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A CRITIC-I-TOPSIS Approach to Assess Public Satisfaction with Cultural Services in Urban Communities

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Abstract

Purpose: This paper aims to propose a multi-criteria evaluation method for assessing public cultural service quality satisfaction in urban communities. The method is validated by evaluating satisfaction with public cultural service quality in the Baihe Yuan community of Nanan District, Chongqing, China. The study also explores the factors influencing public cultural service quality satisfaction in this community. Evaluating satisfaction with public cultural service quality requires assessment across multiple dimensions, making it a classic multi-criteria decision-making problem.

Design/methodology/approach: In the evaluation process, we utilized the CRITIC method to determine the weights of influencing factors and the I-TOPSIS-Sort method to assess the factors affecting public cultural service quality satisfaction in this area. Among them, I-TOPSIS-Sort is a multi-criteria sorting method improved in this study.

Findings: The research findings indicate that the factor of greatest concern to residents of Baiheyuan Community in Nan'an District is "Equipment for Community Cultural Services," while the least concerning indicator is "Personnel of Community Public Cultural Services." Furthermore, in terms of evaluation ratings, all indicators for this community were classified as C, except for "Personnel of Community Public Cultural Services," which was categorized as D. This suggests that residents of the community are generally satisfied with the quality of public cultural services. However, there is still room for improvement in the quality of public cultural services in the community.

Practical Implication: This study focuses on Baiheyuan Community in Nan'an District as the research subject and improves the CRITIC and I-TOPSIS-Sort methods to evaluate the satisfaction level of public cultural service quality in the community. This research is beneficial for assisting policymakers and decision-makers in assessing the quality of public cultural services, thereby aiding them in policy formulation and decision-making. Ultimately, it aims to further refine management systems and better meet the public cultural service needs of residents.

Originality/value: This paper evaluates public cultural service quality satisfaction in urban communities using the CRITIC-I-TOPSIS-Sort method to address the contradictions between the increasing public cultural demands and the original supply. Among them, CRITIC-I-TOPSIS-Sort is the multi-criteria sorting framework proposed in this study.

Keywords: Urban Community Public Cultural Services; Satisfaction Evaluation; CRITIC; TOPSIS-Sort

JEL classification: H83, M14

1. Introduction

The “public cultural services” are important measures to ensure the cultural well-being of people's daily lives. They refer to public cultural facilities, cultural products, cultural activities, and related services, led by the government with the participation of private citizens (Sun, et al., 2023). These services aim to meet the basic cultural needs of citizens and fall under the category of public services. Since entering the 21st century, China has experienced rapid economic development, significantly improving people's material living standards. Consequently, there is an increasing pursuit of satisfying spiritual and cultural needs. People's cultural demands exhibit diverse and contemporary characteristics with noticeable differences. There is a high expectation for the quality of public cultural services. Specifically, there is a substantial demand from grassroots communities for cultural services. This creates a demand space for high-quality public cultural services and imposes new requirements on the government to deliver high-quality cultural services. In recent years, with the acceleration of modernization, communities have emerged as a new domain in grassroots social governance. From a geographical perspective, a community is a gathering and communication space covering a specific geographical area for residents. It serves as a convergence point for various interests. Regarding its constituent entities, both the community and its residents are active participants in governance activities. Community public cultural services refer to providing diverse cultural resources, facilities, and services within the community's service scope, guided by residents' basic needs. Building high-quality community public cultural services plays a crucial role in safeguarding residents' fundamental cultural rights and enhancing residents' sense of political identity (Cai & Liu, 2022).

The contradiction between the supply and demand of public cultural services in Chinese communities remains prominent (Xie, et al., 2022). There is a significant gap between the supply capacity of community public cultural services and the rapidly growing demand for these services (Wanyan & Wang, 2022). After reviewing relevant literature and conducting on-site investigations, it has been found that there are several concerning issues in the current community public cultural services. These problems may profoundly impact the community's cultural development and its residents' cultural life. To address these issues, the first step is to promote the innovation of diversified cultural content. Secondly, it involves strengthening the training and recruitment of professional talents. Lastly, improving the current state of public cultural facilities is essential to optimize and enhance community public cultural services. Addressing the issues above is not merely a matter of increasing the supply of public cultural services. It is crucial to analyze the problems and development levels existing in community public cultural services and accurately assess the quality and standards of these services. In other words, evaluating the satisfaction with the quality of community public cultural services is imperative to resolve these issues. Clearly defining the evaluation dimensions of urban community public cultural service quality satisfaction and

comprehensively constructing an evaluation system can objectively analyze the current issues in the public cultural service system and achieve the self-optimization and upgrading of each cultural service system.

Overall, this study aims to address the following issues:

- Investigate the factors influencing satisfaction with the quality of community public cultural services.
- How to evaluate the satisfaction with the quality of community public cultural services.

To address this, the paper conducted on-site investigations and identified ten factors that impact the quality of community public cultural services. Furthermore, we proposed an alignment assessment method based on CRITIC-I-TOPSIS-Sort to analyze and evaluate these factors. In the evaluation process, we first utilized the novel CRITIC method to calculate the weights of various evaluation indicators. Subsequently, we improved the traditional TOPSIS-Sort method and introduced the I-TOPSIS-Sort evaluation method to score and classify the influencing factors. Finally, as a case study, we applied and validated the proposed methods using the Baihe Yuan community in Nanan District, Chongqing City, China. This study introduces a novel multi-criteria sorting method, providing theoretical reference and methodological guidance for evaluating satisfaction with the quality of public cultural services.

In summary, the research contributions of this paper are as follows: Firstly, it proposes several indicators for evaluating the satisfaction with public cultural service quality, offering a comprehensive set of metrics for assessing this satisfaction. Secondly, the study enhances TOPSIS-Sort to create I-TOPSIS-Sort, offering a new method for multi-criteria decision sorting that does not require decision-makers to predefine classification boundaries. Finally, the research surveys the satisfaction with public cultural service quality in the Baiheyuan community in Nanan District, Chongqing, offering theoretical references and suggestions for improving the satisfaction with public cultural services in the community.

The remaining sections of this paper are arranged as follows. Section 2 is a literature review that examines current research on the quality satisfaction of urban community public cultural services and summarizes these studies. Section 3 is dedicated to the evaluation methods, where we review the calculation process of the CRITIC method and propose the I-TOPSIS-Sort method. Section 4 presents the case study, where we provide relevant information about the Baiheyuan community in Nanan District, Chongqing. In this section, we conduct a questionnaire survey, process the data, calculate indicator weights, and perform an evaluation of the case. Section 5 is the discussion, where the calculation results from Section 4 are analyzed. Based on these results, management suggestions are provided. Section 6 is the conclusion.

2. Literature Review

Some scholars have extensively researched the indicator system for public cultural service satisfaction. For example, Kelly and Swindell (2002) conducted an evaluation of local public cultural service effectiveness based on citizen satisfaction and performance assessment systems within the research area. They argued that satisfaction outcomes should be formed through the public's evaluation of multiple indicators. Shi, et al. (2004) approached the issue from the perspective of readers' needs and expectations, utilizing the gap theory to establish a satisfaction indicator system. They examined readers' satisfaction levels across dimensions such as information products, library retrieval information systems, and library services. Black (2011) analyzed reader satisfaction data collected from databases and found that, among various evaluation indicators, the modern design level of the library is the most crucial factor influencing reader satisfaction. It also has a significant positive relationship with the service quality of the library. Noh (2012) conducted a satisfaction survey with students, constructing a satisfaction evaluation indicator system. Based on the survey results, recommendations were made to expand library electronic resources and optimize the digital library environment. Based on the Service Quality (SERVQUAL) theory, Sun and Shi (2023) conducted a user-perceived service quality assessment, collecting questionnaire survey data on the satisfaction of different social groups with the quality of public cultural services in Harbin. They comprehensively evaluated the quality of public cultural services in Harbin. Yang, et al. (2024) constructed a museum public cultural innovation service model based on artificial intelligence and analyzed the impact of artificial intelligence on public cultural services.

Some scholars' research on urban community public cultural services mainly focuses on urban community public cultural service system studies, studies on the supply and demand of urban community public cultural services, and studies on the satisfaction of urban community public cultural services. In the research on urban community public cultural service systems, Sun (2022) focused on optimizing the public cultural service pathways in the Chongqing Street community of Changchun City. The study analyzed issues within public cultural services, such as incomplete related institutional frameworks, irrational allocation of facility resources, low levels of public cultural service, and the singular nature of public cultural service providers. Xiong and Zhou (2021) discussed resident participation in community public cultural services. They proposed a dual-drive analytical framework based on the quality of community public cultural services and residents' motivation for public services. Yang and Hua (2018) explored the operational logic of endogenous social organizations participating in the supply of public cultural services. They analyzed its utility and development limitations in community governance, aiming to explore new mechanisms to supply community public cultural services. Furthermore, this year, the supply and demand relationship of urban community public cultural services is a hot topic among Chinese scholars. Most research on urban community public cultural services in China revolves around exploring their

supply and demand dynamics. Hu and Xu (2021) studied the precise matching of supply and demand in community public cultural services from the perspective of social enterprises. Rong and Wang (2022) conducted research on the supply subjects, supply-demand content, and satisfaction levels of community public cultural services. The “funnel-shaped” supply structure of community public cultural services and the various issues it triggers, such as fragmented supply leading to normalized multi-agency management, misalignment between supply orientation and public demand, and the coexistence of surplus and insufficient supply, have become the main factors constraining resource coordination and adequate supply. Drawing inspiration from customer satisfaction models, they constructed a satisfaction model for community public cultural services in the neighborhood centers of Jiading District, Shanghai. The emphasis was on how community public cultural services can satisfy residents, aiming to provide feasible suggestions for enhancing satisfaction with public cultural services in the Zhanyi District.

In summary, there is a scarcity of existing research evaluating the satisfaction of urban community public cultural service quality. Even though some scholars have considered evaluating urban community public cultural services, these assessments mostly remain qualitative. Existing scholars often assess the quality of community public cultural services from a multi-criteria perspective. To address the shortcomings, we propose evaluating the satisfaction of urban community public cultural service quality based on the introduced CRITIC-I-TOPSIS method.

3. Evaluation Methods

3.1 Weight Determination for Indicators: CRITIC

The Criterion Importance Through Inter-criteria Correlation (CRITIC) technique is a weighting model used to calculate the weights of attributes in the Multiple-Criteria Decision Making (MCDM) process. Multi-Criteria Decision Making (MCDM) is a type of decision-making method used to select and evaluate among multiple alternatives. It is particularly suitable for situations where the decision-making process involves multiple conflicting criteria or objectives. The core objective of MCDM is to assist decision-makers in systematically selecting the optimal option or ranking the available alternatives when faced with multidimensional and complex decision problems. The CRITIC method employs standard deviation (S.D) and correlation coefficient (C.C) to quantify the value of each criterion (Khan, et al., 2024). The standard deviation measures the variability or spread of values for a given criterion, while the correlation coefficient indicates the degree of linear relationship between pairs of criteria. Considering these statistical measures, the CRITIC technique aims to assign appropriate weights to attributes, facilitating a more informed and objective decision-making process in MCDM (Akram, et al., 2023). This method calculates weights by computing the correlation coefficients and standard deviations among indicators, considering the

magnitude of evaluation values and the mutual influence relationships between indicators. The specific steps are as follows:

Step 1: Obtain the multi-criteria assessment matrix M through surveys.

$$M = \{x_{ij}\}_{m \times n}, \quad (1)$$

where x_{ij} represents the evaluation value of the i^{th} assessment object under the j^{th} evaluation criterion.

Step 2: In multi-criteria decision-making problems, criteria are usually classified into beneficial and non-beneficial types (Shahid, et al., 2023; Su, et al., 2024; Tešić, et al., 2024; Wu, et al., 2020). For example, cost is classified as a non-benefit criterion. In the traditional CRITIC method, for beneficial criteria, the distance from the criterion to the minimum value is typically normalized by the range length. In contrast, for non-beneficial criteria, the range length normalizes the distance from the criterion to the maximum value. The specific calculation process is as follows:

$$r_{ij} = \begin{cases} \frac{x_{ij} - \min_j(x_{ij})}{\max_j(x_{ij}) - \min_j(x_{ij})}, & \text{for benefit index,} \\ \frac{\max_j(x_{ij}) - x_{ij}}{\max_j(x_{ij}) - \min_j(x_{ij})}, & \text{for non-benefit index,} \end{cases} \quad (2)$$

where r_{ij} represents the standardized evaluation value of the i^{th} assessment object under the j^{th} criterion.

Through the normalization process mentioned above, we obtain the standardized assessment matrix R , which takes the following specific form:

$$R = [r_{ij}]_{m \times n}, \quad (2)$$

where r_{ij} represents the standardized evaluation value of the i^{th} assessment object under the j^{th} criterion.

Step 3: Calculate the correlation between each criterion. Here, the Pearson correlation coefficient is used to measure the correlation between criteria.

$$\rho_{jk} = \frac{\sum_{i=1}^m (r_{ij} - \bar{r}_j)(r_{ik} - \bar{r}_k)}{\sqrt{\sum_{i=1}^m (r_{ij} - \bar{r}_j)^2 \sum_{i=1}^m (r_{ik} - \bar{r}_k)^2}}, \quad (4)$$

where ρ_{jk} represents the Pearson correlation coefficient of the j^{th} criterion and the k^{th} criterion. \bar{r}_j represents the average evaluation value under the j^{th} criterion and \bar{r}_k represents the average evaluation value under the k^{th} criterion. The calculation process is as follows:

$$\bar{r}_j = \frac{\sum_{i=1}^m r_{ij}}{m}, \quad \bar{r}_k = \frac{\sum_{i=1}^m r_{ik}}{m}. \quad (5)$$

Step 4: Calculate the standard deviation for each criterion.

$$\sigma_j = \sqrt{\frac{1}{n-1} \sum_{i=1}^m (r_{ij} - \bar{r}_j)^2}, \quad (6)$$

where σ_j represents the standard deviation of the j^{th} criterion and $\bar{r}_j = \frac{1}{m} \sum_{i=1}^m r_{ij}$.

Step 5: Determine the weights.

$$e_j = \sigma_j \sum_{k=1}^n (1 - \rho_{jk}), \quad (7)$$

$$w_j = \frac{e_j}{\sum_{j=1}^n e_j}, \quad (8)$$

where, e_j represents the index of the j^{th} criterion, w_j represents the weight of the j^{th} criterion.

3.2 Multi-Criteria Evaluation Method: I-TOPSIS-Sort

TOPSIS-Sort is a multi-criteria sorting method derived from the extension of TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution) (Faraji Sabokbar, et al., 2016). This method introduces additional steps for scheme classification based on the TOPSIS approach. It not only sorts methods to support decision-making but also assists decision-makers in categorizing schemes based on scheme boundaries (Faraji Sabokbar, et al., 2016). The specific algorithm for this method is as follows (Faraji Sabokbar, et al., 2016):

Algorithm 1: TOPSIS-Sort Algorithm

Step 1: Construct the matrix ($\mathbf{X} = [\mathbf{x}_{ij}]_{m \times n}$) for evaluating community public cultural service quality

satisfaction. Here, x_{ij} represents the evaluation value of the i^{th} assessment object under the j^{th} evaluation criterion.

Step 2: Decision-makers determine classification boundaries $\mathbf{BP} = [\mathbf{p}_{ij}]_{q \times n}$. p_{ij} represents the value of the i^{th} boundary under the j^{th} criterion.

Step 3: Integrate the matrix for evaluating community public cultural service quality satisfaction with the matrix for classification boundaries to obtain the comprehensive matrix for evaluating community public cultural service quality satisfaction:

$\mathbf{D} = [\mathbf{dm}, \mathbf{cp}]_{(m+k) \times n}^T = [\mathbf{r}_{ij}]_{(m+k) \times n}$, \mathbf{dm} represents the decision matrix, \mathbf{cp} represents the classification boundary, and r_{ij} represents the i^{th} value under the j^{th} evaluation criterion.

Step4: Standardize the matrix for evaluating community public cultural service quality satisfaction,

obtaining the matrix $S = [s_{ij}]_{(m+k) \times n}$. s_{ij} represents the standardized evaluation value of the i^{th} assessment object under the j^{th} criterion. The standardization process is as follows (where P represents beneficial criteria and N represents non-beneficial criteria):

$$s_{ij} = \begin{cases} \frac{r_{ij}}{\max_{j=1, \dots, n} r_{ij}}, j \in P \\ 1 - \frac{r_{ij}}{\max_{j=1, \dots, n} r_{ij}}, j \in N. \end{cases} \quad (9)$$

Step 5: Weighted the standardized matrix for evaluating community public cultural service quality satisfaction, obtaining the matrix for community public cultural service quality satisfaction evaluation: $Q = [q_{ij}]_{(m+k) \times n} = [w_j \times s_{ij}]_{(m+k) \times n}$, in which $q_{ij} = w_j \times s_{ij}$ represents the weighted standardized value of the i^{th} assessment object under the j^{th} evaluation criterion.

Step 6: Determine the positive and negative ideal solutions, q_j^+ and q_j^- . q_j^+ and q_j^- represent the maximum and minimum values under the j^{th} evaluation criterion, respectively. The specific process is as follows:

$$q_j^+ = \left\{ \max_{i=1, 2, \dots, k+m} q_{ij}, j \in C_b \mid \min_{i=1, 2, \dots, k+m} q_{ij}, j \in C_c, \right. \quad (3)$$

$$q_j^- = \left\{ \min_{i=1, 2, \dots, k+m} q_{ij}, j \in C_b \mid \max_{i=1, 2, \dots, k+m} q_{ij}, j \in C_c. \right. \quad (4)$$

Step 7: Calculate the Euclidean distance from each solution to the positive and negative ideal solutions. D_i^+ and D_i^- represent the distances of the i^{th} objective to the positive and negative ideal solutions, respectively. The calculation process is as follows:

$$D_i^+ = \sqrt{\sum_{j=1}^n (q_{ij} - q_j^+)^2}, i = 1, 2, \dots, m. \quad (5)$$

$$D_i^- = \sqrt{\sum_{j=1}^n (q_{ij} - q_j^-)^2}, i = 1, 2, \dots, m. \quad (6)$$

Step 8: Calculate the closeness of each solution using the following formula:

$$CL_i = \frac{D_i^-}{D_i^- + D_i^+}, \quad (7)$$

where CL_i represents the closeness coefficient of the i^{th} alternative.

Step 9: Calculate the closeness (CL_i^p) of the classification boundary matrix. Based on CL_i and CL_i^p , classify each solution into categories. Let CL_e^{pu} and CL_e^{lp} represent the upper and lower bounds of class e, and for $CL_e^{lp} < CL_i < CL_e^{lu}$, solution i belongs to class e.

The improved TOPSIS-Sort (I-TOPSIS-Sort) is an extension of TOPSIS-Sort. In the classification process, there is no need to predefine classification boundaries. On the other hand, TOPSIS-Sort requires defining class boundaries using upper and lower limits, which may not align with decision and classification requirements for sorting solutions. Furthermore, there is no consideration for applying a specific weighting method to the standardized matrix in the decision-making process. Given the above considerations, this paper proposes the I-TOPSIS-Sort method for evaluating the

satisfaction of urban community public cultural service quality. The specific process of this method is as follows:

Step 1: Construct the matrix to evaluate community public cultural service quality satisfaction. Decision experts evaluate the satisfaction of public cultural service quality in the communities, which is assessed based on evaluation criteria. The final result is the evaluation matrix A .

$$A = [x_{ij}]_{m \times n}, \quad (8)$$

where, x_{ij} represents the evaluation value of the i^{th} assessment object under the j^{th} evaluation criterion.

Step 2: Predefine evaluation levels or classification levels. Here, we use S to represent the classes. Its definition is as follows:

$$S_1 \succ S_2 \succ S_3, \dots, \succ S_N, \quad (9)$$

where $S_i (i = 1, 2, \dots, N)$ represents the i^{th} evaluation level. It is worth noting that the higher the classification level, the more superior the alternatives within that level.

Step 3: Normalize the matrix to evaluate community public cultural service quality satisfaction and perform weighted calculations on the normalized matrix. Firstly, standardize the elements in the matrix to evaluate community public cultural service quality satisfaction. The commonly used standardization method in this process is the MAX-MIN method. After standardization, we obtain the standardized evaluation matrix $R = [r_{ij}]_{m \times n}$. The standardization process is as follows:

$$r_{ij} = \begin{cases} \frac{x_{ij} - \min_j x_{ij}}{\max_j x_{ij} - \min_j x_{ij}}, & \text{for positive criteria,} \\ \frac{\max_j x_{ij} - x_{ij}}{\max_j x_{ij} - \min_j x_{ij}}, & \text{for negative criteria,} \end{cases} \quad (10)$$

where r_{ij} represents the standardized evaluation value of the i^{th} assessment object under the j^{th} criterion. Thereafter, by using the weights obtained from the D-CRITIC method, one can then compute the weighted standardized value W_{ij} of the standardized evaluation matrix by using the following formula:

$$W_{ij} = w_j \times r_{ij}, \quad (11)$$

and obtain the weighted standardized matrix $D = [W_{ij}]_{(m+s) \times n}$.

Step 4: Determine the positive ideal solution P and negative ideal solution N under each evaluation criterion, where $P = (p_1^+, p_2^+, \dots, p_n^+)$ and $N = (N_1^-, N_2^-, \dots, N_n^-)$. Their calculation method is as follows:

$$p_j^+ = \max_j W_{ij}, \quad N_j^- = \min_j W_{ij}, \quad (12)$$

where, p_j^+ represents the positive ideal solution under the j^{th} criterion, while N_j^- represents the negative ideal solution under the j^{th} criterion.

Step 5: Calculate the Euclidean distance between the positive and negative ideal solutions to the satisfaction of the community's public cultural service quality and the classification boundaries of the cities to be assessed. The calculation process is as follows:

$$Dis_i^+ = \sqrt{\frac{1}{n} \sum_{j=1}^n (p_j^+ - W_{ij})^2}, \quad (13)$$

$$Dis_i^- = \sqrt{\frac{1}{n} \sum_{j=1}^n (N_j^- - W_{ij})^2}, \quad (14)$$

where, Dis_i^+ and Dis_i^- represent the distances of the i^{th} objective to the positive and negative ideal solutions, respectively.

Step 6: Calculate the closeness of each city's community public cultural service quality satisfaction and the closeness of each sectional boundary. The calculation procedure is as follows:

$$CL_i = \frac{Dis_i^-}{Dis_i^+ + Dis_i^-}, \quad (15)$$

where CL_i represents the closeness coefficient of the i^{th} alternative.

Step 7: Define classification boundaries and classification method. Assuming during classification, we divide all alternatives into l classes. Following the study by Hendiani and Walther (2023), we define the boundary of the K^{th} class (C_K) as:

$$C_K = \frac{l-K}{l}, C_K \in [0,1]. \quad (16)$$

Based on the classification boundaries mentioned above and evaluation results, we define the following classification rules:

$$\begin{cases} A_i \in C_1, \text{iff } CL_i \geq C_1 \\ A_i \in C_k, \text{iff } C_{K-1} > CL_i \geq C_K, \\ A_i \in C_l, \text{iff } CL_i < C_{l-1} \end{cases} \quad (17)$$

where A_i be the i^{th} object to be evaluated. In formula (24), when $CL_i \geq C_1$, the CL_i corresponding scheme A_i is classified into category C_1 ; when $C_{K-1} > CL_i \geq C_K$, it is classified into category C_K ; and when $CL_i < C_{l-1}$, it is classified into category C_l .

Based on the above process, it can be observed that the method proposed in this paper has the advantage of simplicity in computation, eliminating the need for predefined classification boundaries. Instead, it only requires determining the number of classes. This method is not only applicable to the current study but can also be extended to other evaluation and classification problems. This is because TOPSIS is a widely used method. It can be applied to data collected from questionnaires and similar datasets, and it is versatile in addressing decision-making, evaluation, and classification problems (Irfan, et al., 2022; Wang, et al., 2015; Yatsalo, et al., 2024). Compared with Fuzzy

Uncertain MCDM (Mandal, et al., 2024), a neutrosophy-based MCDM (Bera & Mahapatra, 2024), and AHP (Li, et al., 2019), the proposed method is the simplest and most commonly used multi-criteria decision-making method. Therefore, the I-TOPSIS-Sort method, which is an extension of TOPSIS, also shares these advantages.

4. Case Study

4.1. Evaluation Indicator System for Community Public Cultural Service Quality Satisfaction

Evaluation indicators are crucial for assessing issues. The existing literature employs two main approaches to evaluation indicators. One approach involves reviewing the research of existing scholars and summarizing suitable evaluation indicators based on their studies to address the research problem. For instance, Wei (2021) established an evaluation of Photovoltaic Poverty Alleviation Projects (PPAP) in Guangxi, China, by summarizing past scholars' research and identifying four primary indicators: benefits, opportunities, costs, and risks. Li, et al. (2023) evaluated the sustainability of power generation systems from technical, economic, environmental, and social perspectives by referring to previous scholars' research. The other approach involves conducting surveys and data collection, then determining suitable evaluation indicators based on the survey results to address the research problem. For example, Wang et al. (2024) established an evaluation indicator system for ecological governance in the Yellow River Basin in China through surveys and data collection, focusing on economic, environmental, and social perspectives. This paper is similar to such approaches. We conducted on-site inspections of the community and discussed with residents to establish the following ten indicators for evaluating community public cultural service quality satisfaction. As shown in Table 1.

Table 1. Evaluation Indicators for Community Public Cultural Service Quality Satisfaction

	Indicators	Mark
Community Public Cultural Service Quality Satisfaction	Public Cultural Service Facilities	<i>Ind₁</i>
	Community Cultural Exhibitions	<i>Ind₂</i>
	Knowledge Exchange Areas	<i>Ind₃</i>
	Public Cultural Activity Spaces	<i>Ind₄</i>
	Diversity of Community Cultural Activities	<i>Ind₅</i>
	Community Features	<i>Ind₆</i>
	Personnel of Community Public Cultural Services	<i>Ind₇</i>
	Equipment for Community Cultural Services	<i>Ind₈</i>
	Residents' Participation	<i>Ind₉</i>
	Digitization and Innovation of Community Public Cultural Services	<i>Ind₁₀</i>

Note: Table 1 is the evaluation metrics table, which includes 10 metrics represented by Ind₁, Ind₂, Ind₃,, Ind₁₀ respectively.

4.2 Case Background

This study takes the example of the Baihe Yuan Community in Nanan District, Chongqing, China, to evaluate community public cultural service quality satisfaction. The Baihe Yuan Community is located in the southwest of Nanan District, belonging to one of the eight communities under Nanping Town in Nanan jurisdiction. Nanping Town is a culturally rich town in Nanan District, situated in the western part of Nanan District, approximately 1 kilometer from the seat of the Nanan District People's Government. The total area of the region is 10 square kilometers. As of the end of 2018, the registered population of Nanping Town was 81,324. As of June 2020, Nanping Town has jurisdiction over ten communities. In 2018, Nanping Town had 13 industrial enterprises, including 9, with a scale of operation above a certain threshold. There were 17 comprehensive stores or supermarkets with a business area exceeding 50 square meters. The Baihe Yuan Community in Nanan District is important in Nanping Town, with 304 households and approximately 1,216 residents.

4.3 Data Collection

In this study, the research data were collected through survey questionnaires. Evaluation indicators are shown in Table 1. During the research process, we distributed online questionnaires to residents in the Baihe Yuan Community, Nanan District, Chongqing, China, who have lived there for more than a year and are over 18. These online questionnaires were distributed in the community's WeChat groups, and residents were encouraged to voluntarily fill them out through incentives. The collection was stopped once the required number of responses was reached. Due to the large population in the Baihe Yuan Community, it was challenging to survey all residents. Therefore, to ensure the scientific validity of the survey results, this study used Taro Yamane's formula to calculate the actual sample size of respondents with a confidence level of 95%. The simplified formula for calculating the sample size is as follows (Ime, et al., 2022):

$$n = \frac{N}{1 + Ne^2}, \quad (25)$$

where n is the sample size, N is the population size, and e is the precision (sampling error) = 5% or 0.05.

Based on the calculation using formula (24), we obtained the following results:

$$n = \frac{1216}{1 + 1216 \times 0.05^2} = 300.99 \quad (18)$$

Based on the above calculation results, this study plans to distribute at least 301 questionnaires.

4.4 Data Processing

All computations in this study were implemented using Python 3.6. Through the questionnaire survey, we collected 302 responses. Among them, one questionnaire showed abnormal data, one respondent

was under 18 years old, and one respondent in another questionnaire had lived in the Baihe Yuan Community for less than one year. After excluding the above invalid data, we have 299 remaining valid questionnaires. We will evaluate the satisfaction of public cultural service quality in this community based on the remaining 299 valid questionnaires. The data is presented in Table 2.

Table 2. Survey Data

ID	Ind ₁	Ind ₂	Ind ₃	Ind ₄	Ind ₅	Ind ₆	Ind ₇	Ind ₈	Ind ₉	Ind ₁₀
3	5	4	5	5	4	5	3	4	4	5
4	5	4	5	5	4	4	4	4	4	4
5	2	2	3	5	2	4	2	4	3	4
6	3	4	5	4	3	5	3	3	3	4
7	5	5	5	4	5	5	5	5	4	5
8	2	4	1	3	3	3	3	3	2	2
9	4	5	5	1	4	4	5	3	4	3
10	3	5	4	3	3	4	4	4	4	5
11	3	4	4	3	4	3	2	3	2	3
12	4	4	4	4	4	4	3	4	4	4
...
293	4	2	3	5	4	4	3	5	4	4
294	3	4	2	4	3	2	2	4	4	3
295	3	3	4	2	3	3	3	2	3	3
296	3	4	3	4	5	3	4	4	4	4
297	2	3	3	4	3	3	2	2	2	2
298	4	4	1	3	3	3	3	3	3	3
299	3	4	4	5	4	4	4	4	4	5
300	5	5	5	5	4	5	5	4	4	4
301	3	4	3	3	3	3	3	3	3	1
302	5	4	5	5	3	5	5	5	5	5

Note: Table 2 is the survey data table. This table includes 299 survey respondents, represented by 3, 4, 5,, 302. Ind₁, Ind₂, Ind₃,, Ind₁₀ represent the evaluation metrics. The remaining values represent the evaluation scores, which range from 1 to 5, with higher values indicating better performance on the evaluation metrics.

4.5 Determination of Indicator Weights

Based on the CRITIC method discussed in Section 4.1, calculate the weight values between various influencing factors affecting community public cultural service quality satisfaction. The specific calculation process is as follows:

Step 1: Standardize the survey data in Table 2 based on formulas (2) and (3) to eliminate the influence of maximum and minimum values on the calculation process. The results are obtained in Table 3.

Table 3. Standardized Survey Data

ID	Ind ₁	Ind ₂	Ind ₃	Ind ₄	Ind ₅	Ind ₆	Ind ₇	Ind ₈	Ind ₉	Ind ₁₀
3	1	0	1	1	0	1	0	0	0	1
4	1	0	1	1	0	0	0	0	0	0
5	0	0	0	1	0	0	0	0	0	0
6	0	0	1	0	0	1	0	0	0	0

7	1	1	1	0	1	1	1	1	0	1
8	0	0	0	0	0	0	0	0	0	0
9	0	1	1	0	0	0	1	0	0	0
10	0	1	0	0	0	0	0	0	0	1
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
...
293	0	0	0	1	0	0	0	1	0	0
294	0	0	0	0	0	0	0	0	0	0
295	0	0	0	0	0	0	0	0	0	0
296	0	0	0	0	1	0	0	0	0	0
297	0	0	0	0	0	0	0	0	0	0
298	0	0	0	0	0	0	0	0	0	0
299	0	0	0	1	0	0	0	0	0	1
300	1	1	1	1	0	1	1	0	0	0
301	0	0	0	0	0	0	0	0	0	0
302	1	0	1	1	0	1	1	1	1	1

Note: Table 3 is the Standardized Survey Data. This table includes 299 survey respondents, represented by 3, 4, 5,, 302. Ind₁, Ind₂, Ind₃,, Ind₁₀ represent the evaluation metrics. The remaining values represent the evaluation scores, which range from 0 to 1, with higher values indicating better performance on the evaluation metrics.

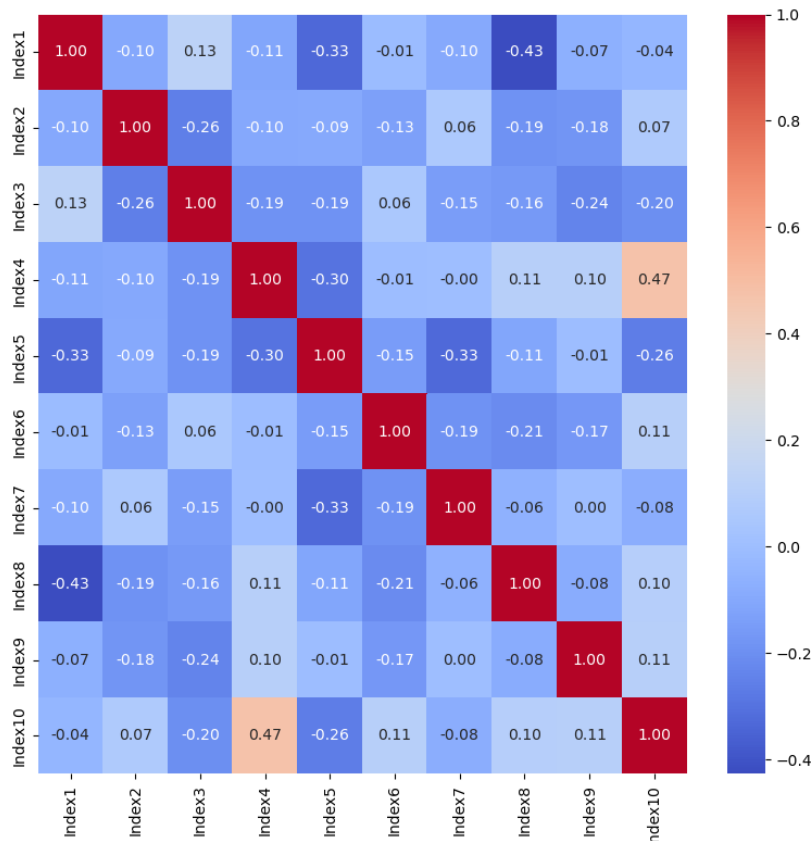
Step 2: Calculate the Pearson correlation coefficients and standard deviations between various influencing factors based on formulas (5)-(8), and calculate the weight values for each influencing factor. The results are shown in Figure 1 and Table 4:

Table 4. Standard Deviation and Weights

	<i>Ind₁</i>	<i>Ind₂</i>	<i>Ind₃</i>	<i>Ind₄</i>	<i>Ind₅</i>	<i>Ind₆</i>	<i>Ind₇</i>	<i>Ind₈</i>	<i>Ind₉</i>	<i>Ind₁₀</i>
Standard Deviation	0.468	0.456	0.484	0.494	0.439	0.489	0.434	0.490	0.471	0.484
Weights	0.102	0.098	0.105	0.100	0.101	0.103	0.093	0.107	0.098	0.093
Ranking	4	7	2	6	5	3	10	1	8	9

Note: Table 4 includes the Standard Deviation, Weights, and Ranking of the 10 evaluation metrics. Among these, a higher ranking indicates poorer performance of the metric.

Figure1. Correlation Coefficients between Various Evaluation Indicators



Note: Figure 1 shows the correlation coefficients of the 10 evaluation metrics. The redder the color, the higher the positive correlation; the bluer the color, the higher the negative correlation.

4.6 Evaluation Results

This section will use the proposed I-TOPSIS-Sort method to evaluate the ten factors influencing public cultural service quality satisfaction in Nanan District, Chongqing, China. In the evaluation process, we will calculate the Euclidean distance between the ten factors, the positive and negative ideal solutions, and the closeness to the ideal solution. The larger the closeness value, the more significant the impact of that factor on the community's satisfaction with public cultural service quality. Based on the closeness values, we predefined four levels: A, B, C, D, and E. Level A is the highest, indicating that factors in this level are decisive and play a crucial role in determining the satisfaction of public cultural service quality in the community. When factors in level A change, it will directly cause a significant change in overall satisfaction. On the other hand, level E is the lowest level, and changes in factors in this level will cause changes in satisfaction, but the impact is minimal. The specific process is as follows:

Step 1: Standardize the survey data. The processing results here are the same as those for calculating the weights between indicators, as shown in Table 3.

Step 2: Determine the evaluation levels, defining them as A, B, C, D, and E. A is the highest level, and E is the lowest level.

Step 3: Calculate the weighted evaluation matrix. The results are shown in Table 5.

Table 5. Weighted Evaluation Matrix

ID	Ind ₁	Ind ₂	Ind ₃	Ind ₄	Ind ₅	Ind ₆	Ind ₇	Ind ₈	Ind ₉	Ind ₁₀
3	0.1024	0	0.1053	0.0995	0	0.1034	0	0	0	0.0929
4	0.1024	0	0.1053	0.0995	0	0	0	0	0	0
5	0	0	0	0.0995	0	0	0	0	0	0
6	0	0	0.1053	0	0	0.1034	0	0	0	0
7	0.1024	0.0981	0.1053	0	0.1007	0.1034	0.0928	0.1073	0	0.0929
8	0.1024	0	0.1053	0.0995	0.1007	0.1034	0.0928	0.1073	0.0977	0.0929
9	0	0.0981	0.1053	0	0	0	0.0928	0	0	0
10	0	0.0981	0	0	0	0	0	0	0	0.0929
11	0	0.0981	0.1053	0	0.1007	0	0	0	0	0
12	0.1024	0.0981	0.1053	0.0995	0.1007	0.1034	0	0.1073	0.0977	0.0929
...
293	0	0	0	0.0995	0	0	0	0.1073	0	0
294	0	0.0981	0	0.0995	0	0	0	0.1073	0.0977	0
295	0	0	0.1053	0	0	0	0	0	0	0
296	0	0	0	0	0.1007	0	0	0	0	0
297	0	0	0	0.0995	0	0	0	0	0	0
298	0.1024	0.0981	0	0	0	0	0	0	0	0
299	0	0	0	0.0995	0	0	0	0	0	0.0929
300	0.1024	0.0981	0.1053	0.0995	0	0.1034	0.0928	0	0	0
301	0	0.0981	0	0	0	0	0	0	0	0
302	0.1024	0	0.1053	0.0995	0	0.1034	0.0928	0.1073	0.0977	0.0929

Note: Table 5 is the Weighted Evaluation Matrix. This table includes 299 survey respondents, represented by 3, 4, 5,, 302. Ind₁, Ind₂, Ind₃,, Ind₁₀ represent the evaluation metrics. The remaining values represent the evaluation scores, which range from 0 to 1, with higher values indicating better performance on the evaluation metrics.

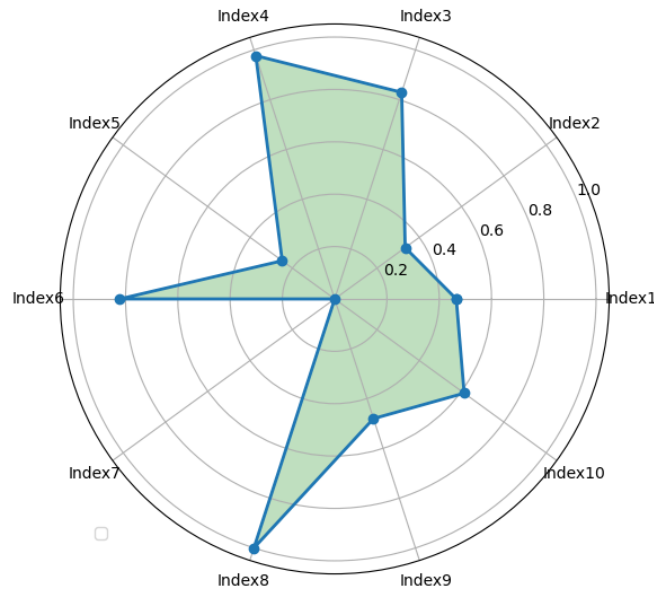
Step 4: Calculate the Euclidean distance and closeness between each influencing factor and the positive and negative ideal solutions. The results are shown in Table 6 and Figure 2.

Table 6. Euclidean Distance and Closeness between Influencing Factors and Positive/Negative Ideal Solutions

	Ind ₁	Ind ₂	Ind ₃	Ind ₄	Ind ₅	Ind ₆	Ind ₇	Ind ₈	Ind ₉	Ind ₁₀
Positive ideal solution distance	1.429	1.446	1.333	1.256	1.481	1.325	1.51	1.284	1.402	1.336
Negative ideal solution distance	1.079	1.019	1.214	1.235	0.997	1.206	0.885	1.279	1.066	1.087
Closeness	0.43	0.413	0.477	0.496	0.402	0.476	0.37	0.499	0.432	0.449
Ranking	7	8	3	2	9	4	10	1	6	5

Note: Table 6 contains the distances to the positive and negative ideal solutions, the closeness coefficients, and the rankings of the 10 evaluation metrics. A higher ranking indicates poorer performance of the metric.

Figure2. Closeness Ranking



Note: Figure 2 illustrates the closeness coefficients of the 10 evaluation metrics to the positive and negative ideal solutions.

Step 5: Calculate the classification boundaries and classify the alternatives. The results are shown in Table 7.

Table 7. Classification Boundaries and Results

Classification boundaries	Classification levels	Inclusive Factors
1.0	A	-
0.8	B	-
0.6	C	<i>Ind₁, Ind₂, Ind₃, Ind₄, Ind₆, Ind₈, Ind₉, Ind₁₀, Ind₅</i>
0.4	D	<i>Ind₇</i>
0.2	E	-

Note: Table 7 presents the classification boundaries, classification levels, and classification results for these 10 metrics.

5. Discussion

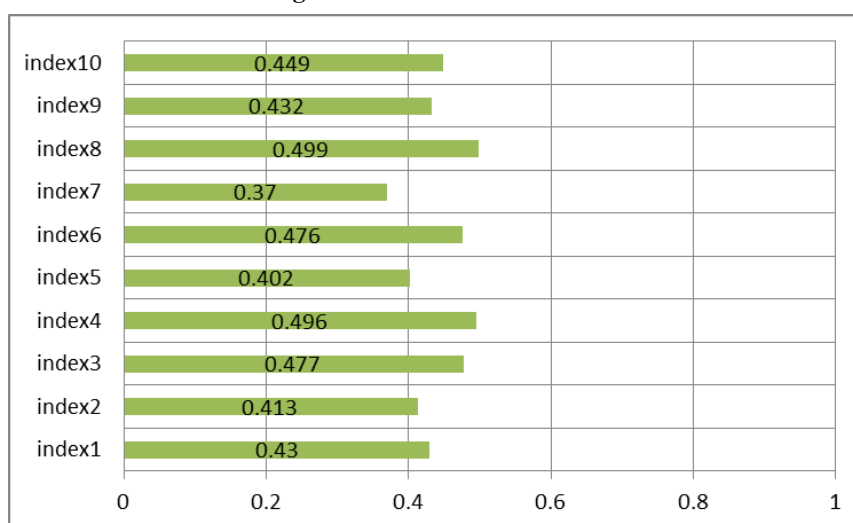
5.1 Results Analysis

From the weight calculation results, *Ind₈* is the factor with the highest weight among all factors. This indicates that the surveyed individuals consider this factor the most crucial in influencing the community's satisfaction with public cultural service quality. This is because the facilities and equipment of community public cultural services form the foundation for providing such services. The community can effectively offer public cultural services only with well-established facilities and equipment. The next significant factor is *Ind₃*, which is not significantly different in importance compared to *Ind₈*. This is because the knowledge exchange area is a space for community communication, providing residents with a venue for learning and interaction. Overall, the

importance ranking of these factors is $Ind_8 > Ind_3 > Ind_6 > Ind_1 > Ind_5 > Ind_4 > Ind_2 > Ind_9 > Ind_{10} > Ind_7$.

From the evaluation results, Ind_8 is the factor with the highest evaluation value among all factors. This evaluation aligns with its importance level and is consistent with its weight results. The next significant influencing factor is Ind_4 , with an evaluation score as high as 0.496. The ranking of these influencing factors is $Ind_8, Ind_4, Ind_3, Ind_6, Ind_{10}, Ind_9, Ind_1, Ind_2, Ind_5, Ind_7$. As shown in Figure 3, the worst classification occurs when using I-TOPSIS-Sort, with the lowest classification level at D, while the other factors are all in level C. This indicates that among all factors, the professional level of community public cultural service personnel can influence the satisfaction of public cultural service quality in the community, but it is not the main factor. In other words, adjusting or training community public cultural service personnel may not significantly improve the community's satisfaction level of public cultural service quality. However, if community public cultural service personnel lack good professional service skills, it can still affect the community's satisfaction with public cultural service quality.

Figure 3. Classification Results



Note: Figure 3 displays the classification results for the 10 metrics. The Y-axis represents the metric names, and the X-axis represents the classification boundaries.

5.2 Managerial Implications

Based on the research and analysis of public cultural service quality satisfaction in the Baihe Yuan Community, Nanan District, Chongqing, China, we propose the following suggestions to enhance the quality and satisfaction of public cultural services:

- (1) Strengthen training for service personnel and enhance innovative capabilities. Organize training courses, seminars, and other forms to enhance the innovative capabilities of community service personnel, encouraging them to be more creative in conducting community activities. The

government can formulate relevant policies to support and encourage community service personnel to participate in training, thus improving their professional competence and service levels.

- (2) Construct well-equipped multifunctional activity rooms. The survey results indicate that having multifunctional activity rooms is one of the most significant influencing factors. The government can propose policies to build more and higher-quality multifunctional activity rooms. Invest resources to ensure that these rooms meet the needs of different resident groups, covering various aspects such as literature and art, sports, education, etc.
- (3) Optimize service facilities and equipment. The government should strengthen the management and maintenance of community public cultural service facilities and equipment, ensuring their functionality to enhance overall satisfaction with public cultural services. Through investment and policy support, update and upgrade community facilities to meet residents' needs better.
- (4) Organize diverse community cultural activities. Encourage communities to organize various cultural activities to meet the needs of residents of different age groups, interests, and cultural backgrounds. The government can provide financial support and formulate incentive policies to inspire communities to organize more attractive cultural activities.
- (5) Strengthen communication and feedback mechanisms with residents. Establish a sound community service feedback mechanism and encourage residents to provide opinions and suggestions. The government can actively obtain feedback from residents through regular satisfaction surveys, setting up suggestion boxes, etc., to make timely improvements and optimize services.
- (6) Promote community resident participation. The government can introduce policies encouraging residents to participate in community cultural activities, providing rewards and incentives to enhance resident engagement. At the same time, strengthen communication with community residents, understand their needs and expectations, and better meet their cultural service requirements.
- (7) Establish a sound management system. Develop and improve management norms and standards for community public cultural services to ensure rationality and efficiency. The government can establish specialized management agencies responsible for supervising and evaluating the operation of community public cultural services, promptly identifying and resolving issues.

6. Conclusion

Motives: The evaluation of satisfaction with the quality of public cultural services in the community is an essential reflection of the living standards of community residents (Sun, et al., 2023). With the rapid development of the Chinese economy, people's cultural demands have shown diverse and contemporary characteristics with noticeable differences. Especially for grassroots communities with a large population size, the diversification of demands is more pronounced. This creates a demand

space for providing high-quality public cultural services and also places new demands on the government to provide high-quality cultural services. Therefore, improving the level of satisfaction with the quality of public cultural services in the community has become an urgent issue.

Contributions: To address this issue, this paper proposes an evaluation method based on CRITIC-I-TOPSIS-Sort to assess the level of satisfaction with the quality of public cultural services in the community. In addition, we also conducted on-site inspections to identify ten indicators that influence the satisfaction of community public cultural service quality. Finally, we took the Baihe Yuan Community in Nanan District, Chongqing, China, for example, conducting a questionnaire survey and data analysis. Unlike previous studies, this research is the first to combine the **CRITIC** method and an improved **TOPSIS-Sort** approach to evaluate satisfaction with the quality of community public cultural services. Methodologically, this study introduces improvements and applies the enhanced method to assess satisfaction with community public cultural services. On one hand, it optimizes the multi-criteria evaluation framework; on the other hand, it provides decision-makers with valuable references for policy formulation and decision-making.

Findings: The analysis results indicate that the facilities and equipment of community public cultural services are important factors influencing the level of satisfaction with the quality of public cultural services in the community. Community public cultural service personnel are the least influential among these factors, but this does not imply that this factor is unimportant. It is considered the least influential factor among these factors. Implementing proposed policy suggestions can improve the quality of public cultural services in the Baihe Yuan Community, Nanan District, Chongqing, China. This will promote cultural participation and satisfaction among community residents and drive the overall improvement of community cultural levels. These measures help address current issues and lay a more solid foundation for the future development of community public cultural services.

Limitations: This study conducted on-site inspections to identify ten influencing factors and proposed a multi-criteria evaluation method to analyze and assess these factors. However, in practical scenarios, more influencing factors are likely to affect the satisfaction with the quality of community public cultural services.

Suggest Directions: Therefore, in future research, we will continue to explore these influencing factors and conduct detailed evaluations and analyses. Furthermore, the CRITIC-I-TOPSIS-Sort demonstrates its evaluative performance in numerical assessments. However, improvements are needed for the method presented in this paper when dealing with fuzzy linguistic sets. Therefore, in future research, we will further refine the proposed method.

Ethical approval statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of School of Administrative Studies, Maejo University (Sep 30, 2023)

References

- Akram, M., Ramzan, N., & Deveci, M. (2023). Linguistic Pythagorean fuzzy CRITIC-EDAS method for multiple-attribute group decision analysis. *Engineering Applications of Artificial Intelligence*, *119*, 105777. <https://doi.org/10.1016/j.engappai.2022.105777>
- Bera, T., & Mahapatra, N. K. (2024). Selection of waste water treatment plans alternative: a neutrosophy based MCDM approach *OPSEARCH*, *61*, 524–547. <https://doi.org/10.1007/s12597-023-00708-2>
- Black, A. (2011). ‘We don’t do public libraries like we used to’: attitudes to public library buildings in the UK at the start of the 21st century. *Journal of Librarianship Information Sciences*, *43*(1), 30-45. <https://doi.org/10.1177/0961000610390991>
- Cai, W., & Liu, Y. (2022). The Value of Immersive Media in Expanding Chinese Public Cultural Participation and Its Realization Path From the Perspective of Cultural Education. *Front Psychol*, *13*, 915913. <https://doi.org/10.3389/fpsyg.2022.915913>
- Faraji Sabokbar, H., Hosseini, A., Banaitis, A., & Banaitiene, N. (2016). A novel sorting method TOPSIS-Sort: An application for tehran environmental quality evaluation. *E+M Ekonomie a Management*, *19*(2), 87-104. <https://doi.org/10.15240/tul/001/2016-2-006>
- Hendiani, S., & Walther, G. (2023). TOPSISort-L: An extended likelihood-based interval-valued intuitionistic fuzzy TOPSIS-sort method and its application to multi-criteria group decision-making. *Expert Systems with Applications*, *233*, 121005. <https://doi.org/https://doi.org/10.1016/j.eswa.2023.121005>
- Hu, Z., & Xu, X. (2021). How accurate is the supply of public cultural services in urban communities: the perspective of social enterprises? *Journal of the Party School of the Central Committee of the C.P.C.(Chinese Academy of Governance)*, *25*(06), 103-110. <https://doi.org/10.14119/j.cnki.zgxb.2021.06.010>
- Ime, I. M., Shuaibu, M. S., Dixit, S., Obong, L. B., & Bala, B. B. (2022). The effects of overcrowding on students living in university of Calabar Female Hostel, Cross River State, Nigeria. *Journal Healthcare Treatment Development*(24), 8-27. <https://doi.org/10.55529/jhtd24.8.27>
- Irfan, M., Elavarasan, R. M., Ahmad, M., Mohsin, M., Dagar, V., & Hao, Y. (2022). Prioritizing and overcoming biomass energy barriers: Application of AHP and G-TOPSIS approaches. *Technological Forecasting and Social Change*, *177*. <https://doi.org/10.1016/j.techfore.2022.121524>
- Kelly, J. M., & Swindell, D. (2002). A multiple–indicator approach to municipal service evaluation: Correlating performance measurement and citizen satisfaction across jurisdictions. *Public Administration Review*, *62*(5), 610-621. <https://doi.org/10.1111/1540-6210.00241>
- Khan, A. A., Mashat, D. S., & Dong, K. (2024). Evaluating sustainable urban development strategies through spherical CRITIC-WASPAS analysis. *Journal of Urban Development and Management*,

3(1), 1-17. <https://doi.org/10.56578/judm030101>

- Li, R. Y. M., Chau, K. W., & Zeng, F. F. (2019). Ranking of Risks for Existing and New Building Works. *Sustainability*, 11(10), 2863. <https://doi.org/10.3390/su11102863>
- Li, W., Ren, X., He, Q., Xu, D., & Dong, L. (2023). Sustainability assessment of power generation systems under the objective consideration of criteria interactions. *Journal of Cleaner Production*, 395, 136423. <https://doi.org/10.1016/j.jclepro.2023.136423>
- Mandal, S., Gazi, K. H., Salahshour, S., Mondal, S. P., Bhattacharya, P., & Saha, A. K. (2024). Application of Interval Valued Intuitionistic Fuzzy Uncertain MCDM Methodology for Ph.D Supervisor Selection Problem. *Results in Control and Optimization*, 15, 100411. <https://doi.org/10.1016/j.rico.2024.100411>
- Noh, Y. (2012). A study measuring the performance of electronic resources in academic libraries. *Aslib proceedings*, <https://doi.org/10.1108/00012531211215169>
- Rong, L., & Wang, X. (2022). A study on matching supply and demand of public cultural services in urban communities in Wuchang district, Wuhan City, China *PR Magazine*(17), 83-85. <https://doi.org/10.16645/j.cnki.cn11-5281/c.2022.17.041>
- Shahid, T., Ashraf, S., & Mashat, D. S. (2023). Enhancing urban development with picture fuzzy sets: A strategic decision support framework. *Journal of Urban Development and Management*, 2(4), 172-180. <https://doi.org/10.56578/judm020401>
- Shi, X., Holahan, P. J., & Jurkat, M. P. (2004). Satisfaction formation processes in library users: understanding multisource effects. *The Journal of Academic Librarianship*, 30(2), 122-131. <https://doi.org/10.1016/j.acalib.2004.01.002>
- Su, J., Wang, D., Xu, B., Zhang, F., & Zhang, N. (2024). An interval-valued intuitionistic fuzzy group decision-making method for evaluating online knowledge payment products. *Applied Soft Computing*, 150(111046). <https://doi.org/https://doi.org/10.1016/j.asoc.2023.111046>
- Sun, C., Tan, G., Chai, X., & Zhang, H. (2023). Analysis on the Satisfaction of Public Cultural Service by Township Residents: A Qualitative Perspective. *Sustainability*, 15(9), 7302. <https://doi.org/10.3390/su15097302>
- Sun, Y. (2022). *Study on the optimization path of public cultural services in chongqing street community in changchun city* [master's degree, Party School of the Jilin Provincial Committee of the Communist Party of China (Jilin Provincial School of Administration)]. <https://doi.org/10.27474/d.cnki.gzjld.2022.000038>
- Sun, Y., & Shi, Y. (2023). *Evaluation of public cultural service quality in harbin based on SPSS software* Proceedings of the 2nd International Conference on Public Management and Big Data Analysis, <https://doi.org/10.5220/0012070100003624>
- Tešić, D., Božanić, D., & Khalilzadeh, M. (2024). Enhancing multi-criteria decision-making with fuzzy logic: An advanced defining interrelationships between ranked ii method incorporating triangular fuzzy numbers. *Journal of Intelligent Management Decision*, 3(1), 56-67.

<https://doi.org/10.56578/jimd030105>

- Wang, P., Fu, Y., Liu, P., Zhu, B., Wang, F., & Pamucar, D. (2024). Evaluation of ecological governance in the Yellow River basin based on Uninorm combination weight and MULTIMOORA-Borda method. *Expert Systems with Applications*, 235, 121227. <https://doi.org/https://doi.org/10.1016/j.eswa.2023.121227>
- Wang, X., Chan, H. K., & Li, D. (2015). A case study of an integrated fuzzy methodology for green product development. *European Journal of Operational Research*, 241(1), 212-223. <https://doi.org/10.1016/j.ejor.2014.08.007>
- Wanyan, D., & Wang, Z. (2022). Why low-income people have difficulty accessing to obtain public cultural services? Evidence from an empirical study on representative small and medium-sized cities. *Library Hi Tech*, 40(5), 1244-1266. <https://doi.org/10.1108/LHT-02-2021-0055>
- Wei, Q. (2021). Sustainability evaluation of photovoltaic poverty alleviation projects using an integrated MCDM method: A case study in Guangxi, China. *Journal of Cleaner Production*, 302, 127040. <https://doi.org/10.1016/j.jclepro.2021.127040>
- Wu, H.-W., Zhen, J., & Zhang, J. (2020). Urban rail transit operation safety evaluation based on an improved CRITIC method and cloud model. *Journal of Rail Transport Planning & Management*, 16, 100206. <https://doi.org/10.1016/j.jrtpm.2020.100206>
- Xie, Z., Zhang, Y., & Fang, Z. (2022). The Space–Time Evolution of the Coupling and Coordinated Development of Public Cultural Services and Cultural Industries: A Case Study of 31 Regions in China. *Sustainability*, 14(22), 15463. <https://doi.org/10.3390/su142215463>
- Xiong, Y., & Zhou, Y. (2021). Resident participation in community-based public cultural services: the dual drivers of public service quality and motivation *Library Development*, 3, 34-45. <https://doi.org/10.19764/j.cnki.tsgjs.20201912>
- Yang, G., & Hua, X. (2018). Endogenous supply mechanism and effectiveness of public cultural services in urban communities: A practical analysis based on Wuhan Community S's "Lelingju" *Journal of Social Work*, 3, 98-108+112.
- Yang, Z., Xia, M., Wan, X., Wang, M., & Tang, W. (2024). Artificial intelligence technology enabling innovation in museum public cultural service models. *Applied Mathematics and Nonlinear Sciences*, 9(1). <https://doi.org/10.2478/amns.2023.2.01661>
- Yatsalo, B., Radaev, A., Haktanir, E., Skulimowski, A. M. J., & Kahraman, C. (2024). A family of fuzzy multi-criteria sorting models FTOPSIS-Sort: Features, case study analysis, and the statistics of distinctions. *Expert Systems with Applications*, 237. <https://doi.org/10.1016/j.eswa.2023.121486>