

Research on the Innovation and Inheritance of Traditional Cultural Elements in the Environmental Art Design of Modern Housing

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Abstract: The value of traditional culture in modern residential environment design has gradually been paid attention to, and housing art design integrating traditional cultural elements helps to enhance residential aesthetics and cultural identity. This study centers on the innovative application of traditional cultural elements in modern housing environment art design, and selects 10 new Chinese-style residential districts in City D as samples to be analyzed through on-site research, SD evaluation method and principal component analysis. The survey used 16 landscape evaluation factors and invited 45 evaluators with different professional backgrounds to complete the questionnaire. The results showed that cleanliness (0.86) and openness (0.74) had the highest scores, demonstrating the advantages of the current new Chinese design in terms of space and hygiene. The results of the regression model showed that symmetry (0.635), landscape vignettes (0.617) and infrastructure (0.469) were the key factors to enhance landscape quality. The explanatory power of the model was good ($R^2 = 0.815$, $\text{Sig} < 0.05$). The conclusion points out that the effective integration of traditional cultural elements needs to focus on the optimization of specific visualization elements, and combine modern technology and regional cultural context to promote the coordinated development of cultural heritage and modern design.

Keywords: traditional culture, housing environment, SD evaluation method, principal component analysis, landscape evaluation, design innovation

1. Introduction

Traditional Chinese culture is a valuable cultural heritage, which profoundly influences the way of life and thinking of Chinese people based on its unique thought, art and cultural tradition [1-2]. And in modern housing environmental art design, the innovation and inheritance of traditional cultural elements are very important [3].

First of all, traditional cultural elements can be the design modeling of a particular item or the application of decorations that represent unique traditional elements [4]. In modern housing environmental art design, the style of Chinese culture can be strengthened by traditional cultural elements, such as Chinese paintings, blue and white porcelain and other cultural symbols, which are able to satisfy people's appreciation feelings and psychological needs well [5-7]. They are skillfully integrated into the modern housing environmental art design, and the effect presented is also very outstanding [8-9].

Secondly, in modern housing environmental art design, large diagonal cut structures, carvings and wooden materials can be utilized, which can express traditional cultural elements well [10-11]. For example, the thousand-leaf screen and the white horse head are inspired by traditional cultural elements,



which complement the modern housing environmental art design [12].

In addition, the inheritance of traditional cultural elements is also shown in the use of color [13]. Color is an expression of emotion and an externalized manifestation of culture. In traditional Chinese culture, the doctrine of the five elements is one of the most important elements, and black, white, red, yellow and cyan all represent different elements and directions [14-16]. The inheritance of traditional cultural elements in modern housing environmental art design is very important, how to use modern methods to reflect the qualities of traditional culture and combine them with modern housing life is the difficulty of design [17-19].

Under the background of rapid urbanization in contemporary society, people's aesthetic and cultural demands for living space show a diversified trend. Housing is no longer just a shelter from the wind and rain, but also a carrier of emotional support and cultural expression. In this context, traditional culture, as an important spiritual resource of the Chinese nation, has a far-reaching significance to be reproduced in the design of residential environment. If the architectural forms, symbolic images and ritual concepts of traditional culture can be effectively absorbed by modern design, it can not only enhance the residents' sense of cultural belonging, but also inject historical thickness and humanistic temperature into the urban space. However, at present, many new Chinese-style houses are just a formality, lacking systematic design methodology and user experience support. How to promote its revitalization and transformation through innovative means on the basis of respecting tradition has become an urgent question in the field of art and design. This study is carried out in this context, hoping to explore the deep integration path between traditional cultural elements and modern housing environmental art through scientific evaluation system and quantitative analysis, and to provide empirical support for design practice. The study selects 10 new Chinese-style residential districts in City D as samples by random sampling method, obtains evaluation factor data by SD method, and analyzes the influence of elements by principal component analysis and regression model to construct the evaluation system of housing environment landscape quality. The study not only analyzes the correlation between each cultural element and design quality, but also identifies the key factors with significant influence, and then proposes practice-oriented optimization paths and strategy suggestions.

2. Study design

2.1. Selection of research subjects

In order to study the innovative design of traditional cultural elements in the environmental art of modern housing, this paper adopts the random sampling method to establish a grid of 1 kilometer \times 1 kilometer in actual distance in the four administrative districts of the main city of D City, using Google Maps and according to the scale of the map. A total of 350 grids within the study area were numbered, and 50 of them were randomly selected, excluding samples with no residential neighborhoods and samples with residential neighborhoods that did not meet the conditions of the survey, and finally selecting 10 new Chinese-style residential neighborhoods for the field survey. And based on the field survey, the questionnaire survey of SD evaluation method was conducted.

2.2. Research methodology

This paper mainly adopts the following research methods: on-site investigation method, SD evaluation method and principal component analysis method. The on-site investigation method is to obtain site-related information through field research (questionnaire survey, actual recording, photographing, mapping, observation, etc.) on the new Chinese housing space in the city, and summarize, generalize and analyze it. Then the SD evaluation method is applied to evaluate the environmental design of modern housing that incorporates traditional cultural elements, and the principal component analysis method is used to explore the influence of individual elements on its environmental design.

2.2.1. SD evaluation method

The core idea of the SD method, also known as the Semantic Difference Method (SDM), is to measure the psychological feelings of the respondents by using "words" as a measure in semantics, and then quantitatively describe the concepts and constructs of the research object through the analysis of the established scales. The main idea is to use adjectives to measure the psychological feelings of the respondents, so as to obtain quantitative data, and then further analyze them with the factor analysis method, and come up with the corresponding influencing factors.

2.2.2. Principal component analysis methods

Principal component analysis is a statistical analysis method that reduces multiple variables into a small number of principal components through dimensionality reduction techniques. These principal components can reflect most of the information of the original variables, and they are usually expressed as some linear combination of the original variables. As a basic mathematical analysis method, principal component analysis has a wide range of practical applications, such as demographics, quantitative geography, molecular dynamics simulation, mathematical modeling, mathematical analysis and other disciplines, and is a commonly used multivariate analysis method.

(1) Definition and derivation of principal component analysis algorithm

Let $x = (x_1, x_2, \dots, x_p)'$ be a p -dimensional random vector and assume the existence of second-order moments, denoted $\mu = E(x)$, $\Sigma = V(x)$. Consider the following linear transformation:

$$\begin{cases} y_1 = a_{11}x_1 + a_{21}x_2 + \dots + a_{p1}x_p = a_1'x \\ y_2 = a_{12}x_1 + a_{22}x_2 + \dots + a_{p2}x_p = a_2'x \\ \vdots \\ y_p = a_{1p}x_1 + a_{2p}x_2 + \dots + a_{pp}x_p = a_p'x \end{cases} \quad (1)$$

Here y_1, y_2, \dots, y_p all have specific meanings. The first is a composite variable y_1 to represent the original p variables, and in order for y_1 to be the most representative of all linear combinations of x_1, x_2, \dots, x_p , the variance should be maximized to retain the maximum amount of information contained in this set of variables. Since for any constant k , there is $V(ka_1'x) = k^2V(a_1'x)$, if no restriction is placed on a_1 , i.e., $a_1'a_1 = 1$, the vector a_1 is sought under this constraint such that $V(y_1) = a_1'\Sigma a_1$ is maximized and y_1 is called the first principal component.

Derive the first principal component. Let $\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p \geq 0$ (since Σ is non-negative definite) be the eigenvalues of Σ and t_1, t_2, \dots, t_p be the corresponding unit eigenvectors which are mutually orthogonal. Then we have that

$$\Sigma = T \Lambda T' = \sum_{i=1}^p \lambda_i t_i t_i' \quad (2)$$

where $T = t_1, t_2, \dots, t_p = (t_{ik})$ is an orthogonal matrix and $\Lambda = \text{diag}(\lambda_1, \lambda_2, \dots, \lambda_p)$. due to:

$$\begin{aligned} a_1'\Sigma a_1 &= \sum_{i=1}^p \lambda_i a_1' t_i t_i' a_1 = \sum_{i=1}^p \lambda_i (a_1' t_i)^2 \leq \lambda_1 \sum_{i=1}^p (a_1' t_i)^2 \\ &= \lambda_1 \sum_{i=1}^p a_1' t_i t_i' a_1 = \lambda_1 a_1' T T' a_1 = \lambda_1 a_1' a_1 = \lambda_1 \end{aligned} \quad (3)$$

And when $a_1 = t_1$, there is:

$$t_1'\Sigma t_1 = t_1'(\lambda_1 t_1) = \lambda_1 \quad (4)$$

Therefore, $y_1 = t_1'x$ is the first principal component sought, and its variance has the maximum λ_1 value.

If the first principal component does not contain enough information to be representative of the original p variance, it is necessary to reconsider the use of y_2 it, and in order that the information contained in y_2 it does not overlap with y_1 it should be requested:

$$\text{Cov}(y_1, y_2) = 0 \quad (5)$$

Thus, the vector a_2 is sought under the above equation and constraint $a_2'a_2 = 1$ such that $V(y_2) = a_2'\Sigma a_2$ is maximized and the resulting y_2 is called the second principal component. Similarly, the third principal component to the p th principal component can be defined again. In general, the i th principal component $y_i = a_i'x$ of x is defined as: under constraints $a_i'a_i = 1$ and:

$$\text{Cov}(y_k, y_i) = 0, k = 1, 2, \dots, i-1 \quad (6)$$

Under seek a_i so that $V(y_i) = a_i' \Sigma a_i$ is maximized and $i = 1, 2, \dots, p$.

The second principal component is then sought, as shown in the above equation:

$$\text{Cov}(y_1, y_2) = \text{Cov}(t_1'x, a_2'x) = a_2' \Sigma t_1 = \lambda_1 a_2' t_1 = 0 \quad (7)$$

And so:

$$a_2' t_1 = 0 \quad (8)$$

From there:

$$\begin{aligned} V(y_2) &= a_2' \Sigma a_2 = \sum_{i=1}^p \lambda_i a_2' t_i t_i' a_2 = \sum_{i=1}^p \lambda_i (a_2' t_i)^2 \leq \lambda_2 \sum_{i=1}^p (a_2' t_i)^2 \\ &= \lambda_2 \sum_{i=1}^p a_2' t_i t_i' a_2 = \lambda_2 a_2' T T' a_2 = \lambda_2 a_2' a_2 = \lambda_2 \end{aligned} \quad (9)$$

If $a_2 = t_2$ is taken, then there is:

$$t_2' \Sigma t_2 = t_2' (\lambda_2 t_2) = \lambda_2 \quad (10)$$

So, $y_2 = t_2' x$ is the second principal component sought, having variance λ_2 . In general, the i th principal component can be sought as $y_i = t_i' x$, which has variance λ_i , $i = 1, 2, \dots, p$. Geometrically, t_i indicates the direction of the i th principal component y_i which is the projection of x on t_i , and λ_i is the variance of these values, which reflects the dispersion of the projected points on t_i .

(2) Implementation steps of principal component analysis algorithm

The basic steps of the principal component analysis algorithm are as follows:

(1) Before using the algorithm, in order to eliminate the influence of the scale, the original variables are first standardized, and then the principal components are derived from the covariance matrix of the standardized variables. There are many kinds of data standardization methods, often used mainly "maximum value - minimum value standardization", "Z-score standardization", etc. In this paper, we adopt the Z-score standardization method to standardize the data of the original p random variable x_1, x_2, \dots, x_p . In this paper, we use the Z-score standardization method to standardize the original data:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1p} \\ x_{21} & x_{22} & \cdots & x_{2p} \\ \vdots & \vdots & & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{np} \end{bmatrix} \quad (11)$$

Standardization as:

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1p} \\ a_{21} & a_{22} & \cdots & a_{2p} \\ \vdots & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{np} \end{bmatrix} \quad (12)$$

The standardized indicator data has a mean of 0 and a standard deviation of 1, where:

$$\begin{aligned} a_{ij} &= (x_{ij} - \bar{x}_j) / \sqrt{\frac{1}{n} \sum_{i=1}^n (x_{ij} - \bar{x}_j)^2}, \quad i = 1, 2, \dots, n \\ \bar{x}_j &= \frac{1}{n} \sum_{i=1}^n x_{ij}, \quad j = 1, 2, \dots, p \end{aligned} \quad (13)$$

2) Find the correlation matrix of the standardized indicator data as follows:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1p} \\ r_{21} & r_{22} & \cdots & r_{2p} \\ \vdots & \vdots & & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{np} \end{bmatrix} \quad (14)$$

Among them:

$$r_{ij} = \frac{\sum_{i=1}^n (a_{ij} - \bar{a}_j)(a_{ik} - \bar{a}_k)}{\sqrt{\sum_{i=1}^n (a_{ij} - \bar{a}_j)^2 \sum_{k=1}^n (a_{ik} - \bar{a}_k)^2}}, \quad (15)$$

$$\bar{a}_j = \frac{1}{n} \sum_{i=1}^n a_{ij} \quad i = 1, 2, \dots, n; j, k = 1, 2, \dots, p$$

3) Then find the eigenvectors and eigenvalues of the correlation matrix. As follows: eigenvalue λ_j is obtained from $|R - \lambda_j E| = 0, j = 1, 2, \dots, p$, where E is the unit matrix. The eigenvector t_k is obtained from $(R - \lambda_j E)t_k = 0, k = 1, 2, \dots, p$.

4) Next, find the principal components. The eigenvalues derived above are ranked in order of magnitude to obtain $\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p$. The contribution rate of each principal component is determined by the eigenvalues, and generally the principal component whose cumulative contribution rate exceeds 60% is taken from the first k principal components, and its corresponding eigenvector is determined. Multiply the original p standardized indicator variable data and eigenvectors to get k comprehensive principal component indicator data.

(5) Finally, the composite score is calculated. Multiply the k comprehensive principal component index data with the corresponding principal component contribution ratio and sum them up to get the comprehensive score.

3. Evaluation and elemental analysis of the artistic design of housing environments

3.1. Evaluation of landscape elements based on SD method

3.1.1. Adjectives and evaluation scales

In this survey, 16 adjectives were chosen to describe the landscape characteristics of modern housing environment design incorporating traditional cultural elements from five aspects: space, architecture, roads, vegetation and others. Each group of adjectives is expressed by “very”, ‘general’ and “agreeable”, and the scores are set as -2, -1, 0, 1, 2, with 0 as the axis of symmetry, which indicates that the state of agreeable between a pair of adjectives with opposite lexical meanings, negative scores favor the adjectives on the left side, and positive scores favor the adjectives on the right side, and the scores are only used for the statistical results, and they do not represent the superiority or inferiority. The scores are only for statistical results and do not represent the degree of superiority or inferiority.

Spatial evaluation factors: openness, cleanliness, seclusion, symmetry, novelty, labeled as A1~A5.

Architectural evaluation factors: architectural style, architectural volume, architectural color, noted as A6~A8.

Road evaluation factors: sense of order, safety, labeled as A9 and A10.

Plant evaluation factors: plant species, vegetation level, vegetation coverage, labeled as A11~A13.

Other evaluation factors: signage, landscape vignettes, infrastructure, notated as A14~A16.

3.1.2. Evaluators and judging methods

The evaluators of SD method are usually 20-50 people and try to choose different types of people, and there are also special cases in which only a specific group of people is investigated. In this paper, 15 practitioners or students of landscape gardening and environmental arts, 8 students of other majors, 10 people from enterprises and institutions, 5 freelancers, 2 retired people, 5 people from other professions, totaling 45 general urban residents, were chosen as the evaluators of this survey. There were 22 male evaluators and 23 female evaluators. Before judging, all the photos were shown to the evaluators once and the judging process was explained. The photos were displayed in a chaotic order, with a time interval of seconds, so that the evaluators had a certain basic impression of all the sample

photos and the content of the judgment to be made. The time interval between each photo is 60 s. At the same time, the overall environmental art design quality scores of the 10 new Chinese-style residential neighborhoods are obtained.

3.1.3. SD method evaluation statistics

The average value of each evaluation factor of each sample is calculated and summarized in the table, and the evaluation results of 10 samples of SD method survey are shown in Fig. 1. Openness A1 and cleanliness A2 have the highest evaluation scores of 0.74 and 0.86, indicating that the degree of cleanliness and openness of the new Chinese residential environment is now basically satisfactory. 9 of the 16 landscape elements still have evaluation scores below 0, indicating that there is still room for improvement in these dimensions.

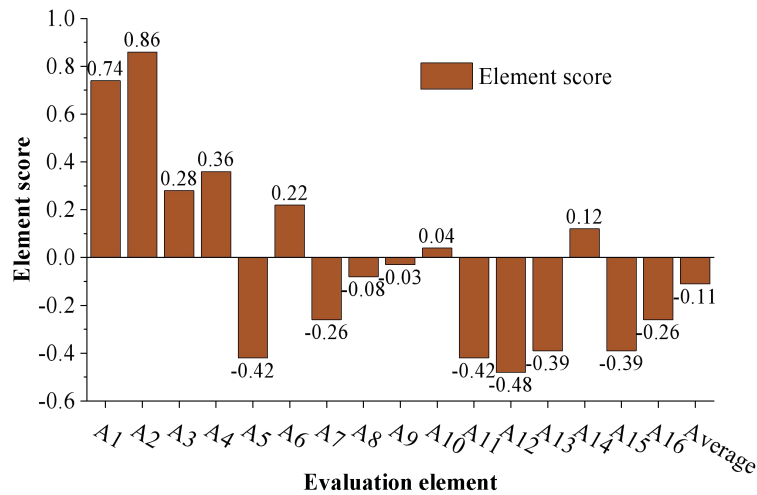


Figure 1. 10 samples of SD survey results

3.2. Analysis of Residential Landscape Elements

3.2.1. Correlation analysis

First of all, the SPSS software was used to conduct a simple correlation analysis between the scores of each evaluation factor of the sample and the standardized scores of landscape quality, and the correlation between each landscape factor and landscape quality was calculated by taking the scores of the evaluation factors as the independent variable and the standardized scores of the landscape quality of the environmental art design of the housing environment that integrates traditional cultural elements as the dependent variable.

Correlation analysis is a statistical analysis method to study the correlation between two and more random variables, usually used to describe the degree of closeness of the relationship between different objective things. The degree of correlation is expressed by the correlation coefficient r . When the correlation coefficient is $0 < r < 1$, it represents a positive correlation between the variables. When $-1 < r < 0$ and 0 , it represents a negative correlation between the variables. the closer the absolute value of r is to 1, the stronger the correlation between the two variables, and the closer the absolute value of r is to 0, the weaker the correlation between the two variables.

This paper uses SPSS software to conduct a simple correlation analysis of the scores of each evaluation factor of the 10 samples and the scores of the landscape quality of the housing environmental art design integrating traditional cultural elements, taking the 16 landscape evaluation factors as the independent variable, and the landscape quality scores as the dependent variable, to calculate the correlation between each landscape element and the landscape quality scores, and the correlation between the landscape elements and the landscape quality scores is shown in Figure 2. Statistics according to the P-value obtained by the significance test method, generally when $P > 0.05$ is defined as significantly irrelevant, the relationship between all the evaluation factors and the landscape quality score is positively correlated, but the P-value of the three evaluation factors of architectural volume A7, architectural color A8, and identifiers A14 are all greater than 0.05, which means that the relationship with the housing environment, art and innovation design is not significant.

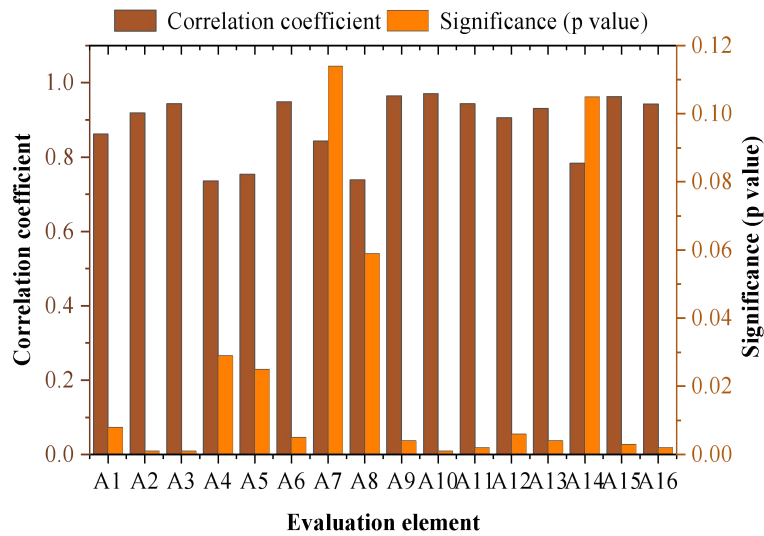


Figure 2. Correlation between evaluation factors and landscape quality

3.2.2. Results of principal component scores

The three evaluation factors that are not significantly related, namely, building volume, building color, and identity, are eliminated, and principal component analysis is performed on the remaining 13 evaluation factors. The scores of the first four principal components can explain 81.52% of the information in the 13 pairs of adjectives, and in general only greater than 60% is needed, so the number of principal components was determined as four.

The scores of the principal components were further calculated by SPSS to replace the independent variables, resulting in the scores reflected by the four principal components in these 10 samples, i.e., the principal component scores, and the principal component scores of the 10 samples are shown in Figure 3. Among the housing neighborhoods integrating traditional cultural elements, Sample 2, Sample 3, and General 6 have the highest principal component scores of 0.53, 0.43, and 0.43, respectively, and the samples with principal component scores greater than 0 and less than 0 account for 60% and 40% of the samples, respectively.

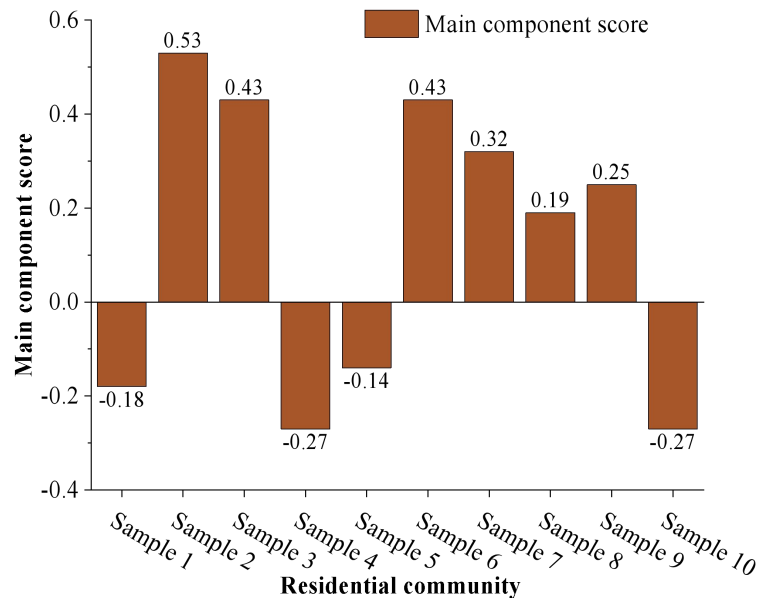


Figure 3. The main component scores of 10 samples

3.2.3. Principal component regression analysis

Regression analysis is an important part of data analysis and a widely used method of quantitative analysis. Regression analysis is used to analyze the statistical relationship between things, focusing on the changes in the relationship between variables. In the analysis of regression, the most common is

multiple linear regression, but when there are more independent variables, it will be due to the existence of its multiple covariance, which will lead to some important independent variables to be screened out, so that the reliability of the model is seriously reduced, so the multiple covariance regression is not suitable for the analysis of more independent variables. While principal component regression can solve the problem of multicollinearity, principal component regression is a commonly used statistical method to analyze the linear relationship between a dependent variable and an independent variable, and its advantage is that it can retain as many independent variables as possible, and its pattern also matches with common sense, which is more reliable for the analysis of multiple independent variables.

With the quality score of each landscape as the dependent variable and the value of the principal component as the independent variable, the data came out with SPSS software to establish a multiple regression model. In the significance test of the linear regression of the landscape quality score and the principal components, $R^2 = 0.815$, $\text{Sig} < 0.05$, indicating that the fit is good and the model is usable. The regression analysis coefficients are shown in Table 1.

In the regression analysis (principal component analysis) coefficient table, where B is the principal component coefficient and the constant is 1.742, the relationship model formula can be derived as $Z = 0.815F1 + 0.932F2 + 0.816F3 + 0.744F4 + 1.742$. Where the dependent variable is the landscape quality score Z, and F1, F2, F3, and F4 are the principal components of the independent variables. Substituting the relationship model between the four principal components and the factors into the relationship model between the landscape quality score and the principal components, the standardized regression model of the landscape quality score and the factors can be obtained with the formula:

$$Z=0.251*A1+0.287*A2+0.397*A3+0.635*A4+0.184*A5+0.198*A6+0.218*A9+0.207*A10+0.322*A11+0.458*A12+0.331*A13+0.617*A15+0.469*A16$$

The results of regression modeling show that the factors of symmetry A4, landscape vignette A15, infrastructure A16, vegetation level A12 and seclusion A3 are the most important for the application of traditional cultural elements in the innovative design of housing environmental art, with the coefficients of 0.635, 0.617, 0.469, 0.458 and 0.397, which has a certain reference basis and practice for the innovation and design of traditional cultural elements in the housing environmental art. Design has certain reference basis and practical significance.

Table 1. Regression analysis coefficient

Model	Nonnormalized coefficient		Normalization factor	t	Sig.
	B	SE			
(constant)	1.742	0.016		118.519	0.000
F1	0.815	0.016	0.405	4.331	0.000
F2	0.932	0.016	0.562	5.452	0.000
F3	0.816	0.016	0.483	7.283	0.000
F4	0.744	0.016	0.451	6.454	0.000

a. Dependent variables: landscape quality scores

4. Strategies for the transmission and development of traditional culture in housing design

4.1. Revolutionize the concept of architectural design

Housing environmental art design needs to pay attention to the connotation of traditional culture, designers need to deeply understand the value and role of traditional culture, to avoid using it only as a decorative element, in the design process, comprehensively consider the cultural background, historical lineage and social function, so that the architectural works have aesthetic value, but also can convey a profound cultural significance. Advocating an interdisciplinary way of thinking, integrating sociology, humanities, environmental science and other fields of knowledge, the formation of diversified design concepts, designers need to play their own initiative, and actively cooperate with historical scholars, cultural researchers, to comprehensively excavate the essence of traditional culture, as a basis for innovative design. In addition, the combination of modern technology and traditional craftsmanship can not only ensure the performance of the housing environment, but also retain the characteristics of traditional culture.

4.2. Full integration of regional culture

In the artistic design of the housing environment, the characteristics of regional culture, including

climate, topography, history and folklore, are taken into full consideration, and based on an in-depth analysis of the regional characteristics, a design scheme suitable for the local environment is formulated to promote the harmonious symbiosis between the housing environment and the surrounding environment. Reasonable reference is made to local traditional architectural forms, materials and decorative arts, so that the new buildings retain local characteristics while also possessing modern functions and strengthening the sense of local identity. In the artistic design of the housing environment, community participation is actively encouraged, and community members are guided to express their opinions on the design scheme through collective discussion and collection of opinions, so as to enhance the cultural identity of the building on the one hand, and effectively pass on the local traditional culture on the other hand, so as to make the building an important carrier of social culture.

4.3. Fostering specialized design talents

In order to promote the cultivation of professional design talents, the relevant departments need to carry out in-depth communication and exchanges with colleges and universities, add traditional culture courses to the curriculum, guide students to deepen their understanding and cognition of traditional culture, and enhance their practical ability and cultural literacy with the help of activities such as the study of traditional crafts and cultural expeditions. Exploring the application of traditional culture in modern design, design schools and research institutes can set up relevant awards to motivate students and designers to carry out projects related to traditional culture and promote cultural re-creation. In addition, building an exchange platform between designers and traditional culture experts, through exhibitions, lectures, seminars and other forms, to enhance designers' understanding of traditional culture and deepen culture experts' knowledge of modern architectural design, truly realizing two-way activities and learning, is a key role for the inheritance and development of traditional culture.

5. Conclusion

The results of the principal component scores of the 10 new Chinese-style residential neighborhoods in City D show that Sample 2, Sample 3, and Sample 6 have higher scores of 0.53, 0.43, and 0.43, respectively, demonstrating better design quality in terms of the integration of traditional cultural elements. The principal component scores of the samples were higher than 0 in 60% and lower than 0 in 40%, reflecting the regional differences and uneven distribution of quality in the promotion of new Chinese design. Among the 16 evaluation factors, 9 scores are lower than 0, showing that there is still more room for optimization in landscape design. Especially in terms of building color and iconicity, the correlation P value is higher than 0.05, which does not show a significant effect, suggesting that the current design still needs to improve the importance of color matching and iconic symbols. Meanwhile, the five key factors identified in the regression analysis are symmetry (coefficient 0.635), landscape vignettes (0.617), infrastructure (0.469), vegetation level (0.458) and seclusion (0.397), showing that these factors have the most prominent effect on landscape quality enhancement. The analysis of these data shows that traditional cultural elements should be strengthened in design expression by combining interactivity and functionality with the environment to further expand their practical and aesthetic values.

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