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Research Article

Evaluation and Selection of Cultural and Creative Design Solutions Based on Grey Correlation Multicriteria Decision Analysis

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Cultural and creative design (CCD) plays an important role in the transmission and development of culture, and this paper takes the design of campus cultural and creative products (CCCPs) in the context of new media communication as an example to study. The rapid development of new media has been accompanied by the full development of a wide range of communication media. With the application of Internet technology in cultural development, it has led to better design of CCCPs. However, research on CCCPs reveals that the homogenization of products is relatively serious and the quality of cultural and creative products is too low. In order to select high-quality cultural and creative products, this paper proposes a method for evaluating and selecting CCD solutions based on grey correlation multicriteria decision analysis. By using a combination of grey correlation analysis and multicriteria decision making, a comparative study of various CCCPs is conducted and specific selection strategies are given, providing a reference for effectively grasping the scientific design of CCCPs in the context of the times.

1. Introduction

As the development of culture is gradually gaining attention, the development for cultural and creative (CC) industries is gradually becoming a general trend. The booming development of this industry is remarkable for the growth of benefits in both the campus economy and society, and this process cannot be separated from the function of campus culture [1]. The emergence of new media has changed the way information is disseminated, and as the most dominant means of communication at present, the new media industry is constantly being updated as society continues to develop. As more and more ways of information are available in people's lives, it has indirectly promoted the rapid development of campus CC industries [2].

With the popularization of Internet technology, cultural and creative products (CCCPs) have gradually received attention, and the development of campus culture has become mainstream [3, 4]. Campus is of great significance to the spread of culture, and campus culture is an indispensable factor for students' growth [5]. The development and design of campus CCCPs require a series of processes to be effectively constructed, which is the inheritance of campus culture. In the inculcation of campus culture, the cultural brand is inherited [6]. Using the connotation and concept of campus culture to carry out image-based or product-based design so that it can be presented as a carrier of CCCPs [7], and can achieve the growth of a school's cultural, economic, and social benefits in many aspects. New media should be integrated with campus culture, and a good campus cultural environment should be actively promoted through the development mode of CCCPs.

CCCPs should contain the unique cultural characteristics of the school [8]. The design of the products should include factors such as history and culture and campus architecture, and the characteristic elements of the campus should be explored [9]. As campus culture has a profound heritage, it needs to be studied vigorously before the value of campus culture can be reflected in the products [10]. Each school has its own cultural characteristics. Incorporating the unique culture into cultural creative products will not only make the audience resonate more but also make the products more representative and unique.

The design of CCCPs must rely on the corresponding cultural background of the school. Therefore, in the process of carrying out the design, the goal should be to establish the campus brand. As different schools are founded with different aims, the corresponding campus branding varies over the course of the schools' development [11]. For the design of the products, factors such as the schools' regional characteristics and historical philosophy need to be taken into account to build branded products with special characteristics. These branded CCCPs can enhance the campus brand value and reflect the cultural heritage of the campus.

In the development of cultural creative products and the design of derivative products, it is necessary to consider their functionality, aesthetics, and innovation. In other words, in product design, it is necessary to think not only about how to effectively integrate artistic design and cultural connotation but also the actual use value of the product. The design of CCCPs is closely related to cultural connotation and artistic aesthetics. The connotation and artistic treatment of campus culture can be achieved by improving the application value of the products [12]. In the actual design of CCPs, a variety of factors should be taken into account to make the products more inclusive.

Today in the market consumer groups have changed, and the market style is gradually developing in the direction of youthfulness [13]. Newly designed products should therefore meet the needs of the younger generation so that their features are sought after by young people and become popular among them. At the same time, design work needs to integrate culture and life [14]. In product design, it is not only necessary to emphasize the individuality of the product but also to avoid homogenizations and to create a distinctive brand. The audience needs to be a key consideration in the design, and the psychology of purchase and cultural characteristics need to be considered to improve the recognition of the CCPs.

At present, there are still certain shortcomings in the development of CCCPs, which are still at a preliminary stage, imitating previous models, with serious homogenizations in terms of content and expression [15]. For the application of CCCPs in the new media communication environment to be effective, it is necessary to start with product positioning and marketing links to achieve a relatively complete industrial chain construction. The products must be diversified in form and effectively penetrated into multiple environments. Through multichannel sales, these products will not only be recognised by teachers and students but also appreciated by a wider range of people, effectively increasing social influence.

The design of products needs to achieve precise positioning for customers in order to enable the needs of multiple groups to be met. In actual production, the design positioning of the product and the characteristics of the audience groups need to be combined with the entire segment to select media platforms in a targeted manner for communication. Different groups have different needs in the new media environment due to their own differences. School CCPs need to be combined with multiple various groups for mining to achieve more accurate product positioning and thus efficient product design. Grey correlation multicriteria decision analysis can be used to evaluate and select the designed CCPs. In this paper, the grey correlation analysis method is combined with the AHP model to propose an evaluation system for CCD solutions by comparing the evaluation of various CCCPs. By ranking the evaluations of multiple CCPs, specific product tendencies are obtained, thus providing more accurate opinions on the design of CCCPs.

2. Multiobjective Integrated Evaluation Methods

The method of using grey correlation to analyze trends between subfactors and reference factors is known as grey correlation analysis [16]. The core of the method is the transformation of data series into data curves and the determination of the degree of correlation based on the shape and relationship of the curves.

The basic principles of grey correlation analysis are further elaborated using 4 data series as an example. Let $a^{(0)}$, $a^{(1)}$, $a^{(2)}$, and $a^{(3)}$ be four known data series:

$$\begin{aligned} a^{(0)} &= \left(a_1^{(0)}, a_2^{(0)}, \ldots, a_n^{(0)}\right), a^{(1)} = \left(a_1^{(1)}, a_2^{(1)}, \ldots, a_n^{(1)}\right), \\ a^{(2)} &= \left(a_1^{(2)}, a_2^{(2)}, \ldots, a_n^{(2)}\right), a^{(3)} = \left(a_1^{(3)}, a_2^{(3)}, \ldots, a_n^{(3)}\right), \end{aligned} \quad (1)$$

where $a^{(0)}$ is the reference series and $a^{(1)}$, $a^{(2)}$, and $a^{(3)}$ are the comparison series.

Let r_1, r_2, r_3 be the grey correlation between curves $a^{(0)}$ and $a^{(1)}$, $a^{(0)}$ and $a^{(2)}$, and $a^{(0)}$ and $a^{(3)}$, respectively, with $r_1 > r_2 > r_3$. Grey correlation analysis is therefore a method of measuring the magnitude of the correlation between each comparative series and the reference series by comparing the change in the geometry of each comparative series with the geometry of the reference series, i.e., the similarity on the graph.

3. Multicriteria Decision Analysis

Multicriteria decision making focuses on the ranking, selection, and evaluation of a limited number of alternatives under multiple criteria, and has become one of the important contents of modern decision theory. Common multicriteria decision-making methods include hierarchical analysis and linear weighting method. The TOPSIS [17] or AHP [18] methods need to consider the extreme values of the criteria as the positive ideal solution (PIS) [19] and negative ideal solution (NIS) [20] of multicriteria decision-making problems. It is not scientific for the decision maker to determine the optimal alternative based on the extreme values, and the traditional multicriteria decision-making method may lead to "rank reversal" when adding or removing alternatives.

In order to avoid the "rank reversal" problem, a new criterion optimality method is used to calculate the performance in an interval that can effectively avoid the rank reversal problem where the decision mechanism determines the optimal alternative by reference to a range rather than an extreme value. Multicriteria decision making has now been extended in different decision-making environments and used in a number of ways. With the increasing changes in the socio-economic environment, it is necessary to extend and apply the decision-making method in the actual process due to the complexity, ambiguity, and uncertainty of things themselves, as well as the limitations of human knowledge structure and professional level, which increase the difficulty of multicriteria decision-making problems.

3.1. Hierarchical Analysis. The basic steps for calculating weights using the hierarchical analysis method are as follows:

(1) The hierarchical analysis method decomposes the problem under analysis into a target layer, a criterion layer, a subcriterion layer, and a solution layer. The first layer is the objective layer, i.e., the specific problem to be solved; the second layer is the criterion layer, i.e., the specific implementation method to measure the problem in the objective layer; the subcriterion layer is a refinement of the criterion layer; and the bottom layer is the solution layer from which an optimal solution is selected for decision making. The need for subcriterion and solution layers depends on the specific problem.

(2) After the hierarchy has been established, the interrelationships between the factors in each level are determined. In determining the weights of the factors in each level, a factor in the upper level is used as a criterion, and a two-by-two comparison is made for each factor in the lower level that falls within that criterion. For comparing the importance of indicators, the nine numbers from 1 to 9 are usually used. The meaning of these nine numbers is shown in Table 1, with the numbers not mentioned in the table indicating between the maximum and minimum values.

A visual comparison of these scales is shown in Figure 1, which shows the correspondence between the scale value and the importance of the indicator. All indicators in Figure 1 are substituted using the first two letters.

It has the advantage again of being able to rely on subjective evaluations to rank the advantages and disadvantages of options, requiring less data, and taking very little time to make decisions.

AHP is suitable for qualitative human judgment and cannot directly measure the decision outcome accurately, which requires the decision maker to have a more in-depth and comprehensive understanding of the problem. When faced with an evaluation problem with many factors and a large scale, the evaluator is required to be able to grasp the essence of the problem, the elements it contains, and the logical relationships between them very thoroughly, otherwise the evaluation results are prone to problems.

Table 1: Indicator importance scale value.

Type of indicator	Indicator value
Equally important	1
Slightly important	3
Significantly important	5
Strongly important	7
Extremely important	9

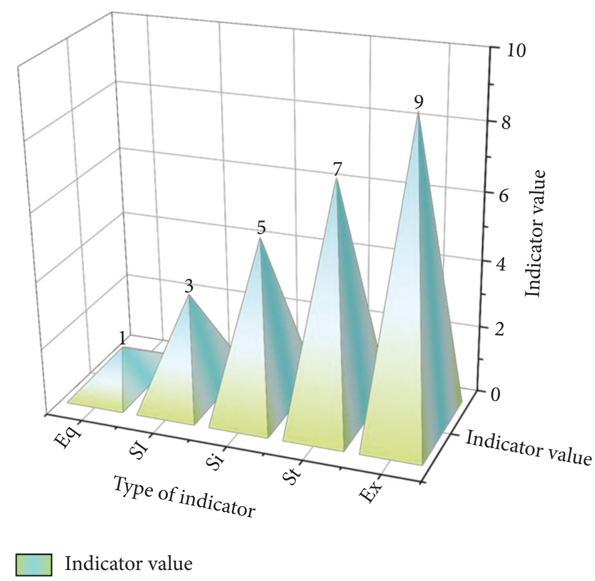

Figure 1: Comparison of scale values for importance of indicators.

If a criterion has a lower level of n factor $F_1, F_2 \ldots F_n$, the judgment matrix A is created as shown in the following equation:

$$A = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n-1} & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n-1} & a_{2n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n-1} & 1/a_{2n-1} & \cdots & 1 & a_{n-1n} \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1/a_{n-1n} & 1 \end{bmatrix}. \quad (2)$$

It is necessary to ensure that the judgment matrix A satisfies consistency to calculate the weights of each factor, where the consistency index of the judgment matrix is

$$\mathrm{CI} = \frac{\lambda_{\max} - n}{n - 1}. \quad (3)$$

The larger the value of CI, the worse the consistency of the judgment matrix, and vice versa. The special case when $E = 0$, then the judgment matrix fully satisfies the consistency.

The consistency test coefficient is shown in the following equation:

$$\mathrm{CR} = \frac{\mathrm{CI}}{\mathrm{RI}}. \quad (4)$$

The consistency indicator RI in the formula is related to the order of the judgment matrix, and the correspondence is shown in Table 2.

As can be seen from Table 2, the intuitive correspondence between the random consistency index and the order is shown in Figure 2, from which it can be seen that the random consistency index shows a positive correlation with the order of the judgment matrix, and as the order of the judgment matrix increases, the corresponding random consistency index also gradually increases.

Hierarchical total ranking refers to the calculation of the weight of each factor at each level with respect to the decision objective. After the consistency test has been completed for the hierarchical single ranking, the hierarchical total ranking begins, which is completed top-down, one at a time.

Table 2: Correspondence between random consistency index and order.

n	1	2	3	4	5	6	7	8	9
RI	0.13	0.28	0.56	0.80	1.12	1.34	1.46	1.52	1.68

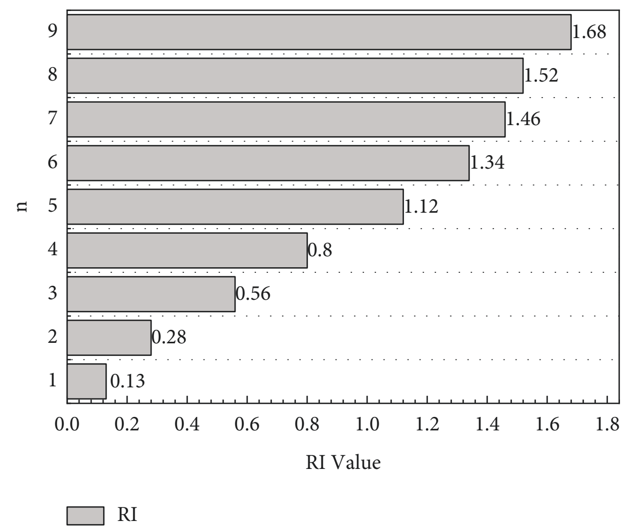

Figure 2: Visual correspondence between random consistency indicators and order.

3.2. Principle of the TOPSIS Method. TOPSIS is a ranking method that approximates the ideal solution and ranks the solutions in solution set X by means of the PIS and NIS of a multiattribute problem. The central idea is to imagine a PIS and NIS and then calculate the distance between each solution and the PIS and NIS, respectively. The solution that is closest to the PIS and furthest from the NIS is the optimal solution.

Let the set of alternatives for an attribute decision problem be $X = \{x_1, x_2, \ldots, x_m\}$ and the vector of attributes measuring the merit of an option be $Y = \{y_1, y_2, \ldots, y_n\}$. The vector $Y_i = \{y_{i1}, y_{i2}, \ldots, y_{in}\}$ of n attribute values for each option $x_i\,(i = 1, 2, \ldots, m)$ in the option set X is then used as a point in a n-dimensional space that uniquely characterizes option x_i.

The ideal solution x^+ is a virtual best solution that does not exist in solution set X, where each attribute value is the best value of that attribute in the decision matrix, while the negative ideal solution x^- is a virtual worst solution, where each attribute value is the worst value of that attribute in the decision matrix. The solution that is both close to the ideal solution and far from the negative ideal solution is the best solution in solution set X, and can be ranked accordingly.

3.3. TOPSIS Method Based on Grey Correlation. Let a multiattribute decision problem have m solution with solution set $A = \{A_1, A_2, \ldots, A_m\}$, where each solution has n attributes with attribute set $F = \{f_1, f_2, \ldots, f_n\}$, and decision matrix $X = (x_{ij})_{m\times n}$, where x_{ij} denotes the attribute value of the ith solution with respect to the jth attribute and $i = 1, 2, \ldots, m, j = 1, 2, \ldots, n,$ denote $M = \{1, 2, \ldots, m\}$, $N = \{1, 2, \ldots, n\}$. Let the weight vector of attributes be $\sum_n^{j=1} w_j = 1, \quad w_j \geqslant 0,\ j = 1, 2, \ldots, n.$

The traditional TOPSIS method only considers the relationship between the location of the factors, i.e., the absolute value of the magnitude, so this paper proposes to replace the Euclid distance of the traditional TOPSIS method with the grey correlation degree. The basic process of the grey correlation-based TOPSIS method is as follows:

(1) The original decision moments $X = (x_{ij})_{m\times n}$ are normalized using the polar difference transformation method to obtain the normalized decision matrices $Y = (y_{ij})_{m\times n}$, where $y_{ij} = x_{ij} - \min_i x_{ij} / \max_i x_{ij} - \min_i x_{ij}, \quad i = 1, 2, \ldots, m;\ j = 1, 2, \ldots, n.$

(2) Weighting of the normalized decision matrix to obtain $V = (v_{ij})_{m\times n}$, where $v_{ij} = w_j y_{ij}, i = 1, 2, \ldots, m;\ j = 1, 2, \ldots, n.$

(3) After obtaining the weighted calculated normalized matrix $V = (v_{ij})_{m\times n}$, the positive solution A^+ and the negative solution A^- can be found as $A^+ = \{v_1^+, v_2^+, \ldots, v_n^+\}, A^- = \{v_1^-, v_2^-, \ldots, v_n^-\}.$

(4) The grey correlation coefficients of each alternative with the positive solution A^+ were calculated R^+ to obtain matrix $R^+ = (r_{ij}^+)_{m\times n}$. The grey correlation coefficients of each alternative with the negative solution A^- were calculated to obtain matrices R^- and $R^- = (r_{ij}^-)_{m\times n}$.

(5) Solve for the grey correlation r_i^+ of each alternative with the positive solution, $r_i^+ = 1/n \sum_n^{j=1} r_{ij}^+$. Solve for the grey correlation r_i^- of each alternative with the negative solution, $r_i^- = 1/n \sum_n^{j=1} r_{ij}^-$.

(6) Construct a new relative closeness $P_i^+ = r_i^+ / r_i^+ + r_i^-$, $i = 1, 2, \ldots, m$, which is known from the principles of grey correlation analysis $0 < r_i^+ \leq 1$, and thus $0 < p_i^+ \leq 1$.

(7) The calculation yields a new relative closeness of all the alternatives, which is then ranked according to the magnitude of the value. The larger the value, the better the alternative is in relation to the positive

ideal solution and the better the alternative is, and vice versa.

4. Model Evaluation

The selection of the campus CCD solution is a typical multiobjective decision in which the affiliation matrix is obtained by quantitative analysis of each alternative solution using the affiliation function determination method in fuzzy mathematical theory. The evaluation process of the proposed CCD solutions is shown in Figure 3.

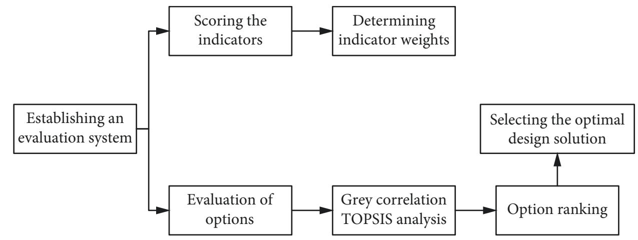

Figure 3: The process of evaluating and selecting CCD solutions.

4.1. Construction of the CCD Evaluation Index System. The experimental rubrics in this study were established by collecting information through research at work sites and interviews with staff and teachers, administering questionnaires to testers, and recording indicators that teachers felt were important in the CCD. The evaluation index system was compiled with reference to the industry standard of CCD and the school standard and combined with the evaluation index system involved in the domestic and international literature. The evaluation indicators in academic papers were analyzed for their applicability to this paper, and five evaluation indicators for campus CCD programs were identified through the literature review method, and one additional evaluation indicator was added through teacher interviews, resulting in a total of six evaluation indicators being identified. The evaluation indicators are shown in Table 3.

Table 3: Categories of the selected evaluation indicators.

Number	Evaluation indicators	Source of indicators
F01	Practicality	Normative standards
F02	Durability	The authors present
F03	Energy efficiency	Normative standards
F04	Workability	Normative standards
F05	Loadability	Teacher interviews
F06	Innovation	Normative standards

4.2. Data Analysis of Evaluation Indicators. The data required for this study was obtained from a call for creative designs from students across Peking University in 2021 and was taken through the aid of a questionnaire. The questionnaire was administered on a five-point Likert scale, with scores from 1 to 5 representing five levels of significance, from low to high. The questionnaires were administered both in person and online using the "questionnaire star" software, and distributed to students, staff, and teachers. A total of 180 questionnaires were distributed and 161 were returned; excluding invalid questionnaires, a total of 153 valid questionnaires were returned. Of the 153 valid questionnaires returned, 29 had been involved in the design of CCPs for 0–5 months, 35 for 6–10 months, 54 for 11–15 months, and 35 for more than 15 months, as shown in Table 4.

Table 4: Statistics on the length of time that valid survey respondents have been engaged in the study of CC product design.

Time	Number of people	Proportion (%)
0–5 months	29	18.95
6–10 months	35	22.87
11–15 months	54	35.29
Over 15 months	35	22.87
Total	135	100

The proportion of the four groups of people with experience in creative design in the questionnaire among all the valid survey respondents is shown in Figure 4. It can be seen from Figure 4 that the largest proportion of people with 11–15 months is indicative of the high level of enthusiasm for creative design among school students, while the smallest proportion of people with 0–5 months is indicative of the gradual involvement of many students in creative design.

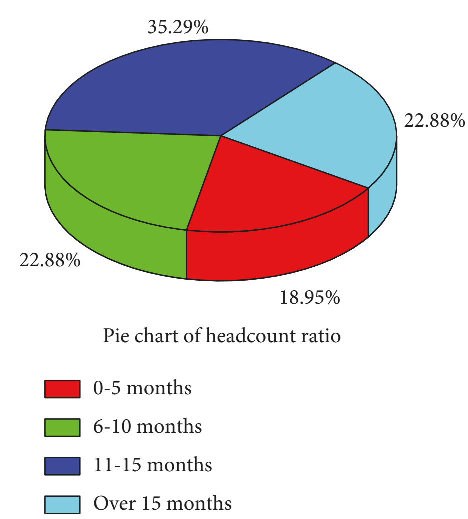

Figure 4: Pie chart of the time spent by valid survey respondents in the study of CC product design.

A summary of the results obtained from the creative products collected and the questionnaire yielded a total of 435 design proposals, of which all the designs were divided into six main categories, with the design types and corresponding number of designs for each category shown in Table 5.

A comparison of the number of students in the six creative designs obtained in the two formats is shown in Figure 5. As can be seen from Figure 5, the number of creative art works obtained from the school call was greater in all six categories than in the questionnaire format, which shows that the design of the creative arts program was welcomed by students and facilitated the program evaluation and selection study.

Table 5: Design types and number of design proposals.

Category	Questionnaires	Call for entries
Ceramic product creative design	20	50
Cultural and costume design	35	45
Paper carving art creative design	25	65
Brilliant creative design	15	55
Silk scarf culture creative design	18	35
Paper and plastic window flower creative design	22	50

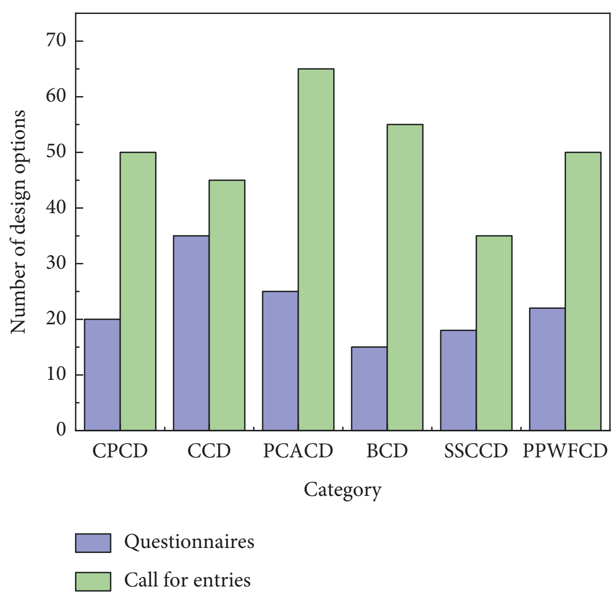

Figure 5: Comparison of the number of people accessing the six CCD under the two approaches.

4.3. Application of AHP and GC_TOPSIS Methods in Program Evaluation

4.3.1. AHP Evaluation Index Weights Determination. In this paper, the 1–9 scoring method is used to judge the matrix scale, and teachers with more than 5 digits and odd digits analyze and judge the probability and importance of risk occurrence, and build up the corresponding discriminant matrix.

Based on the indicators of the first target layer A, the discriminant matrix was constructed for the elements of criterion layer B as shown in Table 6.

The corresponding judgment matrix is

$$A = \begin{bmatrix} 1 & 1/2 & 3 \\ 2 & 1 & 4 \\ 1/3 & 1/4 & 1 \end{bmatrix}. \tag{5}$$

The matrix data were entered into MATLAB for correlation calculations and the results were $\lambda_{max} = 3.0813$, $CI = 0.0091$, and $CR = 0.0176 < 0.1$, satisfying the consistency test.

The guideline tier of technologically advanced indicators and its subindex tier weights are calculated as shown in Table 7.

Table 6: Comparison of the importance of the target layer.

A	Economic rationality	Technically advanced	Practical coherence
Economic rationality	1	1/2	3
Technically advanced	2	1	4
Practical coherence	1/3	1/4	1

A visual diagram comparing the importance of advanced technologies is shown in Figure 6. As can be seen from the graph, the closer to the centre the indicator represented the less important it is, and vice versa, the more important it is, showing that the importance of innovation is the highest of all indicators.

The total ranking and weighting of the evaluation indicators are shown in Table 8.

A comparison of the weights of the secondary indicators is shown in Figure 7. It can be seen that energy efficiency has the greatest weight and plays the greatest role in the evaluation of the design of the work.

4.3.2. The GC_TOPSIS Evaluation Model Calculates and Solves the Grey Correlation Ideal Solution. Based on the evaluation data of various CCD solutions, the affiliation of quantitative indicators is calculated by applying the formula, and the affiliation relationship between the tone operator and the quantitative scale is shown in Table 9.

A comparison of the relative affiliation relationship between the 11 different degrees of tone operators and the quantitative scale is shown in Figure 8, the first two letters of tone arithmetic are used instead of horizontal coordinates in Figure 8. As can be seen from the figure, the relative affiliation of the tone operator and the quantitative scale show different trends, with the value of the tone operator gradually decreasing and the value of the relative affiliation gradually increasing.

The qualitative index is calculated as an example of utility, and the three schemes are compared two by two according to the judgments given by the experts, resulting in a binary comparison matrix E.

Option A_1 is superior to option A_3, and option A_1 is equally superior to option A_2, resulting in an affiliation matrix $R_2^T = \left[1 \;\; 1 \;\; 0.538 \right]$ based on the "more" and "equally" subjunctive.

The distance from the alternative design solutions to the positive ideal solution of the grey correlation V^+ and the negative ideal solution of the grey correlation V^- can be obtained by calculating $d^+ = \left[0.1309 \;\; 0.1841 \;\; 0.1961 \right]$. The distance from the alternative design solutions to the negative ideal solution of the grey correlation $d^- = \left[0.1961 \;\; 0.0849 \;\; 0.1309 \right]$. The grey correlation between each solution and the ideal and negative ideal solutions can be obtained, and the relative closeness of the alternative design solution to the grey correlation positive ideal solution is $c^* = \left[0.5997 \;\; 0.3156 \;\; 0.4003 \right]$.

Table 7: Comparison of the importance of advanced technology.

B	Practicality	Durability	Energy efficiency	Workability	Loadability	Innovation
Practicality	1	3	1/3	3	3	1/2
Durability	1/3	1	1/2	1/5	1	1/7
Energy efficiency	3	2	1	3	2	1/3
Workability	1/3	5	1/3	1	3	1/4
Loadability	1/3	1	1/2	1/3	1	1/5
Innovation	2	7	3	4	5	1

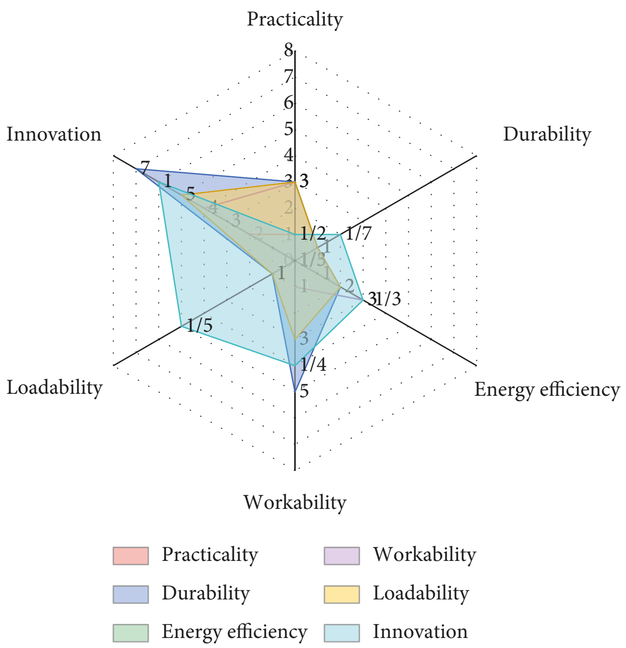

Figure 6: Visual radar chart comparison of the importance of advanced technologies.

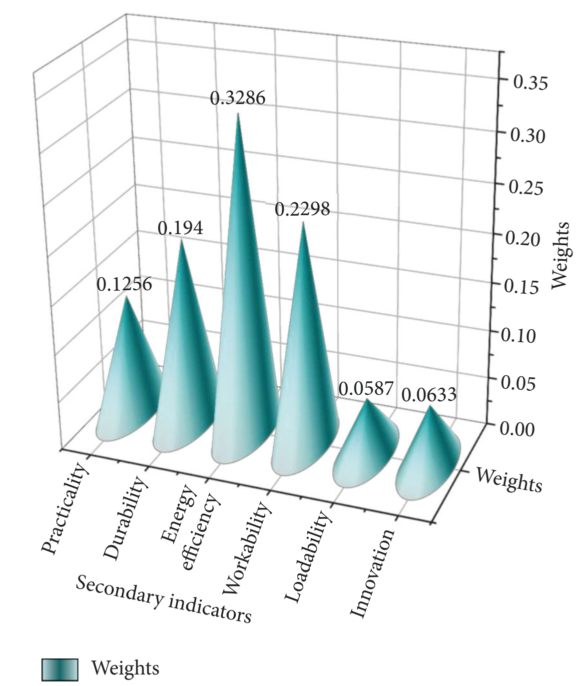

Figure 7: Comparison of weight data of secondary indicators.

Table 8: Total ranking and weighting data for the evaluation indicator hierarchy.

Type of indicator	Weights	Secondary indicators	Weights	Sorting
Economic rationality	0.3196	Practicality	0.1256	4
		Durability	0.1940	3
Technically advanced	0.5584	Energy efficiency	0.3286	1
		Workability	0.2298	2
Practical coherence	0.1220	Loadability	0.0587	6
		Innovation	0.0633	5

Table 9: Relative affiliation between tone operators and quantitative scales.

Tone arithmetic	Quantitative scaling	Relative affiliation
Similarly	0.525	0.905
A little bit	0.575	0.739
Slightly	0.625	0.600
More	0.675	0.481
Significantly	0.725	0.379
Markedly	0.775	0.290
Very	0.825	0.212
Highly	0.875	0.143
Extremely	0.925	0.081
Excellent	0.975	0.026
Incomparable	1.000	0

4.4. Analysis of Case Evaluation Results. The closeness of the grey correlation ideal solution for scenario A_1, A_2, A_3 is 0.5997, 0.3156, and 0.4003, respectively, and the three scenarios are ranked with a result of $A_1 > A_3 > A_2$. This results in the optimal solution for the design of CCCPs being scenario A_1, the 435 design solutions obtained are evaluated under six indicators and the optimal design solution is selected. The design work of CCPs is crucial, directly affecting the success or failure of practical applications and having a significant impact on designers and economic benefits. High-quality design solutions can reduce the problems that may be encountered in the later stages of the product, improve efficiency and product safety, and reduce design costs. The GC_TOPSIS model, based on the basic theories of hierarchical analysis, grey correlation analysis, and approximate ideal solution, has been developed to evaluate design solutions and to determine their merits. The GC_TOPSIS model was developed to evaluate the design solutions.

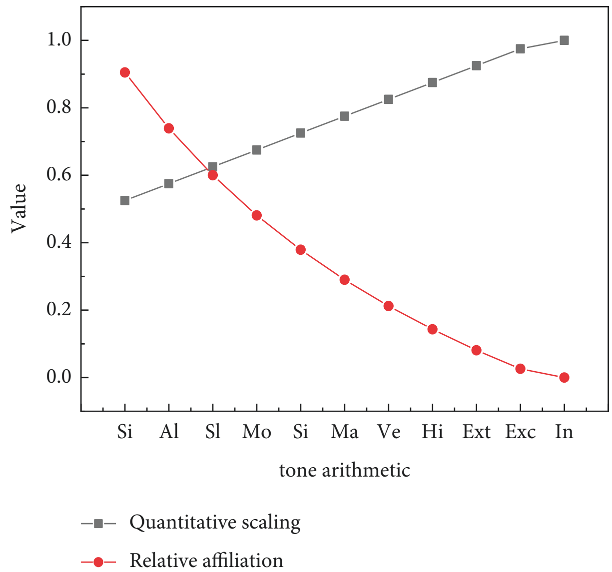

Figure 8: Comparison of the relative affiliation relationship between the 11 different degrees of tone operators and the quantitative scale.

5. Conclusion

In recent years, public attention to CCPs has increased significantly, and the development and derivation of campus culture has gradually become a hot spot. From the investigation and research of CCCPs, it is found that the homogenization of products is relatively serious, mainly by combining and decomposing them appropriately and applying the corresponding elements to conventional CCPs such as clothes and stationery, which are not highly innovative. In this paper, an evaluation and selection system for campus CCD solutions is constructed. Through an in-depth and systematic analysis of the evaluation indicators, six evaluation indicators are selected by reviewing a large amount of literature, collecting CCD products and questionnaire surveys. The weights of the indicators were calculated through the hierarchical analysis method to reduce the influence of human subjective factors on the evaluation model. Through the grey correlation analysis of the affiliation matrix, combined with the weighted TOPSIS solution method, the relative closeness of each alternative to the positive and negative ideal solution is obtained, which reflects the degree of the feasibility of the alternative, completes the ranking of the superior and inferior solutions, and finally realizes the selection of the best design solution. As the indicators selected in this paper are limited, in the future we will discover more indicators that will make the CCD products more valuable in practice.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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