Reinterpreting Traditional Textile Auspicious Motifs in Cork Footwear Design: A Multi-Criteria Evaluation Framework Using Quantitative Decision Models

Tianyi Chen,[a,*] and Yujie Mei [b]

Traditional Chinese textile auspicious motifs are increasingly being applied in sustainable cork footwear design, facilitating cultural heritage preservation and creative industry innovation. This study proposes a systematic framework bridging digital motif archiving with design translation. Using a quantitative decision-making model, textile auspicious motifs were digitally archived, and Kansei descriptors were extracted. The Analytic Hierarchy Process (AHP) identified users' preference weights, while Quality Function Deployment (QFD) mapped requirements to design features. Three representative motifs were transformed *via* shape grammar rules into prototypes. Repeated-measures ANOVA evaluated user satisfaction. Results showed naturalness and aesthetics as the most critical criteria. Notably, Prototype F1, which reinterpreted the original motif, significantly outperformed others in cultural and artistic dimensions, validating the framework's effectiveness in integrating traditional textile motifs with modern cork footwear design.

DOI: 10.15376/biores.21.3.8031-8052

Keywords: Cork Footwear Design; Design Innovation; Textile Auspicious Motifs; Analytic Hierarchy Process (AHP); Repeated-Measures ANOVA

*Contact information: a: Fashion Design College of Istituto Marangoni Zhejiang Sci-Tech University (International Institute of Fashion Technology), Hangzhou 311103 China; b: School of Fashion, Zhejiang Sci-Tech University, Hangzhou 311103 China; *Corresponding author: ctychenyy@zstu.edu.cn*

INTRODUCTION

Textile auspicious motifs exhibit pronounced artistic characteristics in terms of chromatic expression, formal attributes, and compositional rules. Their application in contemporary product design offers unique opportunities for cultural heritage preservation while addressing modern aesthetic and functional demands, thereby enhancing product differentiation in a highly saturated market (Dong and Jamali 2025). Cork-based products, in particular, have a unique porous structure and excellent formability, making them compatible with various surface treatment techniques such as embossing, branding, and collage. These attributes provide a material foundation for articulating the nuanced details and tactile qualities of textile auspicious motifs. As an integral part of daily wear, footwear occupies an intersection between personal intimacy and public display, offering a compelling context for the reinterpretation of textile auspicious motifs. Accordingly, this study aims to investigate the interplay between textile auspicious motifs and users' cognitive perceptions, with the goal of optimizing their application in modern cork footwear design.

Recent years, scholarly attention to the application of traditional textile auspicious motifs in modern design has grown considerably. Using literature review and field investigation, Zhang (2024) demonstrated that traditional motifs provide a rich source of inspiration for contemporary design. Zou *et al.* (2024) applied the analytic hierarchy process to explore cross-cultural design approaches for motifs; they have not yet established an empirical link with consumer preferences. Quantitative methods for capturing users' affective responses have been widely adopted across various design fields. Chen *et al.* (2021) examined the lotus motif and employed Kansei engineering to connect motif features with consumers' perceptions, revealing associations between perceptual imagery and design attributes. While existing research has evaluated textile auspicious motifs from the perspective of modern translation, there remains a dearth of systematic investigation into their specific application in modern cork footwear design and the methodological realization of motif reinterpretation.

In the context of cork footwear design, this study integrates the Affinity Diagram method, AHP, QFD, Shape Grammar, and repeated-measures ANOVA. Using a sample library of textile auspicious motifs, it establishes a comprehensive framework, ranging from the extraction of perceptual descriptors and weight calculation to final design evaluation, to achieve motif reinterpretation in cork footwear. The Affinity Diagram identifies consumers' perceptual responses and culturally resonant semantics, while AHP ranks and quantifies these perceptual dimensions. QFD maps high-priority user needs to design attributes, while Shape Grammar adapts motifs to cork footwear characteristics while preserving core identifying features. Reinterpretation here is not simple replication but a systematic transformation of symbolic and visual forms based on original cultural semantics, contemporary context, and product functions. This study has three objectives: (1) to construct a motif sample library, clarify feature-perception relationships, and reconstruct motifs for application in cork footwear; (2) to extract perceptual vocabulary and develop a model linking user needs to motif features to assess design feasibility; and (3) to propose an expandable practical framework for the innovative transformation of textile auspicious motifs in cork footwear design.

Contemporary Implementation of Traditional Auspicious Motifs in Modern Product Design

This categorization aligns with the dimensionality reduction principle in Kansei engineering—from concrete vocabulary to abstract dimensions—and ensures both the internal homogeneity of indicators within each criterion level and the discriminability between levels. The contemporary implementation of auspicious motifs is not a simple formal transposition but a complex process of deep integration between cultural connotations and modern design paradigms. Innovation grounded in the cultural semantics and artistic characteristics of these motifs can augment cultural attributes and ornamental inspiration for various product designs, including packaging (Y. Zhang 2024) and furniture (Wang *et al.* 2025).

Recent studies have approached the translation of traditional auspicious motifs into modern design from three primary methodological pathways: generative deep learning, perceptual engineering, and practice-led design.

The first pathway employs generative adversarial networks (GANs) and other algorithmic techniques to produce novel motifs while preserving cultural fidelity. Meng *et al.* (2025) constructed a database of Yi traditional auspicious motifs using GANs and generated new variants that balance cultural authenticity with stylistic adaptation. Similarly, Ni *et al.* (2024) applied motif generation techniques based on relative coordinate positioning and regional content replacement to extract and redesign Zhuang traditional auspicious motifs. Both studies demonstrate the viability of computational methods in sustaining cultural value while meeting market imperatives; however, they focus primarily on visual generation quality without systematically examining user perception or acceptance of the generated motifs.

The second pathway adopts perceptual and statistical methods to decode consumer preferences. Qin *et al.* (2025) focused on auspicious motifs in Jiangnan homespun textiles, using questionnaires to collect consumer evaluations of emotional vocabulary and applying principal component analysis (PCA) to extract key perceptual dimensions. They specifically explored the effect of motif symmetry on consumer perception and proposed practical design applications. This approach directly engages user feedback, yet it remains confined to a specific material context (textiles) and does not extend to three-dimensional product forms such as footwear.

The third pathway comprises practice-led design studies that extract core visual elements from traditional motifs and integrate them into conceptual product design. Chang *et al.* (2025) extracted visual elements from auspicious motifs found in Henan's Dangyangyu marbled porcelain and incorporated them into seating design, offering an extensible methodology for motif transformation. Qiang and Pashkevych (2023) examined animal motifs in traditional Chinese children's shoes, exploring their cultural connotations and artistic characteristics to achieve motif inheritance through design practice. Cao *et al.* (2022), based on traditional Chinese motifs aligned with Taoist philosophy, compared their integration into footwear design across major historical periods with contemporary design approaches, thereby providing an expandable technical pathway for modern footwear design. While these studies successfully demonstrate how motifs can be translated into tangible products, their selection of design features often relies on subjective heuristics and aesthetic intuition, lacking empirical validation from target consumers.

In summary, extant literature has established preliminary correlations between the cultural semantics and aesthetic innovation of traditional auspicious motifs, achieving a translation pathway from in-depth cultural interpretation to materialized design solutions. However, most studies approach this from the perspectives of motif semiotics and designer-driven interpretation, without systematically examining the consumer's vantage point to reveal the internal logic between user needs and motif design features. Consequently, in the design practice of cultural and creative products, the selection of design features often lacks responsiveness to users' authentic perceptions—a gap the present study aims to address by incorporating consumer evaluations into the design evaluation framework.

Quantitative Decision-Making and Evaluation of User Needs in Design

Incorporating quantitative methods to evaluate user needs is a critical step in satisfying diverse design objectives. In recent years, quantitative model-driven design decision-making has been widely applied across fields such as product design (Qu *et al.* 2026) and architecture (Song *et al.* 2025). Within the domain of form–emotion linkage and design optimization, existing studies can be broadly categorized into two methodological pathways: affect-driven neural network approaches and hybrid frameworks combining shape grammar with multi-criteria decision-making.

The first pathway focuses on constructing computational models to map emotional vocabulary to design parameters. Ren *et al.* (2025) introduced Kansei engineering concepts to calculate emotional vocabulary weights and then combined a genetic algorithm–optimized backpropagation neural network to derive optimal design configurations, thereby connecting form and emotion and providing a reference path for affect-driven design. This approach effectively captures nonlinear relationships between design variables and user perceptions; however, it does not explicitly incorporate semantic constraints from traditional cultural motifs, limiting its direct applicability to heritage-sensitive product development.

The second pathway integrates multiple quantitative methods to balance user needs, design rules, and product features. L. Wang *et al.* (2025) proposed an AI-driven theoretical tool integrating shape grammar and Kansei engineering. By morphologically analyzing representative artifacts, they generated design solutions using shape grammar and calculated user perceptual dimension weights via the Grey Analytic Hierarchy Process (G-AHP). They then integrated user emotional needs and product features into a QFD matrix to optimize products, offering an extensible technical pathway for quantifying user perceptions in traditional motif-based design innovation. Similarly, Kirgizov and Kwak (2022) integrated a quantitative Kano model into an improved QFD method to analyze the nonlinear relationship between user needs and satisfaction, validating its effectiveness in identifying latent needs and optimizing design decisions through a case study on automotive interior design. Compared to the first pathway, these hybrid frameworks better accommodate multi-objective trade-offs, yet they exhibit two common limitations: (1) user need dimensions are often predefined without empirical refinement, leading to indicators that do not fully align with users' authentic expectations, and (2) the deep integration of user needs, motif semantics, and product design remains insufficiently addressed—motif characteristics are usually treated as fixed inputs rather than dynamically linked to perceptual responses.

To fill these gaps, it is necessary to construct a technical framework—from sample library establishment to quantitative perceptual analysis and finally to motif generation—that enables traditional textile auspicious motifs to undergo modern visual reinterpretation on cork footwear products while preserving their original cultural connotations and responding to users' perceptual preferences. This study takes traditional Chinese textile auspicious motifs as its research object, leveraging their morphological characteristics and auspicious symbolism to explore a framework that integrates visual form reconstruction with quantitative decision models, thereby promoting the convergence of cork footwear design with contemporary consumer demands.

EXPERIMENTAL

Proposed Methodological Framework

This study focuses on modern cork footwear design and systematically explores pathways to enhance cultural value by integrating traditional textile auspicious motifs. By synthesizing the Affinity Diagram method, Analytic Hierarchy Process (AHP), Quality Function Deployment (QFD), Shape Grammar, and repeated-measures ANOVA, the study refines cork footwear design solutions while facilitating the contemporary reinterpretation of these motifs. A framework comprising analytical, creative, and evaluative phases is proposed, which involves motif repository construction, user requirement quantification, design transformation, form generation, and empirical validation. The specific stages of this framework are illustrated in Fig. 1 and detailed as follows:

（1）Systematically collect and categorize traditional Chinese textile auspicious motifs to establish a comprehensive sample repository.

（2）Identify 14 thematic descriptors across three dimensions (artistic, cultural, and functional) using the Affinity Diagram method, followed by calculating users' subjective preference weights for each perceptual attribute *via* AHP.

（3）Determine design features most significantly associated with users' perceptual requirements regarding auspiciousness using QFD and subsequently select three representative motifs. Utilize Shape Grammar rules to reconfigure the three target motifs and generate high-fidelity renderings.

（4）Administer survey instruments to collect user ratings of the design solutions and analyze the impact of different designs on user satisfaction using repeated-measures ANOVA.

Affinity Diagram Method

The Affinity Diagram method is a qualitative analysis tool that systematically organizes and clusters unstructured linguistic data obtained from surveys or interviews to reveal the underlying structure and latent patterns of information (Fang and Qu 2025).

This study employs this method to elucidate users' perceptual conception of textile auspicious motifs. The analytical procedure consists of four steps: identifying the target cohort, data collection, lexical refinement and synthesis, and thematic descriptor extraction.

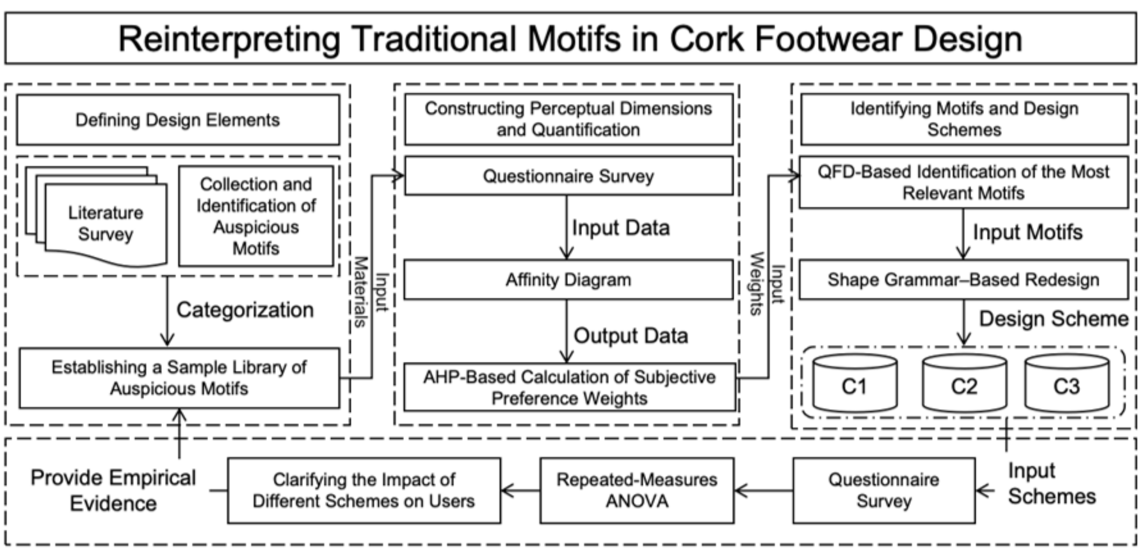

Fig. 1. Methodological Framework

First, a questionnaire survey was administered to consumers possessing prior experience purchasing cork footwear or demonstrating a preference for traditional cultural products to collect initial perceptual descriptors. Subsequently, a panel of nine domain experts was invited to refine and synthesize the collected vocabulary, removing semantically ambiguous items and merging similar expressions. Finally, through inductive analysis, a refined set of high-frequency consensus words was extracted, forming the core perceptual vocabulary of textile auspicious motifs and providing a basis for subsequent quantitative evaluation and design innovation.

Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) is a multi-criteria decision-making method designed (Saaty 1980) to assist decision-makers in determining the weights and priorities of various factors in complex problems (F. L. Zhang *et al.* 2024). In this study, AHP was used to decompose the abstract concept of user perception into a concrete hierarchical structure and to resolve potential conflicts among different perceptual indicators. Furthermore, the consistency check ensured the logical reliability of expert judgments. However, AHP has certain limitations, as it relies primarily on experts' subjective pairwise evaluations, which may be influenced by cognitive biases. To address this, the study formed a panel of nine experts from diverse backgrounds and provided them with relevant instructions prior to evaluation. The scale shown in Table 1 was then used to compare indicators within the same level, thereby constructing the pairwise comparison matrix. The component corresponding to the largest eigenvector of the matrix served as the coefficient for each indicator, and the weight values of evaluation indicators at each level were finally calculated.

Table 1. Relative Importance Represented by Each Scale Value

Scale value	Definition of relative importance
1	Indicator i and j are equally important
3	Indicator i is slightly more important than j
5	Indicator i is significantly more important than j
7	Indicator i is strongly more important than j
9	Indicator i is absolutely more important than j
2,4,6,8	Intermediate values between the adjacent scales

Based on AHP, weights were assigned to the auspicious vocabulary derived from the Affinity Diagram method. The specific steps are listed below.

Step 1: Normalize the column vectors of the pairwise comparison matrix.

$$\bar{a}_{ij} = \frac{a_{ij}}{\sum_{k=1}^{m} a_{kj}}, i,j = 1,2,\cdots,m \tag{1}$$

where $\bar{a}_{ij}$ denotes the element in the i row and j column of the judgment matrix, $\sum_{k=1}^{m} a_{kj}$ is the sum of the elements in the j column, and $\bar{a}_{ij}$ represents the normalized matrix element.

Step 2: Sum the normalized matrix row-wise, then perform normalization again to calculate the weight vector for each indicator.

$$\mathrm{W}_{ei} = \frac{\sum_{j=1}^{m} \bar{a}_{ij}}{\sum_{k=1}^{m} \sum_{j=1}^{m} \bar{a}_{ij}}, i = 1,2,\cdots,m \tag{2}$$

where $\sum_{j=1}^{m} \bar{a}_{ij}$ is the sum of the elements in the i row of the normalized matrix, and the denominator is the sum of all row sums. The resulting w_{ei} is the weight coefficient of the i indicator, reflecting its relative importance in the evaluation system.

Step 3: While calculating the weight vector, a consistency check must be performed to verify the logical consistency of the judgment matrix and ensure the validity of the assigned weights. The key metric, the consistency ratio CR, is calculated as follows,

$$CR = \frac{CI}{RI} \tag{3}$$

where CI is the consistency index and RI is the average random consistency index. The formula for CI is,

$$CI = \frac{\lambda_{MAX} - m}{m-1} \tag{4}$$

where $\lambda_{\max}$ is the maximum eigenvalue of the judgment matrix and m is the order of the matrix. $\lambda_{\max}$ can be computed using the following equation：

$$\lambda_{MAX} = \frac{1}{m}\sum_{i=1}^{m} \frac{(AW)_{ei}}{W_{ei}} \tag{5}$$

The average random consistency index RI can be obtained from a lookup table based on the matrix order m, as shown in Table 2. Once the CR value is calculated, the following criteria are applied:

(1) If $CR < 0.1$, the judgment matrix is considered to have satisfactory consistency, and the weight calculation results are acceptable.
(2) If $CR > 0.1$, the judgment matrix exhibits logical inconsistency and must be revised until the consistency requirement is met.

Table 2. Random Consistency Index RI Corresponding Table

Matrix order （m）	1	2	3	4	5	6	7
RI	0	0	0.52	0.89	1.12	1.26	1.36

Quality Function Deployment (QFD)

Quality Function Deployment (QFD) is a systematic tool for translating user needs into actionable design elements by constructing multi-level quality matrices that decompose user requirements layer by layer (Akao 1990). This method uses the House of Quality (HoQ) as its core vehicle to establish a visual link between user needs and technical attributes, thereby clarifying design features in the early stages of product development (Wen *et al.* 2025). In this study, QFD is employed to transform the prioritized emotional vocabulary—determined via AHP weighting—into corresponding design features, while simultaneously establishing a priority ranking of emotional vocabulary, providing a structured decision-making framework for optimizing auspicious motif design. The specific implementation steps are as follows:

Step 1: Construct the relationship matrix between user auspicious needs and motifs.

Based on the user auspicious needs obtained in the preceding steps, this study constructs a correlation matrix linking user needs with traditional Chinese textile auspicious motifs. An expert panel is invited to assign the strength of association between each auspicious need and each motif, thereby establishing a link between user needs and textile auspicious motifs.

Step 2: Determine the degree of correlation.

The user weight of each auspicious need—derived from the AHP-calculated weight coefficients W_{ei} of the perceptual vocabulary—is entered into the matrix. In this matrix, row vectors correspond to the set of user auspicious needs $R = \{R_1, R_2, \dots, R_m\}$ summarized *via* the Affinity Diagram method, and column vectors correspond to the selected set of traditional Chinese textile auspicious motifs $P = \{P_1, P_2, \dots, P_n\}$. To establish a quantitative link between user needs and motifs, an expert panel comprising cork footwear designers, target users, and university design faculty is invited to assign the strength of association between each auspicious perceptual need and each motif design feature. The specific form of the matrix is shown below

$$W_{RP} = \begin{bmatrix} W_{11} & W_{12} & \cdots & W_{1n} \\ W_{21} & W_{22} & \cdots & W_{2n} \\ \vdots & \vdots & & \vdots \\ W_{m1} & W_{m2} & \cdots & W_{mn} \end{bmatrix} \tag{6}$$

where W_{mn} represents the strength of association between the user need and the auspicious motif.

Step 3: Calculate the weight of each auspicious motif,

$$w_{Ti} = \sum_{i=1}^{m} (W_{RP} \times W_{ei}) \tag{7}$$

where w_{Ti} denotes the weighted score of the auspicious motif Ti. After calculating the weighted scores for all textile auspicious motifs, they are sorted in descending order to determine the implementation priority of key user needs. By applying the Quality Function Deployment method, this study translates user needs into design features of textile auspicious motifs and, through the construction of a correlation matrix, achieves a quantitative evaluation of the importance of each motif.

Shape Grammar

Shape grammar represents a syntax-based form generation method employed to achieve shape derivation and reconstruction (Stiny and Gips 1972). By extracting the visual features of a product, it establishes a design language, thereby formalizing the logical pathway of form generation. In practical application, this method provides designers with a systematic reasoning framework, enabling them to generate innovative geometries based on predefined transformation rules (including substitution, addition, deletion, scaling, mirroring, and duplication, among others) (Xue and Chen 2024). The generation and derivation rule system of shape grammar is illustrated in Fig. 2, which systematically outlines the core rules of the grammar and provides a methodological foundation for the subsequent innovative design of textile auspicious motifs. In specific design practice, a single rule or a combination of multiple rules is flexibly selected according to the motif evolution requirements to execute the shape transformation.

In this study, three traditional Chinese textile auspicious motifs selected *via* the QFD model served as the initial shapes for shape grammar operations. Based on predefined grammatical composition rules and visual constraints, the original motifs were morphologically derived to construct visual solutions that balance cultural value and formal innovation. Digital drawing tools were employed to deconstruct and reconstruct the selected motifs, and the compositional patterns of graphic units were derived following the core rules of shape grammar. The generated visual solutions were integrated into cork footwear design practice, resulting in three final design iterations. These solutions preserve the core cultural characteristics of traditional auspicious symbols while fulfilling users' perceptual needs for auspicious connotations and contemporary aesthetic preferences.

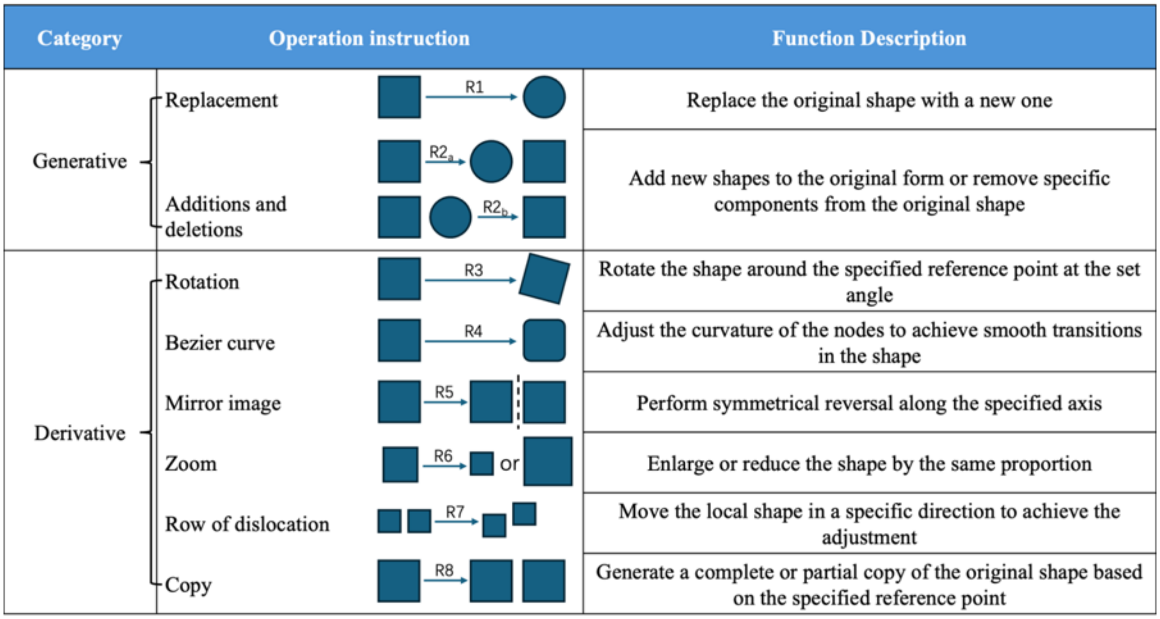

Fig. 2. Operational Rules and Corresponding Descriptions

RESULTS AND DISCUSSION

Procurement and Categorization of Traditional Chinese Textile Auspicious Motifs

In the traditional Chinese decorative system, textile auspicious motifs embodying benevolent symbolism were widely applied to folk textiles, architectural decorations, and utilitarian implements, encapsulating human aspirations for a prosperous life and their aesthetic pursuits. Identifying the compositional elements and decorative features of these motifs is a requisite for their modern translation and design reconstruction. Through a systematic literature review and field investigation, complemented by museum collections, folk artifacts, and auction records, 52 specimens of traditional Chinese textile artifacts and image materials featuring textile auspicious motifs were procured. These items are in good condition, with their provenance ranging mainly from the Ming and Qing dynasties to the Republic of China period. A review panel consisting of nine experts from diverse backgrounds was convened to evaluate the representativeness and design applicability of each motif based on two principles: typicality (patterns widely recognized and frequently used in textile crafts) and structural clarity (patterns with clear, extractable, and vectorizable graphic units). Subsequently, high-resolution scanners and professional photography equipment were used for digital acquisition of the samples. On this basis, hand-drawn tracing was employed to extract and categorize the various auspicious motifs, ultimately constructing a sample library of traditional Chinese auspicious motifs, as shown in Fig. 3.

Fig. 3. Repository of Textile Auspicious Motifs

Among them, M1 is the GuaiZi Long and Antique Motif, a geometric variation of the dragon motif, with the dragon body composed of angular, winding lines and a simplified, concise dragon head, arranged in symmetrical or continuous compositions. M2 is the Swastika Motif, an equilateral cross with arms bent at right angles in the same direction, forming a rotationally symmetric structure. It can be used individually or repeated continuously to create backgrounds or borders, featuring a rigorous, square form and even line thickness. M3 is the Fret Motif, composed of lines that turn at right angles in either identical or alternating directions, forming closed, linked bands or square patterns. The structure is regular and rhythmically precise. M4 is the Fish Playing Amid Lotus Motif, typically depicting fish swimming between lotus flowers, sometimes leaping out of the water or holding a lotus in their mouths, with lively poses arranged symmetrically or rotationally. M5 is the Chrysanthemum Motif, characterized by long, slender petals radiating in layered whorls, a full flower center, palmately lobed leaves, and robust stems. M6 is the Interlocking Orchid Vine Motif, a plant-based motif featuring orchid flowers as the main subject, typically with three to five petals. The stems are slender and natural, the leaves elongated and elegant; intertwining stems curve and undulate, linking flowers and leaves in a continuous rhythm. M7 is the Gourd-and-Endless-Knot Motif, where the gourd has an upper and lower rounded belly with a constricted waist, interwoven with the Endless knot. M8 is the Swastika-and-Endless-Knot Motif, based on the endless, head-and-tail-free framework of the Endless knot, with swastika units inserted at turns or connection points, creating a complex, continuously interlocking pattern. M9 is the Peony Motif, characterized by large, layered, full-blossomed flower heads, accompanied by compound leaves and branches, presenting a graceful and opulent appearance. M10 is the Plum

Blossom Motif, featuring small, rounded five-petal flowers with dotted stamens, set against stout, often twisted and gnarled branches.

Extracting and Quantifying Perceptual Descriptors of Auspicious Connotations

To systematically extract the core perceptual vocabulary of auspicious motifs in cork footwear design, this study situates the consumer survey within scenarios such as gift-giving during traditional festivals, important ceremonial events, and traditional cultural consumption contexts, capturing consumers' perceptual preferences for auspicious motifs on cork footwear. Based on this contextual framing, a two-step open-ended questionnaire was employed. The first step collected consumers' demographic information; the second step presented a scenario and asked respondents to list words or phrases related to "redesigning traditional fabric auspicious patterns on cork footwear". Recruitment was conducted through online cultural product communities and offline retail touchpoints, yielding 127 valid responses from consumers in Hangzhou and Shanghai, China. The open-ended questionnaire generated over 420 raw descriptive terms. After removing synonyms, proper names, and ambiguous expressions, a panel of nine experts from relevant fields was invited—consisting of three cork material designers, three traditional motif research specialists, and three university professors in design studies—to collaboratively clean and consolidate the initial vocabulary. Synonyms were merged and ambiguous items eliminated, resulting in a preliminary list of 53 unique terms. On this basis, the Affinity Diagram method was further applied to extract perceptual vocabulary related to auspicious motifs in cork footwear. Through the above steps, a total of 14 thematic vocabulary items were obtained (as shown in Figure 4), laying the foundation for the subsequent construction of a perceptual evaluation system for auspicious motifs and the calculation of dimension weights.

Fig. 4. Affinity Diagram

Based on this, the perceptual descriptors summarized *via* the Affinity Diagram method were integrated to construct a perceptual image evaluation system for textile auspicious motifs in cork footwear design. The system comprises a hierarchical structure of three tiers (the goal level, the criterion level, and the sub-criterion level), as shown in

Table 3. The criterion level encompasses three core dimensions (artistic, functional, and cultural), comprising a total of 14 attribute indicators. During the clustering process of the Affinity Diagram method, the raw perceptual vocabulary was naturally grouped into three thematic clusters based on semantic similarity and intrinsic relationships: cultural, functional, and artistic. This categorization aligns with the dimensionality reduction principle in Kansei engineering—from concrete vocabulary to abstract dimensions—and ensures both the internal homogeneity of indicators within each criterion level and the discriminability between levels. For subsequent quantitative analysis, each indicator factor was coded. Specifically, indicators under the cultural dimension $N1$ were coded as $N1_1$ to $N1_4$; those under the functional dimension $N2$ as $N2_1$ to $N2_4$; and those under the artistic dimension $N3$ as $N3_1$ to $N3_6$.

Table 3. Evaluation System of Perceptual Image for Textile Auspicious Motifs in Cork Footwear Design

Goal level	Criterion level	Sub-criterion level
Perceptual image of textile auspicious motifs in cork footwear design (N)	Cultural ($N1$)	Ethnic ($N1_1$), Symmetry ($N1_2$), Traditional ($N1_3$), Rustic ($N1_4$)
	Functional ($N2$)	Innovative ($N2_1$), Practical ($N2_2$), Modern ($N2_3$), Minimalist ($N2_4$)
	Artistic ($N3$)	Natural ($N3_1$), Warm ($N3_2$), Aesthetic ($N3_3$), Exquisite ($N3_4$), Abstract ($N3_5$), Layered ($N3_6$)

To ensure objective and accurate evaluation results, this study invited the nine experts from the Affinity Diagram process to assess each indicator factor. The expert scoring procedure was as follows:

First, experts were invited to learn the AHP 9-point Likert scale through examples. On this basis, the experts independently assigned scores to each criterion and sub-criterion. The scores for each indicator were then aggregated, and the average score for each vocabulary item was calculated. Finally, a matrix was constructed to perform pairwise comparisons of vocabulary items at the same level, yielding the weight of each vocabulary item.

The Analytic Hierarchy Process (AHP) 9-point scale shown in Table 1 was used to construct pairwise comparison matrices. Through the survey, consensus was reached on the relative importance of indicator factors at each level, and the judgment matrix at the goal level was subsequently constructed, as shown below.

$$N = \begin{bmatrix} 1.000 & 1.629 & 0.526 \\ 0.614 & 1.000 & 0.146 \\ 1.902 & 6.835 & 1.000 \end{bmatrix}$$

Based on this, the judgment matrices for each criterion level were correspondingly constructed, as shown below.

$$N1 = \begin{bmatrix} 1.000 & 4.213 & 0.372 & 2.466 \\ 0.234 & 1.000 & 0.158 & 0.381 \\ 2.691 & 6.313 & 1.000 & 4.537 \\ 0.406 & 2.624 & 0.220 & 1.000 \end{bmatrix}$$

$$N2 = \begin{bmatrix} 1.000 & 1.800 & 0.231 & 0.717 \\ 0.705 & 1.000 & 0.173 & 0.500 \\ 3.366 & 5.780 & 1.000 & 1.922 \\ 1.579 & 2.000 & 0.520 & 1.000 \end{bmatrix}$$

$$N3 = \begin{bmatrix} 1.000 & 1.457 & 0.613 & 2.020 & 4.950 & 2.861 \\ 0.689 & 1.000 & 0.455 & 1.358 & 3.570 & 1.867 \\ 1.632 & 2.198 & 1.000 & 3.232 & 7.840 & 4.533 \\ 0.500 & 0.736 & 0.390 & 1.000 & 2.475 & 1.458 \\ 0.202 & 0.280 & 0.128 & 0.404 & 1.000 & 0.572 \\ 0.350 & 0.536 & 0.221 & 0.686 & 1.747 & 1.000 \end{bmatrix}$$

Based on the expert judgment matrices, the weights and consistency of the goal level, criterion level, and each evaluation indicator were calculated using Eqs. 1 through 5. The specific results are shown in Tables 4 and 5.

Table 4. Goal-level Element Weights

Perceptual image of textile auspicious motifs in cork footwear design (N)	W_{ei}	$\lambda_{\max}$	CI	CR
Cultural ($N1$)	0.256	3.069	0.034	0.066
Functional ($N2$)	0.122			
Artistic E ($N3$)	0.620			

Table 5. Perceptual Vocabulary Weights and Rankings by Criterion Level

Criterion level	$\lambda_{\max}$	CI	CR	Sub-criterion level	W$_{ei}$	Rank order
$N1$	4.064	0.021	0.024	$N1_1$	0.067	6
				$N1_2$	0.017	13
				$N1_3$	0.140	3
				$N1_4$	0.034	9
$N2$	4.056	0.019	0.021	$N2_1$	0.019	12
				$N2_2$	0.013	14
				$N2_3$	0.062	7
				$N2_4$	0.028	11
$N3$	6.004	0.001	0.001	$N3_1$	0.143	2
				$N3_2$	0.099	4
				$N3_3$	0.227	1
				$N3_4$	0.072	5
				$N3_5$	0.029	10
				$N3_6$	0.051	8

Therefore, when evaluating the integration of traditional textile motifs into modern products such as cork footwear, consumers place greater value on the artistry of cork footwear than on its cultural or practical functionality. This suggests that, for everyday wearable items, the aesthetic congruence between traditional textile motifs and the modern form of the product is the primary driver of user acceptance, upon which deeper cultural perception can subsequently be realized. Hence, designers should first ensure formal resonance between the motif and the product's modern aesthetics before pursuing cultural or functional dimensions. The relatively lower scores for the functional dimension imply that consumers may regard functionality as a basic requirement—one that is not directly influenced by the motif itself.

Motif Selection and Visual Scheme Reconstruction

In the third phase of this study, the objective was to establish an empirical correlation between user requirements and textile auspicious motifs, thereby providing a scientific rationale for cork footwear product development. Based on prior scholars' use of the QFD method (Yang *et al.* 2026) and the user auspicious needs weights established in the first phase, the House of Quality tool within Quality Function Deployment was employed to construct a correlation matrix linking user needs with the ten traditional auspicious motifs shown in Fig. 3. The weighted score of each motif was calculated using Eqs. 6 and 7, and the three motifs with the highest congruence with user needs were selected. This ensured that the three subsequent cork footwear design solutions optimally aligned with user expectations.

Based on the scores from the user requirement-motif association matrix (Table 6), the House of Quality was constructed, as shown in Table 7. The results indicated that motifs M3, M7, and M10 achieved weighted scores of 20.16, 11.07, and 18.45, respectively, ranking among the top three candidates. Accordingly, these three motifs were selected as the core elements for cork footwear motif design and progressed to the subsequent stages of shape grammar derivation and solution refinement.

Table 6. User Needs–auspicious Motif Assignment Correspondence Table

Degree of relevance	Extremely strong	Moderate	Weak	No relevance
Symbol	※	⊙	○	-
Assigned value	5	3	1	0

Building upon the representative textile auspicious motifs (M3, M7, and M10) identified in the preceding phase, a set of design rules was further developed to guide the application of these motifs to cork footwear products, ensuring that the final designs achieve aesthetic-functional synergy. This systematic framework encompasses dimensions such as product positioning, target usage scenarios, motif spatial distribution across footwear components, and the coordination between the motifs and the overall footwear geometry. Following the above rules and using graphic design software in conjunction with shape grammar, the rule-based nature of shape grammar ensures the reproducibility and controlled complexity of the design process, effectively avoiding the excessive intricacy that can result from directly transplanting original motifs. Ultimately, this study generated three sets of motif solutions tailored to cork footwear.

The evolution process of Scheme C1, featuring the gourd-and-endless-knot motif, is illustrated in Fig. 5. First, following Rule R5, the original gourd-and-endless-knot motif was flipped vertically to create a symmetric base form. Subsequently, by combining Rules R3 and R5, the folded motif unit was rotated and flipped again at a 45° angle to generate a new unit. Next, based on Rule R2a, local details were incorporated into the new unit to enrich the layering of the motif. Finally, Rule R5 was applied again to replicate and systematically arrange the resulting unit, reinforcing visual rhythm and yielding a novel continuous pattern design in a quartered layout.

Table 7. House of Quality Mapping User Needs and Textile Auspicious Motifs

	Weight	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
$N1_1$	0.067	○	-	-	-	-	○	-	-	-	※
$N1_2$	0.017	※	○	-	⊙	○	※	※	○	○	-
$N1_3$	0.14	-	-	⊙	-	-	-	-	○	-	-
$N1_4$	0.034	-	※	-	○	※	-	※	※	○	-
$N2_1$	0.019	※	○	※	※	○	※	※	○	※	⊙
$N2_2$	0.013	※	○	○	※	○	※	※	○	※	-
$N2_3$	0.063	-	-	-	○	-	-	-	-	○	※
$N2_4$	0.028	⊙	○	-	○	○	⊙	※	○	⊙	-
$N3_1$	0.143	-	-	⊙	-	-	-	-	○	-	-
$N3_2$	0.099	-	○	-	-	-	○	-	-	○	⊙
$N3_3$	0.227	-	-	⊙	-	-	-	-	-	-	○
$N3_4$	0.072	-	-	○	○	-	○	-	-	○	※
$N3_5$	0.029	○	※	○	○	⊙	⊙	※	※	○	-
$N3_6$	0.051	○	⊙	-	○	※	○	※	⊙	○	-
Level of Importance	Absolute weight %	47.60%	64.40%	173.90%	48.80%	58.90%	70.50%	95.50%	82.80%	60.90%	159.10%
	Relative weight %	5.52%	7.47%	20.16%	5.66%	6.83%	8.17%	11.07%	9.60%	7.06%	18.45%
	Ranking	10	6	1	9	8	5	3	4	7	2

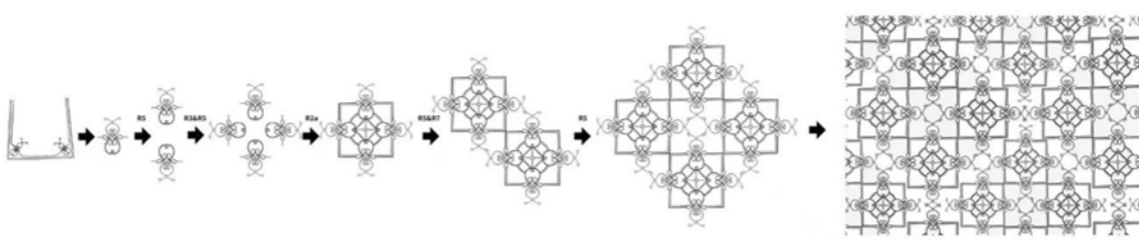

Fig. 5. Design Reconfiguration Scheme C1: Gourd-and-Endless-Knot Motif

The derivation process of Scheme C2 is illustrated in Fig. 6. Following Rules R5 and R3, the original motif was mirrored, inverted, and rotated to form a base module. Subsequently, Rule R5 was applied multiple times to transform the unit, expanding the morphological variation of the pattern. Finally, the resulting units were systematically arranged using Shape Grammar (SG) rules to generate a fret-patterned design in a quartered layout.

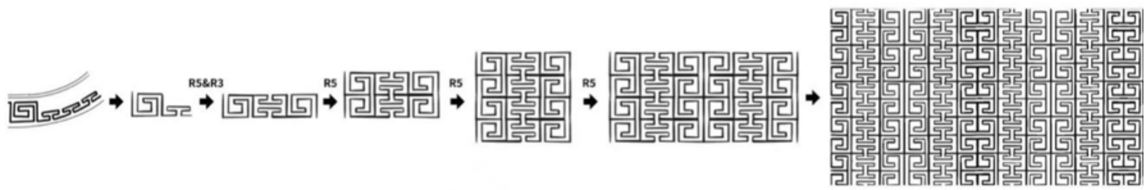

Fig. 6. Design Reconfiguration Scheme C2: Fret Pattern

The reconstruction began by deconstructing the swastika and endless knot motif into two subunits, P1 and P2. For subunit P1, graphical elements were added according to Rule R2a, followed by a mirror inversion based on Rule R5 to achieve a symmetrical configuration. Subsequently, a compound operation combining rotation and inversion was applied using Rules R5 and R3 to construct a new unit structure, designated P1'. For subunit P2, Rule R5 was first applied to perform an inversion; then, in combination with Rules R5 and R3, the motif was rotated and inverted again. Finally, a shear transformation was applied using a combination of Rules R5 and R7 to obtain P2'. Based on the redesigned subunits P1' and P2', Rules R5 and R7 were applied again to further adjust the proportional composition of the motif, resulting in the reconstructed design scheme C3 for the swastika and endless knot motif, as illustrated in Fig. 7.

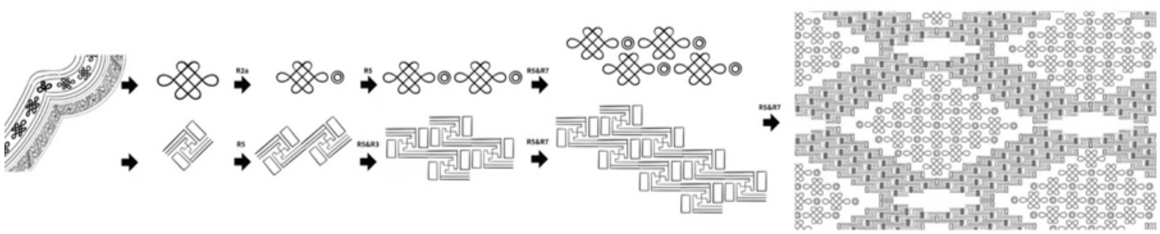

Fig. 7. Design Reconfiguration Scheme C3: Swastika-and-Endless-Knot Motif

Building upon this foundation, the study proceeded to apply the generated auspicious motif reconfiguration schemes to the specific design practice of cork footbed sandals. In the process of footwear design, this study comprehensively considered multiple dimensions, including shoe silhouette, upper decoration, target consumer groups, and style positioning, to ensure the compatibility between the motif schemes and the product form.

The study first categorized the application of textile auspicious motifs in cork footwear into two integration methods: localized and layered. Localized integration involves applying the motif to specific parts of the footwear, using subtle embellishments to accentuate design details, highlight the decorative effect of the motif, and enhance the cultural connotation of the footwear. Layered integration achieves multi-level expression of the motif at the same location through different craftsmanship techniques, resulting in a visual effect characterized by the interplay of virtual and real elements and distinct layering. Regarding the shoe form, the classic broad toe-box design and arch support structure of the footbed sandal were retained to ensure wearing comfort. Meanwhile, the upper segmentation was functionally divided according to the motion patterns of the foot, with motifs concentrated in non-flex areas to guarantee durability. The integration of textile auspicious motifs with cork footbed sandals yields an overall aesthetic that embodies a fusion of traditional imagery and contemporary minimalism, making the design suitable for urban commuting and casual social scenarios. The target consumer group is positioned as urban men and women aged 25 to 40 with a preference for cultural aesthetics.

Through the systematic design process described above, this study ultimately developed a cork footbed sandal design, as illustrated in Fig. 8. While preserving the inherent functional advantages of the product, this design achieves a cultural reinterpretation and modern transformation of textile auspicious motifs, addressing the multifaceted needs of contemporary consumers in terms of cultural identity, aesthetic preference, and everyday practicality.

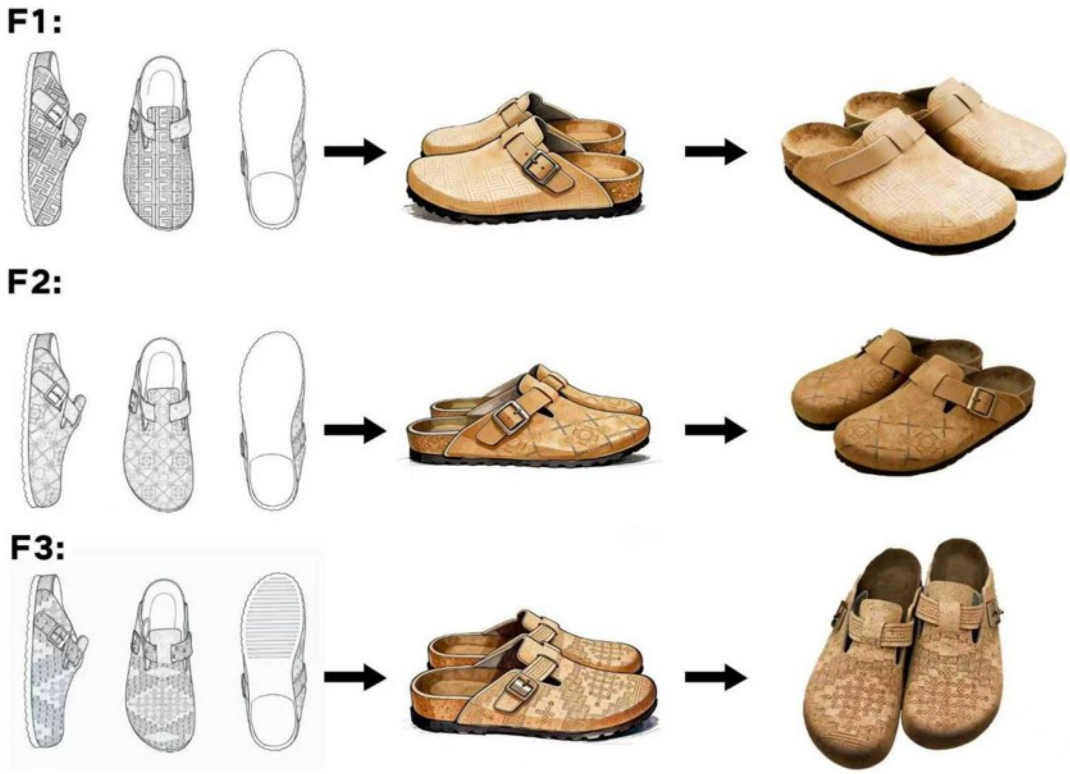

Fig. 8. Cork Footwear Design Schemes

Impact of Design Schemes on User Perception

The next step was to assess the impact of diverse design schemes incorporating textile auspicious motifs in cork footwear on user perception and to delineate their distinctive characteristics across various evaluative dimensions. Preliminary pretesting and exploratory factor analysis indicated that the 14 initial three-level indicators could be effectively aggregated into the three main factors described above. Evaluating at the two-level dimension avoids indicator redundancy and the judgment overload and data quality degradation caused by 14 separate indicators. Furthermore, this study aimed to compare the overall differences among design solutions at the macro-perceptual dimension level; the three dimensions directly correspond to the core indicators of design optimization, making the results more practically applicable. Therefore, this study enlisted 53 target consumers to evaluate the three prototypes based on three dimensions: cultural value, functionality, and aesthetics. Data were gathered using a 7-point Likert scale, and the mean scores for each scheme across each dimension were subsequently calculated. The results are presented in Table 8.

Table 8. Mean Scores of Each Design Scheme Across Evaluation Dimensions

Scheme Type	Cultural Value	Functionality	Aesthetics
F1	6.50	5.42	6.28
F2	4.31	4.49	4.19
F3	3.49	4.98	4.39

Based on the descriptive statistics, design scheme F1 yielded superior mean scores across all three evaluation dimensions compared to F2 and F3. Specifically, F1 attained a mean of 6.50 in cultural value, markedly surpassing F2 (4.31) and F3 (3.49). In aesthetics, F1 scored 6.28, consistently outperforming F2 (4.19) and F3 (4.39). In functionality, F1 scored 5.42, exhibiting a marginal lead over F2 (4.49) and F3 (4.98). In terms of the extent of mean differences, the influence of F1 was most pronounced in the cultural dimension, followed by aesthetics, with a relatively subtle difference in the functional dimension. These results indicate that the cork footwear scheme F1, derived from the gourd and endless knot motif reconfiguration scheme C1, possessed a substantial overall impact on users, demonstrating particular advantages in cultural communication and aesthetic expression.

The results of further repeated-measures ANOVA are presented in Table 9. The statistical analysis revealed a significant main effect of scheme type ($F = 498.86$, $p < 0.001$), indicating significant overall differences among the three design schemes, with F1 demonstrating significantly superior overall impact compared to F2 and F3. A significant main effect was also found for evaluation dimension ($F = 13.34$, $p < 0.001$), indicating significant differences in ratings across the three dimensions of cultural value, functionality, and aesthetics. Furthermore, the interaction effect between scheme type and evaluation dimension was significant ($F = 118.37$, $p < 0.001$), suggesting that the influence of different design schemes varies across evaluation dimensions.

Table 9. Repeated-Measures ANOVA Results

Source of Variation	F	pValue
Scheme Type	498.86	<0.001
Evaluation Dimension	13.34	<0.001
Scheme Type × Evaluation Dimension	118.37	<0.001

Based on these findings, along with the interaction plot presented in Fig. 9, design scheme F1 exhibited the most salient influence on user perception in the cultural dimension, followed by a strong influence in the aesthetic dimension, while its influence in the functional dimension was comparatively moderate. This pattern suggests that the integration of reconfigured traditional textile auspicious motifs into cork footwear effectively elicits positive user perceptions in terms of cultural identity and aesthetic experience, whereas the functional dimension (regarded as a fundamental attribute of footwear products) showed relatively narrower differences across schemes. Overall, the design strategy grounded in motif reinterpretation demonstrates significant differentiation in the cultural and aesthetic dimensions, confirming the efficacy of the proposed design approach in enhancing the perceptual value of cork footwear products.

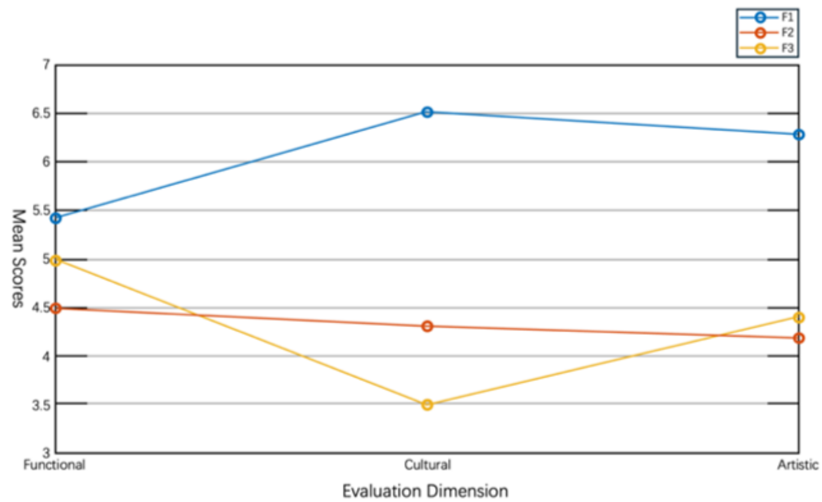

Fig. 9. Interaction plot of scheme type and evaluation dimension

This study has certain limitations. Due to logistical constraints, the 53 evaluators were drawn primarily from a specific geographic region and age group, which may not fully capture the diversity of cultural backgrounds, consumption habits, and generational differences. Consequently, the external validity of the findings warrants further examination. Moreover, while the three core dimensions (cultural value, functionality, and aesthetics) capture the fundamental value orientation of the design schemes, they remain somewhat reductive and do not fully address other potentially relevant evaluative dimensions.

Future research should broaden the participant demographic by including evaluators from more diverse backgrounds to enhance the generalizability of the design outcomes. Additionally, the evaluation framework should be extended beyond the existing tripartite dimensions to incorporate a broader set of indicators, thereby constructing a more comprehensive user perception assessment framework. Finally, comparative studies on the application of textile auspicious motifs to other cork products are important to advance the integration of traditional motifs with cork product design, enriching the cultural connotations while promoting the evolutionary transformation of traditional textile auspicious motifs.

CONCLUSIONS

1. This study established a robust methodological framework by synthesizing the Affinity Diagram method, the Analytic Hierarchy Process (AHP), Quality Function Deployment (QFD), and Shape Grammar, to facilitate the reinterpretation of traditional textile auspicious motifs in cork footwear design.
2. Commencing with consumer perception, the study extracted a perceptual lexicon using the Affinity Diagram method and applied AHP to determine attribute weights, thereby identifying cultural value and aesthetics as pivotal determinants in user cognition.

3. Building upon this empirical foundation, the QFD method was employed to map user requirements to specific design attributes, facilitating the strategic selection of traditional motifs.
4. Finally, visual reconfiguration was executed using Shape Grammar, generating design schemes precisely tailored to the structural and technological characteristics of cork footwear.
5. In the empirical validation phase, 53 target consumers were enlisted to evaluate the three schemes across three dimensions. Repeated-measures ANOVA revealed that design scheme F1 significantly outperformed schemes F2 and F3 in the cultural and aesthetic dimensions, yielding a profound influence on consumers, while its functionality score showed a marginal improvement over the other two.
6. These results validate the efficacy of the proposed design model in enhancing the cultural value and reconfiguring the aesthetic form of cork footwear products through the integration of traditional motifs, thereby satisfying the multifaceted needs of contemporary consumers in terms of cultural identity, aesthetic preference, and everyday practicality.

ACKNOWLEDGEMENTS

The authors thank all participants and experts for their valuable contributions to user research and evaluation. To ensure transparency, the authors declares that ChatGPT (OpenAl) was solely utilized for English translation and language polishing, with all research design, data analysis, and conclusions being the independent work of the authors.

REFERENCES CITED

Akao, Y. (1990). *Quality Function Deployment: Integrating Customer Requirements into Product Desig*n, Productivity Press, Cambridge, MA.

Chang, J., Han, H., and Yuan, K. (2025). "How can regional cultural symbols be integrated into public seating design? An innovative exploration using marbled porcelain patterns as an example," *BioResources* 20(4), 8420-8438. https://doi.org/10.15376/biores.20.4.8420-8438

Chen, D., Cheng, P., Simatrang, S., and Joneurairatana, E. (2019). "Kansei engineering as a tool for the design of traditional pattern," *Autex Research Journal* 21(1), 125-134. https://doi.org/10.2478/aut-2019-0052

Cao, Z. H., Yuan, G. X., Sheng, R., and Liu, S. Y. (2022). "The influence of Chinese cultural elements in footwear design," *Textile Science and Economy* 10, 88-94.

Dong, R., and Jamali, S. (2025). "The application of ancient Chinese ornamentation in modern furniture design," *Herança: Revista de História, Patrimônio e Cultura* 8(2), 56-75. https://doi.org/10.52152/heranca.v8i2/1140

Fang, Y., and Qu, Y. (2025). "Symmetric alignment between affective semantics and biomimetic forms: Sustainable packaging design and decision support," *Symmetry* 18(1), article 19. https://doi.org/10.3390/sym18010019

Kirgizov, U., and Kwak, C. (2022). "Quantification and integration of Kano's model into QFD for customer-focused product design," *Quality Technology and Quantitative Management* 19(1), 95-112. https://doi.org/10.1080/16843703.2021.1992070

Meng, K., Li, H., Shu, Y., Chen, M., Han, X., and He, L. (2025). "Database construction and remodeling method on traditional Yi nationality patterns of China with GAN model," *NPJ Heritage Science* 13(1). https://doi.org/10.1038/s40494-025-01707-w

Ni, M., Huang, Q., Ni, N., Zhao, H., and Sun, B. (2024). "Research on the design of Zhuang brocade patterns based on automatic pattern generation," *Applied Sciences* 14(13), article 5375. https://doi.org/10.3390/app14135375

Qiang, W., and Pashkevych, K. (2023). "Interpretation and practice of animal elements in traditional Chinese children's shoes," in: *VI International Scientific and Practical Conference, Topical Issues of Modern Design*, (pp. 157-160), Kyiv National University of Technologies and Design.

Qin, M., Wang, J., Ding, X., and Zhang, H. (2025). "Symmetrical traditional patterns and user perception: A study on innovation in home textile design," *Symmetry* 17(6), article 960. https://doi.org/10.3390/sym17060960

Qu, M., Ren, Z., Wu, C., and Xi, L. (2026). "Integrating user feedback into air purifier innovation: The FKANO-DEMATEL-VIKOR decision framework," *Engineering Management Journal* 38(1), 81-98. https://doi.org/10.1080/10429247.2024.2447233

Ren, Z., Chen, D., Gong, Y., Niu, S., An, W., Liu, Z., and Wei, S. (2025). "Exploring the complex mapping between user perception and product form: A case study of air purifiers," *Journal of Engineering Design* 2025, article 2546834. https://doi.org/10.1080/09544828.2025.2546834

Saaty, T. L. (1980). *The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation*, New York, McGraw-Hill.

Song, J., Liu, Y., Chow, D., Liu, B., and Cho, S. (2025). "Correlation between the insolation shadow ratio and thermal comfort of urban outdoor spaces in residential areas in Xi'an," *Buildings* 15(12), article 1995. https://doi.org/10.3390/buildings15121995

Stiny, G. and Gips, J. (1972). "Shape grammars and the generative specification of painting and sculpture," *Information Processing* 71: Proceedings of the IFIP Congress 1971, 1460-1465.

Wang, C., Zhang, J., Liu, D., Cai, Y., and Gu, Q. (2024). "An AI-powered product identity form design method based on shape grammar and Kansei engineering: Integrating Midjourney and Grey-AHP-QFD," *Applied Sciences* 14(17), article 7444. https://doi.org/10.3390/app14177444

Wang, L., Gong, Y., Niu, S., and Ren, Z. (2025). "Cultural symbols migration and user perception: Innovation in Chinese-style furniture design," *BioResources* 20(2), 3476-3496. https://doi.org/10.15376/biores.20.2.3476-3496

Wen, Z., Yang, J., Sun, B., and Liu, Y. (2025). "Research on symmetry optimization of designer requirements and prototyping platform functionality in the context of agile development," *Symmetry* 17(4), article 502. https://doi.org/10.3390/sym17040502

Yang, Y., Zou, S., Cao, G., Liu, X., and Liu, X. (2026). "From user needs to sustainable innovation: An integrated NLP-grounded theory-Kano-AHP QFD approach to the modern design of Yi ethnic lacquerware chairs," *BioResources* 21(2), 4375-4407. https://doi.org/10.15376/biores.21.2.4375-4407

Xue, G., and Chen, J. (2024). "Strategies for applying shape grammar to wooden furniture design: Taking traditional Chinese Ming-style recessed-leg table as an example," *BioResources* 19(1), 1707-1727. https://doi.org/10.15376/biores.19.1.1707-1727

Zhang, F. L., Li, X., Xu, S. Z., Zhao, X., and Gao, Y. X. (2024). "Ergonomic design of safety protective wearables in confined space operations," *Advanced Design Research* 2(2), 137-150. https://doi.org/10.1016/j.ijadr.2025.01.001

Zhang, S., and Jiang, R. (2026). "Exploration of visual appeal and local cultural identity in wooden packaging design," *BioResources* 21(1), 188-207. https://doi.org/10.15376/biores.21.1.188-207

Zhang, Y. (2024). "The evolution and contemporary expression of traditional Chinese patterns: Water patterns and cloud patterns as examples," *Mediterranean Archaeology and Archaeometry* 24(1), 112-122. https://doi.org/10.5281/zenodo.10604209

Zou, Y., Zhao, C., Childs, P., and Luh, D. (2024). "Cross-cultural design in costume: Case study on totemic symbols of China and Thailand," *Humanities and Social Sciences Communications* 11(1), article 1263. https://doi.org/10.1057/s41599-024-03707-w

Article submitted: June 9, 2026; Peer review completed: June 6, 2026; Revised version received: June 11, 2026; Accepted: June 30, 2025; Published: July 10, 2026.
DOI: 10.15376/biores.21.3.8031-8052