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Study on the Advancement of Cultural and Design-Oriented Products Through the Interaction Between Cantonese Opera and Historical and Architectural Heritage in Macau

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Abstract: Macau, renowned for its unique blend of Chinese and Western cultural influences, occupies a distinctive position in global cultural heritage. However, the challenges posed by rapid urbanization necessitate innovative approaches to preserve and reimagine its Cantonese Opera and historical architectural heritage. This study adopts a mixed-methods approach, combining case studies and questionnaire surveys to investigate the incorporation of Cantonese Opera artistry and architectural elements into the design of contemporary cultural and creative commodities. The research highlights the transformative potential of cultural heritage when reimagined through a modern design language that harmonizes traditional cultural identity with contemporary aesthetic and functional needs. The findings reveal strategic approaches for incorporating the visual and narrative elements of Cantonese Opera and the historical architectural features of Macau into product design, thereby promoting public engagement with and appreciation of Macau's cultural legacy. By developing culturally enriched and market-oriented products, this study promotes the dual objectives of heritage preservation and the expansion of the cultural and creative industries. Also, the research proposes a novel framework for integrating cultural and design practices, addressing the intricate balance between tradition and innovation within a rapidly modernizing urban context. The findings highlight the potential of creative design to revitalize cultural heritage, ensuring its relevance and sustainability in the contemporary era.

Keywords: Cultural and creative design; Cantonese opera elements; Historical architectural heritage; Design strategies

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1. Introduction

The rapid growth of Macau's gaming industry has solidified its reputation as a "gaming capital," overshadowing its rich and diverse cultural heritage. In response to this stereotype, Macau's cultural and creative merchants primarily focus on producing gaming-themed products, thereby perpetuating the misconception that gaming is Macau's sole cultural hallmark [1]. In response, the Government of the Macau Special Administrative Region has introduced measures to curb the dominance of the gaming industry and promote the integrated development of culture and tourism. Central to this initiative is the imperative to transcend the gaming-related stereotype and harness cultural innovation as a transformative opportunity [2].

Macau's cultural uniqueness lies in its blend of traditional Chinese culture and European colonial history, creating a distinctive and multifaceted cultural landscape [3]. A prominent example is Cantonese Opera, a significant traditional art form that embodies the cultural characteristics of the Guangdong-Hong Kong-Macau region. Its development has been marked by the integration and adaptation of external cultural influences, cross-disciplinary innovation, and the construction of a shared cultural identity, making it a significant vehicle for cultural recognition in the region [4]. Architectural landmarks like the Ruins of St. Paul's and the Rosary Church similarly symbolize Macau's historical evolution [5]. However, these cultural resources face significant challenges, including urbanization, the dominance of casino culture, and the erosion of traditional practices, all of which threaten the preservation of both tangible and intangible heritage.

In addressing these challenges, this study seeks to explore several interrelated research questions:

- How can the cultural and artistic elements of Macau's Cantonese Opera and historical architectural heritage be effectively integrated into innovative cultural and creative product designs to achieve a balance between traditional culture and contemporary aesthetics?
- What design strategies are necessary to preserve the distinctiveness and heritage value of these cultural assets while meeting the demands of modern markets?
- How can such products contribute to the preservation and dissemination of Macau's cultural heritage, promote the sustainable development of its cultural and creative industries, and reshape its image by transcending the entrenched "gaming capital" stereotype?

By exploring these questions, this study aims to propose strategies that address the challenges of heritage preservation while enhancing Macau's cultural identity and tourism appeal through innovative design.

2. Literature Review

2.1. The Relationship Between Cultural Creative Industries and Cultural Heritage Preservation

The cultural and creative industries, which leverage intellectual property based on cultural resources and creativity, have generated significant economic benefits and employment opportunities [6]. According to Lin et al., these industries span thirteen sectors, including advertising, architecture, arts, and artifact trade, playing a pivotal role in the preservation of cultural heritage. Research suggests that the growth of culturally and design-driven products modernizes cultural heritage elements, attracting the attention of younger generations and, in turn, promoting the protection and transmission of cultural heritage [7]. Subsequently, Azevedo et al. highlighted that cultural creative product, by integrating traditional art forms with modern design languages, can establish a cross-temporal cultural connection, thereby enhancing consumers' cultural identity and engagement [8].

Furthermore, Wang's study emphasized that cultural heritage, through meticulously designed cultural and creative commodities, can effectively convey its core values to the global market. However, balancing cultural significance with market demand during product development remains a critical challenge [9].

2.2. Development and Challenges of Macau's Cultural Creative Industries

Researcher Yangyi Li highlighted that Macau's culturally and design-oriented products deeply integrate local cultural elements, such as Portuguese tile patterns and historical architectural styles, significantly enhancing both their cultural value and market competitiveness [10]. Subsequently, Chenxi Li and Haoyu Yang emphasized that cultural product design should align with market demand by employing consumer surveys to gather data, ensuring that design directions meet practical market needs, which in turn improves product acceptance and sales performance [11]. Furthermore, Ying Zhang underscored that the in-depth exploration and integration of Macau's diverse cultural resources are key strategies for designing culturally and design-oriented products [12]. These products not only carry rich cultural significance but also enhance public understanding and appreciation of cultural heritage, achieving a balance between cultural preservation and commercial success [13]. Lee et al. further analyzed how the extraction of cultural symbols and their integration with modern product design languages could improve the market acceptance of cultural creative products. This approach offers valuable insights into the growth of Macau's Cultural and creative commodities [14]. However, these strategies largely focus on broad principles, lacking detailed applications of specific cultural elements, such as Cantonese Opera or architectural heritage, in product design. As Loulanski et al. pointed out in their study, achieving sustainable integration between cultural heritage and tourism requires striking a balance between cultural preservation and economic development. However, the specific strategies to achieve this balance remain an area that requires further exploration [15].

2.3. Current Research on Cantonese Opera as Cultural Heritage

In China, research on Macau's Cantonese Opera remains relatively scarce, despite its significance as a vital component of Macau's cultural identity. Guo Yuanying points out that Cantonese Opera plays an indispensable role in festivals and religious ceremonies, integrating various artistic elements such as music, singing, costumes, and stage design, all of which contribute to its cultural richness [16]. Jin Yao and Lin Faqin emphasize that Cantonese Opera, as an intangible cultural heritage, enhances the cultural identity of younger generations through educational and community activities. Also, the introduction of modern technologies has opened new pathways for the innovative development of Cantonese Opera while preserving its traditional essence [17]. However, existing studies primarily focus on cultural preservation and transmission, with limited exploration of how its artistic elements can be innovatively incorporated into culture- and design-oriented products.

2.4. Current Research on Macau's Architectural Heritage

Macau's architectural heritage, including 22 historic buildings and 8 squares, was inscribed on the World Heritage List in 2005. Tong Qiaohui and Wei Wei note that the development of thematic tourism routes has effectively integrated historical buildings with tourism, revitalizing cultural heritage and fostering the growth of Macau's cultural and tourism industries [18]. Subsequently, Zhang Yayan and Wang Boxun analyze the diversity of Macau's architectural heritage, which includes religious, commercial, military, educational, municipal, and residential structures. Iconic sites such as the A-Ma Temple, the Ruins of St. Paul's, and St. Dominic's Church are not only symbols of Macau's cultural heritage, but also reflect the fusion of Chinese and Portuguese cultures, highlighting Macau's unique historical position and cultural value [19]. While the Macau Special Administrative Region Government has implemented various measures under the Cultural Heritage Protection Law, including identification, documentation, restoration, and promotion, existing studies have paid insufficient attention to how architectural decorative details or structural styles can be applied to the growth of culture- and design-oriented products.

2.5. Adapting Macau's Cultural and Architectural Heritage for Creative Product Innovation

Leveraging cultural and architectural heritage for cultural and creative industries has gained scholarly attention. Zhang and Wen developed a model that uses emotional imagery and local architectural culture to guide the early stages of product development, highlighting the potential to extract cultural symbols from Macau's historic architecture to enhance creative products and resonate with consumers [20]. Similarly, the Cantonese Opera Art Museum exemplifies the integration of tangible and intangible heritage, offering insights into how traditional aesthetics, such as those of Lingnan gardens, can be reinterpreted into portable and marketable cultural products [21]. Other studies, including Kong's research on Cantonese Opera in urban public spaces [22] and Grazuleviciute's exploration of the economic and social potential of heritage [23], emphasize the broader value of cultural preservation. However, these studies fall short of providing specific strategies for applying these elements to innovative product design. They reveal a clear research gap: the lack of systematic and practical strategies for adapting Macau's cultural and architectural heritage to contemporary market-driven creative products.

2.6. Research Gaps and Focus of the Study

Macau's cultural creative industries have made notable contributions to the preservation and transmission of cultural heritage. However, existing research often focuses on cultural preservation, neglecting the systematic application of Cantonese Opera and architectural heritage elements in the design of cultural creative products. While prior studies have highlighted the symbolic and aesthetic value of Macau's architectural details and Cantonese Opera's artistic features, they lack practical frameworks for incorporating these elements into product design that aligns with contemporary market demands. Furthermore, strategies for balancing heritage conservation with consumer preferences remain underexplored. To

address these gaps, this study proposes actionable strategies that integrate Cantonese Opera and architectural heritage into culture- and design-oriented products. Through case analysis and data-driven insights, the research provides a framework for achieving cultural preservation while enhancing the market competitiveness of Macau's cultural creative industries.

3. Case Analysis

3.1. Integration of Cultural Symbols in Macau's Cultural Creative Brands

Macau's cultural creative brands, such as Omoon, Livraria Portuguesa (Portuguese Bookstore), and Livraria Universal (Universal Bookstore) exhibit distinct approaches to incorporating cultural symbols into modern design. By utilizing iconic elements like Portuguese tiles and the Ruins of St. Paul's, these brands transform Macau's historical and cultural features into culturally rich yet market-oriented products. However, their design practices are limited in expressing cultural depth and addressing market demands comprehensively.

3.2. Analysis of the Omoon Brand

The Omoon brand focuses on the cultural symbols of Macau and Portugal, showcasing the ability to modernize traditional cultural elements. For example, it incorporates classic Portuguese tile patterns into daily items like ceramic coasters and fridge magnets (**Figure 1**), effectively promoting the widespread dissemination of these cultural symbols [24]. Omoon's innovative use of color, blending traditional blue-and-white tile patterns with contemporary hues like pink and yellow, enhances visual appeal and resonates particularly well with younger consumers. Also, cross-brand collaborations with international names like Sanrio expand Omoon's market influence, demonstrating the potential of merging cultural symbols with fashion trends for effective market promotion.



Figure 1. China's Population Age Structure and Dependency Ratio from 2018 to 2022 (photo taken by Langqian Pan)



Figure 2. *Cultural and Creative Souvenirs Inspired by Vientiane Bookstore and Portuguese Bookstore (photo taken by Langqian Pan)*

However, Omoon's designs often focus on superficial applications of visual symbols, neglecting the historical stories and craftsmanship behind these cultural elements. Such a shallow representation may limit consumers' deeper cultural experiences, reducing the potential of cultural creative products in cultural dissemination [25]. While the product line has diversified into functional items, it remains limited to specific categories, such as decorative or single-use products, and fails to meet the increasingly diverse needs of consumers.

3.3. Analysis of Livraria Universal and Livraria Portuguesa

Livraria Universal and Livraria Portuguesa prioritize cultural narratives and knowledge dissemination through their designs, aiming to highlight the cultural value of Macau's historic architecture. Cultural tourism products, by integrating local cultural heritage into tangible items such as postcards and notebooks (**Figure 2**), play a key role in creating authentic and engaging experiences, appealing to tourists' interest in cultural narratives [26]. Also, the unified design style of these brands employs a blue-and-white color palette, echoing the traditional patterns of Portuguese tiles, thereby enhancing their brand identity through visual impact.

Nonetheless, the product range of Vientiane Bookstore and Portuguese Bookstore remains primarily focused on stationery and souvenirs, limiting their ability to meet diverse market demands. Their current design strategies predominantly cater to the tourist market, with limited appeal to local young consumers and ordinary residents. Furthermore, while their products emphasize the visual presentation of cultural elements, there are relatively few attempts at functional design, which restricts their practicality in everyday scenarios. Integrating creativity with functionality is crucial in product design, as an overemphasize on visual aesthetics at the expense of functionality can undermine the practical usability of products [27]. These characteristics highlight the need for further optimization in diversifying product categories, enhancing functionality, and expanding the reach to a broader market.

3.4. Common Challenges

Despite their unique design strategies, Omoon, Livraria Universal, and Livraria Portuguesa face similar challenges. First, their designs often rely on direct representations of symbols such as Portuguese tiles and iconic Macau architecture, leading to product homogenization and making it difficult to establish distinct competitive advantages in the market [28]. Second, insufficient emphasis on functional design restricts product diversity and application scenarios, as seen in the stationery-dominated offerings of Livraria Universal and Livraria Portuguesa [29]. Lastly, inadequate investment in market research and consumer demand analysis leads to designs that reflect brand-driven cultural expression rather than tailored consumer needs. This disconnect not only hinders market performance but also limits the potential of cultural creative products in cultural dissemination and market competitiveness.

3.5. Preliminary Strategic Recommendations

3.5.1. Deep Exploration of Cultural Symbolism

Future designs should explore the historical context and cultural significance behind cultural symbols. For instance, product packaging could feature brief explanations of the origins of Portuguese tile patterns or the symbolic meanings of Cantonese opera costumes. Such efforts would enhance consumer recognition of the product's cultural depth and increase its added value.

3.5.2. Innovative Integration of Diverse Cultural Elements

Cultural creative products should aim to blend different cultural elements to create richer design expressions. For example, combining architectural decorative styles with other Macau cultural symbols could lead to more attractive accessories or household items. This diversity could help avoid design monotony and increase product appeal.

3.5.3. Enhanced Functionality and Practicality

In response to consumer demands for practicality, designs should strike a balance between aesthetics and functionality. For example, stationery could integrate cultural symbols into designs suitable for office use, while household items could incorporate functional features to meet the needs of various consumer groups. Enhancing functionality would broaden market acceptance and improve usability.

3.5.4. Data-Driven Design Optimization

Incorporating consumer surveys to identify the specific needs of different demographic groups can provide actionable insights. For instance, products aimed at tourists could emphasize commemorative value, while those for younger consumers might focus on contemporary and trendy styles. Data analysis and continuous market feedback would ensure that product designs align with both cultural dissemination objectives and market competitiveness.

4. Market Research

4.1. Questionnaire Design and Implementation

The questionnaire survey method is essential in this study, aiming to collect extensive public data to gain a deeper understanding of the audience's perceptions of Macau's Cantonese Opera and historical architectural heritage, their areas of interest, and their needs and preferences regarding related cultural and creative products. The questionnaire design is based on the core directions of the design strategy, encompassing the exploration of cultural symbolism, the integration of diverse cultural elements, enhancement of functionality and practicality, and optimization of design based on market demand. This approach seeks to provide comprehensive and scientific data support for subsequent research.

4.2. Audience Groups

The target audience for the questionnaire includes Macau residents, tourists, and cultural enthusiasts, aiming to ensure the diversity and representativeness of the collected data. Tailored questions were designed for each group to address their specific perspectives: for Macau residents, the focus is on their awareness and emotional connection to local cultural symbols; for tourists, the questionnaire explores the appeal of Macau's cultural elements and their travel consumption behavior; and for cultural enthusiasts, it examines their deeper interest in Cantonese Opera's artistic elements and historical architecture, as well as their potential purchasing intentions. This segmentation ensures that the questionnaire results can effectively guide the subsequent design of cultural and creative commodities.

4.3. Questionnaire Contents

The questionnaire design covers four primary dimensions, ensuring close alignment with the design strategy:

- **Cultural Symbol Awareness and Value:** This dimension examines respondents' level of awareness regarding Cantonese opera and historical architectural heritage, as well as their understanding of the cultural symbolism, particularly its historical background and artistic value.
- **Cultural Element Integration and Preferences:** It explores respondents' preferences for diverse cultural elements, such as the integration of Cantonese opera costume patterns and architectural decorative styles with contemporary design language.
- **Functionality and Practicality Preferences:** This dimension analyzes respondents' functional requirements for cultural and creative commodities, focusing on whether the balance between practicality and aesthetics in everyday items meets their expectations.
- **Market Demand and Design Direction:** It aims to understand the preferences of different groups regarding product types (e.g., household items, decorative pieces, and souvenirs) and their specific expectations for design styles, providing a foundation for market-driven design strategies.

4.4. Data Collection

The questionnaire survey for this study was conducted through a combination of online and offline methods, with the data collection period ending in June 2024. Online questionnaires were distributed via social media platforms, ensuring a broad reach, while offline questionnaires were administered near Macau's iconic cultural landmark, the Ruins of St. Paul's, targeting both tourists and local residents. A total of 411 questionnaires were collected, of which 346 were deemed valid after screening, resulting in an effective response rate of 84.18%. The screening criteria included the completeness of responses, logical consistency, and reasonable completion time. By employing multi-channel and multi-scenario data collection methods, the study ensured the scientific rigor and diversity of the sample, providing strong empirical support for the research.

4.5. Market Data Analysis and Results

After completing 346 valid questionnaires, this study utilized descriptive statistical methods to analyze the basic characteristics and overall trends of the respondents. In terms of gender, 47.14% of the respondents were males, and 40.86% were females. In terms of age distribution, 65.71% of the respondents were aged between 18 and 45, while the remaining respondents were under 18 (11.14%), between 46 and 55 (14%), and over 56 (9.14%). As for residency, 41.14% were Macau residents, while 58.86% were non-residents. The respondents' occupations span education, culture, tourism, and service industries, with 70% holding a college degree or higher. This indicates that the sample group possesses a high level of cultural awareness and significant consumption potential.

4.6. Market Data Analysis and Key Findings

4.6.1. Element Selection Preferences

Respondents' preferences for Cantonese opera elements were calculated based on comprehensive scores derived from the questionnaire data. The comprehensive score was determined using the formula below:

Average comprehensive score for an option = $(\sum \text{Frequency} \times \text{Weight}) / \text{Number of respondents who answered the question}$ where, weights were assigned to options in descending order according to their rank. Higher scores indicate stronger preferences for the respective options.

(A) Preference Levels for Elements of Macau Cantonese Opera

The analysis shows that the comprehensive scores for Cantonese opera elements ranged from 2.04 to 2.69. Stage design ranked first with an average score of 2.69 and was selected as the top choice by 45.7% of the respondents, indicating its significant appeal and making it the most favored element of Cantonese opera. Costumes and props ranked second with an average score of 2.21 and were the second choice for 36.05% of the respondents, indicating a stable audience base. In comparison, music and songs had the lowest average score of 2.04. However, they were chosen as the third and fourth options by 29.3% and

31.53% of the respondents, respectively. This shows there is potential market growth, especially among specific audience groups (**Table 1**).

(B) Preference Levels for Elements of Macau Cantonese Opera

The analysis of respondents' preferences for historic architectural elements in Macau's central district revealed that the comprehensive scores ranged from 3.13 to 5.01, with the Ruins of St. Paul's ranking highest at 5.01 and being the top choice for 30.99% of respondents, thereby demonstrating its strong appeal and significance as a primary element for cultural and creative product development. St. Lawrence's Church followed with a score of 4.41, selected as the top preference by 24.35% of respondents, demonstrating substantial market development potential. Lilau Square ranked third with a score of 4.09, demonstrating good recognition and development value. Na Tcha Temple had a comprehensive score of 3.51 and was the fourth choice for 24.57% of the respondents, indicating specific market appeal. Zheng's Mansion, St Joseph's Seminary Building and Church and A-Ma Temple scored 3.13, 2.27 and 2.03, respectively, ranking lower overall. However, A-Ma Temple accounted for 38.27% of seventh-choice preferences, suggesting potential development opportunities in niche scenarios (**Table 2**).

Table 1. Preference Analysis of Cantonese Opera Elements: Comprehensive Scores and Ranking Distribution (compiled and visualized by Langqian Pan)

Options	Overall Score	1st place	2nd place	3rd place	4th place	Subtotal
Stage Design	2.69	138(45.7%)	84(27.81%)	57(18.87%)	23(7.62%)	302
Storyline	2.21	62(21.09%)	106(36.05%)	81(27.55%)	45(15.31%)	294
Costumes and Furnishings	2.19	89(27.81%)	58(18.13%)	63(19.69%)	110(34.38%)	320
Music and Songs	2.04	61(19.43%)	62(19.75%)	92(29.3%)	99(31.53%)	314

Table 2. Preference Analysis of Historic Architectural Elements in Macau's Central District: Comprehensive Scores and Rankings (compiled and visualized by Langqian Pan)

Options	Overall Score	1st place	2nd place	3rd place	4th place	5th place	6th place	7th place	Subtotal
Ruins of St Paul's	5.01	106 (30.99%)	51 (14.91%)	69 (20.18%)	60 (17.54%)	24 (7.02%)	16 (4.68%)	16 (4.68%)	342
St. Lawrence's Church	4.41	110 (40.59%)	66 (24.35%)	48 (17.71%)	23 (8.49%)	7 (2.58%)	8 (2.95%)	9 (3.32%)	271
Lilau Square	4.09	64 (22.22%)	63 (21.88%)	60 (20.83%)	47 (16.32%)	23 (7.99%)	16 (5.56%)	15 (5.21%)	288
Na Tcha Temple	3.51	20 (6.83%)	48 (16.38%)	54 (18.43%)	72 (24.57%)	56 (19.11%)	32 (10.92%)	11 (3.75%)	293
Zheng's Mansion	3.13	29 (9.67%)	32 (10.67%)	33 (11%)	37 (12.33%)	76 (25.33%)	65 (21.67%)	28 (9.33%)	300
St Joseph's Seminary Building and Church	2.27	13 (4.64%)	24 (8.57%)	20 (7.14%)	22 (7.86%)	48 (17.14%)	76 (27.14%)	77 (27.5%)	280
A-Ma Temple	2.03	8 (2.89%)	21 (7.58%)	14 (5.05%)	27 (9.75%)	44 (15.88%)	57 (20.58%)	106 (38.27%)	277

Table 3. *Preference Analysis of Architectural Elements: Comprehensive Scores and Respondent Rankings (compiled and visualized by Langqian Pan)*

Options	Overall Score	1st place	2nd place	3rd place	4th place	Subtotal
Building skin color	2.71	137(45.67%)	101(33.67%)	36(12%)	26(8.67%)	300
Window pattern and decoration	2.35	83(27.48%)	91(30.13%)	90(29.8%)	38(12.58%)	302
Architectural style	2.27	86(26.63%)	68(21.05%)	78(24.15%)	91(28.17%)	323
Wall tile pattern and color	1.83	44(14.19%)	55(17.74%)	88(28.39%)	123(39.68%)	310

(C) Preference Levels for Elements of Historic Architecture

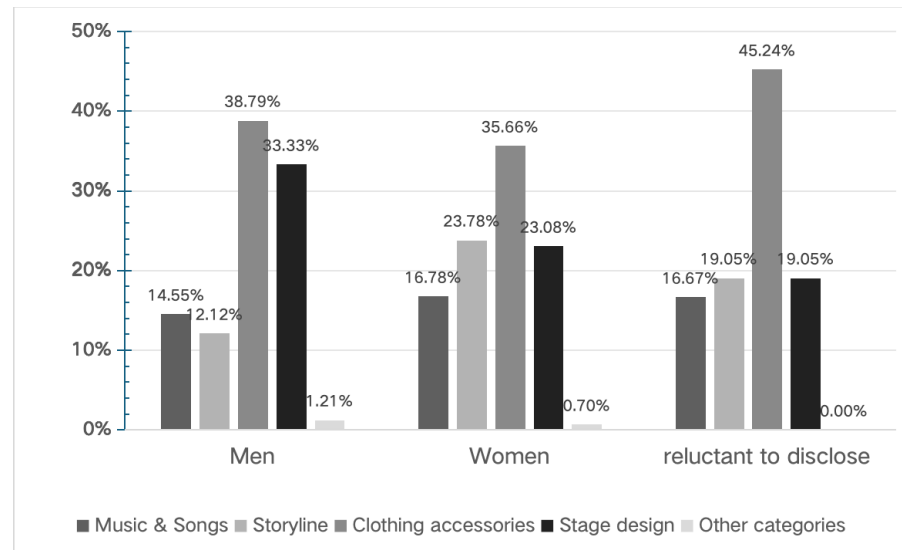
In the analysis of preferences for architectural elements, the respondents' comprehensive scores ranged from 1.83 to 2.71. Building skin colors ranked highest with an average score of 2.71 and were selected as the top preference by 45.67% of respondents, indicating significant appeal and widespread recognition. Window pattern and decoration elements scored 2.35, ranking second, and were selected as the second and third choices by 30.13% and 29.8% of the respondents, respectively, reflecting consistent appeal. Architectural style had an average score of 2.27 and was the fourth choice for 28.17% of the respondents, suggesting potential exploration value. In contrast, Wall tile pattern and color scored the lowest (1.83), but were selected as the fourth choice by 39.68% of the respondents, indicating potential value as an element for deeper exploration and development (Table 3).

4.6.2. Exploring the Influence of Gender and Residency on Preferences for Cultural Elements and Cultural Creative Product Types

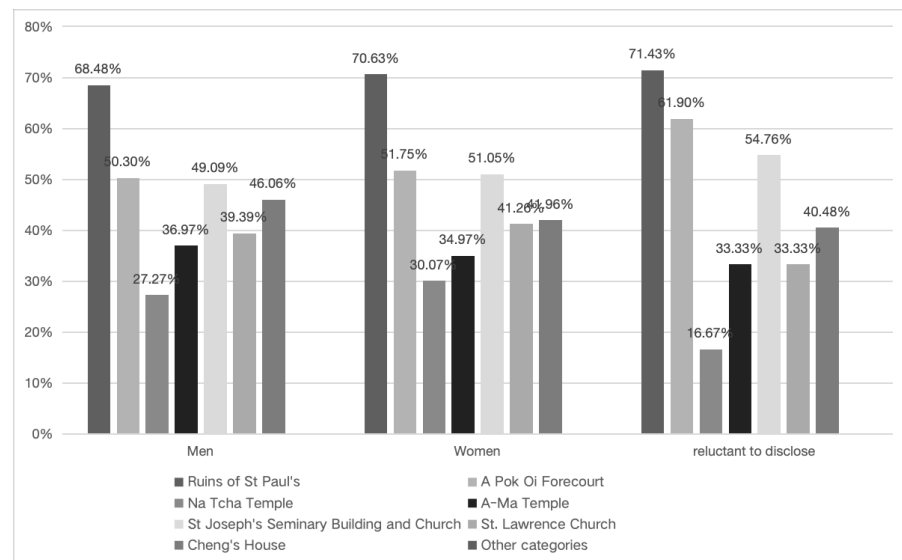
Research indicates that differences in demographic factors such as age, gender, living environment, and purchasing power significantly influence individuals' personality traits and aesthetic preferences. These variations, in turn, affect preferences for cultural elements and product designs [30]. Consequently, this study further investigates the impact of gender and residency on preferences for Macau's Cantonese Opera elements, historical architectural heritage features, and cultural creative product types. This exploration aims to provide precise reference points for the formulation of subsequent design strategies.

(A) Gender-Based Preferences in Cantonese Opera, Historical Architecture, and Cultural Product Design

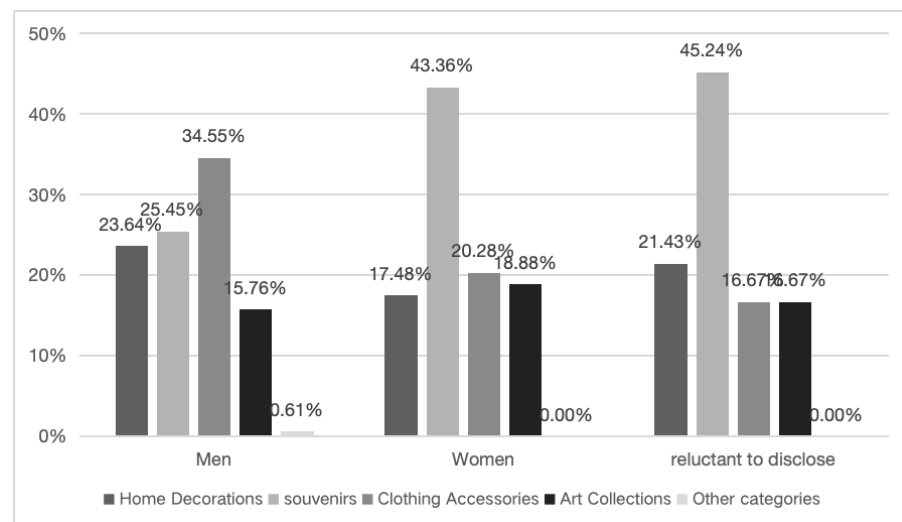
The survey results indicate there are significant differences between male and female preferences regarding Cantonese opera and historical architectural heritage. Female respondents tend to focus more on the cultural connotations and artistic value of Cantonese opera, showing particular interest in aesthetic elements such as stage design and costumes (Figure 3a). In contrast, male respondents are more inclined toward the entertainment aspects of music and performance. Regarding historical architecture, females place greater emphasis on cultural background and emotional value, while males prefer features with visual impact and structural characteristics (Figure 3b).



(a)

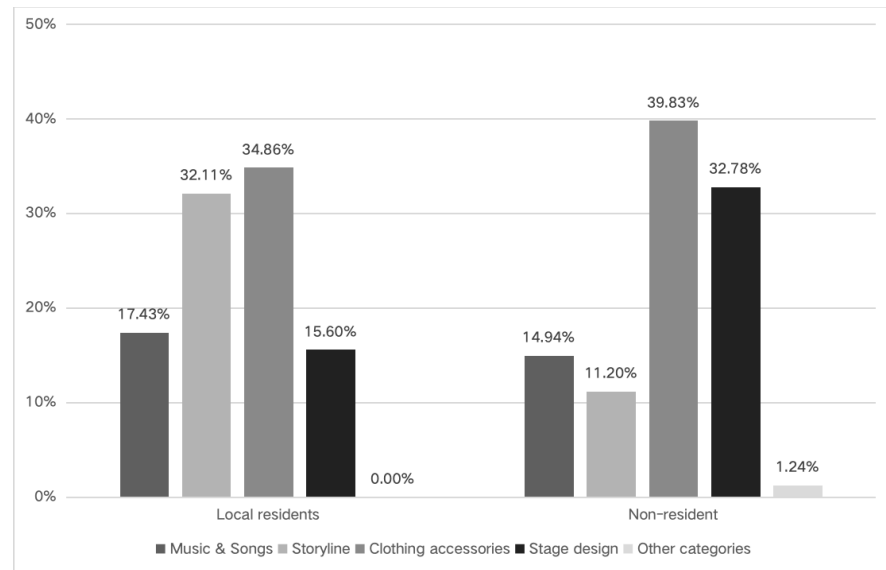


(b)

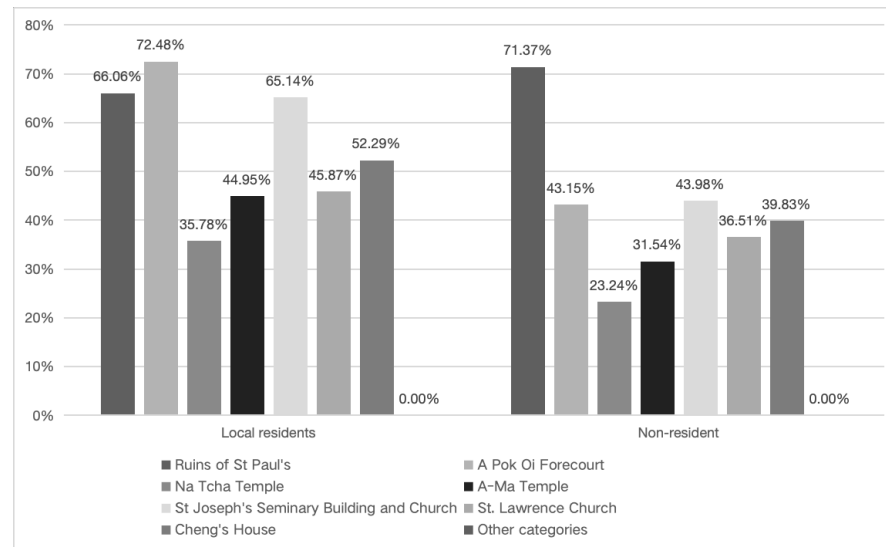


(c)

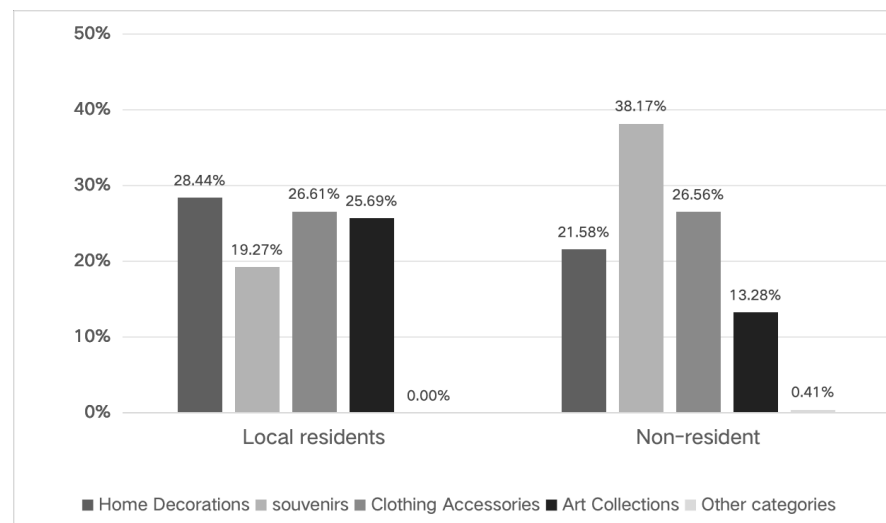
Figure 3. Gender-Based Analysis of Preferences for Cantonese Opera, Historical Architecture, and Cultural Product Type (compiled and visualized by Langqian Pan)



(a)



(b)



(c)

Figure 4. Preference Differences Between Macau Residents and Non-Residents in Cantonese Opera, Historical Architecture, and Cultural Creative Products (compiled and visualized by Langqian Pan)

In terms of cultural and creative product preferences, males tend to favor practical items, such as household products, whereas females are more drawn to decorative and aesthetically valuable items, such as jewelry and artworks. These gender differences provide valuable insights for design strategies. Future efforts could focus on combining practicality with decorative appeal to meet the needs of different genders, thereby enhancing the market appeal and competitiveness of the products (**Figure 3c**).

(B) Comparative Analysis of Preferences for Cantonese Opera, Historical Architecture, and Cultural Creative Products Between Macau Residents and Non-Residents

The analysis reveals significant differences between Macau residents and non-residents in their preferences for Cantonese opera elements, historical architecture, and cultural creative products. Residents place greater emphasis on the cultural values and regional characteristics of Cantonese opera, such as stage design and costumes, while non-residents are more inclined toward its entertainment and sightseeing attributes (**Figure 4a**). Regarding historical architecture, residents show greater interest in the cultural background and emotional connection associated with the sites, whereas non-residents tend to focus more on iconic landmarks such as the Ruins of St. Paul's (**Figure 4b**).

In terms of cultural and creative product preferences, residents prefer items that combine practicality with cultural significance, such as household goods, while non-residents prefer decorative and commemorative items like souvenirs and artworks. These differences provide a clear foundation for developing targeted design strategies for different groups, further supporting the necessity of integrating functionality with cultural elements in product design (**Figure 4c**).

4.6.3. Summary of Market Research

Through a market questionnaire survey, this study collected comprehensive data, providing a solid foundation for subsequent analysis and research. The survey findings revealed nuanced insights into the audience's perceptions and preferences regarding Cantonese opera and historical architectural heritage. These results provide essential references for the targeted development of cultural and creative commodities. By thoroughly understanding market demands, the study accurately identifies the distinct preferences and requirements of various demographic groups, enabling the creation of cultural and creative commodities that are both highly appealing and competitively positioned. This approach facilitates the preservation and innovative transmission of Macau's cultural heritage while advancing the sustainable development of the cultural and creative industries.

5. Design Strategy Summary

Through case analysis and market research, respondents' preferences for Cantonese opera elements and historical architectural heritage have clearly revealed potential directions for cultural and creative product design. Data analysis indicates that building façade colors and Cantonese opera stage design are the most favored design elements among the audience. Also, tile patterns, window decorations, costumes, and props from Cantonese opera demonstrate varying levels of appeal. The design practices of brands such as Omoon,

Vientiane Bookstore, and Portuguese Bookstore provide valuable references for extracting cultural symbols and integrating functionality with aesthetic value. Based on these findings, this study proposes the following design strategies.

5.1. Strategy 1: Integration of Cantonese Opera and Architectural Elements

Market research reveals that building façade colors are the most popular historical architectural element, with 45.67% of respondents selecting it as their top preference, and earning an average comprehensive score of 2.71. Similarly, Cantonese opera stage design ranks highest among opera elements, with a score of 2.69, revealing its strong visual appeal. This strategy advocates combining the vibrant colors of Cantonese opera costumes with the decorative styles of architectural exteriors to create products that embody both cultural connotations and modern aesthetics. For example, integrating the vivid lighting effects of opera stages with the textures of historical architecture into homeware or decorative items can create a balance between functionality and aesthetic appeal, while infusing products with cultural dynamism.

5.2. Strategy 2: Extraction and Application of Distinctive Cultural Symbols

Although tile patterns and window decorations rank lower in overall preferences, they demonstrate potential appeal among specific high-culture audiences who value in-depth exploration of cultural symbols. Case studies such as Omoon's successful incorporation of cultural motifs into ceramic coasters highlight the importance of this approach. This strategy recommends further extracting elements such as tile patterns, window decorations, and Cantonese opera storylines and applying them to diverse product designs. Examples include showcasing these symbols in tableware, packaging, or book covers to enhance the cultural attributes and storytelling of the products.

5.3. Strategy 3: Innovation in Visual Aesthetics

Market research and gender preference analysis reveal that female consumers favor products with decorative and aesthetic value. To address this, this strategy suggests incorporating Macau's diverse cultural elements, such as the designs of Cantonese opera costumes and the architectural details of the Ruins of St. Paul's, to further enhance the visual appeal of products. Specific implementations could include creating stationery and home décor items that combine functionality with artistic expression, utilizing innovative visual representations to attract more consumer attention.

5.4. Strategy 4: Diversified Product Category Expansion

The survey results indicate that male consumers prefer practical products, such as household items, while female consumers gravitate toward products with higher decorative and artistic value. In addition, Macau residents prefer products that balance practicality and cultural significance, while tourists prefer items with commemorative value. To address

these group-specific characteristics, this strategy recommends segmenting product categories. For local residents, developing functional homeware and stationery is suggested, while for tourists, designing products with strong cultural symbolism and commemorative value would better meet their preferences. This targeted approach ensures precise coverage of diverse market demands.

By integrating these strategies, the study provides actionable directions for designing cultural and creative commodities that not only resonate with varied audiences but also promote the preservation, transmission, and innovative evolution of Macau's cultural heritage while enhancing the competitiveness of its cultural and creative industries.

6. Design Practice

6.1. Design Research

Prior to design practice, this study conducted a questionnaire survey using a combination of online and offline methods, aiming to collect extensive social data. The goal was to gain a deeper understanding of the public's awareness, points of interest, and preferences regarding Cantonese opera and historical architectural heritage, as well as their needs for related cultural and creative commodities. The survey covered diverse groups, including Macau residents, tourists, and cultural enthusiasts, and addressed multiple dimensions such as cultural awareness, consumer behavior, and product type preferences. The results highlighted significant differences among these groups in terms of functionality, ornamentation, and cultural identity, providing a scientific basis for design practice.

6.2. Element Extraction

Based on the analysis of survey data, the study identified key elements from Cantonese opera and historical architectural heritage (**Figure 5**):

Cantonese Opera Elements: These include costume patterns and colors, facial makeup, stage design, and prop details. These elements are rich in artistic expression and cultural distinctiveness, serving as core sources of inspiration for design creation.

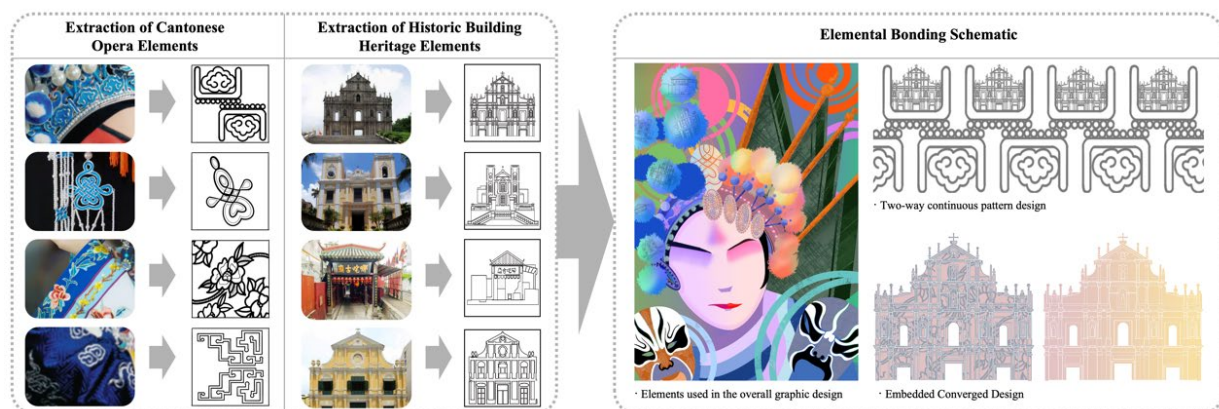


Figure 5. *Element Extraction Representation (created and visualized by Langqian Pan)*

Historical Architectural Elements: Key elements were extracted from landmarks such as the Ruins of St. Paul's, St. Lawrence's Church, and Lilau Square. These include architectural outlines, façade colors, window decorations, and tile patterns, offering a wealth of visual language and cultural connotations to support the design process

6.3. Integrated Design of Cantonese Opera and Historical Architectural Heritage

The integration of Cantonese opera and historical architectural elements provides abundant inspiration for cultural and creative product design. The design practice combined the visual elements of Cantonese opera (e.g., costume patterns and stage designs) with the decorative features of historical architecture (e.g., the architectural details of the Ruins of St. Paul's and the façade colors of A-Ma Temple), exploring modern expressions of cultural symbols. For instance, the vibrant colors of Cantonese opera costumes were blended with architectural aesthetics to create home décor items and souvenirs that preserve the historical value of cultural heritage while enhancing product market appeal.

The design also emphasized storytelling within cultural integration. By merging the narratives of classic Cantonese opera performances with the historical context of architectural heritage, creative products such as stamps, keychains, and brooches were developed, enhancing consumers' cultural identification with Macau. Also, color schemes were derived from the standardized colors of Macau's architectural fades, further emphasizing the regional cultural identity of the products while enhancing their coherence and recognizability.

These designs balanced practicality and aesthetics, meeting the diverse needs of different consumer groups. For male consumers who prefer practical items, functional products like keychains were designed, while brooches and eco-friendly bags were created for female consumers who prefer decorative items. This integrated design approach achieved the contemporary transformation of cultural symbols, promoting the dissemination and innovative application of cultural heritage.

6.4. Souvenir Design

6.4.1. Keychain Souvenir Design

The keychain design combines Cantonese opera facial makeup with simplified line art of the Ruins of St. Paul's in a double-sided format. This helps to balance practicality with collectible value. The target audience for this design is male consumers who prefer functional products (**Figure 6**).

6.4.2. Commemorative Stamp Design

The stamp design incorporates extracted architectural elements to embellish the imagery of Cantonese opera performers, showcasing Macau's cultural uniqueness through vibrant colors and the standardized façade colors of Macau's architectural heritage. The design prioritizes the dissemination of cultural symbols and the creation of collectible value, while also emphasizing its artistic expression to elevate consumer appeal (**Figure 7**).

6.4.3. Gift Packaging Design

The gift packaging design integrates elements of Cantonese opera and historical architecture, utilizing the standardized façade colors of Macau's architectural heritage to highlight cultural authenticity and artistic aesthetics. The design of the packaging box not only reflects a modern interpretation of traditional cultural symbols but also aims to enhance the cultural depth and added value of the cultural and creative commodities (**Figure 8**).



Figure 6. Keychain Souvenir Cultural and Creative Development Design (created and visualized by Langqian Pan)



Figure 7. Commemorative Stamps and Souvenirs Cultural and Creative Development and Design (created and visualized by Langqian Pan)



Figure 8. Gift Packaging and Souvenir Development Design (created and visualized by Langqian Pan)



Figure 9. Commemorative Brooch Development and Design (created and visualized by Langqian Pan)

6.4.4. Brooch Design

The brooch design centers on Cantonese opera facial makeup, incorporating motifs inspired by Macau's rich architectural heritage and accentuating them with a palette of vibrant colors. Emphasizing decorative appeal and cultural characteristics, this design is targeted at consumers seeking personalization and cultural uniqueness, making it particularly suitable as a personal accessory (Figure 9).

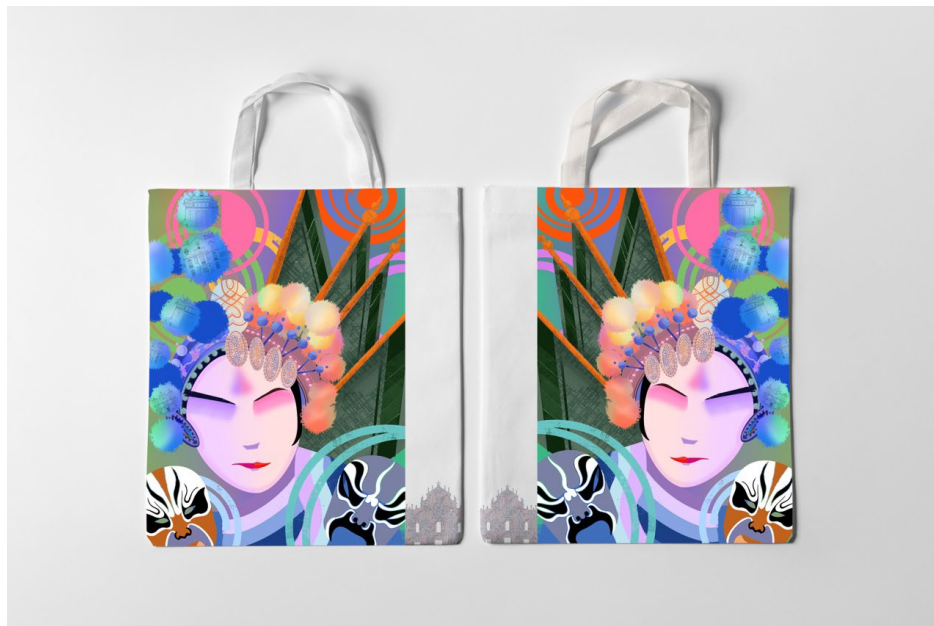


Figure 10. *Eco-Bag Development and Design (created and visualized by Langqian Pan)*

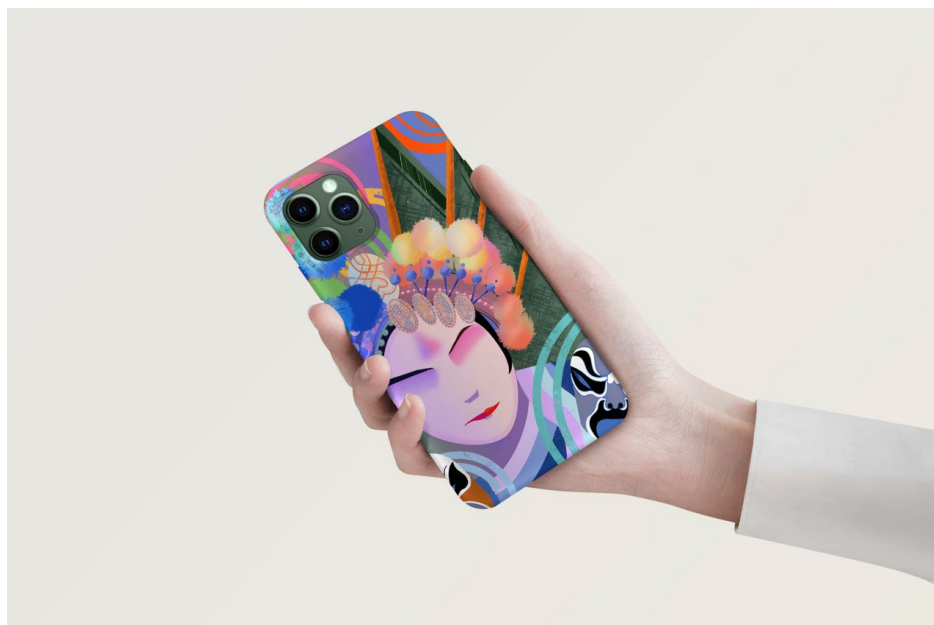


Figure 11. *Development And Design of Mobile Phone Cases (created and visualized by Langqian Pan)*

6.5. Expansion of Functional Product Categories

6.5.1. Eco-bag Design

The eco-friendly bag design combines the Ruins of St. Paul's with Cantonese opera patterns inspired by Macau's architectural heritage. It incorporates standardized color tones from Macau's cultural landmarks, such as the deep red of A-Ma Temple and the light gray of the Ruins of St. Paul's. The design aims to enhance cultural awareness and promote Macau's heritage through the cultural expression of a practical everyday item (**Figure 10**).

6.5.2. Mobile phone case Design

The phone case design targets a young audience by combining Cantonese opera character imagery with modern design elements, featuring vibrant and dramatic colors. This design does not only provide practical protection for phones but also showcases the user's cultural taste and recognition of Macau's heritage. It is a cultural and creative product that is highly preferred by young consumers (**Figure 11**).

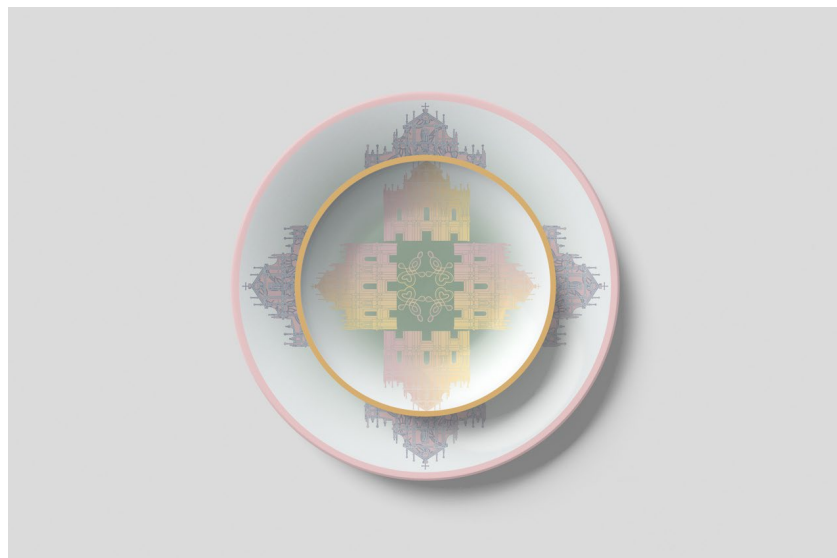
6.6. Expansion of Practical Product Categories

6.6.1. Tableware Design

The tableware design draws inspiration from Macau's tile patterns and architectural decorative elements. The edge patterns incorporate the soft yellow tones of St. Dominic's Church and the gray details of the Ruins of St. Paul's, demonstrating a harmonious blend of culture and functionality. The design aims to provide Macau residents with practical products that combine artistic value with a rich cultural ambiance (**Figure 12a, 12b, and 12c**).



(a)



(b)



(c)

Figure 12. Tableware Development and Design (created and visualized by Langqian Pan)

6.6.2. Coaster Design

The coaster design features the pattern of the Ruins of St. Paul's, utilizing black-and-white lines and colored line art to balance the solemnity of the architecture with the modernity of contemporary design. The design aims to provide consumers with small cultural creative products that seamlessly combine cultural expression with practical functionality (**Figure 13**).



Figure 13. Drink Coaster Development and Design (created and visualized by Langqian Pan)

7. Discussion and Future Directions

7.1. Discussion

This study explores how the cultural elements of Macau's Cantonese opera and historical architectural heritage can be effectively integrated into modern cultural and creative product design, proposing specific design strategies. Through questionnaire surveys, case studies, and analytical summaries, the research reveals public perceptions and preferences for these cultural elements. Also, it investigates practical pathways for incorporating these elements into cultural and creative commodities through design practices. The findings indicate that Macau residents have a strong emotional connection to Cantonese opera and historical architectural heritage, whereas tourists are more focused on their unique cultural imagery and visual appeal. These insights provide valuable references for product design, enabling the creation of products with both cultural depth and market relevance, and offering new approaches for the dissemination and innovation of Macau's cultural heritage.

Despite the achievements in design strategies and practices, the study has several limitations: 1、Limited Sample Scope: The questionnaire survey focused on Macau residents, tourists, and cultural enthusiasts, failing to include a more diverse range of social groups. As a result, the findings may not fully represent the broader population's perceptions and preferences regarding Cantonese opera and historical architectural heritage. 2、Market Orientation Constraints: The analysis of survey data primarily reflects the subjective preferences of current respondents, which may not adequately capture future market trends or latent demands. This limitation could reduce the flexibility and long-term applicability of the proposed design strategies. 3、Time and Resource Constraints: Due to limitations in time and resources, some design experiments and market tests were not conducted in depth, potentially affecting the comprehensiveness and reliability of the study's conclusions.

7.2. Future Directions

To address these limitations, future research should expand the sample scope to include a wider range of social groups, enhancing the universality and representativeness of the findings. Also, deeper exploration of the cultural significance and historical context of Cantonese opera and historical architectural heritage is recommended to imbue cultural and creative commodities with richer cultural connotations. Encouraging designers to pursue diversified and innovative design approaches will help avoid product homogenization and improve market competitiveness. Lastly, conducting long-term market analysis and consumer behavior research will provide forward-looking guidance for cultural and creative product design, ensuring alignment with market trends and emerging demands.

8. Conclusion

This study summarizes strategies for integrating cultural elements into modern cultural and creative product design. First, by combining the costumes and stage designs of Cantonese opera with the visual features of Macau's historical architecture, the study provides distinctive cultural identifiers for creative products. These designs not only highlight

aesthetic value but also effectively promote Macau's cultural appeal. Second, the in-depth exploration of Macau's multicultural historical background and narrative significance demonstrates that this approach significantly enhances the cultural depth and attractiveness of creative products. By materializing cultural stories through language design, the study fosters greater public recognition and appreciation of cultural heritage. Finally, the growth of targeted design strategies based on consumer needs—such as practical household items for Macau residents and commemorative decorative items for tourists—strengthens the market competitiveness of these products through a market-driven approach.

In conclusion, this study explores innovative pathways for the integration of culture and design by summarizing design strategies and applying them to cultural and creative commodities that blend elements of Macau's Cantonese opera and historical architectural heritage. These strategies and practical case studies not only expand the cultural expression dimensions of creative products but also offer innovative solutions for the preservation and dissemination of cultural heritage. By striking a balance between cultural and commercial value, this research makes a significant contribution to the promotion and preservation of cultural heritage, while also supporting the sustainable development of the cultural and creative industries.

Author Contributions:

Langqian Pan: Responsible for research conceptualization and design, including formulating research questions, establishing the theoretical framework, and selecting research methods. Conducted data collection and analysis, including case studies, questionnaire surveys, and data visualization. Wrote the first draft of the manuscript.

Xin Hu: Provided overall supervision and guidance, reviewed the manuscript, and offered revision suggestions.

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The authors declare that they have no conflicts of interest related to this research.

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References

- 1 Zhang, B., et al. "He qu he cong: A Study on the Development Status and Innovation Strategies of Cultural and Creative Commodities in Macao—A Perspective Based on the Diffusion of Innovation Theory." *Cultural Innovation Comparative Studies* 7, no. 20 (2023): 107–12. (In Chinese).
- 2 Xing, Y. "Research on the Design of Macao Tourist Souvenirs from the Perspective of Cultural Symbols." *Packaging Engineering* 43, no. 4 (2022): 392–400. <https://doi.org/10.19554/j.cnki.1001-3563.2022.04.048>. (In Chinese)
- 3 Zhou, D. "Cultural Diversity and Harmony in Macao—A Discussion on Huntington's 'Clash of Civilizations.'" *Journal of Sun Yat-sen University (Social Science Edition)*, no. 3 (2007): 7–13. (In Chinese)
- 4 Zheng, Y. "Promoting Cultural Identity in the Integrated Development of Cantonese Opera in Guangdong, Hong Kong, and Macao." *Journal of Shaoguan University* 44, no. 7 (2023): 7–11. (In Chinese)
- 5 Tong, Q. "Study on the Urban Environment and Cultural Context of Macao." PhD diss., Southeast University, 2005. <https://kns.cnki.net/kcms2/article/abstract?v=jEKy9Hq18MJx>. (In Chinese)
- 6 Yao, L., and Q. Li. "Early Cultivation of Cultural and Creative Talents: Experiences and Reflections from British Cultural Education." *Global Education Outlook* 53, no. 8 (2024): 133–46. (In Chinese)
- 7 Lin, R., and P. Fu. "The Development Prospects and Planning of Macao's Cultural and Creative Industries." *Journalism and Communication Studies* 18, no. 5 (2011): 99–105, 113. (In Chinese)
- 8 Azevedo, M., and Á. Barbosa. "The Creative Industries as an Integrated Factor in a Sustainable Model for Macao's Economic Development." *Creative Industries Journal* (July 2014). Accessed December 28, 2024. <https://www.tandfonline.com/doi/abs/10.1080/17510694.2014.962931>.
- 9 Lee, Y., et al. "Sustainable development assessment of cultural and creative industries in Casino cities: A case study of Macao." *Sustainability* 14, no. 8 (2022): 4749. [CrossRef]
- 10 Li, Y. "On the Development Advantages of Macao Cultural and Creative Derivative Product Design." *Art Observation*, no. 9 (2019): 74–75. (In Chinese)
- 11 Li, C., and H. Yang. "Exploration of the Growth of Macao's Cultural and Creative Industries." *Strait Science and Industry*, no. 9 (2019): 4–5, 8. (In Chinese)
- 12 Zhang, Y. "Development Opportunities and Path Selection of Macao's Cultural and Creative Industries under the Background of the Guangdong-Hong Kong-Macao Greater Bay Area." *Inquiry*, no. 5 (2020): 41–45. <https://doi.org/10.13996/j.cnki.taqu.2020.05.006>. (In Chinese)
- 13 Dai, R., and Z. Zhang. "Cultural Heritage and Tourism Development: Exploring Strategies for the Win-Win Scenario of Heritage Conservation and Tourism Industry." *Geographical Research Bulletin* 3 (2024): 129–41. https://doi.org/10.50908/grb.3.0_129.
- 14 Lee, Y.-J. "Exploration of Local Culture Elements and Design of Cultural Creativity Products." *Journal of Statistical Management Systems* 13, no. 4 (2010): 823–34. [CrossRef]
- 15 Loulanski, T., and V. Loulanski. "The Sustainable Integration of Cultural Heritage and Tourism: A Meta-Study." *Journal of Sustainable Tourism* 19, no. 7 (2011): 837–62. [CrossRef]
- 16 Guo, Y. "Summary of the Academic Symposium on 'Research on Macao's Historical and Cultural Heritage.'" *World History*, no. 2 (2007): 151–53. (In Chinese)

- 17 Jin, Y., and F. Lin. "On the 'Standards' Issue in the Protection of Traditional Drama Intangible Cultural Heritage—A Case Study of Macao Cantonese Opera." *Cultural Heritage*, no. 6 (2020): 2–11. (In Chinese)
- 18 Tong, Q., and W. Wei. "The Digital Preservation Model of Macao's Architectural Heritage." *New Architecture*, no. 6 (2016): 39–43. (In Chinese)
- 19 Zhang, Y., and B. Wang. "Research on the Activation and Conservation of Macao's Historical Buildings—A Case Study of the Growth of Macao's Tourism Routes." *Urban Architecture* 19, no. 20 (2022): 166–70. <https://doi.org/10.19892/j.cnki.csjz.2022.20.48>. <https://doi.org/10.19892/j.cnki.csjz.2022.20.48>. (In Chinese)
- 20 Zhang, Xizhi, and Kuo-Hsun Wen. "A model process of integrating context of local culture for pre-development stage in the design of cultural and creative products—Using Macao's historical buildings as an example." *Sustainability* 12, no. 15 (2020): 6263. [CrossRef]
- 21 Guo, Q., and X. Li. "Integrated Conservation of the Cantonese Opera Art Museum and Intangible Cultural Heritage." *International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences* XL-5-W7 (2015): 187–93. <https://doi.org/10.5194/isprsarchives-XL-5-W7-187-2015>. [CrossRef]
- 22 Kong, Z. "Exploration on the Integration and Development of Cantonese Opera Culture and Urban Public Space." In *Proceedings of the 2024 7th International Conference on Humanities Education and Social Sciences (ICHESS 2024)*, edited by F. Zeng, A. Khalil, F. Wu, and J. Luo, 509–15. *Advances in Social Science, Education and Humanities Research* 887. Paris: Atlantis Press SARL, 2024. [CrossRef]
- 23 Gražulevičiūtė, I. "Cultural Heritage in the Context of Sustainable Development."
- 24 Jiang, Y. "Innovative Design and Application of Portuguese Ceramic Tile Patterns from the Perspective of Shape Grammar." *Design* 37, no. 13 (2024): 46–51. <https://doi.org/10.20055/j.cnki.1003-0069.001952>. (In Chinese)
- 25 Wu, J. "Research on the Tourism Survival Model of Intangible Cultural Heritage in Nanping City, Fujian." *Journal of Hunan University of Technology (Social Science Edition)* 24, no. 5 (2019): 70–78. (In Chinese)
- 26 Prentice, R. "Experiential Cultural Tourism: Museums & the Marketing of the New Romanticism of Evoked Authenticity." *Museum Management and Curatorship* 19, no. 1 (2001): 5–26. [CrossRef]
- 27 Hsiao, S.-W., and J.-R. Chou. "A Creativity-Based Design Process for Innovative Product Design." *International Journal of Industrial Ergonomics* 34, no. 5 (2004): 421–43. [CrossRef]
- 28 Li, Y. "On the Existing Problems in the Design of Macao's Cultural and Creative Commodities." *Chinese Art*, no. 1 (2023): 94–101.
- 29 Wei, X., S. Chen, and Z. Zhao. "How to Regain the Splendor of Intangible Heritage Lacquer Art." *Yanhuang Geography*, no. 3 (2024): 56–58.
- 30 Wang, W., and J. Wang. "Color Design Research Based on the Brand Image of Intangible Cultural Heritage Tourism Products." *Ecological Economy*, no. 10 (2013): 111–14.