

Applying Shape Grammar in Chinese 'Circle' Culture-Informed Logo Design: A case study of Tomato Commune

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Abstract

This study explores integrating traditional Chinese "circle" culture into modern logo design using shape grammar. The "circle" symbolizes harmony and unity in Chinese philosophy, and its visual characteristics offer rich potential for cultural expression. Through a case study of the Tomato Commune brand, the research applies shape grammar rules to extract, combine, and evolve visual elements inspired by traditional motifs. The results demonstrate how culturally informed design, guided by a structured method, can produce logos that are both meaningful and visually distinct. This approach supports innovation in branding while preserving cultural identity and aesthetic values.

Keywords: Chinese Circle Culture; Logo design; Shape grammar; Design Innovation

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1.0 Introduction

In contemporary design practice, sustainability encompasses not only environmental concerns but also cultural preservation, social impact, and user connection. Traditional Chinese aesthetics, particularly the concept of the "circle," symbolize harmony, unity, and continuity, and continue to influence modern design. However, while these cultural values hold deep meaning, integrating them into modern logo design often lacks a structured approach, resulting in either superficial symbolism or inconsistent outcomes. This highlights a critical gap in design methods that effectively merge cultural identity with modern branding strategies (Heritage Science, 2025).

This study explores how shape grammar can be used as a systematic design method to embed traditional Chinese "circle" culture into contemporary logo design. The objectives are to identify the visual characteristics of traditional circular motifs, determine how they can be applied using shape grammar rules, and establish a culturally informed logo design process. Using the Tomato Commune brand as a case study, this research offers a replicable model for preserving cultural meaning while addressing modern visual identity needs.

2.0 Literature Review

2.1 Overview of Chinese "Circle" Culture

The concept of the "circle" holds profound symbolic significance in traditional Chinese culture, representing completeness, unity, harmony, and the cyclical nature of life. These ideas are deeply embedded in Confucian and Taoist philosophy, where the "circle" reflects ideals of balance, moderation, and integration (Liu et al., 2019). In ancient Chinese texts such as *Mozi* and *Shuo Wen Jie Zi*, the "circle" is defined not only as a perfect shape but also as a representation of cosmic order and social harmony. Yan (1998) described this as part of China's circular thinking mode, rooted in cosmology, time-space theory, and symbolic visual language.

Recent research has emphasized the importance of applying traditional cultural symbols in contemporary design to enhance cultural identity and user engagement. For instance, Liu and Zhao (2024) demonstrated how metaphorical design rooted in traditional culture significantly influences consumer perception and emotional response. While many studies highlight the symbolic value of these motifs, few provide structured methods for translating them into usable visual forms in branding and logo design. This study addresses that gap by proposing a shape grammar-based approach to systematically integrate the Chinese concept of the "circle" into modern visual identity systems.

2.2 Historical Origin and Aesthetic Value of "Circle" Culture

The concept of the "circle" in Chinese culture has deep historical roots, originating from early observations of celestial bodies like the sun and moon, symbolizing harmony, unity, and the cyclical nature of life (He, 2010). In religious contexts, particularly Buddhism, circular motifs such as the swastika (卐) represent continuity and the boundless nature of existence (Li, 2016).

Aesthetically, the "circle" has been central to Chinese art and design, embodying balance and completeness. Li (2012) highlighted the prominence of circular forms in traditional patterns, emphasizing their role in conveying auspicious meanings and aesthetic harmony. Zhu (2020) further noted that circular motifs in folk customs symbolize unity and collective well-being.

Recent studies have explored the integration of traditional cultural elements into modern design practices. Xu (2022) proposed a packaging design method for modern cultural and creative products based on rough set theory, aiming to overcome challenges in incorporating traditional motifs into contemporary designs. This approach underscores the potential of systematic methodologies in bridging traditional aesthetics with modern design requirements.

2.3 The Potential of Shape Grammar in Logo Design

Shape grammar is a formal design system that uses predefined rules to generate and manipulate shapes in a structured yet creative way. Originally introduced in architecture, it allows designers to explore form variations systematically, ensuring consistency while supporting innovation (Jowers et al., 2019). Recent research has extended its application into visual communication and cultural design. For instance, Liu (2024) developed a graph grammar-based approach for pattern generation, enabling traditional motifs to be applied more effectively in design contexts. Similarly, Haakonsen et al. (2022) emphasized shape grammar's adaptability across creative fields such as architecture, product design, and computational creativity.

Despite its potential, shape grammar remains underutilized in branding, especially in the context of culturally informed logo design. Most studies focus on shape manipulation, with limited attention given to the integration of cultural symbolism into visual identity. This gap presents an opportunity to explore how rule-based systems can bridge traditional aesthetics and modern branding needs. By focusing on Chinese "circle" culture, this study applies shape grammar not only as a visual method but also as a cultural translation tool, aiming to generate logos that are both systematically developed and culturally meaningful.

3.0 Methodology

3.1 Research Framework and Approach

This study applies a qualitative design approach to explore how traditional Chinese "circle" culture can be integrated into modern logo design using a structured visual method. The theoretical foundation is shape grammar, a concept introduced by Stiny in 1980, which provides a rule-based system for generating and transforming shapes logically and creatively. This method is well suited for the integration of cultural symbols into design because it allows the preservation of traditional forms while supporting innovation. The framework also involves expert input and literature-based pattern selection to ensure cultural accuracy and design relevance.

Shape grammar follows a structured model: $SG = S, L, R, I$, where S is the start shape, L is the visual elements, R is the set of transformation rules, and I is the initial instance. It works through rule-based steps, allowing patterns to evolve through repeated transformations. Zeng and Liu (2023) explain that design rules guide how one shape changes into another, while the system builds new forms based on these rules. This study uses eight visual operations, such as rotation, reduction, and scaling to turn traditional motifs into modern, meaningful logo designs. Similar approaches in graph grammar, as shown by Liu (2024), also support structured and creative design development.

3.2 Research Design

The first phase involved collecting literature and image references related to traditional Chinese circle patterns. Thirty motifs were identified, and ten were selected for deeper analysis based on cultural and visual features. Using expert interviews, three core patterns

were chosen for design development. In parallel, thirty existing brand logos were reviewed, and two common visual structures, referred to as flag structures, were selected for integration. This process is illustrated in Figure 1.

In the second phase, the selected motifs were digitized using Adobe Illustrator and treated as initial shape elements. Shape grammar rules, such as reduction, rotation, scaling, and coordinate adjustment, were applied to recombine traditional patterns with the two logo structures. This design process produced four symbolic outcomes called anamorphosis symbols. These results demonstrate how traditional visual elements can be adapted into modern logo formats using a systematic visual method.

The final phase focused on expert validation. Three design experts reviewed the four generated symbols based on cultural meaning, design clarity, and brand relevance. One design was selected and refined by adjusting its shape, layout, and color to match the Tomato Commune brand identity while preserving its cultural essence.

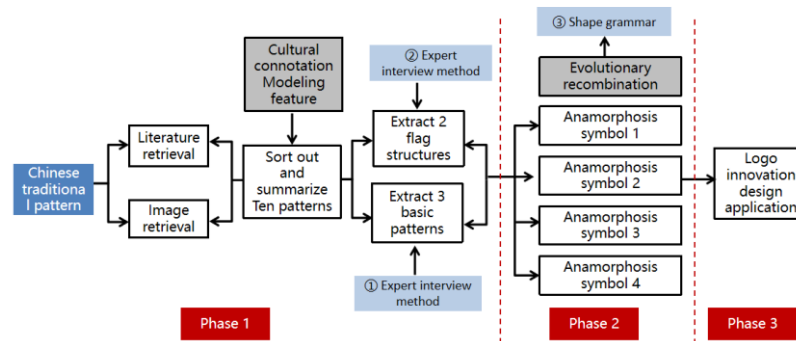


Fig. 1: Research Design

4.0 Data Analysis

4.1 Modelling characteristics of "circle" culture

Table 1. Classification of Pattern Characteristics

ID	NAME	PICTURE	STRUCTURE	DYNASTY	MEANINGS	TYPES	DESIGN CHARACTER
A ₁	Cloud pattern			Zhou Dynasty	propitious, jubilant	Auspicious pattern	It forms a circular structure in the shape of clouds
A ₂	Ring pattern			Zhou Dynasty	continuous Loop	Auspicious pattern	Clean lines and regular circular layout
A ₃	Jewel pattern			Tang Dynasty	Holy Demure, Happy Propitious	Buddhism pattern	With the word "十", "米" or axial symmetry as the artistic framework, with circular radiation or regular diamond shape radiation
A ₄	Peisimmon clay pattern			Warring States	Good fortune and good fortune	Auspicious pattern	The central point is a circular point showing four or five petal radial petals
A ₅	Plate length knot			Ming and Qing Dynasty	Endless life	Buddhist instruments	Line twists and turns, end to end, infinite circulation of geometric patterns
A ₆	Combined character			Han Dynasty	Auspicious Beautiful	Folk font	The different Chinese character parts are cleverly combined to form a complex figure
A ₇	Honeycomb pattern			The Eastern Han Dynasty	Reincarnation and eternal life	Buddhism pattern	Plant patterns are arranged in a continuous and repeated manner to form two consecutive or four consecutive patterns
A ₈	Pattern of Happy Encircled			Neolithic period	Yin and Yang form	Taoism pattern	The "S" shape is the symmetrical rotation of the bone, and the there is mainly geometric pattern and animal pattern to form a "duaf" shape pattern
A ₉	"卍" Pattern			Ming and Qing Dynasty	All the best	Buddhism pattern	With the "卍" four ends extended outward, rotating dynamic
A ₁₀	Tail Eight Trigrams Pattern			Ming and Qing Dynasty	Yin and Yang form	Taoism pattern	Divide the circle into two parts of similar shape and equal area with an "S" shaped line

The modelling characteristics of Chinese "circle" culture are deeply rooted in the fusion of traditional auspicious patterns with the philosophical teachings of Confucianism, Taoism, and Buddhism. These influences shape the artistic expression of the "circle" through symbolic elements such as harmonious composition, integration of opposites, rotational rhythm, and natural color balance. Together, they convey deeper meanings of unity, balance, and cyclical continuity, which are fundamental to Chinese visual and spiritual traditions.

To examine these visual characteristics, thirty traditional pattern samples were gathered from references such as Analysis of Traditional Chinese Patterns, The Complete Collection of Dunhuang Grottoes, Practical Collection of Chinese Auspicious Patterns, and The Classic Pattern Guide of the Forbidden City. Based on expert evaluation, ten representative images were selected as research

samples. Each pattern was analyzed in terms of its age (dynasty), cultural implications (meanings), symbolic type, and design character. Adobe Illustrator was used to digitally trace and diagram the structural forms, which were organized and summarized in Table 1.

According to the classification in Table 1, the patterns fall into three main types: auspicious symbolism (A1, A2), yin and yang symbiosis (A6, A8, A10), and rotational cycle (A3, A4, A5, A7, A9). The analysis revealed that circular forms dominate these samples, with nine out of ten patterns based on a clear circular skeleton. Even in the one remaining pattern, non-circular geometry was arranged in a way that visually implied a closed circular loop. This confirms that the "circle" serves as a foundational structure in traditional Chinese pattern design, both visually and symbolically. These findings informed the selection of motifs for the logo development process.

4.2 Analysis of morphological characteristics of modern signs

To examine how circular elements are used in contemporary branding, this study collected visual data on modern logos through online sources and market research. Given the wide variety of brand types, the research scope was narrowed to focus on logos that reflect simplified geometry and symbolic clarity. Approximately thirty logo samples were compiled, excluding those that were too complex, irrelevant to the study's objectives, or visually redundant. Based on expert evaluation, ten widely recognized and representative logos were selected as research samples across diverse sectors, including communication, agriculture, finance, general merchandise, industry, and science and technology. These samples were labeled with the prefix "B" for identification. Adobe Illustrator was used to process the visual data by removing branding details such as color, text, and texture, allowing the analysis to focus purely on the structural features of each logo. The simplified structures are shown in Table 2.

Table 2. Structural and Visual Characteristics of Selected Modern Logo Designs

ID	NAME	PICTURE	STRUCTURE CHART	TYPE	MODELLING CHARACTERISTICS
B ₁	Bank of China			Finance	Circular outline, center layout.
B ₂	Xiaomi Technology			Technology	The overall shape is circular, the built-in "mi" is the pinyin of "rice", the design of the outer circle and the inner square reflects the "sense of life".
B ₃	Mercedes-Benz			Industry	The circular configuration, the geometric shape of the central three-pointed star pattern, the lines are smooth, simple, and have the meaning of happiness.
B ₄	LG Group			Synthesis	The overall circular structure represents the earth, and the words "L" and "G" are used inside to form a human face.
B ₅	Carrefour France			Department store	The letter "C" is embedded between the two arrows, forming a positive and negative configuration.
B ₆	China Unicom			Communication	Evolves from the ancient Chinese auspicious figure "panlong" pattern; the four squares in the logo shape have the meaning of extending in all directions, and the six circles have the meaning of connecting roads and roads, and the smooth apartment everywhere.
B ₇	Target			Department store	The whole is circular shape, composed of two parts: the center point of the target and the outer ring; the minimalist design is more recognizable.
B ₈	Capital Museum (China)			Culture	The full name of the museum is combined into the shape of a seal using "nine-fold seal"; the four strokes are folded and stacked, uniform and symmetrical, and the layout is square.
B ₉	China First Farm Group			Agriculture	The whole is a circular figure; the figure is based on the Chinese auspicious pattern; and the three "human" shapes support each other to form a rotating dynamic figure.
B ₁₀	Aquarium in Tennessee, USA			Culture	The overall shape is circle, and several white curves are used in the middle to outline the outline of Marine animals; One of the lines, thicker than the others, refers to a river on the map.

Based on the classification in Table 2, the logos were grouped into three main shape categories: polygon (B5, B6, B9), square (B8), and circle (B1, B2, B3, B4, B7, B10). The analysis showed that circular forms appeared most frequently, with six out of ten logos constructed around a circular structure. These circular designs were not only visually balanced but also carried broader symbolic meanings related to unity, adaptability, and global identity. The results suggest that the "circle" is a dominant form in modern logo design, especially among global brands, due to its simplicity and strong communicative power. These findings provided a structural basis for integrating traditional circular motifs into modern visual identity design.

4.3 Shape grammar pattern innovation design

4.3.1 Extraction of initial shape

Based on the pattern classification in Table 1, expert interviews were conducted to select traditional motifs suitable for logo development. Three experts with backgrounds in design and cultural research were consulted. After reviewing the visual features and symbolic relevance of each pattern, they selected A4, A5, and A6 for their strong artistic value and potential for innovation within the context of "circle" culture.

These three patterns were chosen as the initial shapes for shape grammar application. Their characteristics are summarized in Figure 2. Using Adobe Illustrator, the patterns were converted into clean vector forms for further transformation. To streamline the design process, the patterns were renamed as C1, C2, and C3.

Based on the structural analysis of modern logos in Table 2, expert interviews were conducted to select suitable framework models for use in the design process. Three consumer participants were invited and briefed on the research objectives and methodology. They were then asked to evaluate the logos and identify structural frameworks that best reflect brand identity and aesthetic appeal.

As a result, two logos identified as B4 and B8 in Table 2 were selected for their visual clarity and alignment with branding principles. These structures were extracted using Adobe Illustrator and simplified into clean vector forms. For consistency in the shape grammar process, the selected structures were renamed as D1 and D2, as shown in Figure 3.

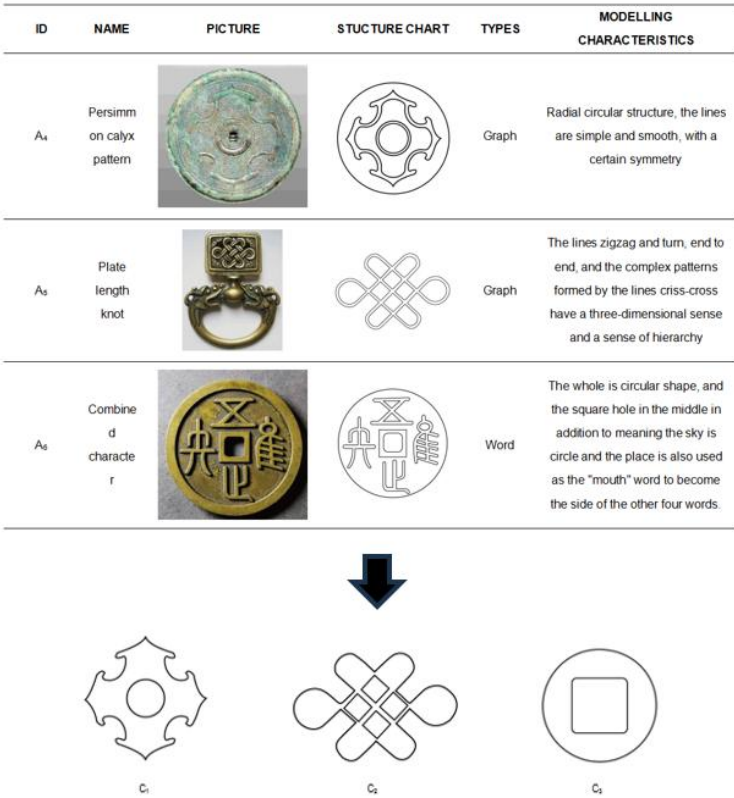


Fig. 2: Initial shape extraction

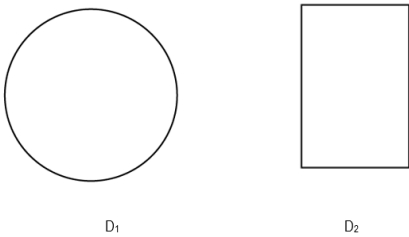


Fig. 3: Skeletal structure of logo modelling

4.3.2 Morphological inference of the logo

In the shape grammar process, using multiple reference samples can result in many design combinations. This increases the number of possible logo outcomes and makes the design process more complex. To make the process more efficient, the combination forms were planned. This helped guide the design direction and reduce unnecessary trials. Each combination includes one traditional pattern and one modern logo structure. The traditional motifs are labeled as A_x, referring to A₄ to A₆ in Figure 2. The modern structures are labeled as B_x, referring to D₁ and D₂ in Figure 3. The planned combinations for the Tomato Commune logo design are shown in Figure 4. These serve as the foundation for the next stage of design development.

Single combination form	Composite combination form	Multiple combination form
A_x B_x > B_x	A_x B_x > A_x B_x	A_x B_x A_x B_x

Fig. 4: Combination Forms for the Logo Design of Tomato Commune

The shape grammar deduction process involved four forms of visual experimentation, each combining selected traditional patterns (C₁, C₂, C₃) with modern logo structures (D₁, D₂) through specific rule-based operations. These operations followed a consistent logic

based on the shape grammar framework, using commands such as substitution, reduction, rotation, shear cut, and coordinate adjustment to explore new logo possibilities.

In Form 1, patterns C1 and D1 were first combined using R1 (Substitution) to produce H1. Then, C3 was transformed using R2 (Reduction) and R6 (Rotate) to form J1. H1 and J1 were further combined with R1 to create H2, and R8 (Coordinate fine-tuning) was applied to produce the final shape H3 (Refer to Figure 5).

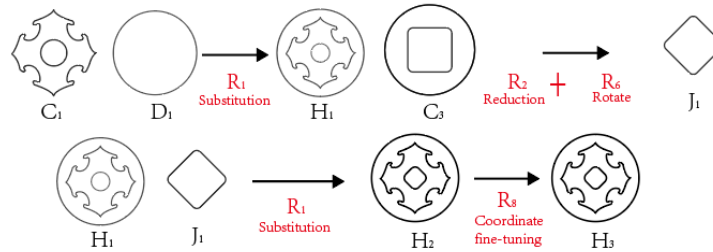


Fig.5: shape grammar deduction (Form 1)

In Form 2, C2 and D1 were used. Rule R2 (Reduction) generated K1, followed by R6 (Rotate) and R7 (Shear Cut) to create K2. Final refinement with R8 produced the completed form K3 (Refer to Figure 6).

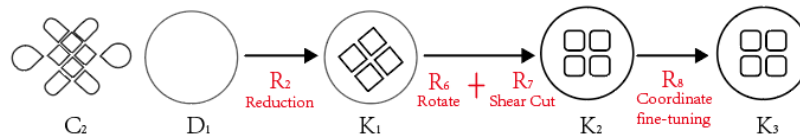


Fig.6: shape grammar deduction (Form 2)

In Form 3, C1 from the traditional pattern set and D2 from the logo structure set were used as the starting elements. A single combination method was applied. Rule R1 (Substitution) and R3 (Scaling) were used to create shape L1. Then, rule R6 (Rotation) was applied to produce L2. Finally, rule R8 (Coordinate fine-tuning) was used to refine the design, resulting in the final shape L3. (Refer to Figure 7).

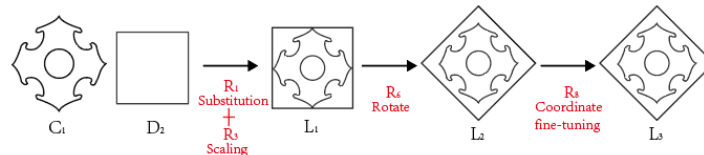


Fig.7: shape grammar deduction (Form 3)

In Form 4, C1 from the traditional pattern set and D1 from the logo structure set were selected. A composite combination method was used. Rule R3 (Scaling) was applied to C1 to produce shape M1, while rule R5 (Copy) transformed D1 into N1. Then, M1 and N1 were combined using rule R1 (Substitution) to create M2. Finally, rule R8 (Coordinate fine-tuning) was applied to generate the final shape, M3. (Refer to Figure 8).

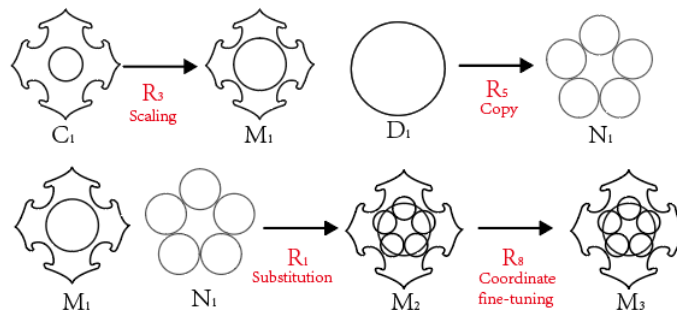


Fig.8: shape grammar deduction (Form 4)

These four forms illustrate how traditional cultural elements and modern logo structures can be systematically integrated through shape grammar to produce innovative and culturally relevant brand identities.

4.3.3 Final logo selection and color application

The final design was selected based on its symbolic clarity, structural balance, and brand relevance. Similar to methods used in packaging design that rely on structured decision models such as rough set theory (Xu, 2022), this study applied expert evaluation and formal rules to determine the most appropriate outcome for visual identity. After completing the four shape grammar deductions (Figures

4 to 7), the final logo was selected based on expert feedback, client preference, and brand relevance. Among the design options, scheme K3 (Refer to form 2 in Figure 6) was chosen as the final logo for its strong visual balance and cultural meaning.

The selected design reflects the idea of "round heaven and square earth" and embodies the artistic values of "circle" culture. It meets formal design standards while integrating traditional and modern elements. The result shows that effective logo design can be achieved by selecting, combining, or reworking meaningful patterns.

For color, red and green were chosen to match the Tomato Commune brand. These colors represent the tomato itself and are also culturally meaningful in the Chinese tradition. Red symbolizes energy and celebration, while green stands for life, growth, and harmony. The final logo, completed using digital tools, is shown in Figure 9.



Fig.9: The final logo design

5.0 Research findings

The findings of this study reveal how Chinese "circle" culture, when analyzed through visual patterns and symbolic meaning, can inform and enhance modern logo design. The application of shape grammar enabled the structured transformation of selected traditional motifs into simplified, contemporary forms. This process resulted in four experimental logo variations, demonstrating that traditional aesthetics can be effectively adapted while maintaining cultural identity. The final design, K3, was selected for its visual clarity, symbolic strength, and alignment with the brand image of Tomato Commune. These results highlight the potential of shape grammar as a design method for embedding cultural meaning into modern visual communication.

6.0 Conclusion

This study investigated how Chinese "circle" culture can be translated into modern logo design using a shape grammar approach. Through the analysis of traditional motifs, modern logo structures, and expert input, the research demonstrated that cultural patterns can be systematically adapted into contemporary visual identities. The development of the Tomato Commune logo served as a practical example, showing how shape grammar supports both creativity and cultural preservation. By combining traditional aesthetics with modern design needs, the study offers a replicable framework for future designers aiming to integrate cultural meaning into brand identity. To build on this work, future research is recommended to expand the range of cultural motifs, include diverse brand types, and explore user perception studies to evaluate the broader impact and acceptance of culturally inspired logo designs.

Paper Contribution to Related Field of Study

This paper contributes to the field of visual communication and design by demonstrating how traditional Chinese cultural elements, specifically circle patterns, can be systematically adapted into modern logo design using shape grammar. It offers a structured design approach that balances cultural heritage with contemporary branding needs, serving as a practical model for culturally-informed design practices.

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