A Study on the Satisfaction of the Elderly with Urban Parks Based on the IPA Model: A Case Study of Cuihu Park in Kunming, Yunnan, China

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Abstract—In examining the satisfaction of older visitors to Cuihu Park in Kunming, Yunnan Province, this study utilized the importance-performance analysis (IPA) model and SPSS statistical software. The study aimed to compare and analyze the expectation and satisfaction levels among older visitors to urban parks. Research shows that accessibility, infrastructure, overall environment, landscape art and management services are the five factors that elderly tourists value most. However, the visitors' satisfaction only partially met their expectations of the park's environment before their visit due to various issues with infrastructure, service facilities, tourism information network construction, and management services. The study offers suggestions for the park's development and management to enhance the satisfaction of older visitors and provide valuable insights for future park construction.

Keywords-component; IPA analysis method; urban parks;elderly

1. INTRODUCTION

The aging of the global population has increasingly improved the elderly quality of life and social participation. As public spaces, urban parks directly affect residents' quality of life and well-being [1]. For older populations, parks are places for physical exercise, social interaction, and mental rest[2] Therefore, improving the satisfaction of the elderly with urban parks is of great significance for improving their quality of life. However, how to scientifically evaluate the satisfaction of the elderly with urban parks and improve park facilities based on the evaluation results to meet the needs of the elderly better requires further research.

This study focused on Cuihu Park in Kunming, Yunnan Province, and examined older visitors' expectations and satisfaction levels. Using the importance-performance analysis (IPA) model and SPSS statistical software, the study assessed the factors that attracted seniors to urban parks. The results indicated that accessibility, infrastructure, overall environment, landscape art, and management services were the top five features that senior visitor valued the most—however, their overall satisfaction with the park needed to meet their expectations wholly. There are significant gaps in accessibility, landscape art, management services, and personal perceptions that need to be addressed. Based on the analysis results, the study recommends further

ICEMME 2023, November 17-19, Beijing, People's Republic of China

DOI 10.4108/eai.17-11-2023.2342746

developing and managing the park to enhance older visitors' satisfaction and provide guidance for future construction projects.

2. LITERATURE REVIEW

As an essential part of the urban ecosystem, urban parks provide meaningful spaces for recreation and entertainment for citizens. For the elderly, parks are the primary place for social activities, physical exercise, and exposure to nature [3]. However, user needs and satisfaction with park facilities may vary significantly across age groups, and the unique needs of the elderly are often overlooked [4]. Therefore, an in-depth understanding of the elderly's satisfaction with parks can help park managers and urban planners better meet the needs of this population.

Satisfaction, an essential indicator of service quality, has been widely used in various studies, including evaluating urban park services[5]. Among these, the importance-performance analysis (IPA) model is a widely accepted tool for measuring and comparing the importance and performance of service quality [6]. The main advantage of this model is that it allows a clear distinction between high-priority areas for improvement and areas where satisfaction has been achieved, but no further improvement is needed.

IPA was first proposed by Martilla J A and James J C and applied to evaluate the effectiveness of automotive marketing programs [7]. Evans M R and Chon K S used it to study tourist destinations and found it very effective [8]. The IPA method not only objectively evaluates the importance and expressiveness of indicators affecting tourist satisfaction in tourist destinations but is also intuitive, visual, and easy to make decisions but is still rare in studies of satisfaction among the elderly in urban parks[9]. Therefore, this study hopes to fill this gap by applying the IPA model to the study of elderly satisfaction in Cuihu Park, Kunming, to provide a basis for park improvement and further improve the park use experience and quality of life of the elderly.

3. RESEARCH METHODS

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3.1 Research methods

In 2023, a pre-survey for the elderly in Cuihu Park, Kunming, Yunnan, was conducted through in-depth interviews with relevant experts and professors. After various adjustments and modifications, a satisfaction assessment model with six primary factors and 24 indicators was ultimately determined, as presented in Table 1.

Table 1 Satisfaction measurement index system of Cuihu Park

Target Level	Element Layer	Indicator Level
Satisfaction	Reachability (A)	External Accessibility(A1)、Internal fluidity(A2)、Wayfinding signage(A3)、Landscape accessibility(A4)
	Facilities (B)	Recreation area (B1)、Environmental Health (B2)、Recreation and fitness facilities (B3)、Internal road facilities (B4)
	Total Environment (C)	Park Features (C1)、Functional Partition (C2)、Air Quality (C3)、Water conditions (C4)
	Landscape Art (D)	Road View (D1)、Sculpture landscape (D2)、Green landscape (D3)、Water body landscape (D4)
	Managed Services (E)	Merchandise Shopping (E1)、Dining Accommodation (E2)、Interactive Interaction(E3)、Interpretation Service (E4)
	Personal Perception (F)	Entertainment (F1)、Educational (F2)、Aesthetics (F3)、Participatory (F4)

3.2 Construction of evaluation model

According to the characteristics of the multi-level evaluation index system, the elderly satisfaction evaluation model of Kunming City Park adopts the multi-objective linear weighted function method. The specific calculation model is:

$$S = \sum_{j=1}^{m} (\sum_{i=1}^{n} B_j P_j) K_i$$

A multi-level evaluation index system is used in the model, including the target layer, element layer, and indicator layer. In the calculation model, the total score S is the weighted sum of the products of the satisfaction scores of each indicator and the weight coefficient and then multiplied by the weight coefficient of the criterion layer. When i=1, the value of j ranges from 1 to 4, corresponding to the degree of accessibility of satisfaction and the four indicators of external accessibility, internal smoothness, road signage, and landscape accessibility. When i=2, the value of j ranges from 5 to 8, corresponding to the four indicators of infrastructure: resting places, environmental sanitation, entertainment and fitness facilities, and internal road facilities. By analogy, when i=3, the value of j is 9 to 12, corresponding to the four indicators of park characteristics, functional zoning, air quality, and water conditions of the overall environment. When i=4, the value of j is 13 to 16, corresponding to the four indicators of landscape art: road landscape, sculpture landscape, green landscape, and water landscape. When i=5, the value of j is 17 to 20, corresponding to the four indicators of management services: commodity shopping, catering, accommodation, interactive communication, and explanation services. Finally, when i=6, the value of j ranges from 21 to 24, corresponding to the four indicators of personal perception of entertainment, education, aesthetics, and participation.

3.3 Definition of evaluation results

Based on the above-mentioned evaluation model of elderly satisfaction in Kunming parks, combined with the Likert scale method. It is divided into five levels: very dissatisfied, dissatisfied, average, satisfied, and very satisfied, corresponding to the assignments from 1 to 5 respectively. According to this model, the satisfaction evaluation results of the elderly are divided into four levels. Those with scores in [4, 5] are rated as "excellent", which means that the elderly are very satisfied with urban parks and the facilities are relatively complete; those with scores in [3, 4] are rated as "good", which means that the satisfaction of the elderly is medium. Above the level, urban parks need targeting renovation and improvement; those with scores in [2, 3] are "medium", and the satisfaction of the elderly is at the lower-medium level, and key improvements are needed; those with scores in [1, 2] As "poor", the satisfaction of the elderly is very low, and the city park is in urgent need of renovation and renovation of the overall environment.

3.4 IPA model

The IPA method, developed by Martilla and James in 1977, prioritizes improvement measures. This method employs a two-dimensional matrix, with importance as the horizontal and actual satisfaction as the vertical coordinate. The average score of the two is used as the origin to divide the matrix into four quadrants. Quadrant I is the high importance/high satisfaction zone, where significant results have been achieved, and excellent performance needs to be maintained. Quadrant II is Maintain (Possible Overkill); although the performance is good and there is high satisfaction, there is no need to improve it deliberately because it is unimportant. Quadrant III is Opportunity Zone (Low Priority). Although unsatisfactory, no improvement is needed due to the low importance. Quadrant IV is the high importance/quiet satisfaction zone, where the focus should be given to advancing in the subsequent development process to enhance visitor satisfaction significantly (Figure 1) [10].

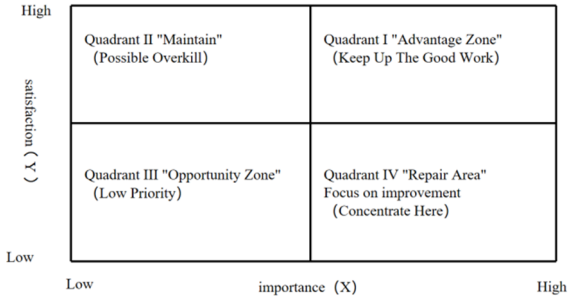

Fig. 1 IPA four-level quadrant chart

4 EMPIRICAL RESEARCH

4.1 Questionnaire design

The survey is divided into two parts through a questionnaire. The first part includes 11 questions about the survey participants' demographic characteristics and park recreation preferences. The second part evaluates the importance and satisfaction of different levels and indicators of the park. It includes six important questions and 24 smaller ones. The survey assesses the satisfaction evaluation index system of Cuihu Park in Kunming, covering each index's importance and actual satisfaction. A five-level Likert scale with five different options for each question is used, with "very important/important/general/unimportant/very unimportant" for important items and a similar scale for satisfaction items. Statistical software assigns 5, 4, 3, 2, and 1 values for importance and satisfaction items. The higher the average score for each indicator option, the higher its importance or satisfaction [11].

4.2 Data Collection and Organization

Two methods were used to gather information on visitors to Cuihu Park in Kunming, Yunnan Province. The first was an online survey conducted through Questionnaire Star's website, which yielded 150 responses from those who had visited the park in the past six months. The second method involved field research from January to May 2023 during holidays and weekends, where 400 questionnaires were distributed, and 392 were collected. After removing 46 invalid questionnaires, 496 valid questionnaires were obtained, resulting in an effective rate of 91.5%.

The data from the online survey could be directly processed into data files. At the same time, the results of the field research were transformed into Excel data for analysis using Excel and SPSS software. Descriptive statistical analysis was mainly used to analyze the demographic and recreation characteristics of the respondents in the first part of the questionnaire. For the second part, which focused on the importance and satisfaction levels of park elements and indicators, paired samples t-test was used for analysis, and an exploratory study was conducted using the IPA model.

4.3 Trust level analysis

To ensure the accuracy and dependability of the data gathered through survey research, we analyzed Cronbach's alpha coefficient using SPSS. The questionnaire had an overall reliability of 0.937, with the importance scale at 0.924 and the satisfaction scale at 0.953. All scales had reliability above 0.9, which indicates that the scale data is highly reliable and stable with excellent internal consistency. Further data analysis is now possible.

5 ANALYSIS OF RESULTS

After analyzing the IPA model (Table 2) and (Figure 2), we have found notable disparities in the evaluation elements of Cuihu Park for older visitors in terms of significance and satisfaction. Their top priorities are accessibility and the park's overall environment, while they are delighted with the infrastructure and overall atmosphere. However, the satisfaction level for all evaluation elements is lower than their importance, particularly regarding accessibility and service

management. This indicates the potential for improvement, highlighting a significant gap between the expectations and actual experiences of senior visitors. Therefore, the park has ample opportunity to enhance and improve to better cater to its old visitors.

Table 2. Statistical table of evaluation results of each element level project

Code	Element Name	Importance I Mean	Satisfaction P mean	I-P
A	Accessibility	4.35	3.79	0.56
B	Infrastructure	4.08	3.95	0.13
C	Overall Environment	4.16	4.05	0.11
D	Landscape Art	4.05	3.92	0.13
E	Management Services	4.13	3.67	0.46
F	Personal Perception	3.94	3.89	0.05

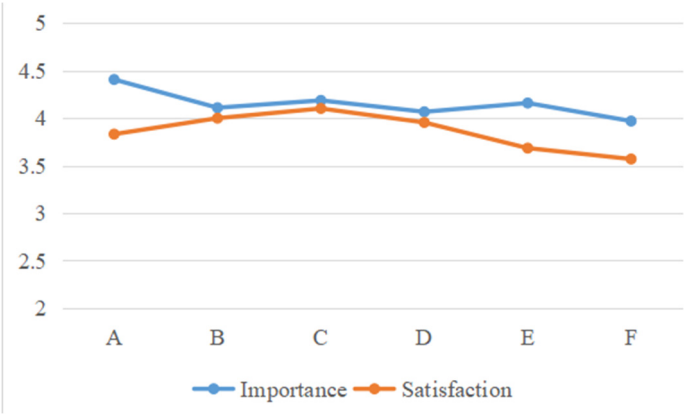

Figure 2. Comparison chart of the evaluation results of each element layer item

5.1 Evaluation index layer

According to the IPA model's results (Table 3), the importance and satisfaction means of older tourists were calculated on an indicator level. Paired-sample t-tests were conducted, and it was found that the importance score for all indicators was 4.17, while the satisfaction score was 3.93. The mean satisfaction was significantly lower than the mean importance.

The importance analysis indicated that visitors rated the indicators between 3.60 and 4.76, with a mean value of 4.10. The top three important items for the elderly were internal accessibility, interpretive services, and educational experiences.

Regarding the satisfaction analysis, the satisfaction scores for each indicator ranged from 3.51 to 4.56, with a mean value of 3.89, which is lower than the importance mean. The three indicators that received the least satisfaction were botanical landscape, landscape accessibility, and educational experience.

Table 3. Statistical table of project evaluation results at each index level

Item	Importance		Satisfaction		T-test	
	Average	Sort	Average	Sort	Differences	P
A1	4.31	8	4.20	5	0.11	0.021*

A2	4.75	1	3.62	17	1.13	0.000**
A3	4.36	5	4.00	10	0.36	0.000**
A4	4.23	13	3.52	20	0.71	0.000**
B1	4.36	6	4.12	7	0.24	0.000**
B2	4.29	9	3.94	12	0.35	0.000**
B3	3.59	24	3.77	14	-0.18	0.000**
B4	4.25	11	4.22	4	0.03	0.238
C1	3.79	21	4.00	11	-0.21	0.000**
C2	4.36	7	3.60	19	0.76	0.000**
C3	4.40	4	4.55	1	-0.15	0.033*
C4	4.24	12	4.30	3	-0.06	0.514*
D1	3.84	20	4.19	6	-0.35	0.000**
D2	3.94	18	4.10	8	-0.16	0.000**
D3	4.21	14	3.52	21	0.69	0.000**
D4	4.27	10	4.00	9	0.27	0.000**
E1	3.87	19	3.65	16	0.22	0.000**
E2	4.10	16	3.60	18	0.5	0.000**
E3	4.19	15	3.72	15	0.47	0.000**
E4	4.47	2	3.76	13	0.71	0.000**
F1	3.75	22	3.60	23	0.15	0.027*
F2	4.42	3	3.48	22	0.94	0.000**
F3	3.93	17	4.06	24	-0.13	0.000**
F4	3.67	23	4.30	2	-0.63	0.000**

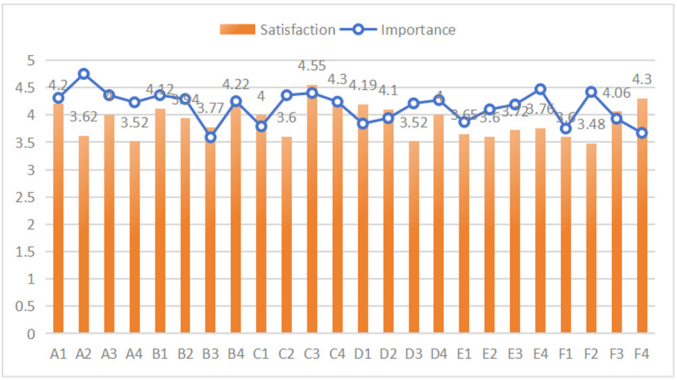

Figure 3. Comparison chart of project evaluation results at each indicator level

5.2 IPA analysis

Based on the IPA model, Table 3 displays how each indicator's importance and satisfaction levels are used to classify them into four quadrants, further illustrated in Figure 3. The high importance/high satisfaction quadrant encompasses eight indicators, such as external accessibility and wayfinding directions, considered strengths and crucial components of the park. However, five of these indicators display significant gaps that require attention and optimization. The low importance/high satisfaction quadrant comprises four indicators, including park features, which perform well and require no further improvement despite their low importance. The inferior importance/low satisfaction quadrant contains recreation and

fitness facilities that do not need immediate improvement but should be nurtured for future growth. On the other hand, the High Importance/Low Satisfaction quadrant comprises seven indicators, such as internal accessibility, that require significant improvement. Notably, internal accessibility and educational experience display the most significant differences, emphasizing the need for improvement in these areas.

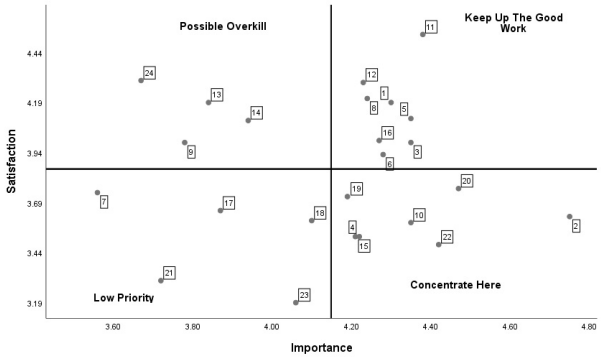

Figure 3. IPA zoning map of each indicator project

6 CONCLUSION

The IPA quadrant chart analysis highlights internal accessibility, landscape accessibility, functional zoning, botanical landscape, interactive activities, interpretive services, and educational experiences as areas that require improvement. Our survey results reveal shortcomings and deficiencies in Cuihu City Park, including scattered attractions and a weak sense of order in the landscape. Additionally, more professional interpreters and interpretation systems must be needed, disorganized plant management and some withered plants.

To address these issues, Cuihu City Park can improve three key areas:

Layout optimization: This is a complex and detailed task that covers numerous aspects, such as the selection of attractions, the design of trails, and the way the landscape is presented. Careful planning allows the park's layout to match visitors' expectations and needs better. For example, designing a guide system that is easy to understand and follow, or creating rest areas, children's play areas, and sports facilities inside the park, will ensure that people of all ages and physical conditions can find activities and services that suit their needs. At the same time, a reasonable layout of the park's interior landscape will enable visitors to discover novelties and enhance their visiting experience.

Interpretation and guide service improvement: Interpretation and guide service can help visitors understand the park's history, culture, and natural features more deeply and improve their visiting experience and satisfaction. For example, interpretive services in information boards, audio tours, and cell phone applications can be provided so visitors can gain sufficient information and knowledge while touring freely. In addition, regular lectures or guided tours

can also be considered so that professionals can provide visitors with more in-depth and attractive explanations.

Plant management and care enhancement: Plants are an essential part of the park, providing an aesthetically pleasing landscape and an ecological environment for the animals. Therefore, strengthening plant management and care can ensure healthy plant growth and enhance the park's landscape quality and environmental value. Specifically, plant species can be changed seasonally to showcase various seasonal characteristics; plant thinning and pruning can be carried out regularly to maintain beautiful plant forms; and effective control of pests and diseases can be carried out to protect plant health. Through these improvement measures, Cuihu City Park can enhance the satisfaction of senior visitors and provide them with a better visiting experience.

The ideas suggested to enhance Cuihu City Park can also be implemented in other city parks. By improving the layout, providing better interpretation and orientation services, and managing plants more effectively, parks can become more appealing to the public and gain greater significance in the community. A well-kept park can also positively impact the well-being of urban dwellers and contribute to a better overall quality of life.

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