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Post Occupancy Evaluation of Service Quality of Community Greenland Environment Based on the Improved Servqual Model

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Abstract: The satisfaction of residents, as the users of the community greenland environment, is the measure of the service quality of the community greenland environment. Post Occupancy Evaluation (POE) of the community greenland provides an effective method. The research on the difference between the service quality perceived by the public and the service quality of their expectation is helpful to discover the problem existing in the construction of community greenland environment. It also provides the basis to the renovation of the community greenland. In this article, SERVQUAL (Service Quality) model was improved to adapt to the POE of the service quality of the community greenland environment. The weight calculation for the evaluation hierarchical structure was carried out by AHP method and SD software. Cronbach's Reliability Alpha shows the high consistency of the survey questionnaire as well as the reasonable structural validity of the questionnaire with KMO value of the factor analysis larger than 0.5 and the value of factor loading larger than 0.7. The result shows that there is a great difference in the service quality of different community greenland environments. SERVQUAL model can be used as the basis for the service quality evaluation and comparison of the community greenland environment. The results will be important for the renovation and the construction of the community greenland environment.

Key words: Service quality, greenland environment, community, SERVQUAL Model, AHP

INTRODUCTION

China is in the midst of largest scale urbanization of the world and the urban community construction is developing very rapidly. With the increase of the income level, the public requirement on the community environment is getting higher and higher. The community environment mainly consists of two parts: building environment and greenland environment. The community architecture is the major component of people's residence. Its layout, internal spatial structure and the appearance design, all have an important impact. And the greenland of the community provides the place for public outdoor recreation (Solomona *et al.*, 2009). The greenland environment of community cannot only provide a good eco-environment and varieties of body-building activities to community residents, but also add to the cultural and artistic atmosphere of the community. Therefore, the greenland environment of the community can promote the health of resident both physiologically and psychologically (Pinder *et al.*, 2009). The greenland

environment quality of community has been an important part to measure the overall environment quality of the community.

Currently, China's community construction has already entered the phase of marketization and the development and construction is mainly undertaken by the real estate developers. At the development and construction stage, the residents barely have the chance to participate. With the increasing fierceness of estate market competition, the community greenland environment construction is highly valued by the developers. In order to win the favour of buyers, the requirement on visual aspect of community greenland environment is getting higher. However, it is uncertain whether the seemingly good community greenland environment does provide a good service to the public. POE (Jiboye, 2012) is a kind of judgment, which collects the evaluation data from the users concerning the object to be evaluated in a standardized and systematic procedure some years after the community greenland environment has been constructed. The user data are then

analyzed to determine their evaluation of the object. This method is widely applied in urban planning, building design (Kansara and Ridley, 2012) and urban landscape (Shermana *et al.*, 2005). But as the traditional POE usually adopts the qualitative description, the data can hardly be quantified. SERVQUAL model is a kind of evaluation method, which is widely used in the service industry (Carrasco *et al.*, 2012). It serves as the basic quantification model for POE. The service quality depends on the difference degree between the service level perceived by users and the service level of users' expectation (Udo *et al.*, 2011). Therefore, it is also called expectation-perception model. But this method does not consider the weight of different evaluation indexes, while the AHP method provides support for the determination of weight. AHP is a mathematic tool for systematic analysis, by dividing the human thinking process into hierarchies and quantifying it. Mathematical means are used to provide quantitative basis to the analysis, decision-making, prediction and control. AHP method is widely applied in the fields of military, medical science and tourism. In this article, AHP method was combined with SQ model (Buyukozkan *et al.*, 2011) to perform POE of community greenland environment and the service function of community greenland environment was quantified. It is beneficial to make the service quality comparison across the community greenland environments and provide the basis for the renovation and construction of community greenland environment.

MATERIALS AND METHODS

Selection of evaluation factors: The selection of factors should obey two principles as follows: One is to reflect the essential requirements of the service quality of community greenland environment; and the other is that the factors should be understood easily by the public. According to literature review, expert interview and the public survey, 12 indexes out of 15 indexes were screened to be the evaluation factors. These 12 indexes belonged to 6 dimensions.

Objects of research: Two communities located in Xinxiang of Henan province were chosen to be the objects: civil servant community (C₁) and Jianye forest peninsula community (C₂). These two communities have been delivered into use for many years with a high occupancy rate.

Questionnaire design and survey: The survey questionnaire consists of two parts: public perception and public expectation. The sample size is determined according to formula 1:

$$n = Z^2 \sigma^2 / d^2 \tag{1}$$

Where:

n = The required sample size

z = Z value at confidence level

σ = The overall standard deviation, generally set as 0.5

d = 1/2 of the confidence interval, usually the allowable error or the survey error in the practice of survey

In this survey, the confidence level is required to be 90% and the sampling error is no more than 5%. After lookup table, z = 1.64, σ = 0.5 and d = 5%. The minimum sample size of this survey is 269 after being calculated by the formula. Three hundred and thirty-seven questionnaires were given out. Among them, the number of C₁ was 162 and 153 valid questionnaires were retrieved; the effective rate was 94.4%. The number of C₂ was 175 and 159 valid questionnaires were retrieved; the effective rate was 90.8%.

To reduce the selection difficulty for residents, the fuzzy set-based assessment was adopted: the residents' attitude was divided into five levels: very dissatisfied, dissatisfied, neutral, satisfied, very satisfied. The values of 1, 2, 3, 4 and 5 were assigned, respectively.

Reliability and validity test: Reasonably designed questionnaire should pass the reliability and validity test. Reliability mainly concerns with the consistency and stability of the survey result, including the test-retest reliability, alternate-form reliability, split-half reliability and α reliability. In this research, the Cronbach's α reliability was used. Validity mainly concerns with the degree of closeness between the test result and the designed objective, including the face validity, content validity and the structure validity. In this research, factor analysis method was used to perform the validity test. The questionnaire achieves a good structure validity when the KMO value is greater than 0.5 and the value of factor loading is greater than 0.6.

Weight calculation: According to 12 evaluation factors of 6 dimensions, AHP model containing target layer, criterion layer and factor layer was established (Fig. 1). The weight was determined by three teachers and three members of proprietor committee. SD software (Sun *et al.*, 2007) was used to analyze the data. This software provides the programmed solution of AHP evaluation.

Calculation of SQ value: The basic formula of the SQ model calculation is:

$$SQ = \sum_{i=1}^m (\bar{P}_i - \bar{E}_i) / m \tag{2}$$

where, SQ is the service quality, P is the service perception, E is the service expectation and m is the

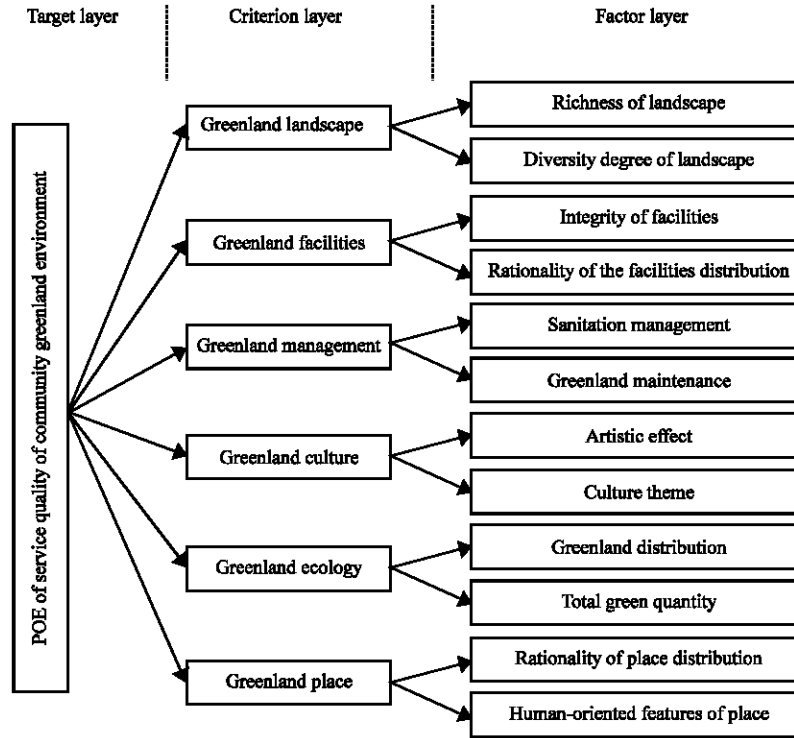


Fig. 1: Structure chart hierarchical model

number of indexes. The service quality of community greenland environment can be judged according to the positive or negative sign and the size of SQ. The service quality of community greenland environment is higher than the average level when SQ is positive, whereas the service quality of community cannot meet the requirement of public when SQ is negative; the community greenland environment has provided the normal service when SQ is equal to 0.

SQ calculation formula (Jing-Ke *et al.*, 2010) after being improved by considering the impact of weight based on the three-hierarchy model is:

$$SQ = \sum_{i=1}^s u_i \sum_{j=1}^t w_{ij} (\bar{P}_j - \bar{E}_j) \quad (3)$$

where, SQ is the service quality, u_i is the weight of the i th second-level index, s is the number of second-level indexes, w_{ij} is the weight of the j th index relative to the i th index and t is the number of third-level indexes under the i th second-level indexes.

RESULTS AND DISCUSSION

Reliability and validity test: In this research, the survey result of service perception and service expectation was tested. The Cronbach Reliability Alpha of the 6

dimensions of public perception was 0.807, 0.842, 0.852, 0.789, 0.812 and 0.790, respectively and the Cronbach Reliability Alpha of the 6 dimensions of public expectation was 0.797, 0.915, 0.762, 0.919, 0.734 and 0.779, respectively, showing a high reliability of the scale.

Factor analysis method was applied according to the scores on public perception scale. The evaluation factors of the research were selected through the KMO test, principal component analysis and the variance maximizing orthogonal rotation. The principal factors were extracted according to the criteria that eigenvalue is larger than 1 and the cumulative contribution reaches 60%. It is suitable to use factor analysis method with KMO = 0.509 and sig. = 0.000. Six principal factors were extracted. They explained 84.6% of the total variation and all the loading of the surveyed factors in principal factors to which it belongs was larger than 0.8, showing a good structure validity of the scale.

Weight: u_i and w_{ij} were obtained according to the pairwise comparison of the factors of each layer of AHP model that were evaluated on 1-9 scoring scale. This was done with SD software (Fig. 2) by 6 evaluators (Table 1). The comparison result was required to pass the consistency test and it needed to be adjusted among the evaluators themselves when the test failed.

Table 1: Relative weight of the Lower layer to the upper layer and the global weight

Target layer	Criterion layer	u_i	Factor layer	w_{ij}	Global weight
POE of service quality of community greenland environment	Greenland landscape	0.2680	Richness of landscape	0.5833	0.1563
			Diversity degree of landscape	0.4167	0.1117
	Greenland facilities	0.1172	Integrity of facilities	0.3722	0.0436
			Rationality of the facilities distribution	0.6278	0.0736
			Sanitation management	0.3444	0.0558
	Greenland management	0.1620	Greenland maintenance	0.6556	0.1062
			Greenland culture	0.1170	0.0705
	Greenland ecology	0.2042	Artistic effect	0.6024	0.0705
			Culture theme	0.3976	0.0465
			Greenland distribution	0.3611	0.0737
	Greenland place	0.1516	Total green quantity	0.6389	0.1305
			Rationality of place distribution	0.5167	0.0783
			Human-oriented features of place	0.4833	0.0733

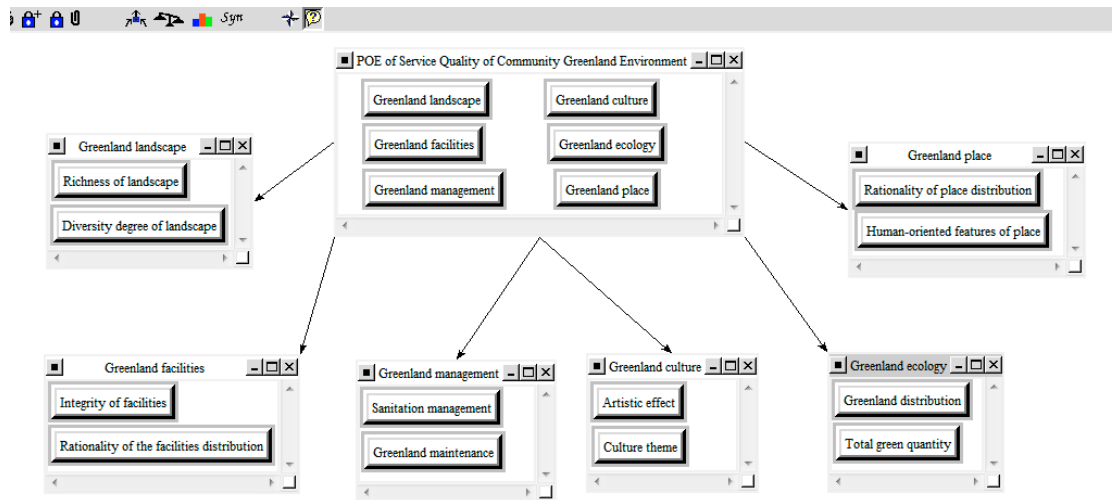


Fig. 2: Structure chart in SD software

Paired sample t-test: In order to test whether the significant difference exists in the means of perception value and expectation value for the same index, the paired sample t-test is needed to be carried out (Table 2). p value is negatively correlated with the reliability degree of the result. The larger the p value, the worse the reliability is. For example, it is indicated that 5% of result may be resulted from the contingency when $p = 0.05$. When p value is lower than 0.05, it is showed that it is caused by statistical significance rather than coincidence.

It can be seen from Table 3 that the service perception of 5 indexes of both C_1 and C_2 is higher than the service expectation, demonstrating that these factors are highly evaluated. In addition, the highly scored factors of service quality of these two communities are the same, including the factors of facilities distribution, sanitation management, greenland maintenance, total green quantity and human-oriented features. It is closely related to the ecological design, humanized design and sports fitness design of China's current landscape design.

SQ calculation was performed in accordance with formula 3, Table 1 and 3. The calculation process of C_1 is here illustrated as an example:

$$\begin{aligned}
 SQ = & 0.2680*[0.5833*-0.229+0.4167*-0.157]+ \\
 & 0.1172*[0.3722*-0.209+0.6278*0.215]+ \\
 & 0.1620*[0.3444*0.314+0.6556*0.314]+ \\
 & 0.1170*[0.6024*-0.209+0.3976*-0.359]+ \\
 & 0.2042*[0.3611*-0.065+0.6389*0.092]+ \\
 & 0.1516*[0.5167*-0.137+0.4833*0.241] = -0.0131
 \end{aligned}$$

The overall service quality score of C_1 is -0.0131 and the overall service quality of C_2 is -0.2366.

The score can be used to compare the overall service quality (Zhang *et al.*, 2012). When the service quality score is positive value, indicating that the residents are satisfied with the services provided by the greenland environment and the services exceed the expectations of the residents; when SQ is the service quality score is negative value, indicating that the services provided by the Greenland don't meet the requirements of the

Table 2: Paired samples test

Pair	Paired differences			95% confidence interval of the difference		t	Sig. (2-tailed)
	Mean	Std. deviation	Std. error Mean	Lower	Upper		
	1	-0.596	1.810	0.102	-0.798		
2	-0.433	1.618	0.092	-0.613	-0.252	-4.722	0.000
3	-0.205	1.750	0.099	-0.400	-0.010	-2.070	0.039
4	0.205	1.767	0.100	0.008	0.402	2.051	0.041
5	0.196	1.706	0.097	0.005	0.386	2.024	0.044
6	0.308	1.859	0.105	0.101	0.515	2.924	0.004
7	-0.462	1.721	0.097	-0.653	-0.270	-4.736	0.000
8	-0.413	1.705	0.097	-0.603	-0.224	-4.284	0.000
9	-0.221	1.753	0.099	-0.416	-0.026	-2.228	0.027
10	0.199	1.769	0.100	0.002	0.396	1.984	0.048
11	-0.167	1.680	0.095	-0.354	0.020	-1.753	0.081
12	0.272	1.855	0.105	0.066	0.479	2.595	0.010

Table 3: Mean of perception and expectation

Factor	C ₁			C ₂		
	Mean of perception (P)	Mean of expectation (E)	Mean of P-E	Mean of perception (P)	Mean of expectation (E)	Mean of P-E
1	3.444	3.673	-0.229	3.340	4.289	-0.949
2	3.647	3.804	-0.157	3.220	3.918	-0.698
3	3.477	3.686	-0.209	3.459	3.660	-0.201
4	3.699	3.484	0.215	3.497	3.302	0.195
5	3.752	3.438	0.314	3.711	3.629	0.082
6	3.667	3.353	0.314	3.830	3.528	0.302
7	3.536	3.745	-0.209	3.428	4.132	-0.704
8	3.549	3.908	-0.359	3.333	3.799	-0.466
9	3.556	3.621	-0.065	3.585	3.956	-0.371
10	3.719	3.627	0.092	3.604	3.302	0.302
11	3.569	3.706	-0.137	3.603	3.799	-0.196
12	3.614	3.373	0.241	3.805	3.503	0.302

residents; when SQ is zero, indicating that the services provided by the greenland just to meet the needs of residents.

It is indicated that generally, the greenland environment quality of these two communities do not meet the requirements of the public and need to be improved based on the research result.

CONCLUSION

POE is a kind of scientific and reasonable method to test the service quality of the community greenland environment and SERVQUAL model can provide basis to the POE quantification.

The service quality evaluation of community greenland environment can be performed from 12 indexes of 6 dimensions.

The reliability and validity test of questionnaire are important means to judge the reliability of the result and the rationality of the content and the structure of the questionnaire.

The combination of SERVQUAL model and AHP method can evaluate the service quality of community greenland environment more scientifically and rationally.

The evaluation result will provide the basis to the renovation and the construction of community greenland environment.

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