



## Article

## Research Article

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# Exploring the Integration of Motorsport Culture into Cultural and Creative Design: A Case Study of the Macau Grand Prix

Bingbing Feng , Yulin Zhao <sup>\*</sup>

Faculty of Innovation Design, City University of Macau, Macau



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Correspondence email: \*  
512080653@qq.com

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**Abstract:** This study explores the Macau Grand Prix as a case study to understand how racing culture can be integrated into cultural and creative design, for the purpose of driving growth in the sports tourism economy. With the growing prominence of cultural and creative industries, the Macau Grand Prix represents a key aspect of Macau identity and carries significant commercial and cultural significance. However, its application in creative design remains inadequately studied. Through an analysis of its historical development, unique characteristics, and socioeconomic influence, this research identifies opportunities to incorporate racing culture into product design to enhance emotional resonance and market competitiveness. Employing literature review, surveys, case analysis, and the Kano model, this study categorizes consumer preferences to inform innovative design strategies. Moreover, by integrating emotional design principles with the Kano model, the research evaluates consumer demand for racing-inspired creative products, enriching them with cultural and emotional significance. The results offer novel insights into the application of racing culture in Macau's and the broader global creative industries, promoting cultural diversity, sustainable development, and a flourishing sports tourism sector.

**Keywords:** Kano model and emotional design theory; Cultural and creative design; Racing culture; Sports tourism economy; Macau Grand Prix Racing

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## 1. Introduction

### 1.1. Research Background and Significance

This study principally evaluates the integration of Macau Grand Prix racing culture with cultural and creative design. Our objective is to infuse cultural and creative products with the unique features and symbolism of racing culture through novel design concepts and strategies, thereby enhancing their market attractiveness and cultural significance. We hypothesize that enriching the fundamental values of motorsport culture and uniting them with contemporary design technologies will not only yield innovative expressions and experiences in cultural and creative products but also facilitate the diversification of Macau's cultural and creative industries and disseminate Macau's singular motorsport culture internationally.

By integrating these findings, this study will offer a more holistic understanding of the various

values in the blend of racing culture and cultural and creative design, including its contribution to economic growth and its advancement of cultural heritage and innovation. We anticipate that this study will furnish valuable perspectives and practical guidance for the development of cultural and creative industries in Macau and worldwide, contributing knowledge and impetus to the development of a more diverse, open, and innovative cultural ecosystem.

This study pursues the following research questions to achieve its objective:

**Consumer Needs Analysis:** This research begins by analyzing the diverse needs consumers demonstrate for cultural and creative products related to motorsport. This includes understanding consumer expectations and preferences related to product functionality, emotional resonance, and aesthetics. Desk research, surveys, and other methods will be utilized to collect and analyze comprehensive data on consumer needs.

**Demand Hierarchy utilizing the Kano Model:** After identifying consumer needs, the Kano Model will be applied to categorize and prioritize them. The Kano Model distinguishes between Must-be Qualities, One-dimensional Qualities, and Attractive Qualities, thus indicating key demand hierarchies in motorsport-inspired cultural and creative design. This process ensures alignment between design direction and consumer expectations.

**Development and Application of Integrative Strategies:** Innovative product design strategies will be developed to address various demand hierarchies and deeply integrate motorsport culture into cultural and creative design. This involves creating a strong brand identity, developing targeted marketing campaigns, and optimizing user experience. These strategies aim to increase consumer satisfaction and brand loyalty while fully reflecting the essence of motorsport culture in cultural and creative products.

By systematically exploring these key areas, this research seeks to offer both a theoretical foundation and practical guidance for the design of creative cultural products inspired by the Macau Grand Prix motorsport culture. The objective is to support the overall development of Macau's cultural and creative industries and improve their competitiveness on a global scale.

## **2. Literature Exploration**

### **2.1. Research on the Racing Culture of the Macau Grand Prix**

#### **2.1.1. Origin and History of the Event**

The Macau Grand Prix, rooted in the city's unique culture and history since its 1954 origin, began as an amateur race, spontaneously created by local motorsports enthusiasts driven by passion and a love for the sport [1].

Its inaugural running on October 30 and 31, 1954, took place on the now-iconic Guia Circuit in the heart of Macau, where Portuguese driver Eduardo "Eddie" de Carvalho, at the wheel of a Triumph TR2, claimed victory, and established a celebrated legacy. Famous for its numerous tight corners and narrow straightaways, the Guia Circuit stands as the world's only street circuit to simultaneously host both car and motorcycle racing events.

The Macau Grand Prix has evolved from a local competition into an internationally acclaimed event [2]. Its inclusion in the international motorsport calendar in 1960 brought it under FIA regulations. By 1966, Belgian driver Mauro Bianchi, representing the European Renault team in a Renault Alpine, achieved a notable win at the 13th running, signaling the event's ascent onto the world stage. The Macau Grand Prix demonstrates speed and passion, functioning as a vital component of Macau's cultural heritage. It significantly contributes to the region's sports tourism economy and acts as a vibrant representative of Macau's international presence [3]. It also encourages growth in tourism, hospitality, and culinary industries, representing a key driver for Macau's general economic and tourism expansion. The Macau Grand Prix has been the subject of thorough historical analysis regarding its cultural impact, providing perspectives on the race's cultural identity [4]. Case studies have further enhanced our understanding of the event's cultural dimensions, offering additional detail about its unique characteristics [5]. Landmark moments in the Macau Grand Prix's history include the first motorcycle race in 1967, the incorporation of Formula 3 racing in 1983, and the establishment of the Macau GT Cup in 2008, each playing a role in the event's progress and worldwide recognition.

The development of the Macau Grand Prix reflects the changes in Macau's sporting events as well as the city's overall growth and cultural inheritance. Today, this prestigious racing event is an integral part of Macau's identity, annually attracting racers and spectators worldwide who gather to experience its spectacle.

### **2.1.2. Racing Cultural Characteristics**

The Macau Grand Prix, a world-renowned motorsport competition, presents a compelling subject for academic research due to its unique track design, racing programs, immersive audience experience, and deep-seated integration with local culture [6].

#### ▪ Uniqueness of Track Design

The Guia Circuit, home to the Macau Grand Prix, is distinguished by its unusual topography and demanding course characteristics. A combination of steep elevation changes, narrow circuit width, and diverse types of challenging corners gives rise to both the challenging spectacle of the race. With a history over seven decades, the circuit displays both Macau's unique cityscape and historical legacy. Famed corners, such as Reservoir Bend, Avenida da Amizade, and Mandarin Oriental, are now all namesakes of this legendary street circuit.

#### ▪ Diversity of Race Composition

The Macau Grand Prix is renowned for its diverse range of events, including the FIA Formula 3 World Cup, FIA GT World Cup, and TCR Asia Challenge. This diversity attracts a global audience and embodies Macau's commitment to inclusivity and comprehensiveness within motorsport. It showcases the unique technical characteristics and competitive spirit of various racing vehicles.

#### ▪ Immersive Audience Experience

Spectators at the Macau Grand Prix are offered a uniquely immersive viewing experience. The urban setting offers an up-close perspective of thrilling races. Supplementary activities,

including racing museum exhibitions and simulator opportunities, amplify engagement and sensory immersion, cultivating viewer satisfaction, loyalty, and the propagation of racing culture [7].

- Integration with Local Culture

The Macau Grand Prix is deeply integrated with local culture, evident in its historical legacy dating back to 1954. It functions as a cultural touchstone, symbolizing Macau's unique cityscape and its embrace of sportsmanship. In addition, the Grand Prix makes significant economic contributions to the city's diversified development, including tourism, catering, and accommodation industries.

In conclusion, the culture of the Macau Grand Prix has enriched Macau's cultural character and significantly advanced the development of global motorsport. Its hallmarks include a singular track design, a diverse field of races, a deeply immersive audience experience, and deep-seated integration with local culture.

### **2.1.3. Event Impact and Status**

- Economic Boost for Macau

As a hallmark annual event, the Macau Grand Prix significantly invigorates the local economy. It draws domestic and international tourists and racing aficionados alike, thereby enhancing tourism, hospitality, food service, and retail sectors. Ticket revenues, sponsorships, and broadcasting rights produce direct income, while visitor spending further promotes market expansion and economic diversification. Moreover, the event attracts international investment and partnerships, nurturing Macau's long-term economic growth.

- Tourism Promotion

The Macau Grand Prix elevates Macau's global reputation as a travel destination, drawing spectators worldwide. Visitors not only experience the thrill of the races but also explore Macau's urban environment, cultural heritage, and culinary offerings, contributing to the holistic growth of its tourism sector.

- Cultural Impact

Besides its sporting element, the Macau Grand Prix offers a stage for cultural expression and heritage preservation. It integrates the spirit of racing into local customs, creating a unique Macau racing culture that both diversifies the cultural landscape and broadens its global reach. The expanded Macau Grand Prix Museum, implementing an "edutainment" approach, has welcomed a large number of visitors, nurturing an appreciation for the legacy of racing culture and deepening Macau's cultural influence.

- International Motor Sports Status

The prestigious status of the Macau Grand Prix in international racing has been forged by its rich history, unique circuit layout, superb event management, and active participation of global talents. It attracts some of the best aspiring racers, crews and teams, extensive media attention, and enthusiastic spectators, further strengthening the sport's international recognition. Therefore, the Macau Grand Prix stands as a marquee event in international

motorsports.

## **2.2. Research on Cultural and Creative Industry and Design**

### **2.2.1. Basic Concept and Development Status**

Cultural and creative industries (CCIs) stand as a key element of the knowledge economy, creating economic and social value through intellectual property by applying creativity, skills, and talent. Their growth opportunities have expanded significantly with global advancements in digital technology. Creative and cultural industries (CCIs) are recognized as a transformative economic force, playing a crucial role in restructuring economies and generating employment opportunities. These factors are crucial for stimulating economic expansion and fostering innovation. The impetus for this development stems from several key drivers: the UNESCO Convention on Cultural Diversity, evolving consumer preferences—particularly the youth segment’s penchant for personalized and experiential consumption—and technological breakthroughs, such as Virtual Reality (VR) and Augmented Reality (AR).

### **2.2.2. Cultural Creative Design in Inheritance and Innovation**

As the foundation of CCIs, cultural creative design plays a crucial role in preserving and reinventing cultural heritage [8]. The concept of “cultural recoding” integrates traditional elements with contemporary design principles. This approach aims to preserve cultural continuity while fostering innovation, maintaining cultural authenticity, and creating new meaning and value, thus leading to cultural transformation. Brand value theories highlight the role of cultural identity and emotional connections in building brand equity. Cultural and creative design can enhance product value, establish unique competitiveness, create emotional bonds with consumers, and strengthen brand loyalty [9]. Cross-border integration (“culture + tech/tourism”) and technological advancement (digital, intelligent design) push product boundaries further, addressing varied market demands and creating new opportunities for businesses.

### **2.2.3. Innovative Methods and Case Studies**

Cultural and creative design innovation comprises storytelling, emotional design, cross-border integration, and technology-driven solutions. “Design thinking” offers theoretical groundwork, focusing on user needs and cross-disciplinary teamwork for quick adaptation. Jones explored the relationships between creative industries, design thinking, and innovation strategies, offering a research structure [10]. The Palace Museum’s “Palace Lipstick” and “Royal Palace Cat” demonstrate successful practical applications, earning recognition for their cultural richness and aesthetic value while reaching both local and global markets, sharing Chinese culture worldwide. Disney and Marvel demonstrate effective brand value optimization through IP licensing and cross-sector partnerships, integrating their cultural elements into various creative offerings.

## 2.3. Research on the Combination of Emotional Design Theory and Kano Model

### 2.3.1. Emotional Design Theory

Emotional design theory advocates a user-centered design philosophy that calls for designers to blend product functionality, visual appeal, and emotional components according to users' psychological and emotional requirements [11]. The theory is structured across three levels:

**Instinctive Layer:** Centers on immediate sensory interactions, including visual presentation and tactile feedback, which influence initial user impressions and emotional connections.  
**Behavioral Layer:** Optimizes user interaction through coherent operation flows, fluid engagement, and constructive feedback, creating an experience marked by ease, comfort, and accomplishment.  
**Reflective Layer:** Establishes deep-seated emotional resonance and meaning through brand identity, cultural elements, or personal attachment, cultivating sustained user commitment and reliance.

### 2.3.2. Kano Model Fundamentals and Categories

Introduced by Noriaki Kano in 1979, the Kano model presents a methodical approach to analyzing and addressing user needs. Research by Materla et al. has contributed valuable perspectives on user need classification and satisfaction evaluation [12]. The model divides user needs into:

- **Must-be Requirements**

These represent essential features users naturally expect in products or services. While their absence leads to significant user dissatisfaction, their inclusion alone does not enhance satisfaction. A smartphone app's stability exemplifies this requirement.

- **One-dimensional Requirements**

These requirements exhibit a direct relationship with user satisfaction. Successfully implementing these features increases satisfaction, while failing to meet them reduces it. App loading speed represents this category.

- **Attractive Requirements**

Features exceeding user expectations, significantly increasing satisfaction. Innovations such as AR integration in applications exemplifies such attractive features.

**Indifferent Requirements:** Features with minimal impact on user satisfaction. Ancillary elements or supplementary features are often into this category.

- **Reverse Requirements**

Features actively disliked by users, potentially decreasing satisfaction. Excessively complex design workflows can be counter-productive.

The Kano model enables designers to prioritize elements crucial for user satisfaction, developing products that not only fulfill fundamental needs but also deliver added value and a delightful experience [13].

### **2.3.3. Application of Kano Model in Emotional Design Theory**

In emotional design, the Kano model is employed as follows:

- Identifying Emotional Need Hierarchy

Through Kano questionnaires and data analysis, designers determine user emotional needs, including fundamental, expected, and desired needs. This informs the integration of emotional elements into product design.

- Guiding Design Decisions

Based on Kano model analysis, designers prioritize emotional needs in product development. For instance, in automotive taillight design with unique aesthetics and a sense of advanced technology can improve user satisfaction.

- Optimizing Product Experience

The model identifies emotionally resonant needs—those producing a “surprise” effect upon fulfillment. Addressing these needs significantly increases product desirability and user satisfaction.

Case studies illustrating the application of the Kano model in emotional design appear in **Table 1**.

## **3. Research Methods**

### **3.1. Research Design**

This research evaluates the deep-seated integration of Macau Grand Prix racing culture into the design of cultural and creative products. By innovatively combining the Kano model with emotional design theory, this study seeks to develop products that not only address users’ emotional needs but also embody racing culture. To achieve this objective, questionnaire surveys and desktop research represent the primary methods for systematically collecting and analyzing user perceptions, preferences, and emotional responses to racing culture and cultural and creative products.

The questionnaire comprises the collection of basic demographic information (such as age, gender, occupation, and interests) to construct user profiles; bidirectional demand exploration (positively inquiring about users’ familiarity, enthusiasm for racing culture, and desired cultural elements, while conversely gathering feedback on dissatisfactions and suggestions regarding existing products), thereby indicating areas for improvement; and evaluations of satisfaction and importance, employing a Kano evaluation results classification comparison table to measure user satisfaction and importance ratings across key dimensions such as design originality, material choices, and cultural element integration (**Table 2**).

**Table 1.** A Review of the Application of Kano Model in Emotional Design (drawn by Bingbing Feng)

Researcher	Time	Research Title	Discuss the Focus/Research Methods	Provenance
Jing Zhang, Jiayi Yin	2021	Research on Emotional Design of Coffee Machine Based on the Kano Model Method	<p><b>Exploring Key Points:</b></p> <ul style="list-style-type: none"> <li>▪ Finding the Mapping Relationship Between User Emotions and Product Design Expressions.</li> <li>▪ Optimizing and Enhancing Product Design to Meet Users' Psychological and Emotional Needs.</li> <li>▪ Verifying the Effectiveness of the Kano Model Method in Product Design.</li> </ul> <p><b>Methodology:</b> Questionnaire Survey Method, Kano Model, Data Analysis.</p>	Zhang, Jing, and Jiayi Yin. "Research on Emotional Design of Coffee Machine Based on the Kano Model Method." <i>She Ji</i> 34, no. 5 (2021): 76–78. <a href="https://www.cqvip.com/doc/journal/955111802">https://www.cqvip.com/doc/journal/955111802</a>
Mei Yang, Huadong Qu	2023	Research on emotionalization of postpartum shaping products based on KANO model	<p><b>Exploring Key Points:</b></p> <ul style="list-style-type: none"> <li>▪ The impact of postpartum shaping products on postpartum women's physical and mental health.</li> <li>▪ Design methods for analyzing, classifying and sorting users' emotional needs.</li> <li>▪ Product design practices aimed at addressing the physical and mental health of postpartum women.</li> </ul> <p><b>Methodology:</b> Emotional design theory, KANO model, Likert scale.</p>	YYang, Mei, and Huadong Qu. "Research on the Emotionalization of Postpartum Shaping Products Based on the KANO Model." <i>Packaging Engineering</i> 44, no. 12 (2023): 165–171. <a href="https://www.cqvip.com/doc/journal/3198399911">https://www.cqvip.com/doc/journal/3198399911</a>
Wenliang Liu, Xuhan Ma	2024	Research on Parent-Child Home Cultural and Creative Product Design Based on KJ-KANO Model	<p><b>Exploring Key Points:</b></p> <ul style="list-style-type: none"> <li>▪ Design and research of parent-child household creative products.</li> <li>▪ Break down parent-child communication barriers and create a harmonious and loving parent-child atmosphere.</li> <li>▪ Accurately obtain the realistic needs of parent-child groups for home cultural and creative products.</li> </ul> <p><b>Methodology:</b> KJ, KANO model, data analysis, research methodology</p>	Liu, Wenliang, and Xuehan Ma. "Research on Parent-Child Home Cultural and Creative Product Design Based on KJ-KANO Model." <i>Furniture and Interior Decoration</i> 31, no. 3 (2024): 72–77. <a href="https://www.cqvip.com/doc/journal/3342035540">https://www.cqvip.com/doc/journal/3342035540</a>
Yuhan Wu	2024	Research on Design Strategies of Cultural and Creative Products Based on Emotional Design Principles	<p><b>Exploring Key Points:</b></p> <ul style="list-style-type: none"> <li>▪ Introduces Emotional Design: Integrates the concept of emotional design into Jilin Ice and Snow cultural and creative products.</li> <li>▪ Establishes Conceptual Link: Elucidates the relationship between emotional design and the creative process of Jilin's ice and snow culture products.</li> <li>▪ Analyzes Design Status: Examines the current state of design within the Jilin Ice and Snow cultural and creative industry.</li> </ul> <p><b>Summarizes Design Principles:</b> Identifies and articulates key principles guiding the design of these products.</p> <ul style="list-style-type: none"> <li>▪ Proposes Development Strategy: Offers a strategic approach for the development of Jilin Ice and Snow cultural and creative products under the emotional design concept.</li> <li>▪ Provides New Insights: Contributes novel perspectives to the design field of Jilin Ice and Snow cultural and creative products.</li> </ul> <p><b>Methodology:</b> Literature research, case analysis, questionnaire, interview, experimental design, and summary and induction</p>	Wu, Yuhan. "Research on Design Strategies of Cultural and Creative Products Based on Emotional Design Principles." <i>Art and Design</i> 7, no. 4 (2024): 95–102. <a href="https://doi.org/10.31058/j.ad.2024.74011">https://doi.org/10.31058/j.ad.2024.74011</a> .
Yue Han, Zhou Tao, Wu Huixin, Wang Ling	January 2024	Research on Chinese non-legacy creative design needs based on Kano model	The purpose is to explore the path and method of living heritage inheritance of China's intangible cultural heritage, and use KJ method and Kano model to analyze user needs.	Yue, Han; Zhou, Tao; Wu, Huixin; Wang, Ling. "Research on Design Requirements of Chinese Intangible Cultural Heritage Cultural and Creative Products Based on Kano Model." <i>Packaging Engineering</i> 45, no. 2 (2024): 385–392. <a href="https://qikan.cqvip.com/Qikan/Article/Detail?id=7111275405&amp;from=Qikan_Search_Index">https://qikan.cqvip.com/Qikan/Article/Detail?id=7111275405&amp;from=Qikan_Search_Index</a>



**Table 2.** Kano Model Evaluation Results Classification Chart (drawn by Bingbing Feng)

User Demands		Lack of This Attribute				
		Prefer 1	Deem Appropriate 2	Neutral 3	Reluctantly Accept 4	Disprefer 5
Lack of This Attribute	Prefer 1	Q	A	A	A	O
	Deem Appropriate 2	R	I	I	I	M
	Neutral 3	R	I	I	I	M
	Reluctantly Accept 4	R	I	I	I	M
	Disprefer 5	R	R	R	R	Q

The target users are specifically focused on racing culture enthusiasts, consumers of cultural and creative products, and Macau Grand Prix spectators and participants, ensuring the representativeness and generalizability of the survey data. The questionnaire distribution strategy employs both online and offline channels, including social media platforms, specialized forums, the event’s official website, live events, and collaborating organizations to maximize reach in the target demographic. Following data collection, a rigorous validation process is employed to eliminate invalid or incomplete responses, ensuring the accuracy and reliability of the analytical findings. Finally, based on the questionnaire data, user needs and emotional preferences are extracted and synthesized, offering a robust theoretical foundation and empirical support for the development and design implementation of the emotional hierarchy model for cultural and creative products in the future.

### 3.2. Research Process

#### 3.2.1. Sample Selection

To optimize the questionnaire and ensure its relevance, this study expanded the selection of visual samples to include offerings from the Macau Grand Prix Cultural & Creative Shop, Triangle Sport Macau, Fingertip Cultural & Creative Studio, and the online retail platforms and studios associated with the Teo wan brand of motorsport-themed cultural and creative products. Exemplary, established cultural and creative products reflecting racing culture from these sources were chosen for sample collection. Collected data comprised product images, descriptive details, and user reviews. A total of 22 product samples of domestically-sold racing culture and creative products were collected (**Table 3**).

#### 3.2.2. Demand Condensation

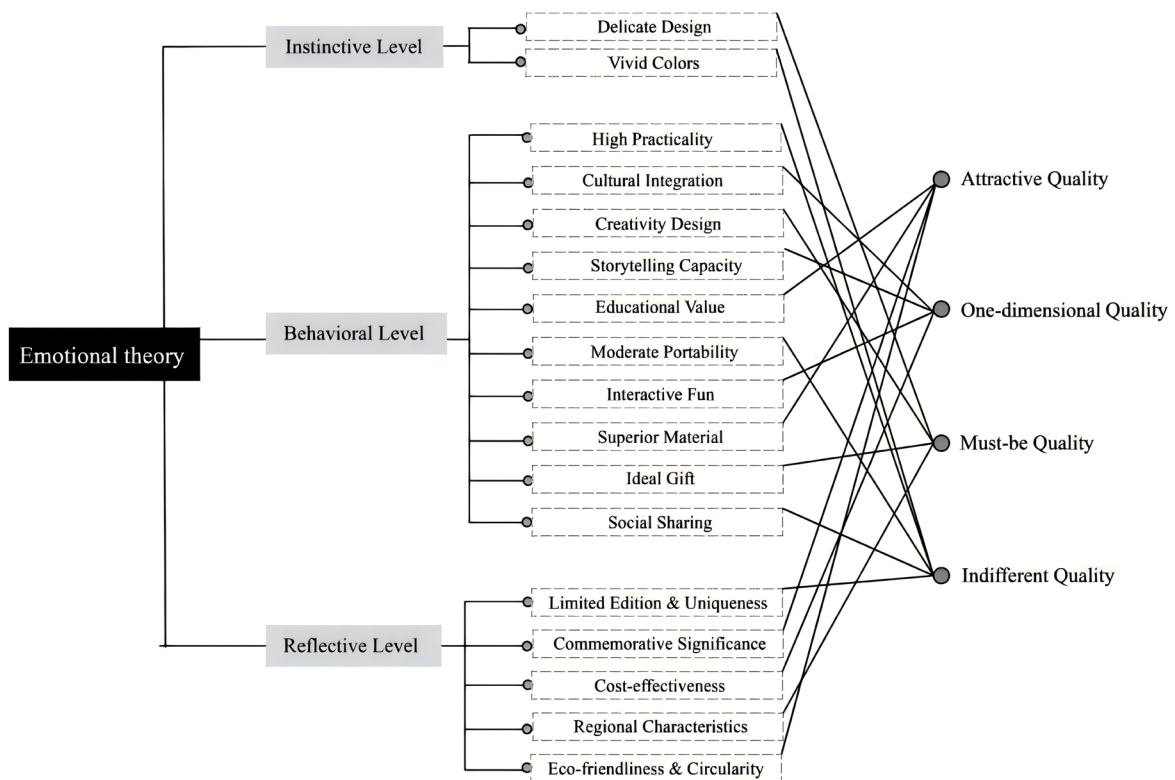
These collected visual samples were then categorized according to the three levels of emotional design theory—visceral, behavioral, and reflective—thereby optimizing the requirements for the questionnaire design (**Figure 1**).

**Table 3.** Sample Collection of Visual Samples of Domestic Racing Cultural and Creative Products (summarized by Bingbing Feng)

Source Website/Studio	Product Name	Descriptive Introduction	User Reviews
(Worker Playground) The Art Of Grand Prix Macau	Guia jacket	The concept of Macau Workers' Stadium is the name of the brand, which evokes the collective memory of Macau people. The clothing design is based on British and American fashion, with some Macau spirit hidden in the design of the clothing.	U1—Bought it as a souvenir while watching the race, but it lacks a series model. U2—Wear the clothes to feel like a racer, racing spirit heritage.
Triangle Sport Macau	Aerated Towels	There are three different designs <ul style="list-style-type: none"> <li>▪ The equation.</li> <li>▪ RV.</li> <li>▪ Motorcycle.</li> </ul>	U3—The design is unique and not flashy, the packaging and color are good, and the physical object is very satisfactory. U4—Convenient to carry, bring it to the site to cheer up, also can be a souvenir. U5—Gave it to a friend as a gift for Macau souvenir, she liked it very much.
	Grand Prix Folding Fan	Chinese folding fan Size: 8 inches Black and yellow	U6—Bring it to the site and fan it, again representing Macau Racing. U7—Rich in design, good color and texture.
Teovan Brands	Teva Variety Pen – Gravity – Supercar Series	This series of pens is inspired by luxury ultra-running, combined with the spirit of racing and exquisite craftsmanship, designed into a replaceable pen body, each pen is the epitome of speed and passion, indicating unique charm and creativity. Drawing on the world-renowned Gulf 917k classic design, its blue and orange Gulf livery did not win at Le Mans, but became a legend among racing fans in the 1971 film Le Mans.	U8—Racing fans will love this series, good quality and practical. U9—Mainly for collection, children like racing culture, like to collect these.
Fingertip Creative Studio	KDA Height Keycap	This series of pens is inspired by luxury ultra-running, combined with the spirit of racing and exquisite craftsmanship, designed into a replaceable pen body, each pen is the epitome of speed and passion, indicating unique charm and creativity. Drawing on the world-renowned Gulf 917k classic design, its blue and orange Gulf livery did not win at Le Mans, but became a legend among racing fans in the 1971 film Le Mans.	U10—Skinning the keyboard feels like speed and passion when typing, the color scheme is nice and textured, and the sound returns very quickly.

### 3.2.3. Questionnaire Design and Testing

Data collection employed both online and offline methods to secure a diverse and representative sample. The questionnaire sought to collect respondents' basic demographic data, information on two-way demand factors, and insights into user awareness and preferences concerning racing culture and related cultural and creative products. The specific design elements are detailed below:



**Figure 1.** Kano-Emotional Flower Design Theory Combined with Demand Classification (drawn by Bingbing Feng)

▪ Basic Information

(A) Demographic Profile: This information comprises age, gender, professional background, and educational attainment.

(B) Racing Engagement: This aspect evaluates participants’ prior involvement with the Macau Grand Prix and their affinity for racing culture.

(C) Preferences for Cultural Creative Products: This respect surveys participants’ customary practices and preferences pertaining to cultural and creative product acquisition and use.

▪ Two-Way Demand Questionnaire (Based on the Kano Model)

(A) Basic Needs

This section addresses the indispensable functionalities of cultural and creative products, including characteristics such as practicality and resilience. These fundamental requirements guarantee that the product fulfills the essential prerequisites for user operability.

(B) Expected Needs

This segment explores supplementary characteristics or design components that users may anticipate in cultural and creative products, for instance, bespoke design and culturally

symbolic elements. These requirements indicate users’ deep-seated preferences, offering designers with valuable perspectives on features that could enhance the user experience.

(C) Excitement Needs

This section explores how products resonate emotionally with users and the value they place on features such as limited editions and personalized design options. Fulfilling these desires goes beyond meeting basic user expectations and can significantly increase purchase interest.

In total, 300 questionnaires were distributed, and 283 valid responses were collected with a 94.3% response rate. The value suggests that the sample is broadly representative. Data collection utilized both online (90.5%) and offline (9.5%) methods to ensure a broad and diverse range of user perspectives. The gender distribution of respondents (64.3% male, 35.7% female) reflects the target demographic. Internal consistency, as measured by Cronbach’s Alpha (0.872), confirms the high reliability and validity of the questionnaire, thus establishing a strong basis for the study’s findings.

**Table 4.** Example of Questionnaire Survey Requirements Setting (summarized by Bingbing Feng)

<b>Basic Demand</b>	Age		Under 18, 19 to 24, 25 to 30, 31 to 35, 36 to 40, 40 and over
	Genders		Male, female, prefer not to disclose/other
<b>Bidirectional Demand</b>	Commemorative value	Forward	How satisfied would you be if this cultural and creative product came with a limited-edition historical photo of the Macau Grand Prix or a replica of a race ticket as a collector’s memento?
		Reverse	How satisfied are you if the product is only used as a general decoration with no special commemorative elements?
	Cultural fusion	Forward	If the design of the cultural and creative products incorporates Macau’s local cultural elements (e.g. local folk culture, etc.) with the racing culture, how satisfied are you?
		Reverse	If the product design only focuses on racing elements and ignores Macau’s local cultural characteristics, how satisfied are you?
	Design creativity	Forward	If the cultural and creative products are designed based on the classic racing cars of the Macau Grand Prix Museum and incorporate modern aesthetic elements, how satisfied are you?
		Reverse	If the product design lacks creativity and simply replicates the look of a race car, how satisfied are you?
	Interactivity	Forward	How satisfied are you if the cultural and creative products (e.g. AR racing car models) can be scanned by cell phone APP for interactive experiences, such as watching racing race videos and participating in virtual racing games?
		Reverse	How satisfied are you if the product is for viewing only, without any interactivity?

To ensure a thorough understanding of user preferences, the questionnaire incorporated detailed inquiries regarding each need category. A combination of positively and negatively worded questions offered a complete perspective of user needs, enabling an accurate evaluation of satisfaction and importance levels related to specific product characteristics (**Table 4**). Utilizing the Kano model, the study categorized these needs to systematically identify and rank product design criteria.

### **3.2.4. Results and Satisfaction Analysis**

Based on the Kano model questionnaire results (**Table 5**), the demand for Macau racing culture cultural and creative products is classified into three categories: One-dimensional Characteristics (O), Attractive Characteristics (A), and Indifferent Characteristics (I). This categorization offers a structured approach to product design and optimization. Analysis of specific functional characteristics allows for a detailed understanding of the hierarchy of user needs.

#### ▪ One-dimensional Characteristics (O)

These characteristics are essential for user satisfaction, reflecting fundamental expectations for cultural and creative products. This study identifies these characteristics as cultural integration, cultural storytelling, interactivity, suitability for gifting, and commemorative value. Cultural integration, for instance, highlights the importance of incorporating elements of Macau's racing culture into the design to create cultural resonance with users. Interactivity increases user engagement through experiential opportunities, while commemorative value imbues the product with special meaning as a souvenir. These characteristics speak to the core values users seek in cultural and creative products and offer a definitive blueprint for design progress.

#### ▪ Attractive Characteristics (A)

While not requirements for all users, characteristics such as practicality, educational merit, material composition, and reasonable pricing greatly amplify a product appeal in certain situations. Implementation of these characteristics allows products to stand out in a competitive marketplace, appealing to users who prioritize premium quality and substantive design. For instance, educational merit enables users to acquire knowledge through product interaction. Sophisticated material composition enhances the perception of excellence, and fair pricing allows wider accessibility. These functional characteristics can operate as distinguishing features in a competitive environment, enhancing a product's market advantage.

#### ▪ Indifferent Characteristics (I)

Characteristics such as color, size and portability, social media sharing capabilities, limited edition availability, and rarity have a minimal bearing on consumer purchasing choices. This suggests these characteristics may have become commonplace expectations or do not yet represent key purchase drivers for users. The dimensions of size and portability, for instance, might require reassessment as user needs and preferences shift to guarantee suitability for a broad array of scenarios.

**Table 5.** Example of Questionnaire Survey Requirements Setting (summarized by Bingbing Feng)

Hierarchical Characteristics	Requirement Functionality	Brief Description of Requirements	Attractive (A)	One-dimensional (O)	Must-be (M)	Indifferent (I)	Attribute
Instinctive Level	Appearance	Delicate Design	11.66%	30.04%	33.57%	16.96%	M
	Color	Vivid Colors	12.37%	29.33%	14.84%	35.34%	I
Behavioral Level	Practicality	High Practicality	37.10%	26.86%	13.78%	14.13%	A
	Cultural Integration	Cultural Integration	27.21%	35.69%	17.31%	10.95%	O
	Design Creativity	Creative Design	15.90%	28.98%	34.98%	13.43%	M
	Cultural Narratives	Storytelling Capacity	27.92%	37.81%	14.13%	10.60%	O
	Educational Value	Educational Value	36.40%	28.98%	13.43%	10.60%	A
	Size & Portability	Moderate Portability	15.55%	26.86%	10.25%	34.28%	I
	Interactivity	Interactive Fun	25.09%	35.34%	10.60%	18.37%	O
	Material Selection	Superior Material	34.28%	25.80%	8.48%	17.31%	A
	Gift Presentation	Ideal Gift	28.27%	36.75%	13.78%	14.49%	O
	Social sharing	Social Sharing	14.49%	26.50%	13.43%	37.81%	I
Reflective Level	Limited Edition & Uniqueness	Limited Edition & Uniqueness	15.55%	30.74%	9.54%	33.57%	I
	Economy	Cost-effectiveness	33.92%	25.09%	16.61%	13.78%	A
	Commemorative Significance	Commemorative Significance	29.68%	34.63%	8.83%	15.19%	O
	Regional Characteristics	Regional Characteristics	15.90%	26.15%	34.63%	11.31%	M
	Sustainability	Eco-friendliness & Circularity	36.04%	26.15%	11.66%	19.43%	A

In the analysis of the Kano model, the Better/SI and Worse/DSI coefficients offer quantitative measures of the effect of product features on customer satisfaction. A two-dimensional attribute analysis, based on Kano model questionnaire data, determines the percentage distribution of characteristics classified as attractive, one-dimensional, must-be, indifferent, reverse, and questionable. In addition to attribute classification, the Better-Worse coefficients, calculated utilizing the following formulas, quantify a feature’s potential to enhance satisfaction or reduce significant dissatisfaction:

(A) Satisfaction coefficient after addition:  $\text{Better/SI} = (A + O) / (A + O + M + I)$

(B) Dissatisfaction coefficient after elimination:  $\text{Worse/DSI} = -1 \times (O + M) / (A + O + M + I)$  (Note the negative sign “-”).

Below presents the Better and Worse values for the functions required by Macau racing-themed cultural and creative designs (**Table 6**). A high Satisfaction Index (SI) is observed for Creative Design (SI = 0.6537), suggesting its strong appeal among the comprehensive features; whereas, Regional Characteristics demonstrate the lowest Dissatisfaction Index (DSI) at 0.3181, indicating minimal negative responses. The low SI values for Moderate Portability and Vivid Colors necessitate further analysis into the sources of customer dissatisfaction with these features.

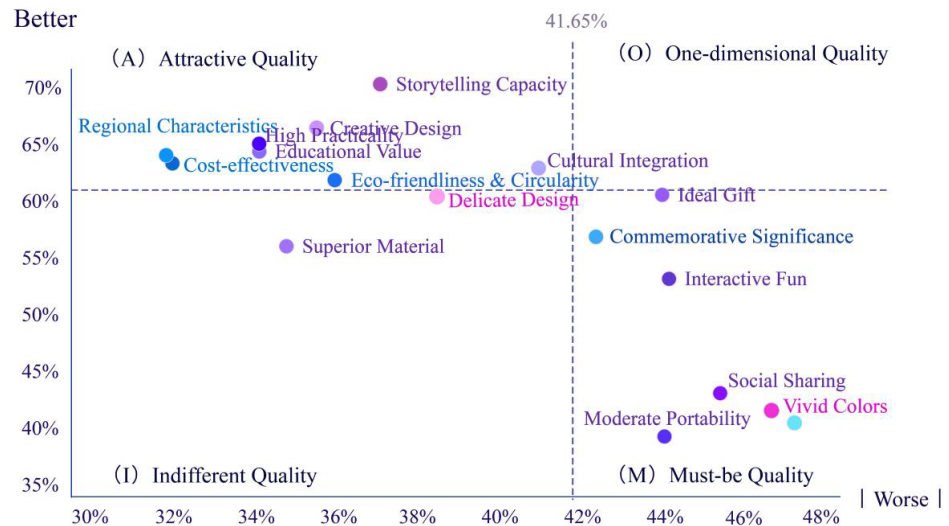
**Table 6.** Macao Racing Culture Cultural Demand Function Better Worse/DSI Value (summarized by Bingbing Feng)

Requirement function description	Better/SI	Worse/DSI
High Practicality	0.6431	0.3393
Cultural Integration	0.62365	0.41165
Creative Design	0.6537	0.35695
Storytelling Capacity	0.6096	0.4311
Educational Value	0.6432	0.3428
Delicate Design	0.6025	0.3852
Moderate Portability	0.3923	0.44
Limited Edition & Uniqueness	0.4046	0.47525
Eco-friendliness & Circularity	0.6078	0.35865
Interactive Fun	0.5336	0.44525
Superior Material	0.5566	0.34455
Commemorative Significance	0.5583	0.4223
Cost-effectiveness	0.6308	0.3198
Regional Characteristics	0.6361	0.3181
Vivid Colors	0.4188	0.47
Ideal Gift	0.6043	0.43995
Social Sharing	0.4117	0.45405

**Table 6** data informs our analysis of functional requirements for 17 racing cultural and creative products through the calculation of average Better-Worse values. Specifically, the mean Better coefficient (SI mean: 0.6099) and mean Worse coefficient (DSI mean: 0.4165) for these secondary-level functional requirements measure overall performance. These values enable accurate mapping of coordinate positions, offering a clear visual representation of the relationship between positive and negative effects on functional satisfaction. This method offers a robust, quantitative foundation for evaluating the design requirements of racing cultural and creative products.

Finally, we constructed a four-quadrant graph for enhanced visualization, employing the Worse index as the horizontal axis and the Better index as the vertical axis. The axes intersect at their respective mean values, establishing a central reference point (**Figure 2**).

### Better-Worse Coefficient Analysis of Four-Quadrant Diagram



**Figure 2.** Four-Quadrant Scatter Plot of Demand Satisfaction of Cultural and Creative Products (summarized by Bingbing Feng)

## 4. Conclusion

This research incorporated Macau Grand Prix racing culture into creative product design, verifying user-centered design principles. The study expanded design theory and furnished practical guidance, emphasizing the importance of emotional design and user insights in cultivating product competitiveness.

### ▪ Research objectives achieved

This study effectively explored the strategy of incorporating Macau Grand Prix culture into creative product design, confirming the effectiveness of the user-centered design principle.

### ▪ User Needs Analysis

The study indicated that consumer demand for creative products centers on desirable characteristics (e.g., cultural integration, storytelling) and attractive characteristics (e.g., creative design, practicality), with less emphasis on neutral characteristics (e.g., color, size).

### ▪ Application of the Kano model

The Kano model effectively identifies and classifies users' emotional needs. Calculating the Better-Worse coefficient sheds light on which product features significantly improve user satisfaction, and which features might cause user dissatisfaction.

### ▪ Importance of Emotional Design



Emotional design theory proved essential for increasing the attractiveness and marketability of creative products, particularly in strengthening the user experience and emotional resonance.

▪ Suggestions for Design Strategies

Designers are advised to prioritize the thorough integration of cultural elements, innovative and creative design, and the products' practical and educational value during the creative process.

▪ Market positioning and development

This study proposes a market positioning and development strategy for Macau Racing's cultural and creative products, and stresses the value of differentiated and personalized design to satisfy the varied needs of users.

▪ Theoretical and Practical Contributions

This study expands the theoretical perspectives of racing culture in creative product design. It offers practical guidance and fresh perspectives for developing creative industries in Macau and globally.

▪ Future Research Directions

While this study delivers in-depth insights and recommendations, further exploration remains possible, particularly concerning the applications of digital technologies and cross-cultural design practices.

In conclusion, this study offers theoretical foundations and empirical data for creative product design relating to Macau Grand Prix car culture, and confirms the crucial role of emotional design and user needs analysis in enhancing product market competitiveness.

**Author Contributions:**

Bingbing Feng was responsible for data collection and conducted statistical analysis. She also participated in the interpretation of results and contributed to the methodology, results, analysis, and conclusion sections of the paper.

Yulin Zhao conceived the research topic and supervised the experimental execution, data analysis, and discussion. She provided crucial guidance and suggestions throughout the process.

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**Conflicts of Interest:**

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

### Author Biographies:

- Bingbing Feng is a graduate student whose research focuses on user research, user experience research, and ergonomics.
- Dr. Yulin Zhao, Ph.D., is currently an assistant professor at the School of Innovation and Design, City University of Macau. His research interests include industrial innovation design, ergonomics, clothing ergonomics, etc. He is a member of Chinese Ergonomics Society (CES).

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