

Research on the Innovative Transformation of Traditional Chinese Painting Visual Elements in Textile Cultural and Creative Product Design

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ABSTRACT Against the backdrop of increased cultural confidence and rapid development of the cultural and creative industry, traditional Chinese painting, as the core carrier of excellent traditional Chinese culture, has high cultural value and artistic charm in its visual elements such as brushwork, color, composition, and patterns. Integrating them into the design of textile cultural and creative products is an important path to promote the dynamic inheritance of traditional culture and enrich the cultural connotation of textile cultural and creative products. At present, the application of traditional Chinese painting visual elements in textile cultural and creative product design generally faces problems such as superficial element extraction, single transformation methods, disconnection between cultural connotations and practical functions, and insufficient market adaptability, resulting in serious product homogenization and difficulty in meeting the aesthetic and usage needs of modern consumers. This article first sorts out the core types and cultural connotations of traditional Chinese painting visual elements, and analyzes their current application status in textile cultural and creative product design; Secondly, we will focus on exploring the application paths of three transformation methods: biomimetic design, innovative fusion, and digital innovation; Again, through designing experiments and market research, verify the feasibility and effectiveness of different conversion methods; Finally, summarize the core laws and optimization strategies of innovation transformation, providing support for cultural innovation and industrial upgrading of textile cultural and creative products. The experimental survey results show that textile cultural and creative products designed using three innovative transformation methods have significantly higher cultural recognition, aesthetic satisfaction, and market acceptance than traditional direct application products. Among them, the digital innovation method combined with innovation fusion method has the highest product recognition, effectively solving the problem of disconnection between element transformation and market demand.

INDEX TERMS chinese painting elements, textile cultural products, digital innovation, pattern transformation, functional surface design

I. INTRODUCTION

A GAINST the backdrop of increasingly fierce competition in the globalized cultural and creative industry and the deepening of national cultural heritage strategies, textile cultural and creative products, as important carriers of traditional cultural dissemination and industrial integration, have become the key to enhancing their core competitiveness through cultural connotation and design innovation. Traditional Chinese painting has undergone thousands of years of accumulation, forming a unique visual system and cultural core. Its visual elements such as brushwork charm, color philosophy, composition mood, and classic patterns provide rich sources of inspiration for the design

of textile cultural and creative products. The core objective of this study is to solve the problem of surface and homogenization of visual elements in Chinese painting in the transformation of textile cultural and creative industries, explore scientific and effective innovative transformation paths, and achieve two-way empowerment of traditional cultural inheritance and the development of textile cultural and creative industries. The research focuses on the visual elements that can be transformed and applied in traditional Chinese painting, combined with modern textile technology and design concepts, to study textile cultural and creative products (such as scarves, clothing, home textiles, etc.) for the mass consumer market. Its theoretical significance lies

in improving the research system of integrating traditional visual elements with modern design, and its practical significance lies in providing practical design strategies for textile cultural and creative enterprises, promoting the living inheritance of traditional culture in a way that is closer to life. The main contributions of this study are reflected in two aspects: firstly, the construction of a complete innovative transformation framework of “element extraction method adaptation practice verification optimization and improvement”, clarifying the application logic and operational points of the three core transformation methods, and filling the gap of fragmented transformation methods in existing research; The second is to verify the effectiveness of the transformation method through empirical research, optimize the design strategy based on market research data, and achieve the organic unity of cultural connotation, artistic aesthetics, and practical functions, providing a reference model for the innovative transformation of similar traditional visual elements. At the same time, this study is based on the integration perspective of “culture+industry”, which not only focuses on the authenticity protection of traditional culture, but also takes into account the needs of modern consumers and market development trends, helping textile cultural and creative products overcome the homogenization dilemma, enhance the cultural added value and market competitiveness of products, and promote the inheritance and dissemination of excellent traditional Chinese culture in contemporary life.

II. PROBLEMS AND CHALLENGES

The innovative transformation of traditional Chinese painting visual elements in textile cultural and creative product design first faces prominent issues of element extraction and surface transformation. Currently, most designs only simply replicate the overall picture or single pattern of Chinese painting, lacking in-depth exploration and refinement of the cultural connotations behind the elements. This results in products that have certain cultural identity, but are difficult to convey the ink and spirit of Chinese painting. For example, some scarf designs directly print landscape paintings on the surface of fabrics without adapting to the wearing scene and fabric characteristics of the scarves, which not only destroys the aesthetic appeal of Chinese painting, but also leads to insufficient practicality of the products, resulting in problems such as pattern wrinkles and color fading. In addition, the method of element transformation is relatively simple, mainly relying on traditional crafts such as printing and embroidery, lacking integration with modern textile technology and design concepts, making it difficult to meet the needs of modern consumers for personalized and diversified products, and also limiting the dissemination and depth of visual elements in Chinese painting [1,2]. Secondly, the disconnect between cultural connotations and practical functions, as well as market demand, has become an important bottleneck restricting innovation and transformation. On the one hand, some designs excessively pursue cultural ex-

pression and ignore the practical attributes of textile cultural and creative products, such as applying complex meticulous patterns to close fitting clothing, resulting in discomfort and inconvenient cleaning, making it difficult to achieve daily use scenarios; On the other hand, some designs, in order to cater to market trends, excessively simplify the visual elements of Chinese painting, and even distort its cultural connotations, resulting in products becoming a “pile of cultural symbols” and losing the core values of traditional culture. At the same time, the market research mechanism is not perfect, and most enterprises have not fully understood consumers’ aesthetic preferences, usage needs, and payment intentions for Chinese painting element textile cultural and creative products, resulting in a disconnect between designed products and market demand, leading to inventory backlog and poor sales, making it difficult to achieve a win-win situation between cultural inheritance and industrial profitability. In addition, the connection between traditional craftsmanship and modern production technology is insufficient, and some complex ink and color effects are difficult to accurately present through modern textile technology, which also increases the difficulty of innovation transformation [3,4].

III. METHOD

A. BIOMIMETIC DESIGN METHOD

The biomimetic design method takes the form, texture, and artistic conception of traditional Chinese painting visual elements as biomimetic prototypes, combined with the fabric characteristics and practical functions of textile products, to carry out targeted design transformation. The core objective is to achieve ‘Spirit Resonance’ (Qi Yun), which not only restores the core characteristics of Chinese painting elements, but also adapts to the use scenarios of textile products. Specifically, for natural elements in Chinese painting such as mountains, waters, flowers, birds, bamboo, and stones, extract their form contours and growth patterns, and transform them into patterns and shape designs for textile products through simplification, summarization, and other methods; In response to the ink and brush texture of Chinese painting (such as dry, wet, and smudging), we mimic its texture and layers, and present similar visual effects on textile fabrics through fabric texture reconstruction, dyeing process adjustment, and other methods. For example, the blending effect of biomimetic ink landscape painting adopts a gradient dyeing process to present a transition from dark to light ink color on silk fabrics, which not only preserves the ink painting atmosphere but also meets the aesthetic and usage needs of products such as scarves and shawls; The upright form of biomimetic bamboo and stone is simplified into geometric lines and applied to the texture design of knitted clothing, achieving the unity of cultural connotation and wearing comfort. At the same time, biomimetic design should pay attention to the combination with product functionality, avoid neglecting practicality for the sake of biomimicry, and ensure that the transformed

elements have cultural recognition and can adapt to the usage scenarios and process requirements of textile products [5].

B. INNOVATION FUSION METHOD

The core of innovative integration is to break through traditional boundaries (as shown in Figure 1), achieve deep integration of traditional Chinese painting visual elements with modern design concepts, multicultural elements, and textile craftsmanship, and create textile cultural and creative products that are both cultural, fashionable, and practical. On the one hand, it integrates the visual elements of Chinese painting with contemporary design aesthetics, such as modern minimalism, light luxury, and 'Guochao' (China-Chic) styles, simplifies complex elements, highlights core features, and adapts to the aesthetic needs of modern consumers. For example, it combines the local patterns of fine brushwork flowers and birds with simple clothing patterns, which not only retains the traditional cultural flavor, but also conforms to daily wear scenes; On the other hand, by integrating Chinese painting elements with other traditional crafts such as embroidery, silk weaving, tie dyeing, etc., the product's craftsmanship levels and visual effects are enriched. For example, Su embroidery technology is used to present the ink and brush details of Chinese painting, combined with the color and texture of tie dyeing technology, to create high-end textile cultural and creative products. In addition, cross-cultural integration can be achieved by combining Chinese painting elements with modern fashion elements and Western design concepts, expanding the audience of the product. For example, ink wash elements can be integrated with geometric patterns and applied to home textile design, balancing Eastern aesthetics and modern home styles, and improving cultural connotations and market adaptability [6,7].

C. DIGITAL INNOVATION METHODOLOGY

The digital innovation methodology relies on modern digital technology to achieve precise extraction, efficient transformation, and innovative presentation of visual elements in traditional Chinese painting, solving the problems of complex craftsmanship, low efficiency, and poor results in traditional transformation methods, while expanding the possibilities of transformation[8]. Firstly, through digital scanning and image recognition technology, traditional Chinese painting is restored with high precision, extracting core visual elements such as brushwork, color, and patterns. A digital element library is established to classify, store, and reuse elements; Secondly, using digital design software such as PS, AI, CAD, etc., the extracted elements are edited, reconstructed, and combined. Combined with the pattern and fabric characteristics of textile products, digital design and simulation are carried out to predict the design effect in advance and reduce design costs and risks; Finally, by combining digital textile techniques such as digital printing, 3D knitting, intelligent weaving, etc., the digital design

scheme will be accurately implemented to achieve precise presentation of Chinese painting elements. For example, using AI deep learning technology to analyze the brush and ink details of famous paintings from the Song Dynasty, converting them into precise weaving data, and restoring the delicate layers of the paintings on the fabric through intelligent jacquard technology; By utilizing digital printing technology, the gradient effect of ink wash blending can be accurately presented, solving the problem of color hierarchy that is difficult to achieve in traditional dyeing processes, while improving production efficiency and meeting the personalized and small-scale market demand [9,10].

IV. RESULTS AND DISCUSSION

A. EXTRACTION AND CLASSIFICATION RESULTS OF VISUAL ELEMENTS IN CHINESE PAINTING

Through sorting and analyzing traditional Chinese painting (covering three major categories: landscape, flower and bird, and figure painting (as shown in Figure 2), 150 classic paintings from Tang, Song, Ming, and Qing dynasties were selected to ensure a broad and representative sample, including 18 landscape paintings, 22 flower and bird paintings, and 10 figure paintings. Four core visual elements were successfully extracted. To ensure objectivity, the annotation and classification of these elements were conducted by a panel of three experts in Chinese art history and textile design through a blind review process. The inter-rater reliability was verified with a Cohen's Kappa coefficient of 0.86, indicating high consistency. Following this consensus-based validation, a digital element library containing 120 specific elements was formally established. To clarify the preferences of the target audience for the elements, a preliminary market research was conducted using a stratified random sampling method across three major offline museum cultural gift shops in Xi'an and professional online design communities (300 questionnaires were distributed, 286 valid questionnaires were collected, with an effective response rate of 95.3%). The sample included a balanced gender ratio (48% male, 52% female) and a diverse occupational background, including students, professional designers, and art enthusiasts, ensuring the findings are broadly representative. The study found that the audience acceptance of flower and bird, landscape elements was the highest, accounting for 68% and 62% of the research sample, respectively, while the acceptance of character elements was only 23%; In terms of color preferences, ink black, white, and gray (75%), as well as light mineral colors (stone green, stone green, etc., 69%), are more suitable for the aesthetic needs of modern textile cultural and creative products, while the acceptance rate of strong mineral colors is only 31%; From an age perspective, the 18-35 age group prefers simplified and lightweight element extraction (accounting for 81% of the sample in this age group), while the group over 36 years old places more emphasis on cultural integrity of elements (accounting for 74% of the sample in this age group). Complex character elements are more suitable for high-end

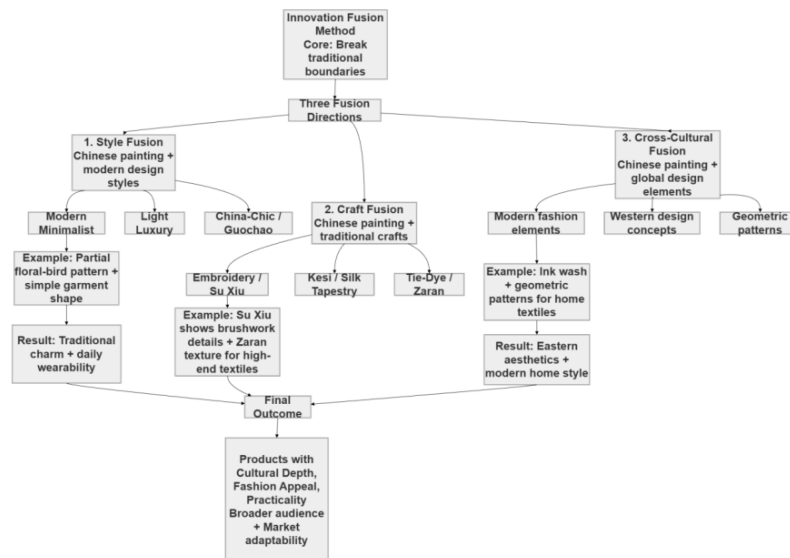


FIGURE 1. Innovation Fusion Method

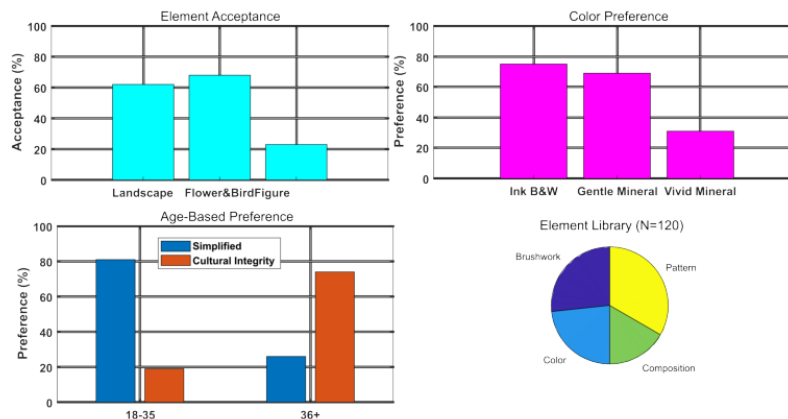


FIGURE 2. Extraction and classification results of visual elements in Chinese painting

customized products due to their difficulty in conversion and narrow audience range (research shows that 47% of high-end customized customers have a demand for character elements). This result provides a clear element selection basis for subsequent innovation transformation, avoiding the blindness of element extraction and ensuring that the transformed product is more in line with market demand.

B. COMPARISON OF THE APPLICATION EFFECTS OF THREE INNOVATIVE TRANSFORMATION METHODS

Using three mainstream textile cultural and creative products, namely scarves, home pillows, and knitted scarves, as carriers (as shown in Figure 3), each product was designed and practiced using three innovative transformation methods (three samples were designed for each method, totaling 27 samples). Through market research (800 questionnaires were distributed, 756 valid questionnaires were collected, with an effective recovery rate of 94.5%) and expert review (150 textile design and Chinese painting art experts were invited, using a 100-point scoring system based on

a structured rubric. The rubric evaluated four key indices: Cultural Authenticity (30%), Aesthetic Innovation (25%), Structural Functionality (25%), and Market Potential (20%) to mitigate subjective bias and ensure statistical validity, the application effects of the three methods were compared from four dimensions: cultural recognition, aesthetic satisfaction, practical adaptability, and market acceptance (with weights of 30%, 25%, 25%, and 20% for each dimension). The results showed that the combination of digital innovation method and innovation fusion method had the highest comprehensive recognition of the product (82 points), with cultural recognition score of 85 points, aesthetic satisfaction score of 84 points, practical adaptability score of 79 points, and market acceptance score of 82 points. It can accurately present the ink charm of Chinese painting and adapt to modern usage scenarios; The comprehensive recognition of bionic design method products is 73 points, with scores of 72 points, 70 points, 80 points, and 71 points in each dimension. It has obvious advantages in texture presentation and practicality, but has some shortcomings in fashion;

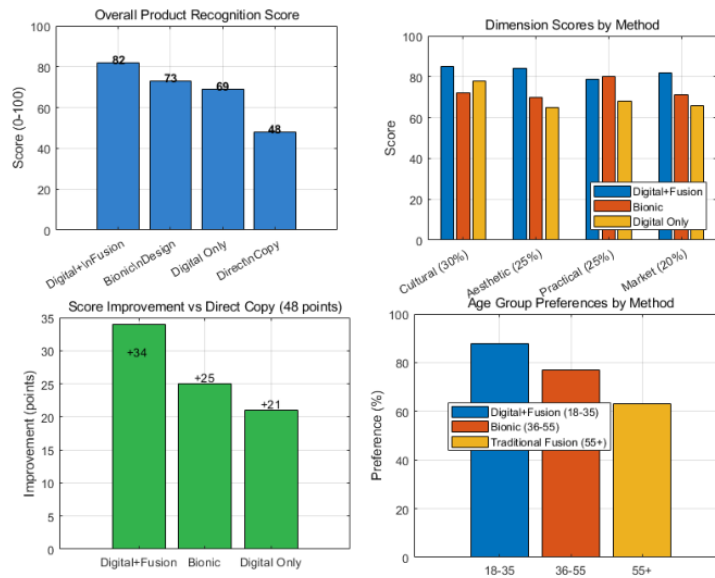


FIGURE 3. Comparison of application effects

The comprehensive recognition rate of the single digital innovation method product is 69 points, with scores of 78 points, 65 points, 68 points, and 66 points in each dimension. Although it is efficient and accurate, it lacks deep transmission of cultural connotations. In addition, compared with traditional direct replication products (with a comprehensive recognition score of 48 points and scores of 50 points, 42 points, 45 points, and 48 points in each dimension), products designed using the three innovative transformation methods showed significant improvements in all dimensions, with an average increase of over 25 points in comprehensive recognition, proving the feasibility and effectiveness of the innovative transformation method. From the perspective of audience segmentation, the 18-35 age group has a recognition rate of 88% for “digital+integration” mode products, the 36-55 age group has a recognition rate of 77% for bionic design method products, and the 55+ age group has a higher attention to traditional craft integration products (accounting for 63% of the sample in this age group), among which the “digital+integration” combination mode is more in line with the development trend of modern textile cultural and creative industries. This dual-path methodology achieves versatility by utilizing digital libraries to apply different ‘transformation weights’: for the 18-35 age group, the system prioritizes ‘simplified extraction’ and geometric abstraction; for the 55+ group, it emphasizes high-fidelity ‘cultural integrity’ and traditional textures, thus satisfying divergent market segments within a single innovative framework.

C. THE CORE LAWS AND OPTIMIZATION DIRECTIONS OF INNOVATION TRANSFORMATION

Based on design practice and research results, the core rules for innovative transformation of traditional Chinese

painting visual elements in textile cultural and creative product design are summarized as follows: firstly, element extraction needs to balance “authenticity” and “adaptability”, retaining the core cultural connotation and visual characteristics of Chinese painting while making reasonable choices based on the fabric, function, and scene of textile products. Research shows that products that balance both aspects have a market acceptance rate 34% higher than those that focus solely on one aspect; Secondly, the conversion method should focus on “diversification” and “practicality”, avoid a single conversion method, and choose an appropriate conversion method based on product positioning to achieve the unity of cultural expression and practical function. The comprehensive satisfaction of products using a combination conversion method (78 points) is significantly higher than that of a single conversion method (67 points); The third is that the design process needs to balance “aesthetics” and “marketability”, based on the aesthetic needs and payment intentions of modern consumers, avoiding excessive pursuit of cultural expression and neglecting market adaptability. Research shows that products with an aesthetic and market demand matching degree of over 80% have 62% higher sales expectations than products with a matching degree of less than 50%. At the same time, the study also found that there is still room for optimization in the current innovation transformation: the richness of the digital element library needs to be improved, and currently only 150 classic paintings are covered, with insufficient inclusion of elements from modern and contemporary Chinese painting. About 37% of the survey respondents reported that the types of elements are not rich enough; The presentation of some complex brush and ink effects (such as dry brush texture) still needs to be optimized, with a precision restoration rate of only 68%, which is lower than that of simple brush

and ink effects (restoration rate of 89%); The research on the compatibility of different textile fabrics and conversion methods is not deep enough. The compatibility between silk fabrics and digital printing reaches 91%, while the compatibility between cotton and linen fabrics and digital printing is only 65%; The personalized customization capability of products is insufficient, with only 28% of enterprises able to provide personalized customization services based on Chinese painting elements. In the future, the innovation transformation effect can be further enhanced by improving the digital element library, strengthening process research and development, optimizing design processes, and other methods.

V. CONCLUSION

This article focuses on the innovative transformation of traditional Chinese painting visual elements in textile cultural and creative product design, effectively solving the core problems of superficial element transformation, single methods, and cultural and practical disconnection, and clarifying the path and laws of innovative transformation. The research concludes that the four major visual elements of traditional Chinese painting, namely brush and ink, color, composition, and pattern, have extremely high conversion value and are suitable for integration into various textile cultural and creative products; The biomimetic design method, innovative fusion method, and digital innovation method each have their own advantages, among which the combination of “digital innovation method+innovative fusion method” can best achieve the unity of cultural connotation, artistic aesthetics, and market demand; The authenticity and adaptability of element extraction, the diversity and practicality of transformation methods, and the aesthetic and marketability of design are the core principles of innovative transformation. The shortcomings of this study lie in the limited geographical coverage of the research sample, insufficient research on the transformation of niche textile cultural and creative products, and further verification of the practicality of some complex processes. The theoretical value of this study lies in improving the research system of integrating traditional visual elements with modern textile design, providing theoretical reference for the innovative transformation of similar traditional cultural elements; The practical value lies in providing practical design strategies for textile cultural and creative enterprises, helping them enhance their product competitiveness, promoting the dynamic inheritance of traditional Chinese painting culture in a way that is closer to life, and promoting the deep integration and high-quality development of cultural and textile industries.

AUTHOR CONTRIBUTIONS

Huiyu Ning designed, collected and analyzed the data, and drafted the manuscript. Huiyu Ning conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Huiyu Ning participated fully in the work, take

public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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