



Study on the Evolution of the Form of the Sumeru Pedestal from the Perspective of Dynasties and Its Digital Translation in Packaging Design

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Abstract. Based on the perspective of dynasties, this paper explores the evolution of the form of the Sumeru pedestal, combines the social and cultural background of each dynasty to explore the historical and cultural connotations behind it, and explores the innovative application of digital imaging technology in the field of packaging design and the forward-looking path of digital imaging technology. The study adopts a method that combines historical data sorting, case analysis and digital technology application. On the basis of exploring the formal characteristics and cultural connotations of the Sumeru pedestal in various dynasties, this paper focuses on exploring the innovative application of Sumeru pedestal elements in packaging design, and explores the potential of digital imaging technology in presenting and disseminating Sumeru pedestal culture and expanding packaging experience, so as to promote the inheritance, innovation and wide dissemination of ancient architectural culture in the digital context.

Keywords: Sumeru pedestal; packaging design; digital imaging technology; cultural translation; innovative application

1 Introduction

As an iconic architectural element, the Sumeru not only plays the role of stabilizing the building structure, but also carries a profound history and culture. Digging deeper into the historical and cultural connotations embedded in its formal evolution is an important window to understand the evolution of ancient architectural styles and the localization of Buddhism. Existing research focuses on the architectural history of Sumeru, and its systematic translation path in modern design has yet to be expanded. Nowadays, packaging design is an important carrier of cultural communication. Incorporating Sumeru elements into it and realizing cultural translation and innovative application can not only inject new inspiration into packaging design and enhance the cultural value of products, but also effectively promote the inheritance of ancient architectural culture. The rapid development of digital technology has opened up a new dimension for the display, experience and dissemination of traditional culture. This

study aims to combine the cultural excavation of Sumeru, the innovative application of packaging and the empowerment of digital technology to explore a cultural heritage and innovation path that integrates tradition and modernity, entity and digital.

2 The Dynasty Characteristics and Cultural Connotations of the Evolution of the Xumi Pedestal Form

2.1 Overview of the Xumi Pedestal

Sumeru Seat, also known as Vajra Seat and Sumeru Altar. "Sumiru" is found in the "Buddhist Sutra" and is the ancient transliteration of Himalaya^[1]. This architectural element originates from India. According to ancient legends, the Himalayas are regarded as "holy mountains". Using Mount Sumeru as the base can highlight the sacred greatness of the Buddha. The basic components of the Xumizuo are roughly composed of five parts: Fang, owl, waist, Guijiao (or Guijiao) and leather strips (see Fig. 1). The shape is stable and solemn, highly decorative, and carries profound symbolic meaning. As an ancient traditional platform base style, Xumizuo is widely used to support noble buildings such as palaces and temples, as well as sculptures such as Buddha statues and gods. It has both practical functions and cultural and religious value.



Fig. 1. Schematic diagram of the composition of the Sumeru pedestal

2.2 The Evolution of the Sumeru Pedestal in Different Dynasties and Characteristics

The development process of the Sumeru pedestal deeply reflects the cultural characteristics and social demands of different eras, and provides inspiration for modern design. During the Eastern Han Dynasty, Buddhism spread eastward, and the Sumeru pedestal was introduced to China. In the early days, the shape was simple, with few layers, and the decorative patterns were mostly foreign styles such as straight lines, geometry, lotus, and honeysuckle. This is consistent with the cultural dissemination status of Buddhism when it first entered the Central Plains and had not yet been fully localized. (see Fig. 2). By the Northern Wei Dynasty, a large-scale Sumeru pedestal appeared in China, the Yungang Grottoes, which initially had a relatively unified style and visual modeling features^[2], and its main function was to support the Buddha statues and highlight their divinity and majesty. This was due to the vigorous development of Buddhism at that time and the rulers' admiration for Buddhism.



Fig. 2. Sumeru pedestal in Yungang Grottoes of Northern Wei Dynasty

During the Tang and Song Dynasties, Sumeru pedestal entered its heyday. During the Tang Dynasty, the country was strong, the culture was open and inclusive, and foreign exchanges were frequent. The number of layers of Sumeru pedestal increased, the waist was raised, and the volume was majestic. The decorative patterns retain Buddhist elements while incorporating a large number of local secular cultural elements, such as the evolution of honeysuckle patterns into curling grass patterns, reflecting the eclectic nature of Tang Dynasty culture^[3]. The commodity economy flourished in the Song Dynasty, and the civic culture rose. Under the norms of the "Yingzao Fashi", the Xumi pedestal became more rigorous in shape and complex in structure, with new components such as waisted Shu columns. The decorative patterns incorporated auspicious patterns such as flowers, birds and animals, and the symbolic meaning became secular, satisfying the society's yearning for a better life. It also reflects the high development of handicrafts in the Song Dynasty and the popularization of cultural aesthetics.

From the Yuan Dynasty to the Qing Dynasty, the style of the Xumi pedestal evolved and simplified. In the Yuan Dynasty, Lamaism was prevalent, and the decoration was simple and elegant. Religious beliefs had a profound impact on architectural aesthetics^[4]. During the Ming and Qing dynasties, the monarchy was strengthened, and patterns such as dragons and phoenixes, which symbolized imperial power, became popular in the decoration of the Sumeru pedestal. The colors were gorgeous, and stone carvings and brick carvings were widely used to reflect the royal majesty. At the same time, Sumeru throne has been widely among the people and is used in archways, stone lions, etc., with diversified symbolic meanings. This is closely related to the development of the commodity economy in the Ming and Qing dynasties, the growth of the citizens' class, and the gradual penetration of culture into the people, fully reflecting the high degree of decoration skills and the social and cultural demands of a specific era^[5]. (see Fig. 3).



Fig. 3. Embossed patterns of Sumeru throne in the Qing Dynasty

3 The Innovative Application of Sumeru Elements in Packaging Design

3.1 Extraction and Analysis of Sumeru Pedestal Elements

In the design of packaging appearance, the characteristics of the multi-layer structure of the Sumeru pedestal can be extracted, and the stacking form of the Sumeru pedestal can be used as a reference to increase the fun and ritual sense of the packaging. In addition, the decorative patterns of the Sumeru pedestal are also prominent. The lotus pattern is a common decorative pattern on the Sumeru pedestal. In Buddhist culture, the lotus symbolizes holiness and purity and has extremely high spiritual connotations. Extracting and applying the lotus pattern to packaging design can make it more in line with modern aesthetics through simplification, deformation and other techniques. In addition to lotus patterns, curling grass patterns, dragon and phoenix patterns also often appear in Sumeru pedestal decorations, enhancing the grade and cultural value of the product. The color system of the Sumeru pedestal is another highlight used in packaging design. During the Ming and Qing Dynasties, the glass craft developed, and the Sumeru pedestal was often decorated with colorful glass. The yellow, green and other glass colors matched each other, which looked magnificent. In packaging design, the color matching of the Sumeru pedestal can convey the charm of traditional architectural culture^[6].

3.2 Principles and Methods of Integrating Sumeru Pedestal Elements into Packaging Design

In packaging design practice, the application of Sumeru pedestal elements is rich and varied. According to the needs of packaging design, the shape, pattern, color and other elements of the Sumeru pedestal can be flexibly selected, and the four principles can be used to create a packaging design that is in line with modern public aesthetics and does not lose cultural heritage^[7]. The following Table 1 shows the four principles and their application strategies and examples.

Table 1. Comparison table of Sumeru pedestal packaging design principles, strategies and cases (created by the author)

Principle	Design strategy	Case Reference
Cultural inheritance	Trace the history of the pattern and interpret its cultural connotations	Xinghua Pavilion Gift Box:Simplifies the elegant lotus pattern of the Tang Dynasty, while maintaining the core of the sacred culture

Adaptability of the times	Simplify the traditional form and combine with digital reconstruction	Extract the stepped structure of the Tang and Song Dynasty's square base, and recreate the visual form through geometric lines and numerical patterns.
Functional practicality	Adaptive packaging function, lightweight material technology	Eight Benefits Tea Canister: Inspired by the hourglass-shaped curved design, it takes into account both the grip feel and the anti-slip function through embossing.
Brand consistency	Match the style of the dynasty and enhance the symbolic value	High-end gift box: Made with dragon and phoenix patterns from the Ming and Qing dynasties and gold-plating technique, conveying the brand image of luxury.

4 Exploration of Cultural Translation and Packaging Interaction Innovation under the Empowerment of Digital Imaging Technology

4.1 3D Digital Reconstruction Builds Accurate Cultural Gene Map and Design Support

3D digital reconstruction technology theoretically deconstructs the historical form of Xumi pedestal through virtual modeling, which mainly relies on laser scanning, photogrammetry, structured light scanning and other technical means. Its workflow usually includes: high-resolution data acquisition of target objects, generation and processing of point cloud data (denoising, registration, fusion), reconstruction of 3D geometric models, and final high-fidelity texture mapping, which can capture the geometric form, surface texture and color information of physical objects in a non-contact and high-precision manner, and build analyzable digital archives with the help of multi-source data acquisition^[8]. It can be applied to representative examples of Xumi pedestals from past dynasties, such as the simple style of Northern Wei grottoes, the complex base of Tang and Song palaces, and the royal glazed base of Ming and Qing dynasties. System scanning and modeling, and can build detailed digital archives. This not only achieves the permanent preservation of cultural heritage, but also provides a basis for quantitative and visual research on the evolution of form from a "dynasty perspective". For example, based on accurate three-dimensional models, virtual measurement and morphological comparison can be carried out to quantitatively analyze the differences in the number of corbels, waist ratios, and scale relationships of components in different dynasties; specific decorative motifs, such as lotus patterns, can be traced from the early Buddhist style to the localized and secularized morphological trajectory; or the structural characteristics of new components such as the Song-style Xumi pedestal Shu column can be analyzed. For damaged examples, virtual restoration

attempts combined with historical documents can provide an auxiliary perspective for understanding their historical original appearance.

Taking the Xinghualou Mid-Autumn Mooncake Gift Box as an example (see Fig. 4), its design inspiration comes from the solemn form of the Xumi pedestal in the Tang and Song dynasties. The multi-layer corbel structure corresponds to the architectural language of "upper beam-waist-guijiao": the bottom layer uses rough textured cardboard to simulate the brick and stone texture of the *guijiao*, the middle layer of the waist part uses glossy colored thin paper and prints simplified Tang lotus patterns, and the upper edge draws on the slightly warped shape of the upper beam and is supplemented with gold edging. Theoretically, the proportional relationship of the Tang Dynasty Sumeru pedestal extracted through three-dimensional digital reconstruction, such as the visual rhythm of the layered structure of 2:3:1, can further optimize the size distribution of each layer of the gift box, so that the packaging can more accurately convey the majestic charm of Tang Dynasty architecture in static vision and avoid the subjective deviation of traditional empirical design from historical prototypes.



Fig. 4. Xinghualou Mid-Autumn Festival mooncake gift box

These digital analysis results can provide more accurate and rich cultural references for packaging design, solving the problem of incomplete morphological information caused by reliance on two-dimensional data in traditional design. Designers can directly extract typical structural proportion characteristics, representative decorative pattern units and color matching schemes based on physical analysis from the three-dimensional models of a specific dynasty. These structured and quantifiable data can be directly converted into the source of visual elements for packaging design, enhancing the innovative possibility of applying cultural elements in design. The key is to convert historical morphological data into a "cultural gene map" that can be directly used by modern design^[9].

4.2 Augmented Reality (AR) Expands the Narrative Dimension of Packaging and Immersive Interactive Experience

Augmented reality (AR) technology achieves "enhancement" of the physical environment by superimposing registered and aligned virtual information such as images, videos, 3D models, text, etc. in real time when users observe the real world^[10]. Its technical implementation relies on image recognition or marker tracking to determine the position and posture of virtual content overlay, and presents it on the user's device through an efficient rendering engine. AR technology is conceived as an interactive medium that connects the Xumi pedestal element packaging with its historical and cultural background. The Xumi pedestal elements on the packaging surface are identified by computer vision algorithms to trigger multi-level narratives. In the design of the scheme, specific visual recognition features can be set on the packaging. When users scan these features through mobile devices, the superimposed digital content can be triggered on the physical packaging. These contents may include: dynamically displaying the Xumi pedestal structural hierarchy and its cultural symbolic meaning used in the packaging design; focusing on the specific patterns used on the packaging, presenting a high-fidelity detailed view of the pattern on the historical Xumi pedestal, and explaining its meaning changes in different dynasties.

Taking the Badayi Pu'er Tea Collection Gift Box as an example(see Fig. 5), the simplified phoenix pattern on its surface can be used as a theoretical interactive anchor point. When the user scans the pattern, AR technology can dynamically present the imperial symbolic meaning of the phoenix pattern in the Sumeru pedestal of the Ming and Qing Dynasties - superimposing the documentary record of "the phoenix is a lucky bird, protecting the imperial power" in the Qing Dynasty Hui Dian, and comparing it with the single-feather straight-line phoenix pattern in the Lamaist style of the Yuan Dynasty, revealing its semantic evolution from a religious symbol to a secular auspicious pattern; for the waist shape of the tea can, virtual animation can be used to demonstrate its geometric echo with the structure of the Song Dynasty Sumeru pedestal Shu column, transforming the "architectural mechanics-container engineering" translation logic behind the design into a visual interactive experience.



Fig. 5. Badayi Pu'er Tea Collection Gift Box (Pu'er Tea Gift Box_Taobao Search)

This interactive concept of virtual-real integration can transform packaging from a "commodity container" to a "cultural narrative carrier." In theory, AR technology can construct three layers of progressive narrative logic: the basic cognitive layer marks the names of components, such as the lower beam, waist, etc. and their symbolic meanings; the historical deep description layer demonstrates the evolution of patterns across dynasties in the form of animation; the scene immersion layer virtually reconstructs the inspiration tracing scene of "Xumeru pedestal-architecture-packaging", such as the overlapping display of the Tang Dynasty palace base and the gift box structure, thereby guiding users to shift from passive viewing to active exploration, enhancing the depth of understanding of the cultural value of the product, and providing a new way for young consumer groups to contact traditional architectural culture^[11].

5 Conclusion

The evolution of the Xumi pedestal reflects the development trajectory of ancient architectural art to a certain extent. The essence of architectural art as "man-made objects" allows its art form to be derived and developed in the fields of packaging design, digital technology, and other fields, and to blend with each other, promoting the protection and inheritance of traditional architectural culture, adapting it to the modern cultural environment, and obtaining a broader space for survival and development^[12]. Looking to the future, as the research continues to deepen, we will have a deeper understanding of the changes in the form of the Xumi pedestal and the cultural significance behind it, and actively use digital imaging technology to achieve modern protection. This will not only help the scientific development of ancient building protection and restoration work, but also provide inspiration for modern design, provide reference for possible empirical research and application development in the future, and effectively promote the inheritance and innovation of traditional culture in modern society.

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