Cultural Heritage Management: Innovative Design of Caisson Honeysuckle Pattern in the Middle Sui Dynasty in Mogao Grottoes

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Abstract. This paper proposes an innovative redesign method the honeysuckle pattern specifically for the caisson in the Mogao Grottoes during the middle Sui Dynasty in order to better inherit the art of Dunhuang and meet contemporary aesthetic requirements. A literature review and case study were used to summarize Lotus pattern types and characteristics. The paper proposes a novel design model for the honeysuckle pattern, drawing inspiration from historical designs and employing a combination of traditional and modern technology. Through this methodology, the paper concludes that the innovative honeysuckle pattern design for the caisson in the Mogao Grottoes successfully integrates traditional design elements with contemporary design methods. This design method does not only reflect the historical context of the Middle Sui Dynasty but also exemplify the potential of method in contemporary design practice.

Keywords. Honeysuckle pattern; Caisson ceilings; Innovative Design.

1. Introduction

The Mogao Grottoes are a series of caves located in Dunhuang, China. These caves are home to an extensive collection of Buddhist art and architecture dating back to the fourth century AD. Among the many artifacts and structures in the Mogao Grottoes, the caisson ceilings are particularly noteworthy. This pattern features a continuous scroll of vines and flowers that resemble the shape of a honeysuckle. The pattern is elegant and harmonious and reflects the artistic style of the middle Sui Dynasty [1].

In recent years, there has been growing interest in using contemporary design methods to create innovative designs based on traditional patterns. This paper aimed to contribute to this growing body of research by proposing an innovative design method of the honeysuckle pattern for the caisson in the Mogao Grottoes, drawing on both historical design elements and contemporary design techniques.
2. Methodology

This study uses a combination of qualitative and quantitative research methods, along with an artwork practice, to understand the innovative honeysuckle pattern for the caisson in the middle Sui dynasty Mogao Grottoes. According to Liu, qualitative study comprised a thorough review of literature and materials on the Sui Dynasty and Mogao Grottoes ‘history, art, and culture [2]. The literature review established the honeysuckle pattern's cultural and historical importance in Sui Dynasty caisson ceiling design. Literature reviews are exploratory in nature and summarize the many properties of honeysuckle patterns. In this study, we aim to Figure out how honeysuckle patterns are inherited. For consistency in collecting and analyzing honeysuckle patterns, researchers categorized and displayed them. Codes that are similar are grouped into higher-level categories.

In addition, the honeysuckle pattern's geometric qualities and characteristics were analyzed using quantitative methods. This requires systematically examining the pattern's size, proportions, and spatial relationships. Quantifying these aspects helped analyze and evaluate the pattern's design features [3].

Furthermore, the honeysuckle motif was explored further hands-on with an artwork approach, we propose a model of the design process based on You et al.'s image transforming design process. There are two stages in this design model, in other worlds, at this point, studio-based research methods are subdivided into the Art Making Process and the Studio Experience [4].

3. Finding

Mogao Grottoes near Dunhuang, China, include about 100 caves. Grottoes have three phases [5]. I'll Statistics representative grottoes with patterns for convenience. (See Table 1)

<table>
<thead>
<tr>
<th>Number of caves</th>
<th>Number of overcast bucket caves</th>
<th>Number of caves with caisson patterns</th>
<th>The proportion of covered bucket grottoes</th>
<th>Proportion of caves with caisson patterns (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early stage</td>
<td>Mid term</td>
<td>Anaphase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>33</td>
<td>65.9</td>
<td>44.6</td>
<td></td>
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<tr>
<td>29</td>
<td>10</td>
<td>38.7</td>
<td>28.6</td>
<td></td>
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<tr>
<td>15</td>
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<tr>
<td>7</td>
<td>7</td>
<td>22</td>
<td>7</td>
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</tr>
</tbody>
</table>

Table 1. Statistical figure of the staging of the grottoes during the Sui Dynasty

Through the statistical analysis of the Sui Dynasty's Inverted funnel grottoes, the following conclusion can be drawn: (1) As more grottoes are excavated over time, the Inverted funnel grottoes increase in number and proportion. (2) The increasing number of grottoes with inscribed caisson ceiling patterns provide us with abundant samples.
3.1 Type analysis of honeysuckle pattern

Honeysuckle pattern is a popular decorative pattern in northern China, having been used for decoration as early as the Han Dynasty [6]. With the introduction of Buddhism, honeysuckle became widely popular, so as to be applied in tombs from Wei and Jin Dynasties, Northern Wei architectural decoration and embroidery. Honeysuckle is also an important pattern in the art of the Dunhuang Grottoes. Honeysuckle flowers resemble trumpets, with four or five lobed petals, and were used from the Northern Liang to the Sui Dynasties. After the Sui Dynasty, the pattern gradually disappeared and was replaced by a variety of scrolling grasses, pomegranate patterns or other patterns from the Tang Dynasty. By the time of the Western Xia Dynasty, the honeysuckle pattern had reappeared, but honeysuckle was no longer as abundant and flourishing [1].

3.2 Honeysuckle Pattern

The following is a list of six different types of honeysuckle patterns from the early and middle Sui Dynasty, based on their branching characteristics: A continuous undulate honeysuckle pattern, B ring-shaped honeysuckle pattern, C tortoise shell shaped honeysuckle pattern, D calabash shaped honeysuckle pattern E triangular symmetrical honeysuckle pattern, and F twisted-branches honeysuckle pattern, which are subdivided into several patterns based on the number of leaves in the branches and vines, the way they are changed, and the way they are combined.

- **Type A: Continuous Undulate Honeysuckle Pattern**

  **Pattern I** is twisted Branches Shaped with Single Leaf. The branch vine is undulating with a single leaf each, and is rolled back in the same direction, continuously arranged, with three leaves of honeysuckle on either side. Represented by Grotto 405, Sui Dynasty (See Figure 1). **Pattern II** is separated Branches with Double Leaves. The branches are undulate with two opposite leaves, which rolled back outwards respectively, and accompanied by small leaves at the branches in a continuous row. Represented by Grotto 305, Sui Dynasty (See Figure 1).

  ![Figure. I Continuous Undulate Honeysuckle Pattern](image)

- **Type B: Ring-Shaped Honeysuckle**

  The feature of the ring-shaped honeysuckle pattern is the branching vine with a ring as the foundation, with two sets of symmetrical honeysuckle leaves set inside the ring. In the pattern IV shaped honeysuckle pattern, the branches and vines are displayed in a ring-shape, and the four leaves on the left and right are symmetrically placed in a V-shape. Grotto 240 of the Sui Dynasty is the typical example (See Figure 2).
Type C: Tortoise Shell Shaped Honeysuckle Pattern

The main feature of the C tortoise shell shaped honeysuckle pattern is the tortoise-type scrolling grass pattern as the base, with the tortoise-shaped interior configured with scrolling grass and small floral patterns. This pattern is represented by Grotto 407 of the Sui Dynasty (See Figure 3).

Type D: Calabash Shaped Strings of Beads

The main feature of the calabash shaped honeysuckle pattern is that the pattern is horizontally sequenced, with a gourd-shaped vine as the base, with inwardly curling leaflets arranged symmetrically above and below from the inside. This pattern is represented by Grotto 301 of the Sui Dynasty (See Figure 4).

Type E: Triangular Symmetrical Strings of Beads

The main feature of the triangular symmetrical honeysuckle pattern is the symmetrical grouping of two honeysuckle leaves, or the top bearing a single honeysuckle leaf, the overall shape being triangular. This type can be divided into three patterns according to the number of leaves, namely pattern I three-leaf honeysuckle, pattern II five-leaf honeysuckle, pattern III seven-leaf honeysuckle pattern, and patterns I + II evolving honeysuckle pattern (See Figure 5).
**Type F: Twisted-Branches Honeysuckle**

The pattern I continuous undulating honeysuckle. The first honeysuckle leaves show a continuous undulating shape, with other leaves smoothly arranged in the undulating shape, forming a certain pattern. This honeysuckle pattern is represented by Grotto 405 of the Sui Dynasty. The **pattern II** undulating honeysuckle pattern. The honeysuckle branch vine is wavy as the same as the undulating honeysuckle pattern II style A, also leaves of the different number of honeysuckle leaves drawn in the rotary branch, showing a richness of exaggerated painting characteristics (See Figure 6).

![Figure 6 Twisted-Branches Honeysuckle](image)

4. Analysis

By comparing the above types of honeysuckle pattern, it is clear that the honeysuckle pattern is mostly undulate-like, with the honeysuckle divided into three or four symmetrically arranged leaves, or twisting vine. The stems and vines of the honeysuckle pattern are intertwined and overlaid and nesting, which makes the honeysuckle pattern rich in variety.

By collating the early and middle Sui Dynasty patterns, the pattern is composed of an s-shaped structure, with double or single leaves on each side, forming individual patterns of triangular symmetry, undulate shapes, squares in undulating or radiating patterns (See Figure 7).

![Figure 7. s-shaped structure](image)

5. Discussion

*Case study - from honeysuckle pattern to Design model.*

According to Tan, with the increasing demand for cultural creative products, there is a need to develop new designs that incorporate traditional patterns into modern products [6]. The honeysuckle pattern is a perfect example of a traditional pattern that can be used in contemporary product design. Cultural creative product design involves using cultural elements and traditions to create unique and innovative products that reflect the values and aesthetics of a particular culture [7]. The honeysuckle pattern is an excellent example of cultural creative product design that can be used in various products such as clothing, accessories, home decor, and even digital products. This design
progress includes five stages, including Research and Analysis, Design Conceptualization, Pattern Refinement, Prototype Fabrication, Testing and Refinement.

Gaynor, Trott, and Vogel et al. argue that the development of a successful new cultural creative product is not a singular event, but rather a process in which a succession of activities is linked, providing a framework for controlling chaos without precisely dictating each step [8]. Despite its three consecutive phases, the framework does not provide enough assistance to designers or design teams to improve their performance.

As stated previously, the design process models are practical and effective and can be incorporated into a single framework. Thus, we propose a model of the design process based on General Principles of design image transforming design process, incorporating process as critical decision-making points, and integrating. There are two stages in this design model (See Figure 8).

Figure. 8. Design Model

6. Conclusion

This paper shows new models for the management of cultural heritage, revealing how traditional patterns are combined with contemporary design to create cultural value. We developed and applied a design process model based on General Principles of design. The outcomes of the study show that the proposed design process model is effective and can be able as a reference used for developing different types of cultural creative products, and furthering educational training.

The diversity of the cultural and creative industries, numerous factors influence the design of cultural and creative products. Due to limited human resources, time and space, this investigation still has room for improvement. In addition, the interpretation and comprehension of the honeysuckle pattern are subjective to some degree, and additional scholarly discourse and collaboration are required for a more complete understanding of its cultural implications. Future research could investigate the symbolism and cultural implications of the honeysuckle motif in greater depth. In addition, the implementation of advanced digital technologies, such as 3D scanning and visualization, can facilitate a
more comprehensive analysis and preservation of the Mogao Grottoes’ caisson ceilings and intricate designs.

References


