness;
- 2) Investigating AI tools for comparative analysis of cultural semantic translation to deepen understanding of human-AI collaborative creation;
- 3) Exploring the cognitive and technical gaps in translating 2D hand-drawn sketches into 3D simulations within AI-augmented workflows, particularly concerning the alignment between image cognition and final design output.

These directions can serve as vital extensions for future research and practice in cultural creative design education, contributing to the sustainable integration of culture, creativity, and technology.

Abbreviations

AI Artificial Intelligence

Author Contributions

Shu Hsuan Chang is the sole author. The author read and approved the final manuscript.

Funding

This work is supported by Fujian Polytechnic of Information Technology (Grant No. YRCSK23-02).

Conflicts of Interest

The author declares no conflicts of interest.

References

- [1] McDermott, C. (1997). *20th century design*. Carlton Books Limited.
- [2] Chen, Y. (2023). Western dominance in AI training datasets: A cross-cultural study of generative design tools. *International Journal of Design Computing*, 15(2), 45-67. <https://doi.org/10.1007/s00158-023-03634-5>
- [3] Lu Dingbang, Zhang Jialing (2007). The Concept and Design Process of User Successive Design. *Journal of Design*, 12(2), 1-13.
- [4] Leong, B. D. (2003). Culture-based knowledge towards new design thinking and practice: A dialogue. *Design Journal*, 19, 48-58.
- [5] Hsu, C. H., & Lin, R. T. (2011). A study on cultural product design process. *Journal of Design*, 16(4), 1-18.
- [6] Zhang, M., Li, X., & Chen, Y. (2021). Parametric design and rule-based systems in architecture: Limitations and prospects. *International Journal of Architectural Computing*, 19(4), 311-329. <https://doi.org/10.1177/14780771211035105>
- [7] Rombach, R., Blattmann, A., Lorenz, D., Esser, P., & Ommer, B. (2022). High-resolution image synthesis with latent diffusion models. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)* (pp. 10684-10695). IEEE. <https://doi.org/10.1109/CVPR52688.2022.01042>
- [8] OpenAI. (2025). Advances in multimodal AI: Capabilities and challenges (Research Report). OpenAI.
- [9] MIT. (2024). AI design failures: Structural and cultural misinterpretations in generative models (Media Lab Report). Massachusetts Institute of Technology.
- [10] Lee, K. (2025). The symbiosis of human and AI creativity: Toward augmented intelligence. *Nature Machine Intelligence*, 7(2), 210-222. <https://doi.org/10.1038/s42256-025-00813-5>
- [11] Brown, T. (2008). *Design thinking*. *Harvard Business Review*, 86(6), 84-92.
- [12] Nessler, D. (2016). *How the Double Diamond works and why it is useful*. Medium. <https://medium.com/@DanNessler/how-the-double-diamond-works-and-why-it-is-useful-7c50e7d6f002>
- [13] Liu, H., Zhang, Q., & Sun, Y. (2023). Generative models for cultural symbol design: Applications in visual communication. *Design Studies*, 89, 45-62. <https://doi.org/10.1016/j.destud.2023.101218>
- [14] Chen, Y., & Wang, L. (2024). Semantic transformation in AI-assisted cultural product design. *International Journal of Design Creativity and Innovation*, 12(3), 201-215.
- [15] Huang, W.-S., & Chen, Y.-K. (2009). A study on the effects of cultural element placement in advertising: The case of Taiwanese indigenous cultural elements. *Chaoyang Business and Management Review*, 8(3-4), 1-23.
- [16] Hinton, G. (2021). Cultural semiotics in digital age. MIT Press.
- [17] Zhang Ming (2022). Artificial Intelligence-Driven Cultural Innovation Design. *Journal of Design Science*, 35(4), 12-25.
- [18] Klopfer, L. E., & Aikenhead, G. S. (2022). *Humanistic science education: The history of science and other relevant contexts*. *Science Education*, 106, 490-504. <https://doi.org/10.1002/sce.21710>

Biography

Shu Hsuan Chang is an Associate Professor at Fujian Vocational College of Information Technology and a member of the Cross-Strait Vocational Education Integration Development Research Center. He received his Ph.D. in 2015 and his Master's degree in 2009, both from Taiwan University of Arts. With long-term dedication to vocational education and cross-cultural education research, he has presided over multiple provincial and ministerial-level teaching and research projects and was awarded the Second Prize for Teaching Achievements in Fujian Province. He currently serves as an editorial board member of *Journal of Vocational Education Research* and has been frequently invited as a keynote speaker at cross-strait education forums.

Research Field

Shu Hsuan Chang: Vocational education policy, Cross-cultural education research, Curriculum development and design, Teaching evaluation systems, Internationalization of education development.