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Evaluation Study of Design Management in Urban Public Space after Renewal - A Case Study of Chongqing Zhujiang Road

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Abstract

This thesis takes the public space of Chongqin2g urban commercial neighborhood as the research object, and chooses Zhujiang Road as a representative case of public space in renewal. Taking the residents' feeling of use as the most basic judgement standard, we adopt the satisfaction evaluation method of Post-Occupancy Evaluation (POE), combining the knowledge of design management, statistics, architecture, sociology and other disciplines to carry out a post-occupancy evaluation study on the research object. Analyse the humanities, behaviours and feelings of use in the renovated space, and dissect the residents' real thoughts and feelings of use in the renovated space. A hierarchical comprehensive evaluation framework for the renewal of commercial neighbourhoods is built, and the indicator system and methods for the urban public space after renewal are constructed, on the basis of which the planning path for the renewal of urban public space is proposed. Through the post-use evaluation study of the Pearl River Road neighbourhood, it can be seen that the users' satisfaction rating of the overall effect of the renovation of Pearl River Road is 2.756 points (total 5 points), which is in a general state. "Overall spatial layout", "green landscape", "humanistic atmosphere", "employment and income improvement effect The ratings of "overall spatial layout", "green landscape", "humanistic atmosphere", and "employment and income improvement effect" are relatively high, and the regeneration is worthy of recognition in these aspects. However, the ratings for "traffic improvement effect", "pavement signals and markings", and "openness and maintenance" are low, and further renovation is needed.

Keywords: Design Management, Urban Public Space, Integrated Evaluation, Post-use Evaluation

Introduction

This project is located in Yangjiaping Pedestrian Street, Chongqing, to carry out a "multi-level" organic renewal of the entire Zhujiang Road,which along the problems of poor landscape experience, traffic congestion, old business, lack of pedestrian flow and Netflix

attractions and other issues. ·

In terms of traffic, the problems on Zhujiang Road are the prominent phenomenon of indiscriminate parking on both sides of the road, resulting in narrowing of the road surface, serious congestion, the road surface lacks tidiness and hygiene. Street space lacks vitality and there is no space for public activities. There are no resting seats in the whole street for the elderly people; the neighborhood also lacks a medium for generating dialogue and communication, and it means there is no space for public communication in the whole neighborhood. Shao, S. (2011)

In response to the cultural and artistic atmosphere of the neighborhood, the neighborhood lacks cultural vitality and a sense of artistic atmosphere, the commercial and cultural atmosphere is weak, the buildings and streets are mainly used for motorbike and motor vehicle parking, and there is not enough public space to display commercial culture and art. Solve the problem of traffic congestion as well as motorbikes parked indiscriminately, to achieve the requirements of coming in, stopping and going out. It also gives community residents and foreign tourists a more spacious, more distinctive net street space in Chongqing, and injects new vitality into Yangjiaping Pedestrian Street.Based on the on-site research and meeting exchanges with relevant personnel of the Yangjiaping government, the author summarizes the specific techniques used in the renewal and reconstruction of Zhujiang Road:

Ground level motor vehicle and motorbike diversion design chapter: combing and screening the parking spaces in the car parks on Pearl River Road, turning the original ground level parking spaces into public spaces in the neighborhood, so that the ground level roads are more accessible and there is more usable space. Smith, N. (1979).

Linear landscape isolation zone design: increase linear landscape isolation zone, alternative to the original parking space and motorbike parking position, through the design of the car away, to solve the problem of traffic congestion and motorbike indiscriminate parking, but also the community residents and foreign tourists a more spacious, more leisure street space.

Flower box and partition design: the whole section of the partition design using a few words flower box combined with piece of art isolation, using flower boxes and stainless steel "wave" art partition combination of ways to form a staggered isolation of space, forming a band of people and vehicles art partition design, staggered isolation device art. This design is an effective solution to traffic congestion and motor vehicles parked indiscriminately.

Artistic painting design: The role is to enrich the commercial feeling of the neighborhood, enhance the sense of catering consumption of tourists, and at the same time play a role in beautifying the effect of the ground and façade along the street Graffiti on the old and dirty ground as well as the building façade, controlling the overall style, low cost, good effect.

Literature review

Post Occupancy Evaluation (POE for short) is an evaluation study of the space in the design stage or after the construction is completed from the user's point of view, and the results of the evaluation are used to provide information that can be used as reference and guidance for the design and planning of similar construction projects. Historically, Qu, P. (2016). scholars in different countries have put forward different theories on post-use evaluation, and Preiser, W., Vischer, J. (2009)., an architectural researcher, pointed out in his book Post-use Evaluation that post-use evaluation is an evaluation study of the built environment (architecture, landscape, planning) and other designs through the use of a systematic and quantitative methodology. The key to POE is to evaluate based on the user's feelings and needs, and to evaluate the design solutions and the social impacts of the built environment through the evaluation of the constructed spaces. The key to POE is evaluation based on the feelings and needs of users, and by analyzing the design solutions that have been constructed and implemented and the evaluations they have received in society, it provides a basis for reference for other design projects.

Therefore, this paper applies the method of post-use evaluation, the purpose of which is to study the user's life trajectory, living habits, in-depth investigation of their living surroundings, combined with the characteristics of the urban public space, research and analysis of the relationship between the environment of the urban public space and the residents' lives, whether to solve the problems of the residents' living needs and to meet the demand for artistic aesthetics, so as to achieve an accurate definition of the problems arising from the renovation and reconstruction and provide real data references for the renewal design of the urban public space. The study will provide real data reference for the renewal design of urban public space. Shen, L. (2012).

The formation and development of the theory of post-occupancy evaluation is mainly influenced by the theory of environmental behavior and the theory of built environment evaluation. Post Occupancy Evaluation originated in the field of environmental psychology and environmental behavior in the 1960s, and has gradually been introduced into the field of urban and built environment evaluation, which focuses on "human activities". It was gradually introduced into the field of urban built environment evaluation, which focuses on "human activities". From the 1970s to the 1980s, the peak of the post-evaluation theory used in foreign countries was research, and POE gradually developed into an independent discipline and established a relatively complete evaluation method system. The use of post-evaluation theory from the mid-20th century since the emergence of the theory, the main experience is three stages of development table, at the moment, the use of post-evaluation theory is still absorbing the essence of multi-disciplinary, and constantly integrating the new concepts, new methods and new connotations, to develop into a diversified, integrated theoretical system.

Research Methodology

Research method

Adopting the statistical survey rating method, the evaluation index set is constructed on

the basis of the pilot study, which mainly includes six evaluation factors, namely, spatial layout, traffic condition, public environment, traffic facilities, ecological environment, social and human environment, so that the factors are specific and have certain operability. Then we select suitable and representative evaluation samples, conduct questionnaire survey and collect receipts, and obtain users' subjective evaluation through statistical analysis.

Using SPSS17.0, YAHHP11.0, MATLAB7.0, EXCEL2010 and other mathematical and statistical analysis software in combination with the use of the data obtained from the questionnaire, mean value analysis, correlation analysis, factor analysis, etc., to get the quantitative evaluation results, to find the main factors affecting the evaluation of the renewal of the use of the public space in commercial districts after the use of the main factors.

Population and sample

The target of this survey is the residents along Pearl River Road as well as the management of the neighbourhood committee, the target of the questionnaire survey was selected by sampling method and semi-structured interviews were conducted with some residents respectively, the survey was conducted from 25th July 2022 to 15th August 2022. A total of 250 questionnaires were distributed, of which 209 questionnaires were valid, and the validity rate of the questionnaire was 83.6%. The questionnaire is detailed in Appendix 1.

According to the 209 valid questionnaires, 44.02 per cent of the respondents were between the ages of 20 and 35, and 33.97 per cent were between the ages of 35 and 50, the two age groups in which the respondents were more concentrated. The gender distribution of the surveyed population is about 2.03:1, and the surveyed population is mainly male. The occupational distribution of the survey population is mainly concentrated in the inconvenient classification of other workers and commercial and service workers, accounting for 36.36% and 40.19% respectively. Educational attainment is mainly concentrated in high school, college and bachelor's degree, accounting for 23.92 per cent, 45.93 per cent and 21.53 per cent respectively. The highest proportion of income is located in the range of 5000-8000 yuan, accounting for 48.33%, 27.75% in the range of 3000-5000 yuan, and 20.57% in the range of less than 3000 yuan. The duration of residence is mainly concentrated in the period of half a year or between half a year and one year, accounting for 28.23 per cent and 49.28 per cent respectively.

Data collection

The measurement method of the questionnaire indicators adopts the method of Likert Scaling (Likert Scaling) to establish a standard structured questionnaire (see Appendix). The scale is designed with 4 first-level evaluation indicators and 26 second-level evaluation indicators, respectively constructing a specific evaluation system from four aspects: evaluation of renewal attitude, evaluation of physical space, evaluation of humanistic environment and evaluation of derived benefits, which are able to adequately reflect most of the contents of the interviewees' concerns. The evaluation level can be divided into five measurement levels: very satisfied, more satisfied, average, less satisfied, very dissatisfied, and assigning values to them as follows: very satisfied=5 points, more satisfied=4 points, average=3 points, less satisfied=2 points, and very dissatisfied=1 point. Through the assignment of the subjective evaluation of the results of the respondent into a fixed distance level measurement level, which can be more accurately reflect the attitude of the measurer, residents can also be free to express their

opinions on each issue, in order to amend the closed-ended questionnaire, the specific evaluation criteria are shown in Table 1

Table 1 Quantitative criteria for evaluation

Assessed value xi	evaluation term	classification
xi>4.5	extremely happy	E1
3.5<xi<=4.5	more satisfied	E2
2.5<xi<=3.5	usual	E3
1.5<xi<=2.5	Less satisfactory	E4
xi<=1.5	Very dissatisfied	E5

Data analysis

Establishment of the evaluation indicator system

Table 2 Indicator system for post-renewal evaluation of public space in commercial neighbourhoods

Level 1 indicators	Secondary indicators	Tertiary indicators
A1Updated Attitude Evaluation	Satisfaction with B1 public space after renovation	C1 Overall space layout
		C2 Traffic Rectification Effect
		C3 Infrastructure Package
		C4 Health Environment
A2 Physical space evaluation	B2 space layout	Delineation of the functions of the C5 neighbourhood
		C6 Degree of effective utilisation
		C7 layout optimisation
	B3 Traffic conditions	C8 Ease of parking for motor vehicles
.		C9 Non-motorised parking management
		C10 Pavement Surface Signals and Signs
		C11 Separation of people and vehicles management (e.g. pedestrian crossings, pedestrian streets, etc.)
	B4 Ecology	C12 Noise Pollution Prevention and Control
		C13 Green Landscape
A3Human Environment Assessment	B5 Artistic aesthetics	C14 Spatial Theme Setting for Commercial Areas
		C15 Artistic Innovation in Public Space
	B6 Emotional experience	C16 Open and Maintain
		The attractiveness of the

		C17 neighbourhood space
	B7 Cultural influences	C18 Continuity of values in history and culture
		C19 Humanistic atmosphere
A4 Evaluation of Derived Benefits	B8 Economic benefits and others	C20 Business Prosperity
		C21 Visibility of transformed commercial areas
		C22 The effect of regulated parking on the economic enhancement of shopping areas
		C23 Commercial Support Facilities
		C24 Appreciation in the value of the building (lease or sale price)
		C25 Employment and income improvement effects
		C26 Economic driving effect of the surrounding region
Are you satisfied with the overall result of the remodelling? Please rate your satisfaction		

Research design

research purpose

1) Examine the general condition of the renewed Zhujiang Road commercial street area in actual use, including commercial operation, traffic congestion, pedestrian and vehicle traffic diversion, the actual use of the isolation zone, and the use of public space in the neighbourhood, etc. Starting from the user's feelings, we will mainly use questionnaire surveys to analyse the data quantitatively, and objectively obtain the overall attitude of the users towards the renewed Zhujiang Road commercial street area;

2) Explore the main influencing factors, the ranking of important factors and the corresponding weights for the evaluation of Chongqing's urban commercial neighbourhoods after renewal and use, and provide an objective basis for the establishment of the evaluation factor set;

3) Through the questionnaire survey and data compilation, analysis and evaluation, find the problems after the renewal of the use of the commercial street area of Zhujiang Road, and classify and analyse the problems, and finally come up with optimized plans and suggestions.

Research framework

The framework of the study consists of nine main parts: identification of the research subjects, clarification of the purpose of the study, exploratory study, research design, questionnaire distribution and collection, data analysis, fuzzy comprehensive evaluation, and conclusion of the evaluation.

（1）poll

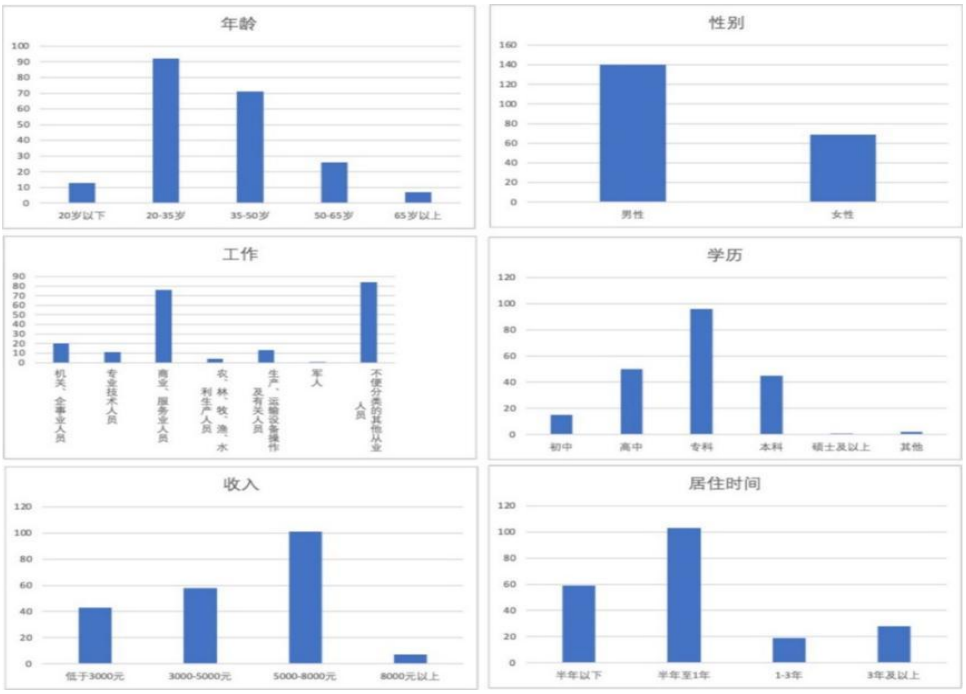

Figure 1 Analysis of survey results Image source: Author's own (questionnaire star).

Statistics and analyses of survey results (evaluation criteria and quantitative methods) mean value analysis

The results of the study show that the overall average satisfaction score for the public space renovation of Zhujiang Road is 2.765 (out of a total score of 5), with an evaluation result of "average". The survey results show that the average score for "openness and maintenance" is only 2.474, significantly lower than 2.5 (with 2.5 being the threshold for fair to less satisfactory), indicating that there are obvious deficiencies in this aspect after the transformation of the public space on Zhujiang Road. The average satisfaction scores of the seven evaluation indicators of "traffic improvement effect, division of neighbourhood functions, convenience of motor vehicle parking, pavement signals and signs, management of pedestrian-vehicle separation (e.g. pedestrian crossings, pedestrian streets, etc.), artistic innovation of public space and continuity of historical and cultural values" fluctuate around 2.55 points, indicating that the effect of the seven evaluation indicators after transformation is relatively general, and the average satisfaction score of the seven evaluation indicators is significantly lower than 2.5 points (2.5 points is the critical value of general to less satisfactory). The average satisfaction score of the seven evaluation indicators fluctuates between 2.55 and 2.55, indicating that the effect of the seven indicators after transformation is relatively general, of which the convenience of motor vehicle parking scores 2.574, with an average evaluation result.

The average satisfaction scores of the remaining 18 evaluation indicators are relatively high, but none of them exceeds the critical value of 3.5 points (3.5 points is the critical value of general to more satisfied), which indicates to a certain extent that the residents' evaluation of the public space renovation of Zhujiang Road is "general", which is basically the same as the overall average satisfaction evaluation. The score of 2.574 for the ease of parking for motor

vehicles is an average satisfaction rating, which proves that the renovated neighbourhood is not particularly satisfactory in terms of parking, and the ease of parking for motor vehicles needs to be further improved.

Calculation of indicator weights

The methods of giving weight to indicators mainly include hierarchical analysis method, Delphi method, brainstorming method, expert scoring method, etc., which are more subjective, and entropy value method, factor analysis method, principal component analysis method, etc., which are more objective. In order to eliminate the influence of subjective factors, this paper adopts the more objective entropy value method to give weight.

Entropy indicates the uniformity of the distribution of an energy in space, belongs to is a concept of thermodynamics, is a measure of the chaos of the system, expressed as S. Applied in system theory, the larger the entropy indicates the more chaotic the system is, the less information it carries, the smaller the utility value and the smaller the weight, the smaller the entropy indicates the more ordered the system is, the more information it carries, the larger the utility value and the larger the weight. The specific practice is as follows:

(i) Data standardisation

Since the indicators in the indicator system have different scales and orders of magnitude, in order to solve the problem of homogenisation of the indicators to ensure the reliability of the results, they need to be made dimensionless. Since there are forward and reverse indicators, different equations will be used for the forward and reverse indicators to perform the dimensionless processing. The specific methods are as follows.

m indicators for the n sample, x_{ij} is the value of the indicator for the j indicator for the i sample.

$(i=1\cdots n,\ j=1\cdots m)$ rule

Positive indicators:
$$x'_{ij}=\frac{x_{ij}-x_{\min}}{x_{\max}-x_{\min}} \quad (1)$$

Reverse Indicator:
$$x'_{ij}=\frac{x_{\max}-x_j}{x_{\max}-x_{\min}} \quad (2)$$

Where x_j is the value of the indicator at j, $x_{\max}$ is the maximum value of the indicator at j, $x_{\min}$ is the minimum value of the indicator at j, and x'_{ij} is the normalised value.

(ii) Assignment of weights to indicators

(1) Calculate the weighting of the value of the i sample indicator under the j indicator. p_{ij}

$$p_{ij}=\frac{x'_{ij}}{\sum_{i=1}^{m}x'_{ij}}(0\le p_{ij}\le 1) \quad (3)$$

(2) Calculate the information entropy value of the j th indicator

$$e_j=-k\sum_{i=1}^{m}p_{ij}\ln p_{ij} \quad (4)$$

where k is a constant and $k=\frac{1}{\ln m}$.

(3) Calculate the information entropy redundancy

$$d_j = 1 - e_j \quad (5)$$

(4) Calculate the weight of the j th indicator

$$w_j = \frac{d_j}{\sum_{i=1}^{m} d_j} \quad (6)$$

Calculated using Stata 17.0 software based on the above steps.

After the above calculation process, the single sorting values and comprehensive weights of the evaluation indicators of each level in the evaluation system of the public space transformation of Pearl River Road for the total objective level are shown in Table 4-7. As can be seen from the table, the top five factors that the respondents attach importance to in the public space transformation index system of Zhujiang Road are: C4 hygienic environment, C10 pavement signals and symbols, C1 overall spatial layout, C22 standardised parking on the economic enhancement of the business district and C14 spatial thematic settings of the commercial area, the reason for this relationship is that the residents are more concerned about the environment around their own living range, especially the old commercial street such as Zhujiang Road, which is the largest in the world. Especially the average age of the residents living in the old commercial street area like Zhujiang Road is higher, and they also hope that there are certain signs and guidelines on the pavement, which can encourage them to better identify the road information; for the people operating businesses on the ground floor, standardised parking is more conducive to the operation of the shops, and also helps to better display the effects of the whole business district, so the effect of C22 standardised parking on the economy of the shopping district is also one of the factors that respondents attach more importance to. One of the more important factors for respondents; C14 The setting of spatial themes in commercial areas is related to the degree of popularity of commercial neighbourhoods, and a layered and themed commercial neighbourhood will generate more business opportunities.

Table 1 Weighting system of evaluation indicators for public space transformation of Pearl River Road

target level	Level 1 indicators	Secondary indicators	Indicator scoring
A Evaluation of Public Space on Pearl River Road	B1 Updated Attitude Rating	C1 Overall space layout	6
		C2 Traffic Rectification Effect	9
		C3 Infrastructure Package	5
		C4 Health Environment	6
	B2 material space evaluation	Delineation of the functions of the C5 neighborhoods	5
		C6 Degree of effective utilization	4
		C7 layout optimization	3
		C8 Ease of parking for motor vehicles	7
		C9 Non-motorized parking management	8
		C10 Pavement Surface Signals and Signs	6
		C11 Separation of people and vehicles management (e.g. pedestrian crossings, pedestrian streets, etc.)	9
		C12 Noise Pollution Prevention and Control	4
		C13 Green Landscape	5
	B3 Human Environment Assessment	C14 Spatial Theme Setting for Commercial Areas	5
		C15 Artistic Innovation in Public Space	7
		C16 Open and Maintain	3
		The attractiveness of the C17 neighborhoods space	5
		C18 Continuity of values in history and culture	4
		C19 Humanistic atmosphere	4
	B4 Evaluation of Derived Benefits	C20 Business Prosperity	8
		C21 Visibility of transformed commercial areas	4
		C22 The effect of regulated parking on the economic enhancement of shopping areas	7
		C23 Commercial Support Facilities	5
		C24 Appreciation in the value of the building (lease or sale price)	4
		C25 Employment and income improvement effects	4
		C26 Economic driving effect of the surrounding region	3

Fuzzy integrated evaluation analysis

(1) Quantitative analysis of evaluation indicators

According to the characteristics and realities of the public space of Zhujiang Road, the Delphi method was used to organise experts (a total of three local professionals and technicians in Chongqing were invited to this study, of which two

were professional in urban planning, one professional in architectural design, and one professional in landscape architecture) to rate the evaluation indexes of its renovation, and the

quantitative scoring of the indexes was assigned a value between 0-10, of which: 5 represents the average industry practice of this index in the location under the premise of complying with relevant laws and regulations, and 10 is the upper limit value of this index, and 0 is the lower limit value of this index. Where: 5 represents the average industry practice of the location of the indicator under the premise of relevant laws and regulations, 10 is the upper limit value of the indicator, and 0 is the lower limit value of the indicator. The scoring results of the evaluation indicators for the transformation of public space on Pearl River Road are shown in Table 4-8.

Table 2 Pearl River Road Public Space Improvement Evaluation Indicator Scores

Level 1 indicators	Secondary indicators	Tertiary indicators
A1 Updated Attitude Evaluation	Satisfaction with B1 public space after renovation	C1 Overall space layout
		C2 Traffic Rectification Effect
		C3 Infrastructure Package
		C4 Health Environment
A2 Physical space evaluation	B2 space layout	Delineation of the functions of the C5 neighbourhood
		C6 Degree of effective utilisation
		C7 layout optimisation
	B3 Traffic conditions	C8 Ease of parking for motor vehicles
		C9 Non-motorised parking management
		C10 Pavement Surface Signals and Signs
		C11 Separation of people and vehicles management (e.g. pedestrian crossings, pedestrian streets, etc.)
	B4 Ecology	C12 Noise Pollution Prevention and Control
		C13 Green Landscape
A3 Human Environment Assessment	B5 Artistic aesthetics	C14 Spatial Theme Setting for Commercial Areas
		C15 Artistic Innovation in Public Space
	B6 Emotional experience	C16 Open and Maintain
		The attractiveness of the C17 neighbourhood space
	B7 Cultural influences	C18 Continuity of values in history and culture
		C19 Humanistic atmosphere
A4 Evaluation of Derived Benefits	B8 Economic benefits and others	C20 Business Prosperity
		C21 Visibility of transformed commercial areas
		C22 The effect of regulated parking on the economic enhancement of shopping areas
		C23 Commercial Support Facilities
		C24 Appreciation in the value of the building (lease or sale price)
		C25 Employment and income improvement effects
		C26 Economic driving effect of the surrounding region
Are you satisfied with the overall result of the remodelling? Please rate your satisfaction		

(2) Vector of indicator weights

1) Weight vector of first-level indicators. According to the entropy method weight

calculation method in the previous section, the first-level indicator weight vector is derived as:

W=[0.172,0.349,0.223,0.256]

2) Vector of weights for secondary indicators. Again based on entropy method weights:

Updated attitudinal evaluation: w1 = [0.258, 0.226,0.232,0.283]

Physical space evaluation: w2 = [0.114,0.111,0.104,0.114,0.103,0.128,0.110,0.104,0.114]

Human environment assessment: w3 = [0.186,0.178,0.177,0.148,0.154,0.158]

Evaluation of derived benefits: w4 = [0.161,0.132,0.164,0.140,0.143,0.132,0.128]

(3) Fuzzy comprehensive evaluation

By taking the value N of the secondary indicator quantified using Delphi above and bringing it into the affiliation function, the set of rubrics for the secondary indicator can be calculated, and then the rubrics can be combined to form the affiliation matrix.

"Renewal of attitudinal evaluation" judgement matrix R1:

Table 3 Update Attitude Evaluation Criticism Analysis

	0	0.5	0.5	0
0	0	0	0	1
0	0	1	0	0
0	0	0.5	0.5	0

"Physical space evaluation" R2:

Table 4 Physical Space Evaluation Critical Analysis

0	0	1	0	0
0	0.5	0.5	0	0
1	1	0	0	0
0	0	0	1	0
0	0	0	0.5	0.5
0	0	0.5	0.5	0
0	0	0	0	1
0	0.5	0.5	0	0
0	0	1	0	0

"Human Environment Assessment" R3:

Table 5 Human Environment Evaluation Critical Analysis

0	0	1	0	0
0	0	0	1	0
1	1	0	0	0
0	0	1	0	0
0	0.5	0.5	0	0
0	0.5	0.5	0	0

"Evaluation of Derived Benefits" R4:

Table 6 Critical Analysis of Derivative Benefit Evaluation

0	0	0	0.5	0.5
0	0.5	0.5	0	0
0	0	0	1	0
0	0	1	0	0
0	0.5	0.5	0	0
0	0.5	0.5	0	0
1	1	0	0	0

2) Fuzzy comprehensive evaluation results

Carrying out the first-level fuzzy operation, the weight vector wi of the first-level indicators and second-level indicators will be fuzzy synthesis operation with the judgement matrix Ri respectively, then the evaluation results of the first-level indicators can be obtained, and the results are as follows:

B1 = W1*R1 = [0, 0 , 0.503, 0.271, 0.226]

b2 = w2*r2 = [0.104, 0.212, 0.399, 0.230, 0.162]

b3 = w3*r3 = [0.177, 0.333, 0.490, 0.178, 0]

b4 = w4*r4 = [0.128, 0.332, 0.345, 0.244, 0.081]

Then the second-level fuzzy operation is carried out, and the evaluation results of the public space transformation of Zhujiang Road can be obtained:

$B = W*R=W*[B1,B2,B3,B4]^T$ = [0.109 0.233 0.423 0.229 0.116]

3) Analysis of evaluation results

① Analysis of evaluation results at the target level

According to the principle of maximum affiliation, the affiliation value corresponding to the "general" level is the largest, which is 0.423, the affiliation value of the "very dissatisfied" level is 0.109, the affiliation value of the "less satisfied" level is 0.233, the affiliation value of the more satisfied level is 0.229, and the affiliation value of the very satisfied level is 0.116 (Figure). The degree of affiliation of the "more dissatisfied" level is 0.109, the degree of affiliation of the "less satisfied" level is 0.233, the degree of affiliation of the "more satisfied" level is 0.229, and the degree of affiliation of the "very satisfied" level is 0.116 (Fig. 4-8), so it can be seen that the evaluation grade of the public space renovation of the Pearl River Road is "general". It can be seen that the evaluation results are basically the same as the average evaluation results in the previous section, and the evaluation results are all "average", which also indicates that there are still a series of problems after the renewal and reconstruction of Zhujiang Road.

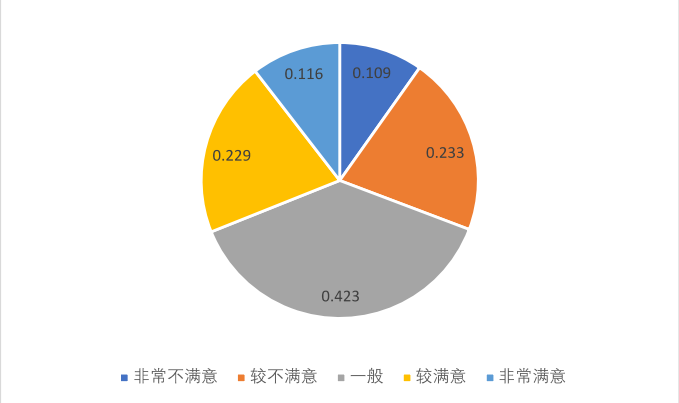

Figure 2 Fuzzy Comprehensive Evaluation

② Analysis of evaluation results at the normative level

According to the evaluation steps and methods of the target level above, the evaluation grades of the first-level indicator level of the evaluation index system of the public space transformation of Pearl River Road can be derived, which are shown in Table 4-13. It can be seen from the table that, in the evaluation of the public space transformation of Pearl River Road, the grades of the B1 evaluation of the attitude to regeneration, the B2 evaluation of the physical space, the B3 evaluation of the humanistic environment, and the B4 evaluation of the derived benefits are all "general". ".

Table 6 Pearl River Road Public Space Improvement Level 1 Evaluation Indicator Scoring Table

Level 1 indicators	rating level
B1 Updated Attitude Rating	usual
B2 material space evaluation	usual
B3 Human Environment Assessment	usual
B4 Evaluation of Derived Benefits	usual

③ Analysis of evaluation results at the indicator level

As can be seen from the table, according to the principle of maximum affiliation, the evaluation results of the evaluation indexes of Zhujiang Road after public space regeneration are as follows: B1 Evaluation of regeneration attitude, B2 Evaluation of physical space, B3 Evaluation of humanistic environment, B4 Evaluation of derived benefits, and the evaluation results of the four major first-level indexes are all in the category of "general".

Analysis and summary of issues

Post occupancy evaluation analysis

Through the post-use evaluation study of the Pearl River Road neighbourhood, it can be seen that the users' satisfaction rating of the overall effect of the renovation of Pearl River Road is 2.756 points (total 5 points), which is in a general state. "Overall spatial layout", "green landscape", "humanistic atmosphere", "employment and income improvement effect The ratings of "overall spatial layout", "green landscape", "humanistic atmosphere", and

"employment and income improvement effect" are relatively high, and the regeneration is worthy of recognition in these aspects. However, the ratings for "traffic improvement effect", "pavement signals and markings", and "openness and maintenance" are low, and further renovation is needed.

"Openness and Maintenance", "Effectiveness of Traffic Improvement", and "Pavement Signals and Signs" are the indicators with low scores in the post-use evaluation of Pearl River Road. Openness and Maintenance" scored the lowest, at 2.474. The problem is mainly reflected in the reconstruction of the neighbourhood, which is caused by the lack of external promotion and publicity of the neighbourhood, and the public space needs to be jointly maintained by the government and the residents.

Summary

According to the results of the fuzzy comprehensive evaluation, it can be seen that the overall evaluation results of the residents in the neighbourhood of Zhujiang Road on the renewed Zhujiang Road are "general", and there is still a certain gap with the residents' material space needs and spiritual and cultural needs, etc. In summary, the following problems exist in the public space of the renewed Zhujiang Road. To sum up, the main problems of the renewed public space of Zhujiang Road are as follows:

Inadequate post maintenance management of public spaces in neighbourhoods

On the issue of public space management, the Yangjiaping government needs to have a certain mechanism for the maintenance and upkeep of public space in the neighbourhood at a later stage. Therefore, there is human damage to the public space and destruction of infrastructure. Community managers also lack humanistic care for the residents of the Pearl River Road neighbourhood, resulting in a weak sense of community and a lack of public collective consciousness among the residents.

Insufficient public artistry and history and culture

Through the analysis and research of mean value analysis and comprehensive fuzzy evaluation methods, the post-use evaluation of the public space renewal of Zhujiang Road has resulted in a low rating for the continuity of the value of artistic innovation and history and culture of the neighbourhood, which belongs to the category of more unsatisfactory and general evaluation. The design of public space renewal and history and culture in the neighbourhood lacks public participation, so the public artistry and history and culture are not prominent enough.

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