THE CONSTRUCTION AND DESIGN OF A TRADITIONAL CERAMIC CULTURE DATABASE ALONG THE SILK ROAD

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ABSTRACT
Based on the contemporary development of design innovation and the demand for the preservation of traditional culture, the integration of culture and technology, digital media, and art has become a significant interdisciplinary research direction. This paper focuses on ceramic artifacts from the northwestern region of China along the Silk Road. Using data collection and re-measurement of these artifacts, we completed the systematic organization, digitization, and visualization of traditional culture. Additionally, we analyzed the contemporary needs for design innovation and subsequently constructed a database for the innovative design of ceramic culture. This database offers design materials and innovative insights for the preservation of existing traditional ceramic culture along the Silk Road and for future design innovations based on this heritage.

Keywords: Industrial Design, Silk Road, Ceramic Culture, Cultural Digitization, Design Innovation, Database

INTRODUCTION
For millennia, the civilizations along the Silk Road have been intertwined, creating a unique cultural landscape that has significantly influenced the development of the regions and countries along its path [1]. Currently, research on the Silk Road, particularly within China, benefits from abundant resources, such as artifacts, literature, and well-documented field investigations, particularly in the realms of culture, art, and folklore.
Among these, ceramics—one of humanity's greatest inventions—have played a vital role in both production and daily life since their inception. Ceramic vessels, initially designed to meet functional needs, reflect various aspects of life, including folk customs, production techniques, culinary traditions, lifestyle, environmental adaptation, and aesthetic preferences.

1 OVERVIEW OF TRADITIONAL CERAMIC CULTURE ALONG THE SILK ROAD
Since ancient times, the Silk Road has served as a crucial bridge for cultural exchange between Eastern and Western civilizations. The cultural interactions along the Silk Road have continually fostered the development of diverse regional cultures. The selection of research areas along the Silk Road generally corresponds to the regions traversed by the traditional overland routes. Within China, this primarily includes the provinces and regions of Shaanxi, Inner Mongolia, Gansu, Ningxia, Qinghai, and Xinjiang. Internationally, it extends to include the five Central Asian countries, as well as regions such as Russia, Ukraine, and various countries in Western Asia. This study is based on the overland Silk Road regions within China, with some expansions into additional areas.
Research on the ceramic culture along the Silk Road currently encompasses several academic perspectives [2]. From an art historical standpoint, studies analyze the craftsmanship, forms, decorations, and aesthetic design concepts associated with these artifacts. Archaeologically, the research has developed mature classifications for these artifacts and examined their current state of preservation. Historically, there is an exploration of these objects as practical items used in daily life, with a comprehensive analysis of their social context. In the field of design studies, however, it is crucial to consider the historical evolution of individual artifacts in conjunction with the comprehensive factors

that influence their design. Such a unified approach enables a deeper understanding of both the material and spiritual cultural dimensions, facilitating effective design development.
Thus, the study of ceramic artifact evolution is essentially an exploration of the processes through which objects are culturally crafted, form distinct cultural identities, engage in cultural exchanges, and undergo self-evolution [3]. It also involves a holistic examination of related aspects such as dining customs, modes of transmission, interaction patterns, and the social and spiritual aspects of daily life.

2 CURRENT STATUS OF DESIGN RESEARCH ON TRADITIONAL CERAMIC CULTURE INNOVATION

With the rise of the cultural and creative industries, design innovation in traditional craftsmanship is continually advancing. Theoretically, scholars focus on extracting and reconstructing elements from ceramic artifacts, such as decorative patterns[4]and shapes[5], for application in modern design. They also explore ceramics-related cultural product design methodologies based on theories like Kansei Engineering[6]and user experience[7], addressing the emotional needs of users. Practically, researchers emphasize integrating elements with regional cultural characteristics[8]and ethnic cultural symbols[9]in product design. They also leverage digital tools, such as mobile applications and digital exhibition halls, to introduce craftsmanship[10], display[11], and encourage public interaction with collections[12].
The existing body of research comprehensively demonstrates the interdisciplinary inclusiveness of design studies, adeptly using emerging research tools and advanced methodologies to facilitate multi-level, multi-perspective, and holistic design innovation transformations[13]. However, there are still some notable challenges:

1) Current ceramic artifact design innovations often focus on visual design elements (such as shapes, patterns, and colors) gathered from archaeological literature. This approach typically lacks a comprehensive consideration of factors such as typological accuracy, cultural authenticity, holistic data analysis of artifacts, and context-specific usage. As a result, design practices predominantly emphasize individual artifact design, with less emphasis on the lifestyles and artifact-making philosophies that the objects reflect.
2) Due to the lack of quantitative standards addressing the differences between professional and general public needs in ceramic artifact design, there is often a mismatch between supply and demand. Many cultural products fall short of meeting the personalized needs of contemporary users, leading to limited industrial transformation of cultural heritage resources.

Therefore, establishing a database for ceramic culture design innovation bridges the gap between archaeology and design. This enables the sharing of research data, resources, and findings while facilitating direct practical applications. Additionally, by leveraging quantitative data on design elements, this database can enhance the understanding of distinctions between cultural disseminators and consumers, ultimately supporting the consumer-driven transformation of design.

3 CONSTRUCTION IDEAS FOR A CERAMIC CULTURE DESIGN INNOVATION DATABASE

3.1 Overall Construction Framework for the Ceramic Culture Design Innovation Database

The Ceramic Culture Design Innovation Database includes both original relic data and design innovation materials. The original relic data encompasses the classification, sequencing, and analysis of relationships between different types of artifacts. The design innovation materials are derived from both the public and expert communities, where qualitative perceptions are transformed into more precise data through data filtering and processing (see Figure 1 for the framework).

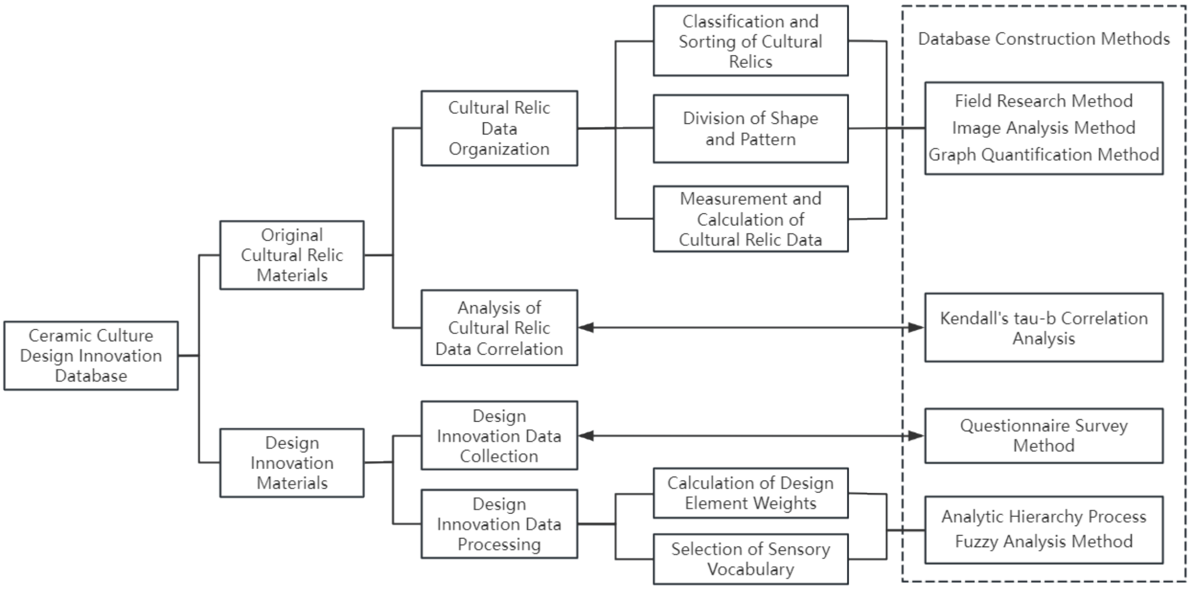


Figure 1 Ceramic Culture Design Innovation Database Structure

3.2 Original Relic Materials

3.2.1 Cataloging of Cultural Relics Materials

(1) Classification and Arrangement of Cultural Relics and Style Division

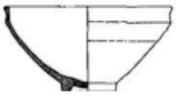
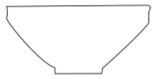
Firstly, the classification, ordering, and pattern division of artifacts are based on established archaeological typology, using the typographic quantification method in conjunction with design requirements. The typographic quantification method is rooted in archaeological typology, categorizing samples into distinct types, each characterized by features that distinguish it from other types. For a type to be clearly differentiated, it must be exclusively defined, ensuring it can be systematically separated from others[14]. This method serves as a fundamental approach for collecting data on ceramic dining vessels along the Silk Road, allowing a clear understanding of both the functional types of ceramic vessels and the main types suited to specific functions.

Based on this method, the classification of Silk Road ceramic vessels is organized according to functional characteristics and the primary interaction interfaces relevant to design use (for instance, cups and bowls are categorized by rim shape; large containers by their body shape; and pitchers by their handle design). Ultimately, the database of ceramic artifact data relies on a scientific archaeological classification system, integrating functional use and interaction points during use, aligning archaeological classifications with design application needs to emphasize the design focus of each artifact.

Secondly, using the typographic quantification method and considering the quantity of each type of artifact, the classification and ordering of vessel types are completed. The vessel types include twelve categories: chicken-leg vase, ewer, bowl, handle cup, tea cup, plate, cockscomb pot, phoenix-head pot, tied jar, jade pot, high-foot cup, and flat pot. Secondly, the classification of styles is carried out based on the changes in the functional use and usage patterns of each vessel type, as shown in Table 1.

Table 1 Classification and Categorization of Ceramic Relics (Partial)

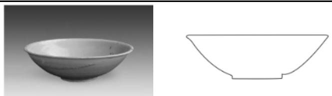
Type	Quantity	Subcategory	Illustration	
Tea Cups	60	Narrow-Mouthed		

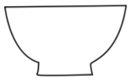
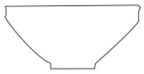
		Wide-Mouthed		
		Constricted-Mouthed		
Stem Cups	63	Flared-mouth style		
		Open-mouth style		
		Straight-mouth style		
Ewers	117	Short straight-spout style with a bulging belly		
		Long curved spout style with a bulging belly		
		Cylindrical body with a short straight spout		
		Flat, rounded body with a long curved spout		
		Gourd-shaped body with a short straight spout		

In the Spring and Autumn Period, tea bowls appeared as vessels for eating, as introduced in the *Comprehensive Dictionary of Ancient Chinese Vessels*. The early bowls from the Spring and Autumn and early Warring States periods were made of bronze or gold, had shallow bodies, three feet, and lids, resembling a basin. During the Three Kingdoms, Jin, and Northern and Southern Dynasties periods, the

custom of tea drinking had not yet spread nationwide, with the northern regions primarily consuming "fermented milk." At this time, tea utensils were not distinctly separate from wine vessels, and wide-mouthed bowls were commonly shared for both purposes. Initially, tea bowls appeared as food vessels, made of bronze or gold, and later evolved into an elliptical shape. During the Warring States, Qin, and Han periods, some bowls were made of lacquer. By the Eastern Han dynasty, porcelain tea bowls were produced, which subsequently became mainstream, serving as essential vessels for both tea and wine.
The ceramic tea bowls unearthed along the Silk Road are mainly concentrated from the Sui, Tang, and Song dynasties, with distinct changes in the shape and form across these three periods. Tang Dynasty tea bowls were more open and shallow compared to those from the Song Dynasty. Their basic features included a wide mouth, slanting straight walls, and a jade bi-disc base. The shape of the tea bowl was larger than the tea saucer and often featured lotus petal or lotus flower designs. The saucer's rim, typically lower, was curled into a lotus leaf shape. During the Song Dynasty, tea bowls came in many styles, including those with constricted or flared mouths and deeper bowls, developed for the practices of tea fighting and tea whisking.
(2) Measurement and Calculation of Cultural Relic Data
In the process of data measurement, the 12 types of cultural relics include data on height, center of gravity, volume, and complexity of form. Additionally, depending on the specific design components of each artifact, further measurements are taken. These include the spout angle and handle interior space for ewers; the diameter of the body, base, and mouth for chicken-leg vases, flat pots, phoenix-head pots, jade pots, and tied jars; the hole types and handle interior space for cockscomb pots; the base and mouth diameters for bowls and plates; the handle interior space, base, and mouth diameters for handled cups; the ratio of bowl to saucer for tea bowls; and the ratio of the foot to the overall height and the rim inclination for high-footed cups.
The complexity of form is assessed based on image elements drawn from quantitative image mapping, which classifies the complexity into four levels (ranging from level 1 to level 4, from least to most complex). For example, the data measurements for tea bowls include height, center of gravity, volume, and complexity of form (some relic data are shown in Table 2).

Table 2 Data Sorting of Tea Cups (Partial)

Subcategory		Images and outlines	Data			
			Height (cm)	Center of Gravity (cm)	Volume (cm³)	Shape complexity
Narrow-Mouthed	Slanting curved body style		4.3	2.68	149.7	2
			5.7	3.16	398.1	1
	Slanting straight body style		1.9	0.90	21.6	2
Wide-Mouthed	Slanting straight body style		5.1	2.83	303.6	2
	Slanting curved		6.4	3.76	966.7	3

body style			4.6	2.70	144.3	2
Constricted -Mouthed			8	4.44	764.2	3

3.2.2 Correlation Analysis of Cultural Relic Data

Kendall's tau-b correlation analysis is used for the correlation analysis of artifact data. Kendall's tau-b is a method suitable for analyzing the correlation between pairs of ordinal variables without requiring them to follow a normal distribution. When all variables are ordinal, Kendall's tau-b coefficient can be applied to assess correlations. This method is used to analyze the correlations between various components and measurements of ceramic artifacts, such as volume, total height and center of gravity, total height and shoulder height, total height and maximum belly width, total height and rim circumference, handle area, spout inclination, usage method, and shape complexity. By comparing these data points, a correlation heat map can reveal the relational strength among design elements in each component, allowing for a rapid understanding of key design features across different artifacts and the relative importance of components in various functional items.

For example, a correlation analysis was conducted on a sample of 60 tea cups (48 from the Song Dynasty, 6 from the Liao Dynasty, and 6 from the Jin Dynasty). Measurements such as height, diameter, and base diameter were taken, along with calculations for the center of gravity height from the ground and the volume of each cup. The 60 artifacts were arranged by dynasty and height for analysis. Using the data from these tea cups, a comprehensive analysis was performed across all types, resulting in a correlation coefficient table, as shown in Table 3.

Table 3 Kendall's Tau-b Correlation Coefficient Table for the Tea Bowls

	Height	Diameter (specifically referring to the opening)	Base Diameter	Center of Gravity (Height Above Ground)	Volume	Shape Complexity
Height	1(0.000***)	0.611(0.000***)	0.298(0.001***)	0.846(0.000***)	0.735(0.000***)	0.138(0.166)
Diameter (specifically referring to the opening)	0.611(0.000***)	1(0.000***)	0.498(0.000***)	0.542(0.000***)	0.845(0.000***)	0.229(0.021**)
Base Diameter	0.298(0.001***)	0.498(0.000***)	1(0.000***)	0.259(0.004***)	0.503(0.000***)	0.033(0.739)
Center of Gravity (Height Above Ground)	0.846(0.000***)	0.542(0.000***)	0.259(0.004***)	1(0.000***)	0.656(0.000***)	0.143(0.152)
Volume	0.735(0.000***)	0.845(0.000***)	0.503(0.000***)	0.656(0.000***)	1(0.000***)	0.167(0.090*)
Shape Complexity	0.138(0.166)	0.229(0.021**)	0.033(0.739)	-0.143(0.152)	0.167(0.090*)	1(0.000***)

Note: ***, **, and * correspond to significance levels of 1%, 5%, and 10%, respectively.

In the correlation coefficient table, results marked with ***, **, and * indicate significance. A significant correlation between two variables suggests a relationship, while a lack of significance indicates no correlation. Specifically, ***, **, and * correspond to significance levels of 1%, 5%, and 10%, respectively; a higher significance level indicates a stronger correlation.

According to the correlation coefficient table for the 60 tea bowls (Table 3), the relationships among the tea bowl characteristics are ranked from high to low in terms of correlation strength as follows: height and center of gravity, mouth diameter and volume, height and volume, volume and center of gravity, height and mouth diameter, mouth diameter and center of gravity, foot diameter and volume, mouth diameter and foot diameter, height and foot diameter, foot diameter and center of gravity, and mouth diameter and complexity of form. There is no correlation between the complexity of form and the relationships involving height, foot diameter, center of gravity, and volume.

Discussion:

1. Among the tea bowls, the elements of height, mouth diameter, foot diameter, center of gravity, and volume are closely related and should be considered comprehensively. The primary consideration should be the relationship between height and center of gravity.
2. The factors that show no correlation among the tea bowls are the relationships between the complexity of form and height, foot diameter, center of gravity, and volume. These four relationships can serve as a starting point for seeking design innovations.

3.3 Design Innovation Materials

3.3.1 Data Collection for Design Innovation

Firstly, the Analytic Hierarchy Process (AHP) is used to collect data for design innovation. AHP is a decision-making method that combines qualitative and quantitative analysis to solve complex multi-objective problems. This method is applied to analyze design elements with the goal of meeting public needs and involves pairwise comparisons to determine the relative importance of each design element, ultimately establishing weight indicators for each element of the artifact. For example, by constructing six design evaluation elements—characteristics, function, shape, color, cultural type, and pattern—and conducting pairwise comparisons, the elements are ranked according to their weights. This provides insights into the perceived importance of each design element among the public, guiding designers in their design innovation efforts.

For instance, a questionnaire survey is conducted among the public and experts regarding ceramic artifacts, covering information on six design elements of the artifacts as well as emotional perceptions toward them. The six design elements involve breaking down each artifact into the following components: functionality (whether the artifact has practical use), characteristics (whether the artifact possesses distinctive features in certain aspects), cultural type (including Central Plains culture, ethnic minority culture, foreign culture, and multiculturalism), shape (the external contour and form of the artifact), color (glaze colors such as white, celadon, black, floral, brown, etc.), and patterns (including geometric patterns, floral patterns, animal motifs, and narrative patterns). Each element will be subject to specific questions. Regarding subjective perception, respondents will be provided with descriptive terms (e.g., generous, simple, luxurious, exquisite, minimalist, practical, etc.) to choose from, and they can also fill in other terms they find appropriate. Taking the Tang Dynasty "Dazhong Yuan Nian" engraved floral ewer as an example, a total of 7 questions will be posed regarding this artifact for both the general public and experts, as shown in Table 4.

Table 4 Questionnaire for the Tang Dynasty "Dazhong Yuan Nian" Inscribed Floral Pattern Teapot

Type	Question	Personal Status				
		Completely unaware/ Completely lacks characteristics/ Completely unacceptable	Not very sure/ No characteristics/ Not very acceptable	Have seen/ Aver age	Aware/ Has some characteristics / It's okay	Familiar/ Very distinctive / Relatively like

	（1）Do you know what the specific function is? （2）Does it have certain characteristics? （3）Are you aware of which cultural type it belongs to? （4）Do you like this shape? （5）Do you like this color? （6）Do you like this pattern?	/
	（7）Which words do you think can describe it?	Luxurious/ Opulent/ Hefty/ Practical/ Elegant/Attractive/ Delicate/ Simple/ Innovative/ Interesting/ Durable/ Rugged/ Minimalist/ Compact

After distributing and collecting the questionnaires, a total of 89 responses were gathered for this artifact. Three invalid questionnaires, which were completed in an excessively short time, were excluded, resulting in 86 valid questionnaires.

3.3.2 Processing of Design Innovation Data

(1) Calculation of Design Element Weights

First, the survey results for the six design elements were analyzed using the Analytic Hierarchy Process (AHP) to perform pairwise comparisons among the elements, ultimately deriving the weight of each element. The specific steps are as follows: First, the responses from the survey participants were converted into a Likert scale format[15]to facilitate subsequent calculations. Next, for a selected artifact, the answers from one respondent were converted into the Likert scale, and the values for each element were compared pairwise, resulting in a judgment matrix. Subsequently, the weight values for each indicator were calculated using the square root method based on the constructed judgment matrix. After that, the consistency of the judgment matrix was tested to determine the validity of the results. Finally, the results were presented in the form of a radar chart to analyze the interrelationships among the various elements.

Using the aforementioned ewer as an example, the answers of 15 respondents to the six questions regarding functionality, characteristics, cultural type, shape, color, and patterns were converted into a Likert scale, as shown in Table 5. Based on the results presented in the Likert scale, the answers were transformed into 15 judgment matrices, one of which is shown in Table 6.

Table 5 Likert Scale for the Questionnaire on the Tang Dynasty "Dazhong Yuan Nian" Inscribed Floral Pattern Teapot

Serial Number	Function	Characteristics	Cultural Type	Shape	Color	Pattern
1	9	7	9	7	7	5
2	1	5	1	3	3	5
3	5	5	3	5	5	7
4	5	5	5	5	5	5

5	5	5	5	7	5	5
6	5	5	3	7	7	7
7	3	5	5	7	5	5
8	1	7	1	7	9	7
9	7	7	1	3	7	9
10	3	5	3	7	7	7
11	3	7	3	5	7	5
12	7	7	7	7	7	7
13	9	7	3	7	5	9
14	5	5	5	5	7	9
15	7	7	5	9	7	9

Table 6 Evaluation Matrix for the Six Key Elements (Partial)

Index	Function	Characteristics	Cultural Type	Shape	Color	Pattern
Function	1	9/7	1	9/7	9/7	9/5
Characteristics	7/9	1	7/9	1	1	7/5
Cultural Type	1	9/7	1	9/7	9/7	9/5
Shape	7/9	1	7/9	1	1	7/5
Color	7/9	1	7/9	1	1	7/5
Pattern	5/9	5/7	5/9	5/7	5/7	1

Based on the judgment matrix, the weight characteristic vector was further derived. The approximate value of the eigenvector of the judgment matrix was calculated using the square root method, denoted as ω, with calculations shown in Equation (1). After obtaining the average value of the 15 eigenvectors, the average eigenvector was then used to calculate the weight values, yielding the average weights for the six main elements of the artifact, as indicated in Equation (2). Finally, a radar chart was created based on the weight calculation results, as shown in Table 7. The distribution of the radar chart indicates that for the Tang Dynasty "Dazhong Yuan Nian" engraved floral ewer, color, shape, pattern, and characteristics are the more important design elements.

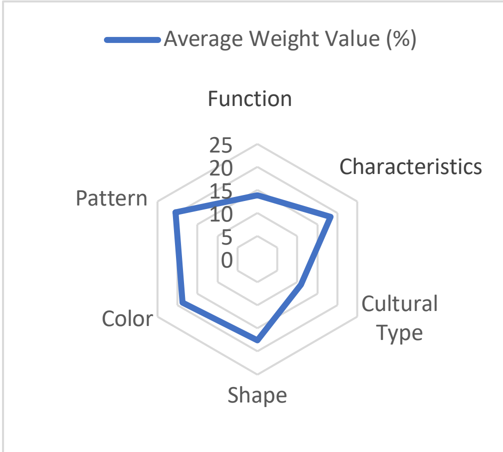
$$\bar{\omega}_i = \sqrt[m]{\prod_{j=1}^{m} a_{ij}} \quad (1)$$

$$\omega_i = \frac{\bar{\omega}_i}{\sum_{j=1}^{m} \bar{\omega}_j} \quad (2)$$

Table 7 Calculation Results of Average Weight Values for the Tang Dynasty "Dazhong Yuan Nian" Inscribed Floral Pattern Teapot

Index	Average Eigenvector	Average Weight Value (%)	Radar Chart Drawing

Function	0.9	13.89
Characteristics	1.19	18.33
Cultural Type	0.71	10.94
Shape	1.14	17.56
Color	1.22	18.79
Pattern	1.33	20.49



After the weight calculations were completed, a consistency test was conducted on the constructed judgment matrix to ensure its accuracy. This involved solving for the maximum eigenvalue and the consistency index (CI) to calculate the consistency ratio (CR), thereby verifying its consistency, as shown in Equations (3)-(5). The calculation results are presented in Table 8.

$$\lambda_{\max} = \frac{1}{n}\sum_{i=1}^{n}\frac{(AW)_i}{W_i} \tag{3}$$

$$CI = \frac{\lambda_{\max} - n}{n-1} \tag{4}$$

$$CR = \frac{CI}{RI} \tag{5}$$

Table 8 Consistency Test Results for the Tang Dynasty "Dazhong Yuan Nian" Inscribed Floral Pattern Teapot

Maximum Eigenvalue	CI Value	RI Value	CR Value	Consistency Test Results
6	0	1.25	0	Pass

The calculation results show that the maximum eigenvalue is 6.0. According to the RI table, the corresponding RI value is 1.25. Therefore, the consistency ratio (CR) is calculated as CR=CI/RI=0.0 <0.1, indicating that the consistency test has been passed successfully.

(2) Emotional Word Selection

Based on the frequency of responses in the questionnaire, the three most commonly selected emotional adjectives were used to represent the artifact's general design style. Based on the concentration or dispersion of the selected vocabulary, the typicality of its design style can be assessed. For example, analyzing the questionnaire responses regarding the aforementioned teapot, the three most frequent terms revealed that the public's affective evaluation of this teapot is concentrated around "simple," "generous," and "practical," as illustrated in Figure 2.

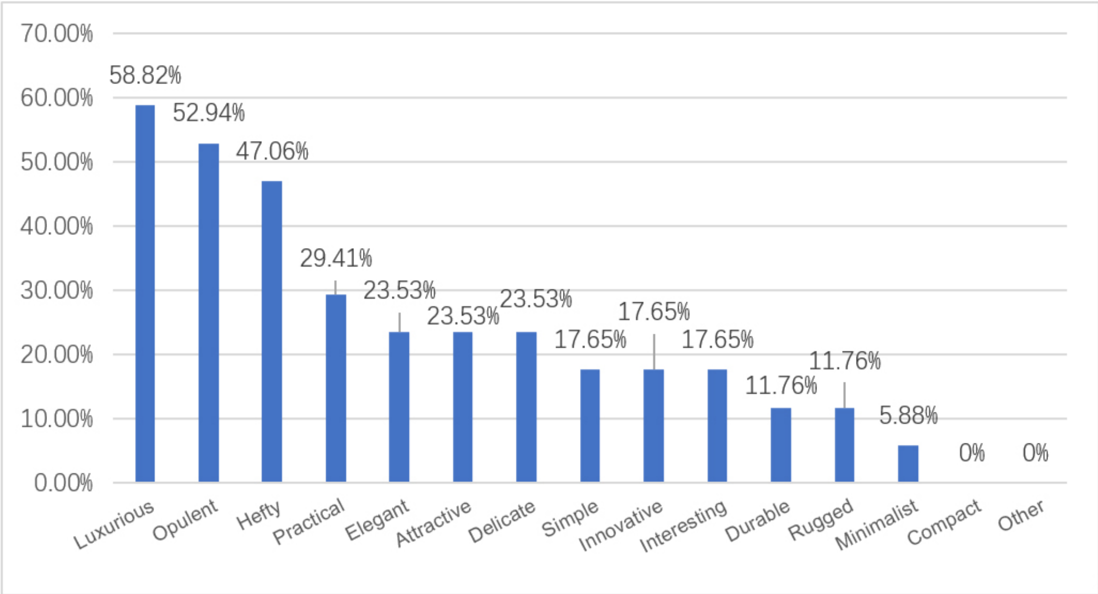


Figure 2: Questionnaire Survey Results for the Tang Dynasty "Dazhong Yuan Nian" Inscribed Floral Pattern Teapot

4 CERAMIC CULTURAL INNOVATION DESIGN STRATEGIES BASED ON DATABASES

4.1 Design Innovation References Based on Original Materials of Cultural Relics

First, the types of artifacts in the database are arranged based on the actual quantity of unearthed relics, and styles are categorized according to important functional components used in practical applications, which provides both typical and widespread representation. Second, by integrating measurement data and correlation analyses of various artifacts, the physical data range for design innovation in vessel types can be clarified, facilitating the search for suitable design reference objects according to design requirements. Therefore, using artifact types as a foundation, along with data measurement and correlation analysis of components, helps designers intuitively grasp the design focus of artifacts and the relationships among different design priorities, allowing for design innovation within reasonable limits.

4.2 Design Value Transformation Based on the Weights of Design Elements

The six design elements reflected in the database represent the recognition level of various artifacts among the public. A higher weight among the six elements indicates a greater recognition among the public, leading to stronger consensus for design innovation and higher market acceptance of the products. Thus, the weight relationships of the six design elements can provide a clearer design direction, aiding in the transformation of design value for ceramic relics. For example, if the weights of shape and functionality are extremely low, the design innovation for that artifact should focus on decorative patterns, cultural types, and color aspects.

4.3 Determination of Design Style Based on the Selection of Affective Vocabulary

The collection of affective vocabulary in the database serves two purposes: first, it presents the top three most commonly chosen words among the public for a particular artifact; second, it reflects the concentration and dispersion of the affective vocabulary. Consequently, the selection of affective vocabulary demonstrates the modern aesthetic characteristics of the ceramic artifact, helping designers determine the design style that meets public demand while also indicating whether potential design styles may exist based on the degree of dispersion.

5 CONCLUSION

Database-driven design innovation in ceramic culture not only facilitates a contemporary inheritance of traditional cultural connotations through an in-depth understanding of these traditions but also aids designers in comprehensively referencing existing archaeological research findings. Ancient ceramic forms serve as crucial vessels for the continuation of ceramic culture in contemporary daily life. Only by integrating artifact data with modern aesthetic demands can we reflect a shared historical memory in design. The ceramic culture design innovation database provides feasible data references for the transformation of design needs in this field. Furthermore, the scientific and artistic framework of the database significantly impacts the mutual reinforcement between research achievements in design studies and archaeology. The statistical data contained in the database greatly facilitates the exploration of the reasons behind the overall design changes of artifacts. Additionally, the scientifically comprehensive analysis of elements and design innovation data also inspires modern design innovations for typical cultures along the Silk Road. Through data organization, traditional culture, ethnic aesthetics, regional culture, and daily life can be utilized as complete scientific resources for design innovation, ultimately achieving the transformation of cultural heritage resources into modern industrial design and production.

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