

## RESEARCH ARTICLE

# Exploring the social-psychological dimensions of sustainable design and cultural heritage in Ge's Theatre Facial makeup

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## ABSTRACT

With the increasing awareness of environmental protection, sustainable design has become a focal point across multiple fields. Excellent traditional culture carries the mainstream consciousness of a nation and is transmitted across generations, shaping social identity and collective values. While traditional culture originates from history and sustainable design looks toward the future, the two are not contradictory. This paper explores the symbiosis and development of sustainable design and cultural heritage from a social-psychological perspective, examining how shared values, cultural identity, and collective perceptions influence design practices. Using Ge's Theater Facial Makeup as a case study, the paper highlights its family inheritance, artistic characteristics, and the cultural meanings embedded in the makeup. It further analyzes how these cultural symbols can be integrated into sustainable product design, clothing, and tourism, emphasizing resource protection, reuse, and social acceptance. Materials such as crab shells, fabrics, and traditional lacquer art are examined as mediums for combining sustainable design with cultural heritage, demonstrating how social-psychological factors shape both the perception and practice of sustainable, culturally grounded design.

**Keywords:** sustainable design; cultural heritage; Ge's Theater Facial makeup

## 1. Introduction

In modern society, the public's demand for cultural identity and social belonging is increasing day by day. Traditional culture not only carries historical memories but also plays an important role in shaping group values and social psychology. Meanwhile, sustainable design, as an innovative practice oriented towards the future, emphasizes resource conservation and environmental responsibility. Introducing the perspective of social psychology into the research of sustainable design and cultural inheritance can provide a deeper understanding of people's emotional identification with cultural symbols, social interaction and behavioral intentions.

Sustainable design, also known as green design or eco-design, is a design concept that focuses on environmental protection and takes into account social and economic benefits. It follows the “3R” principle: Reduce, Reuse and Recycle, and aims to reduce the impact on the environment and realize the efficient use of resources [1,2]. Sustainable design as a concept has gradually expanded across multiple disciplines<sup>[3,4]</sup>. Rather than merely addressing environmental challenges, this design philosophy adopts a holistic perspective

### ARTICLE INFO

Received: 2 October 2025 | Accepted: 15 October 2025 | Available online: 30 October 2025

### CITATION

Xian QC, Zhang ZJ, Chen MW. Exploring the social-psychological dimensions of sustainable design and cultural heritage in Ge's Theatre Facial makeup. *Environment and Social Psychology* 2025; 10(10): 4185 doi:10.59429/esp.v10i10.4185

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that integrates environmental, social, and economic dimensions [5]. At the same time, culture represents the spiritual core of a nation, and cultural heritage serves as a vital medium for preserving and promoting traditional values, thereby fostering social stability and harmony [6]. Although sustainable design and cultural heritage may appear to belong to distinct domains, they are in fact deeply interconnected. Sustainable design emphasizes the conservation of resources and environmental protection—principles that align closely with the core values of cultural heritage [7]. Moreover, cultural heritage must continuously adapt to contemporary social contexts, and sustainable design provides effective strategies and techniques for such adaptation [8]. Using Ge's Theater Facial Makeup as a case study, this paper explores how the principles of sustainable design are embodied in this traditional art form and how their integration contributes to the mutual development and symbiosis of design innovation and cultural heritage.

In classical Chinese opera, people use different colors to draw specific patterns on the faces of characters, depicting the facial features of different characters, called *lianpu* [9]. *lianpu* is the patterned character makeup of Chinese opera [10]. This form has been used until now, and has slowly become a very unique expression in the field of Chinese opera [11,12]. Ge's Theater *lianpu* belongs to the unique folk art treasure of Panjin area in Liaoning Province, China. When mentioning the culture of *lianpu*, people will more often associate it with the Peking Opera and other forms of theater in the form of *lianpu* [13]. However, Ge's Drama *lianpu* skillfully integrates local culture and opera elements, carries heavy historical heritage and rich cultural connotation, and reflects unique regional characteristics. Ge's Theater *lianpu* has become a bright pearl of traditional art with its exquisite craftsmanship and unique artistic charm, and it is also an important medium to show unique folk customs (Figure 1). It has certain cultural, artistic and social values. However, the great changes in the social environment and the impact of multiculturalism have caused changes in the non-heritage environment, and what is more worrying is that the culture of handmade theatrical *lianpu* has fallen into a development crisis, coupled with the fact that most of the contemporary young people do not appreciate the traditional theatrical *lianpu*, and that some of the old craftsmen who have mastered *lianpu* crafts have gradually left the world, and that a number of factors have caused the handmade *lianpu* crafts to be in danger of losing the art and crafts [14]. Ge's Theater *lianpu* Art has experienced birth, development, and weakening during the past century, and has coexisted and developed with sustainable design in the twenty-first century. It is understood that at present, Ge's Theater *lianpu* Art is mainly disseminated through performances and displays. In addition, it is of great significance for the fifth generation of inheritors to study the characteristics and values of Ge's Theatrical *lianpu* Art and innovate with sustainable design for the development of Ge's Theatrical *lianpu* Art.



**Figure 1.** Hongru Ge Tianfu National Troupe Panjin Branch performed at Liaohe Folk Museum to promote the culture of *lianpu*.

With the introduction and promotion of the concept of sustainable development, more and more people have begun to pay attention to environmental protection and the sustainable use of resources. Against this background, symbiosis and development can be achieved by integrating new sustainable forms and styles with traditional folk arts and intangible cultural heritage<sup>[15-17]</sup>. At present, through sustainable design and the artistic characteristics of theatrical Makeup, it is possible to develop “Arts and Crafts *lianpu*”. In this way, *lianpu* can not only be disseminated through the stage, but can also be seen in large buildings, digital channels, packaging of goods, various types of porcelain, and people's clothing in different styles, just like other folk art<sup>[18-21]</sup>. Applying Ge's Theater *lianpu* culture to modern sustainability design, such a symbiotic relationship goes far beyond the scope of stage application, and gradually develops Ge's Theater *lianpu* art can occupy a position in people's minds and have a certain vitality.

## 2. Symbiosis and development of sustainable design and cultural heritage

### 2.1. Sustainable design

Derived from the concept of sustainable development, sustainable design not only addresses environmental issues, but also comprehensively addresses, from a systemic perspective, environmental factors (constraints of natural conditions, resource conservation and pollution prevention), social factors (achieving equal access to resources under peaceful and diverse social conditions) and economic factors (mitigating environmental degradation in the context of economic development)<sup>[22,23]</sup>. There are several implementation strategies for sustainable design. Life Cycle Assessment (LCA) is a commonly used sustainable design tool. It assesses the entire life cycle of a product, including raw material collection, production, use, and disposal, to determine its impact on the environment<sup>[24,25]</sup>. Circular design is the consideration of reuse and recycling of materials at the product design stage to reduce waste generation. This design approach encourages repairability, disassembly, and recyclability of product design<sup>[26]</sup>. Green material selection is an important part of sustainable design. It involves the selection of materials that have a low environmental impact, such as renewable materials, low-toxicity materials, etc<sup>[27]</sup>. Energy efficiency is a key consideration in sustainable design. Reducing energy consumption and lowering carbon emissions through the use of efficient equipment and technology contributes to mitigating climate change<sup>[28,29]</sup>.

### 2.2. Cultural heritage

Cultural transmission refers to the process through which both material and intangible achievements of human society are passed down across generations<sup>[30]</sup>. Cultural heritage plays a vital role in this process by preserving historical memory, maintaining cultural diversity, and shaping collective identity. First, it ensures the continuation of history by carrying the experiences, wisdom, and stories of the past<sup>[31]</sup>. Traditional buildings and handicrafts, for example, serve as tangible carriers of this heritage<sup>[32]</sup>. Second, it safeguards the world's diverse cultures, ensuring that unique regional and community practices are preserved and perpetuated<sup>[33]</sup>. Finally, the transmission of cultural knowledge helps individuals develop a sense of belonging and identity within their own communities<sup>[34]</sup>. For example, traditional festivals, costumes, food and other cultural elements. Providing spiritual nourishment: Excellent cultural traditions can give people spiritual nourishment and inspiration. Moral norms, humanistic spirit, and aesthetic concepts in culture have a profound impact on the cultivation of personal morality, the shaping of values, and the cultivation of creativity. Promote social development: Rich cultural heritage can provide resources and impetus for social development, for example, cultural tourism, creative industries, etc. all rely on the development and utilization of cultural resources.<sup>[35]</sup> In today's context of globalization and modernization, cultural heritage faces many challenges, such as cultural homogenization, the marginalization of traditional culture, and the protection of cultural heritage<sup>[36]</sup>. Therefore, we need to pay more attention to cultural heritage and take

active and effective measures to protect and promote it, so as to ensure the continuation and development of the outstanding cultural heritage of humankind.

### 2.3. Strategies for their symbiosis and development

The integration of sustainable design and cultural heritage lies in their shared emphasis on conserving both environmental and cultural resources [36]. The former can reduce the waste of resources through environmentally friendly design, while the latter can prevent the loss of cultural resources through the transmission of knowledge and skills [37,38]. Both seek long-term, holistic well-being rather than short-term, one-sided benefits. Integration of the two in design practice. In many design practices, sustainable design and cultural heritage have realized a deep integration. For example, designers can apply sustainable design principles and use environmentally friendly materials and technologies to restore and preserve ancient buildings, retaining their historical features while adapting them to the needs of modern life [39]. In terms of material selection and innovation, sustainable materials are utilized and more natural and renewable materials are used. They are recyclable, environmentally friendly and renewable, reducing the need for synthetic fibers [40]. On the other hand, sustainable products can incorporate cultural elements, such as traditional motifs and handicrafts, which both promote cultural heritage and enhance the product's added value [41]. Create cultural and creative products that meet modern design needs and carry cultural significance through craft design. Cultural practices can be reinterpreted through the lens of sustainable development. For example, traditional festival customs can be emphasized for their environmentally friendly and frugal practices, thereby minimizing environmental impact while transmitting cultural heritage.

## 3. Cultural Inheritance of Ge's Theater Facial Makeup

### 3.1. The History of the Ge Theater Facial Makeup Family Lineage

The family lineage of Ge's Theater lianpu practitioners is particularly illustrative of the tradition's transmission across generations. As shown in **Figure 2** and **Table 1**, this inheritance lineage can reflect more comprehensively the history of the change from nothing to something in the art and craft of theatrical Makeup in Panjin area.



**Figure 2.** History of Ge's Theater Facial Makeup inheritors.

**Table 1.** Ge's Theater Facial Makeup lineage.

Name	Gender	Age	Generation	Remarks
Fude Ge	male	1889-1976	first generation	Specialized in Hebei chaotic playing flower face and white face. Founder
Yongcai Ge	male	1913-1993	second generation	Inherit and develop a variety of Facial Makeup crafts
Wanchun Ge	male	1944-2010	third generation	Retaining the production process
Haifeng Ge	male	1969	fourth generation	For work reasons, only organizes events and hardly participates in production
Hongru Ge	male	1998	fifth generation	A Modern and Innovative Representation of Ge's Theater Facial Makeup
Qingchi Xian, Minbohan Ge, Changjun Liu and so on	male and female	1960-2018	sixth generation	After the opening of the new theater class, the new generation of inheritors of Ge's Facial Makeup, from the age of 5 to more than 60 years of age

### 3.2. The artistic characteristics of Ge's Theater Facial Makeups

Ge's Theater lianpu is entirely handmade, following traditional production methods. It encompasses more than twenty distinct operatic art techniques, such as preparing the base, making glue, mold turning, clay molding, positioning, taut cloth application, puppet making, transferring, eye-opening, dotting cui, paper-cutting, sewing, white painting, color painting, plate gold, lacquer work, and shaping, among others. Many forms of opera facial mask production are also covered, such as "straw paper facial mask", "Liaoning puppet puppet head", "cloth silk facial mask", "rock color facial mask", "lacquer facial mask", "crab shell facial mask", "fan facial mask", "hand-painted facial mask" and other technological forms (Figure 3). Numerous traditional aesthetic factors of Opera Facial Makeup are embedded in them, such as: color, line, composition, and style.



**Figure 3.** A demonstration of the production forms of Ge's Theater Facial Makeup. A. Rock Color Facial Makeup Work. B. Facial Makeup Board Painting Work "Jiu Bian Hua Shen Tu". C. Cursive Paper Stripped Facial Makeup.

From the point of view of the use of color, the main feature of the traditional Ge's theatrical Facial Makeup art craft is the bright colors and elaborate use of colors. In lianpu, different colors carry specific symbolic meanings. For example, black signifies justice and dignity, white indicates villainy and treachery, red represents moderation and righteousness, yellow denotes corruption and cowardice, blue suggests intelligence and calmness, green conveys fierceness and impulsiveness, gold symbolizes deities, silver represents immortals, and purple is associated with demons and ghosts. Such as black-faced, red-faced Guan Yu, white-faced Cao Cao and so on. From the point of view of the use of lines, Ge's Theater Facial Makeup techniques have smooth and elaborate lines. The length, thickness, squareness, zigzagging, sparseness and density of the lines, and the various rhythmic changes in the lightness and weight of the brush, staccato, rigidity and softness all correspond to the moods and personalities of the different characters. From a compositional perspective, lianpu follows strict traditional rules, employing a variety of shapes and colors. The design is organized into three primary units corresponding to the eyes, nose, and mouth, with additional subunits on the forehead, eyebrows, and cheeks. Character traits serve as the foundation for these arrangements, allowing the facial design to convey personality and fate. For example, raised eye corners suggest youth and vitality, while rounded or smiling eye shapes symbolize fortune and longevity. The coordinated use of colors and geometric forms throughout the face provides visual cues about the character's role and background. For example, in Nezha's Nezha Pandemonium, the Crab General has a crab motif on the forehead and wave patterns on the cheeks. The design of *lianpu* must be adaptable, ensuring that the painted lines fit different facial shapes and remain suitable for stage performances while also being aesthetically pleasing as handcrafted art. Stylistically, Ge's Theater *lianpu* can be categorized into several types, including full face, mutilated face, yin-yang face, half face, broken face, cross face, and three-flower face. It is evident that lianpu effectively conveys the characters' traits and emotional expressions.

### 3.3. The inheritance Value of Ge's Drama Facial Makeup

As the most regional characteristics of Ge's theater has a long history, but also people worth passing on the artistic treasures. It can be regarded as a prominent representative of the traditional art of folk opera facial makeup and a valuable remnant of folk opera culture, possessing significant historical, cultural, and entertainment value. Historical records, such as Yingkou City Opera Zhi, indicate that folk opera performances were already taking place in Yingkou, within the Panjin region, as early as the fifty-first year of the Kangxi reign in the Qing dynasty (1712). These performances were primarily held during festivals, temple fairs, and in guild halls, reflecting the local cultural practices of the time. Now Panjin's earliest documented location of opera performance venues in Tianzhuangtai Guandi Temple playhouse, the Tongzhi years of the Qing Dynasty, the third repair of the Guandi Temple was completed, in the south of the gate, under the width of 8 meters. The theater building as a whole is square, can meet the requirements of the theater performance on the site, at that time is considered to be a high-grade stage. It can be seen that folk opera activities have always been in the region of the people's life in the integration. These activities are closely related to Ge's Theater Facial Makeup and integrated into the local people's life, such as festivals, celebrating harvest, praying for blessings and worshipping gods, marriages and funerals, adding children to the family, repairing temples and opening the light. In addition, Ge's Theater lianpu possesses significant artistic value. It exhibits a distinctive Liaoxi regional style, characterized by bold and expressive features, and incorporates a variety of traditional folk theater production techniques. As such, it remains a widely appreciated form of local folk art.

## 4. Symbiosis and development of sustainable design and Ge's theatrical Facial Makeup culture

Pattern elements are widely used in design in a variety of fields, such as automobiles, cell phones, architecture, sculpture, etc [42-44]. The application in public art also involves a variety of aspects, such as paper-cutting, colorful sculpture, batik, porcelain firing, shadow, puppet, stamps, calendar merchandise packaging, and the current popularity of cultural shirts and so on [45-48]. While the influence of *lianpu* design elements has expanded over time, the application of Ge's Theater *lianpu* in modern society does not constitute mere copying or simple reproduction of traditional facial patterns. Rather, it starts from the pattern, color and spectrum of Facial Makeup, in-depth understanding and knowledge of the rhythm of Facial Makeup art, absorbing the nutrients from it and transforming it to distill the characteristic cultural elements. We will also make sustainable design, so that the elements of Facial Makeup can be perfectly combined with other fields to better promote the culture of Facial Makeup [49].

In the field of sustainable design, the elements of Facial Makeup also have great application space, which is related to Facial Makeup's emphasis on the division of blocks and blocks, as well as the decoration of lines and the use of blocks and surfaces [50]. In addition, the abstraction and conceptualization of *lianpu* is an important factor in its integration with modern art and design [51]. The colors of *lianpu* are different from the conventional meanings they carry, and when the same colors are used in modern design, it is not just to suit the preferences of different consumers. The use of *lianpu* shapes in modern art design is not simply a copy and paste, but a recreation of traditional shapes [52].

### 4.1. Application of sustainable fabrics

Traditional fabric production often involves the use of chemical dyes, auxiliaries, and finishing agents, which may release harmful gases and wastewater, leading to environmental pollution. In contrast, sustainable fabric production emphasizes the use of eco-friendly dyes and auxiliaries or natural dyeing techniques, such as plant-based dyes, thereby reducing chemical usage and environmental impact. Moreover, the production process typically prioritizes energy conservation and process efficiency. With sustainable fabric as the main material, the products are processed artistically to achieve a certain artistic effect and fulfill people's life needs. Whether now or in the future, only by absorbing the essence of culture, exploring in depth the harmonious relationship between man and nature, and adhering to the road of sustainable development, can we realize the vitality of modernization<sup>[53]</sup>. Under the initiative of the International Silk Alliance and other international organizations, silk-producing countries have undertaken life cycle assessments of silk products to provide essential support for eco-design, sustainable manufacturing, and green consumption, thereby advancing resource conservation, environmental protection, and sustainable development. Ge's Theater *lianpu* also follows this purpose to be designed sustainably. As shown in **Figure 4**, this set of hand-painted silk *lianpu* is a cultural and artistic expression with local characteristics created by integrating traditional folk art elements against the background of local culture in Liaoning Province. The images of spotted seals, black-billed gulls, shrimp soldiers, crab generals, firefoxes, northeastern tigers, cranes and so on make *lianpu* art more contemporary and regional. In this way the application of Ge Theater *lianpu* in people's daily lives allows people to subconsciously understand and accept the art of Ge Theater Face Makeup, and consistently promotes the development of the cultural heritage of Ge Theater *lianpu*.



Figure 4. Liaohe Culture Cloth Facial Makeup by Hongru Ge.

#### 4.2. Recycling of crab shells

The crab shells that people throw away are transformed into crab shell theatrical Makeup after being carefully designed and drawn by Ge Hongru, the fifth-generation inheritor. It integrates the crab-shell culture of the Panjin region with traditional theater lianpu, endowing it with distinctive regional characteristics and reflecting the local social practices and cultural values of the Panjin people. In the creative process, Ge's Theater lianpu preserves the fundamental features of traditional theatrical makeup, including line work, color schemes, and patterns, while integrating modern aesthetic concepts. Techniques such as half-face lianpu and helmet designs render the facial image more contemporary and innovative. Furthermore, by incorporating regional cultural characteristics and blending tradition with modernity, the art achieves a unity of artistic and practical value, with personalized expression and intricate pattern design, thereby contributing to the inheritance and development of traditional theatrical culture. Utilizing recycled waste to make handicrafts through design. In this way, the originally discarded resources can be re-transformed into valuable resources, which greatly improves the utilization rate of resources and reduces the generation of waste and pressure on the environment.



**Figure 5.** Crab Shell Facial Makeup by Hongru Ge.

#### 4.3. Application of lacquer art and design

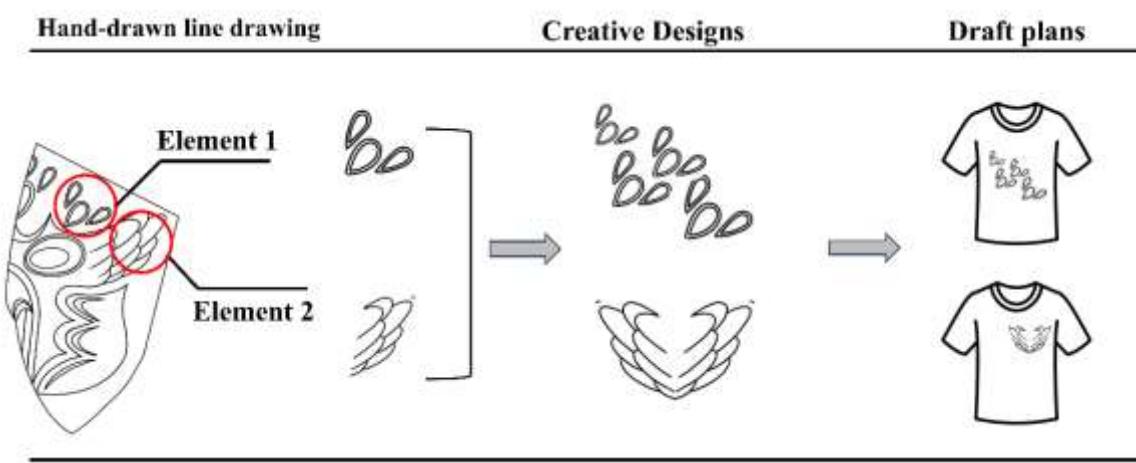
With the development of technology, more and more environmentally friendly materials are being applied in lacquer art creation, such as water-based paint and plant-based paint. This approach not only opens new avenues for the development of lacquer art but also reduces environmental pollution. From a social psychological perspective, lacquer art serves as an aesthetic medium while also contributing to the formation of cultural identity, emotional experiences, and a sense of social belonging among the public. The lacquer art facial makeup created by Ge Hongru organically combines the folk culture of the Liao River Basin, the traditional Ge Opera facial makeup and sustainable lacquer art techniques. As shown in **Figure 6**, this group of works, through the combination of sustainable materials and facial makeup elements, recreates the image of overlooking the Liao River. During the creative process, emphasis is placed on decoration, with rich colors and smooth lines, possessing high aesthetic value and emotional appeal. By integrating traditional lianpu art with lacquer techniques, including lacquer painting and inlay processes, theatrical lianpu exhibits a distinctive artistic style while fostering cultural identity and emotional engagement among the audience, thereby conveying the social and sustainable significance of the art.



**Figure 6.** Liaohe River overlooking the lacquer Facial Makeup.

#### 4.4. Clothing patches

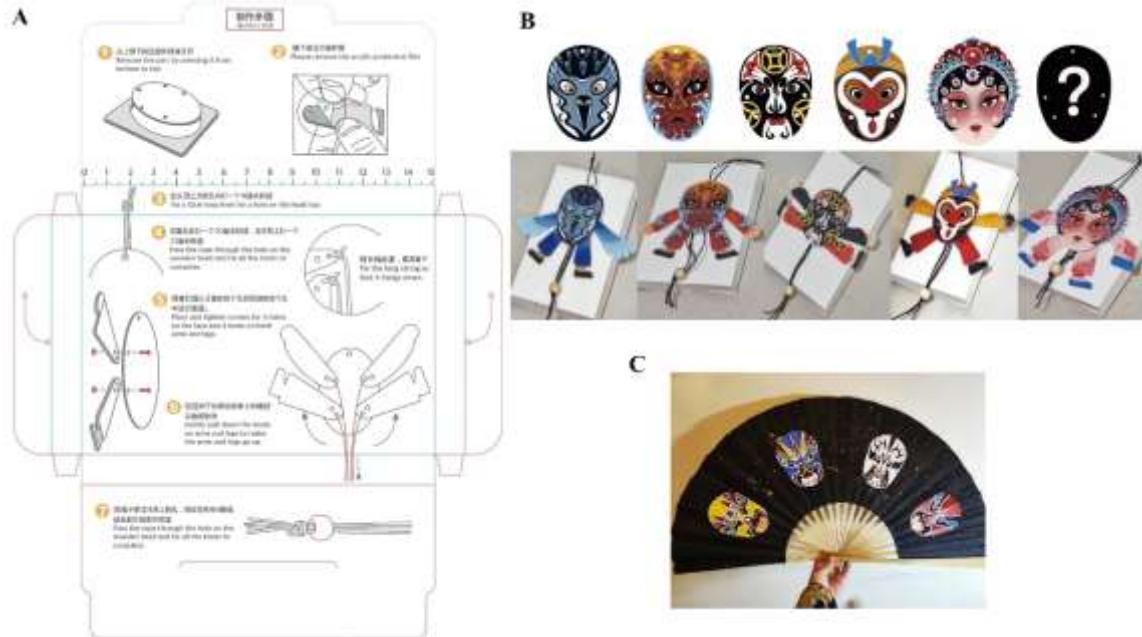
By repairing garments with patches, their service life can be extended, thereby reducing resource waste from discarded clothing and mitigating environmental pollution. In contemporary practice, patches serve as practical repair tools while also functioning as fashion elements that enable individuals to express creativity and personal style, thus promoting the sustainable use of existing items. In design practice, many designers maintain the basic garment silhouette while emphasizing *lianpu* elements, enhancing their distinctive features<sup>[54]</sup>. This is just right for designing patches. *lianpu* paintings are mostly outlined with lines, and a certain part of the *lianpu* pattern is deconstructed with modern printing techniques in the form of a face-style pattern, which is then applied to the garment patches. As shown in **Figure 7**, elements from the line drawings of theatrical Makeup are exemplified for creative design patches and finally shown on the garments.



**Figure 7.** Design of Theater *lianpu* Elements Applied to Clothing Patches.

#### 4.5. Tourism products

With the rapid growth of the tourism industry, the souvenir sector has expanded significantly. Yet, many domestic souvenirs often lack distinctive local cultural characteristics, with similar products appearing across different scenic locations. From a social-psychological perspective, souvenirs function as both memorabilia and tools for reinforcing cultural identity, social connections, and shared values among tourists. By integrating sustainable design principles, the art of Ge's Theater *lianpu* can be creatively incorporated into tourism products, thereby enhancing cultural recognition and fostering emotional engagement. For example, items such as blind boxes and fans are designed to popularize and promote Ge's Drama *lianpu* culture, while being accessible and visually appealing (**Figure 8**). This approach enables tourists to actively engage with the culture, enhances social appreciation of heritage, and promotes the transmission of *lianpu* culture through sustainable and visually meaningful souvenirs.



**Figure 8.** A and B Theater *lianpu* Jumping Baby DIY Blind Boxes. C. Hongru Ge *lianpu* Painting “Si Xiang Sa Jin Shan”.

## 5. Discussion

The technological and informational development of modern society has greatly impacted traditional culture while simultaneously creating new opportunities for its development. By applying sustainable design, we can approach *lianpu* culture from a social-psychological perspective, enhancing understanding and appreciation of the symbolic meanings embedded in these meta-symbols. Identifying the convergence between tradition and modernity allows *lianpu* elements to be integrated into various fields of public art, promoting both cultural inheritance and social engagement. Integrating the niche Ge’s Theater *lianpu* culture with sustainable design moves it beyond a single form of performance or display, encompassing environmental, economic, social, and long-term developmental dimensions. From a social-psychological viewpoint, this approach strengthens collective cultural identity, fosters public recognition and emotional attachment, and encourages socially responsible consumption. Practically, it supports resource conservation by reducing over-exploitation, stimulates new markets and industries, preserves local cultural elements and traditional craftsmanship, and motivates designers and companies to innovate continually. The symbiotic development of sustainable design and cultural heritage is therefore both complex and socially significant, linking cultural heritage with contemporary societal values.

## 6. Conclusion

Based on the above analysis, an interdependent and mutually reinforcing relationship exists between sustainable design and cultural heritage. From a social psychological perspective, implementing sustainable design while respecting and preserving cultural heritage can enhance the public’s cultural identity and sense of social belonging, thereby contributing to the long-term development and prosperity of society. Future research should continue to explore the symbiotic relationship between sustainable design and cultural heritage, uncovering new possibilities and opportunities. This approach aids in the conservation of natural and cultural resources while simultaneously addressing the public’s need for cultural identity and psychological fulfillment, thereby promoting the enhancement of broader social values. We should work

together to promote the symbiotic development of sustainable design and cultural inheritance, and contribute to building a better future.

## Author Contributions

Conceptualization, Q.X.; methodology, X.S.; validation, Q.X.; investigation, Z.Z.; resources, H.G.; writing—original draft preparation, Q.X.; writing—review and editing, Z.Z.; visualization, M.C.; supervision, M.C. All authors have read and agreed to the published version of the manuscript.

## Funding

This research received no external funding.

## Data Availability Statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

## Acknowledgments

The authors are grateful for the support of each generation of the Ge generation.

## Conflicts of Interest

The authors declare no conflicts of interest.

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