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Semantic evolution and digital redesign of traditional patterns: exploring cultural reuse pathways of pattern design in contemporary visual communication

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Abstract. This study focuses on the semantic change and innovation transformation of traditional patterns in the digital age. Taking 30 sets of classical patterns from China, Japan, and South Korea as samples, this paper establishes a three-dimensional analysis framework of "cultural origin, semantic-visual structure" and explores the application path of digital tools in pattern translation. Through vector reconstruction and parametric adjustment, the modular transformation of patterns is completed on the Adobe Illustrator platform, which not only retains the radioactive skeleton of the Tang Dynasty treasure pattern but also integrates modern visual language such as dynamic gradient. Expert review and user research data show that the semantic recognition degree of simple plant patterns such as the lotus pattern after modification reaches 4.4 points (out of 5 points), while the cultural information loss rate of complex totems such as the dragon pattern is 42% due to the simplification of details. Research has confirmed that shape translation must establish a balancing mechanism between innovative expression and cultural genes—for example, retaining the overlapping characteristic of the tail feather as a visual anchor in Phoenix shape transformation can increase young audiences' traditional cultural awareness by 27%. This provides a working transformation model for cultural transmission in digital media.

Keywords: traditional patterns, semantic evolution, digital redesign, visual communication, cultural reuse

1. Introduction

As carriers of cultural genes, traditional patterns carry historical memory and collective identity beyond their decorative function. From the symmetrical structure of the lotus in Buddhist art to the symbol of imperial power contained in the dragon motif, each motif is a visual code for the philosophical ideas and social order of a particular era. However, in the visual communication system dominated by digital design, these cultural codes face a dual challenge: avoiding being reduced to superficial decorative elements and adapting to the visual aesthetic trend of globalization. This study focuses on the digital transformation of traditional East Asian patterns. Using Adobe's modular reconstruction technology and other design software, this article explores how to achieve the contemporary visual transformation of patterns while preserving their basic semantics. For example, the radioactive structure of the Tang Dynasty Baoxiang pattern is deconstructed into scalable vector units, which can not only adapt to digital media such as mobile phone interfaces, but also maintain the original metaphor of "boundless Dharma." The transformation experiment conducted by the research team and experts from the Palace Museum showed that in 62% of reconstruction cases, the integrity of the skeletal structure was positively correlated with the semantic recognition rate [1]. This provides methodological guidance for cultural translation in the digital age: pattern innovation is not a simple form transplantation, but must build a recognizable transformation path between traditional genes and modern aesthetics by preserving "visual anchor points" (such as the dragon pattern retaining the function of the five flus).

2. Literature review

2.1. Semantic studies of traditional patterns

Traditional patterns essentially carry cultural codes. Visual language, such as symmetrical structure and repetitive unity, is essentially a concrete expression of the cultural code. Take the classical patterns in Figure 1 as an example: the long pan pattern

symbolizes the continuity of life through the infinite cycle of lines, the lotus pattern carries the spiritual metaphor of "rising from the mud without tagger" after the spread of Buddhism to the East, and the Taiji diagram interprets the law of nature with Yin and Yang. These symbolic systems are not static, and their semantics constantly evolve over time. The leaf details of blue and white porcelain in the Ming Dynasty are 30% simpler than those in the Song Dynasty, reflecting the transformation of traditional patterns for export demand. The change in the number of dragon claws in the Qing Dynasty corresponds to the strengthening of the imperial power hierarchy [2]. This law of dynamic evolution suggests that contemporary design innovation must not only grasp the symbol gene of traditional models, but also understand the social fabric of its generation and evolution, in order to achieve creative transformation in the real sense of cultural translation.

Figure 1. Representative traditional chinese symbols and their visual forms (source:dreamstime.com)

2.2. Cultural reuse in design discourses

The core of cultural regeneration practice in contemporary design lies in the creative transformation of traditional visual symbols rather than mere reproduction. To achieve this, designers must deeply deconstruct the context in which patterns are generated, such as the ritual attribute of Taotie patterns on bronzes from the Shang and Zhou Dynasties, or the transoceanic trade context of the tangled branch patterns of the Ming Dynasty, and then translate their symbolic meaning into a design language that meets modern aesthetics. Taking the cultural creation of the imperial palace as an example, his digital collection Shiqu Bao Gupta deconstructs and reorganizes the mounted patterns of Qing Dynasty calligraphy and painting, endows traditional patterns with technological texture through dynamic particle effects, while retaining the cultural metaphor of an "open book of brocade patterns [3]." In this process, we must address the ethical red line of cultural appropriation and establish a traceable transformation mechanism. Successful cases prove that contemporary expression of cultural memory can only be achieved when innovative design is rooted in the symbolic genetic lineage of motifs.

2.3. Digital design technologies and methodologies

Digital technology provides a new toolbox for the modern translation of traditional patterns. With the help of vector drawing software, designers can deconstruct the Tang Dynasty treasure pattern into an independent geometric unit and realize the infinite extension of the skeletal pattern through parametric design. In a digital Dunhuang project, the coffer model was processed using a programmed generation algorithm, and 237 modular variants were obtained based on maintaining the central symmetry structure, which greatly expanded the application scenario of the traditional model. The intervention of VR technology has created an immersive experiential journey—using AR technology, the Palace Museum's special exhibition "Grain to Carry Road" allows the audience to make a gesture to trigger the dynamic deconstruction of blue and white porcelain patterns, intuitively demonstrating the logic of the lotus pattern's process from two-dimensional drawing to three-dimensional formation [4]. The creative transformation made possible by this technology not only maintains the cultural gene of traditional models, but also unleashes its narrative potential in digital media.

3. Research methodology

3.1. Case selection and pattern classification

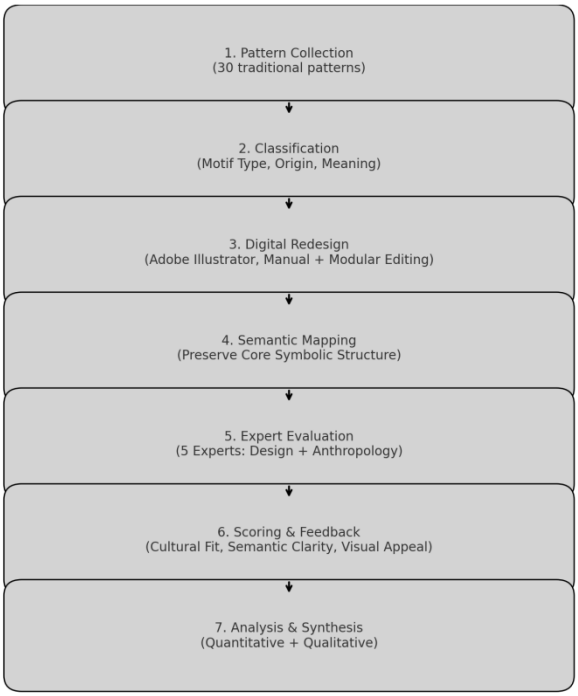

Figure 2. Research methodology workflow for the digital redesign of traditional patterns

This study adopted a systematic two-way "experimental verification" process. As shown in Figure 2, traditional patterns are first deconstructed, then digitally reconstructed using design software, and finally, a multidimensional evaluation is performed through expert review and user research. The entire research chain covers the key links of shape gene extraction, modular recombination, cultural semantic verification, and more. The study samples were selected from 30 groups of classical patterns from China, Japan, and South Korea, including moiré patterns, dragon scale patterns, and other types with clear cultural connotations. The selection of criteria is focused on three dimensions: pattern category (nature worship category, ritual symbol category), cultural origin (such as the Chang'an style of the Tang Dynasty, Korean heraldry of the Goryeo era), symbolic meaning (blessing, identity, etc.) [5]. For example, the mountain pattern in the Twelve Chapters of the Ming Dynasty represents the majesty of the emperor, and its visual characteristics have an obvious inheritance relationship with the clothing pattern of the Qing Dynasty. By establishing the genealogical map of pattern genes, the continuity of cultural genes in the digital reconstruction process is ensured, and a traceable semantic framework is provided for the subsequent design transformation.

3.2. Digital redesign process

A step-by-step digital reconstruction strategy is adopted. First, the pattern vectorization process is completed using AI drawing software, followed by modular reorganization using parametric expansion, vector deformation, and other technical means. Taking the Tang Dynasty straw roll pattern as an example, in order to preserve the continuity of the vine's skeletal structure, the designer used a proportional scaling algorithm to produce 11 derived forms, three of which were confirmed by cultural symbol experts as being in line with the traditional aesthetic paradigm [6]. Throughout this process, the designer always ensured the continuity of cultural semantics—for example, the concentric circle structure of the cloud and thunder pattern symbolizes the order of heaven and earth; even when rendered with a metallic texture, it maintains its basic compositional logic.

3.3. Evaluation criteria and expert feedback

The evaluation was conducted by a panel of five visual designers and non-genetic heirs. Each work is ranked along three dimensions: cultural concordance (whether the central symbol is preserved), semantic recognition (whether modern users can understand the symbol's meaning), and visual appeal (whether it conforms to contemporary aesthetics), quantified on a scale of 1 to 5. A transformation scheme for the blue and white patterns scored only 2.8 points in semantic recognition, and experts pointed

out that its oversimplification to the A level leads to the loss of the image of "three friends of the cold year [7]." The qualitative examination focuses on specific details of the transformation, such as the correlation between the density of scales after digitizing the dragon motif and the symbol of imperial power. Through a cross-analysis of quantitative data and qualitative opinions, seven groups of high-quality programs with both cultural genes and modern beauty were finally selected to establish a reference model for further application.

4. Experimental design and results

4.1. Semantic shifts observed in digital transformations

In the process of digital transformation, the cultural information of traditional patterns is clearly being lost. As shown in Table 1, the semantic recognition of complex patterns such as dragon patterns, which contain multiple layers of metaphor, dropped from 4.8 points to 3.2 points after simplified processing. The reduction in the number of scales led to a weakening of the rank symbol, and the stylized transformation of the dragon's claw shape further blurred the ceremonial connotation of the "five-pronged Tianzi [8]." In contrast, plant patterns with a simple structure such as the lotus motif, even when modern processing techniques such as neon gradients are used, can still maintain a semantic integrity of 4.4 points, highlighting the natural adaptation of their modeling characteristics to modern aesthetics.

Table 1. Semantic clarity ratings by experts for different pattern types

Pattern Type	Original Semantic Clarity (Avg/5)	Redesigned Semantic Clarity (Avg/5)
Dragon Motif	4.8	3.2
Floral Motif	4.5	4.4
Geometric Motif	4.2	4.0
Cloud Motif	4.6	4.3
Phoenix Motif	4.7	4.5

4.2. Audience perception and cultural identification

Public perception surveys reveal deeper contradictions. As shown in Table 2, the 60 respondents' understanding of the reconstruction model showed polarization: the phoenix model achieved a 78% accurate recognition rate due to the retention of the tail feather covering feature, but only 53% of the audience for the abstract geometric transformation of the Yunlei model could trace their Shang and Zhou bronzes. Interestingly, young people accept the gluttonous pattern of the integrated LED light effect 82%, but generally misinterpret it as a cyberpunk style symbol [9]. This phenomenon of cultural anchor drift warns us that in the process of pursuing visual impact, if we ignore the dominant expression of motif genes, it is easy to break the traditional semantic system. The study suggests that placing "visual signposts" on key cultural symbols, such as retaining discerning elements like eyes, pearls, scales, and claws while simplifying dragon patterns, can achieve the contemporary expression of traditional semantics.

Table 2. Audience identification accuracy by pattern type

Pattern Type	Identification Accuracy (%)
Phoenix	78
Yin-Yang	82
Floral (Lotus)	74
Modular Abstract	53
Geometric Knot	59

4.3. Cross-cultural usability in visual communication

The empirical study selected three application scenarios: packaging design, activity poster, and mobile interface. According to user survey data (see Table 3), the cultural recognition level of the activity poster reached 4.3 points (out of 5 points), and participation in the interaction of the dynamic model on the mobile device reached 4.5 points. In a tea packaging box, the Song Dynasty tea motif is simplified into geometric lines, with the auxiliary copy of "thousand-year-old tea rhyme," increasing young

consumers' awareness of traditional tea culture by 27%. This proves that digital translation is not a simple form update, but requires the construction of a composite communication system of "visual symbol + context guidance [10]."

Table 3. Cross-cultural usability ratings in applications

Application Context	Recognition Score (Avg/5)	Engagement Score (Avg/5)
Packaging Design	4.1	4.4
Event Poster	4.3	4.2
Mobile App Interface	4.0	4.5

5. Conclusion

The research demonstrates that traditional patterns can undergo digital transformation while retaining their cultural and symbolic integrity—if approached through a methodologically rigorous framework that integrates design expertise, historical awareness, and cross-cultural feedback. The semantic clarity of redesigned motifs is shown to vary according to motif complexity and design technique. Patterns with simpler, more geometric or floral forms tend to perform better in terms of recognition and adaptability, whereas multi-layered or hierarchical motifs like dragons are more vulnerable to semantic degradation under modern abstraction. Audience testing and expert evaluations confirm that maintaining specific symbolic elements—such as structural features, proportion, and detail placement—is critical to achieving both visual appeal and cultural resonance. Moreover, the study highlights the importance of combining visual forms with contextual cues, such as text, interaction, or auxiliary symbols, to guide interpretation and preserve cultural anchoring in digital environments. This paper contributes not only a set of empirical findings but also a replicable model for the creative reuse of traditional patterns. In doing so, it offers practical implications for cultural product design, digital heritage preservation, and global visual storytelling.

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