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A Study on Prioritization of Urban Forest Composition Using Needs Analysis - Targeting Paju Heyri Village

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Abstract

This study proposes a strategy for the creation and management of urban forests in Paju Heyri art village. Urban forest composition attributes (4 categories and 16 items) were extracted and the questionnaire was asked to the level and the current level for tourists, local residents and workers in Paju Heyri art village. And the priority order for the creation of urban forests was derived through the difference between the present level (performance) and the required level (importance) and the requirements analysis procedure. In this study, the priorities of each item of urban forest formation attributes were determined. The t-test alone had limitations, so we calculated the Borich needs which were not covered by the existing Importance - Performance Analysis (IPA). We used the Locus for Focus Model, which is a method for visually confirming the difference between the current level and the required value for the required level in the 4-quadrant coordinate plane. The results of this study show that the seven priorities can be used as a useful tool for the formulation of urban forests and operational strategies and can be a basic research for the activation of urban forests in the future.

Key Words: urban forest, Paju Heyri, borich's needs, locus for focus model, needs analysis

Introduction

The purpose of this study is to present strategies for the creation and management of urban forests in the whole urban forests of Paju Heyri Art Village, with the problems of the management area of the forest area as a problem. For this purpose, the concept of urban forest was classified into four factors: landscape, environment, social and recreational aspects. Four factors were analyzed in terms of keywords and themes of previous research. The method used to present the strategy for the urban forest formation is to analyze the important factors in the formation and management of the urban forests and to derive the appropriate factors for the art village of Paju Heyri. Among the important factors derived from the demand analysis, And to suggest a method to determine the priority for creating urban forest suitable for the target area.

The preceding research related to the demand analysis is as follows. Shin et al. (2010) analyzed questionnaires on the importance and satisfaction of subcategories of user characteristics and utilization facilities in urban forests, and classified the composition strategies accordingly.

Kang et al. (2014) sought to clarify the differences in usage patterns through survey and site surveys of Achasan and Bongje Mountain users.

Lee (2016) sought to derive the top priority and the difference priority of the tourist 's demand level for the attraction at-

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tributes of city tourism using demand analysis. Demand analysis can analyze the difference between current level (performance or satisfaction) and desirable status (importance or required level), so that it can diagnose the problem of researcher (user, participant) and find an alternative for solving this problem.

Kwak (2013) tried to understand the structural influences of perceived value and behavioral variables of Chinese tourists in Korea by applying tourism attraction attributes and tourism constraints to Chinese tourists.

The Forest Service establishes and implements the 'Urban Forest Basic Plan (2008-2017)' which stipulates matters such as expansion and quality improvement of urban forests. Therefore, urban forests are part of urban forests, so they should be designed and constructed to meet the satisfaction and needs of users.

This study analyzed the survey data using SPSS 21.0 statistical program (Validity and reliability of sample, test of difference between importance and performance average, factor analysis after classification of importance and performance of 4 factors, analysis of one factor of four factors according to demographic classification, Correlation analysis of 8 factors).

After analyzing the statistical analysis, the needs were calculated and shown in the locus for focus model.

Materials and Methods

Materials

Urban forest and Study site

The meaning and scope of the purpose of using the term 'urban forest' vary. The definitions are different according to each criterion that define the urban forests such as function, scope, and surrounding population (Kim 2015).

The Forest Service (2011) is defined as a forest, a forest, a forest park, a street, etc. which are forests and trees that are organized and managed for health, recreation, emotional support and experiential activities.

The site is located at 1652 Jungheung-ri, Tanghyeon-myeon, Paju-si, Gyeonggi-do. The site area is 503,412,9 m^2. The site is formed as a space divided naturally by 6 hills. It is a representative place for culture and art that 1.1 million tourists visit every year. In addition to the forest area, there is a place to create forests in the greenery and the square.

Study material

In this study, the questionnaire was conducted on the villages of Paju Heiri village. The contents of questionnaire were surveyed about four attributes of landscape property, environmental property, social property, and recreational property. Factors. We also added gender, age, occupation, and residence in general.

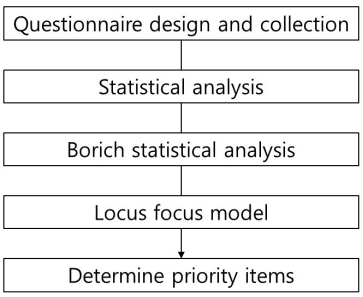

Fig. 1. Research model.

Method

This study method is the same as and SPSS version 24 was used for the analysis method (Fig. 1).

Needs analysis

The needs analysis is a comparative analysis task for resolving the gap between the present level, which is the state before any problem occurs, and the behavior before the action, and the ideal level, which is the ideal future (Ahn 2010). Identify differences between current and required levels to identify the needs of different groups and organizations, and determine priorities for future actions (Han 2009). Kwon (2003) defined the needs as the difference between the present level and the required level, and Heo et al. (2014) expressed the level to reach at the present level.

Needs analysis procedure

The needs analysis depends on the subject, purpose, and situation of the study.

The main purpose of this study is to analyze the needs of the respondents through the questionnaire survey (Huh et al. 2013) In this study, we analyze the needs through the questionnaire of Cho (2009).

The purpose of this study is to determine the priority of urban forests by applying t-test, Borich needs analysis, and The Locus for Focus model.

① Demographic characteristics (frequency analysis)

conducted
② Reliability analysis of sample
③ The current level (performance level) and the required level (importance level)
③ ANOVA (analysis of personality placement analysis) of comprehensive (landscape, environmental, social, recreational) importance and performance according to demographic factors (sex, age, Job, residence)
④ Analysis of correlation between 4 categories (economic, environmental, social, recreational)
⑤ Borich's needs analysis

Borich requirement={Σ (RCL−PCL)×Avg. (RCL)}/N
RCL=required competence level importance level
PCL=current capacity level
RCL=average of required competency levels
N=total number of cases

Locus for focus model

This is a method for visually confirming the difference between the current level and the required level for the required level in the 4-quadrant coordinate plane (Mink et al. 1991).

We divide the average value of the required level by the horizontal axis (X axis), the degree of discrepancy between the current level and the required level by the vertical axis (Y axis) (Ahn 2013).

Explore prioritization strategies

We use the procedure for searching 5 step prioritization plan of Joe (2009)

Step 1: Identify the difference between the required level and the current level through the t test

Step 2: Borich's needs are prioritized through formulas

Step 3: Present Coordinate Plane Results through The Locus for Focus Model

Step 4: Identify the number of items belonging to the HH segment of the Locus for Focus Model and rank the Borich requirements as high as the number of items

Step 5: Determine the priority and rank order by checking the redundancy between Borich's requirements and the HH items in the Locus for Focus Model

Results and Discussion

Needs Analysis result

General characteristics and descriptive statistics of subjects

60.7% of males, 84.2% of 20-49 year olds, 48.6% of workers, and 72.9% of metropolitan area were the study subjects. The descriptive statistics for the 40 properties

Table 1. Test of homogeneity of variances and F-test result (95% confidence)

Factor	Attribute	Homogeneity of variances		F-test	
		Sig.	Accept or Reject	Sig.	Accept or Reject
Sex	Landscape	0.941	Accept	0.245	Accept
	Environmental	0.296	Accept	0.450	Accept
	Social	0.177	Accept	0.670	Accept
	Recreational	0.914	Accept	0.155	Accept
Age	Landscape	0.922	Accept	0.069	Accept
	Environmental	0.608	Accept	0.021	Reject
	Social	0.333	Accept	0.097	Accept
	Recreational	0.024	Reject	0.461	Accept
Job	Landscape	0.091	Accept	0.659	Accept
	Environmental	0.298	Accept	0.300	Accept
	Social	0.431	Accept	0.574	Accept
	Recreational	0.808	Accept	0.226	Accept
Residence	Landscape	0.426	Accept	0.122	Accept
	Environmental	0.534	Accept	0.132	Accept
	Social	0.105	Accept	0.147	Accept
	Recreational	0.575	Accept	0.511	Accept

were high in landscape composition and facility layout status (importance), ecological connection path effect (importance), foundation of forest and art industry complex (performance), and forest experiential function (performance).

Reliability analysis of sample

The Cronbach's alpha value of 0.770 was found to be reliable because it was 0.6 or more. The reliability of each factor for the degree of importance (degree of importance) and performance (satisfaction) of the urban forest was measured.

Factor Analysis

Factor analysis of 8 factors showed that Elgenvalues of Factors 1 and 2 were 1.0 or more, so 2 factors were extracted, 1 explains about 35.2% of Cumulative, and 61.3% when the second factor is included.

As a result of the commonality analysis, which is the ratio explained by the extracted factors, the planting composition (importance) of ecological form, planting composition (importance) of landscape form, landscape composition and facility layout status (importance) 0.4, and the remainder is less than 0.4.

Scree plot showing factor explanatory power shows that when the Elgenvalues of Factors 1 and 2 are 1.0 or higher and the number of factors is changed from 2 to 3, the width of the eigenvalues is the largest and the values of the factors 4 to 8 are small.

As for the factor load value, the factor load of the ecological form (importance) is 0.277, and the factor loading value belonging to 1 factor is 0.718, so this item is more likely to belong to 1 factor have.

Before the rotation, the planting composition (importance) of the ecological form was 0.718, which is higher than 0.718, and 0.763 after the rotation.

Difference between the required level (importance) and the current level (performance) : t-test

Attributes for Urban Forest Creation The t-test was conducted to verify the difference between the required level (importance) and the present level (satisfaction) for each item. The difference between the required level and the present level was statistically significant. Among them, the t-value of environmental factor was the highest at 11.418, and the cultural and artistic function item was the lowest at 5.728.

One-Sample Test The probability of significance is 0.00, which is less than 0.05, so the null hypothesis is not adopted. That is, the average value of importance and performance can not be said to be equal. Also, if we look at the 95% confidence interval for the difference between sample means, we can not adopt zero hypothesis because we do not include zero. Therefore, the average value of importance and performance is not statistically the same.

ANOVA Analysis

Sex

When we examine the homogeneity of the four group variables, the null hypothesis is adopted that the variance of the four groups is the same because the significance probability of Levene Statistic is $p > 0.05$. In addition, since the probability (p value) of the test statistic is $p > 0.05$, the null hypothesis that there is no difference in the importance and performance of the comprehensive factors according to sex is not rejected at the confidence level of 95%.

Age

Since the probability of Levene Statistic of landscape, environment, and society is greater than 0.05, the null hypothesis that dispersion is the same is adopted, but the null hypothesis is rejected because the recreation (0.024) is $p < 0.05$. In other words, it was proved that there is a significant difference in recreation, not the same dispersion.

According to Duncan's post - analysis, the social factors according to age show that there is a difference between the age groups over 50 years old.

The probability of significance is assumed to be $p > 0.05$, except for the environmental factor (0.021). Therefore, the null hypothesis is adopted that the difference in the importance and performance of comprehensive factors is not different according to sex at a confidence level of 95%.

Job

Since all $p > 0.05$, the null hypothesis that the variance is statistically the same is adopted. The probability of significance is $p > 0.05$ for all four factors. Therefore, the null hypothesis that 'the difference of importance and performance of comprehensive factors does not depend on the occupation' is adopted at 95% confidence level.

Residence

$p > 0.05$, the null hypothesis that the variance of landscape, environmental, social and recreational variables according to the residence is the same is adopted. In Duncan, all three factors except the environment are two of the same inclination group. Especially, environmental factors show that there is no difference because all regions have the same tendency.

Since the four factors are all $p > 0.05$, the null hypothesis that 'the difference between the importance of comprehensive factors and performance does not depend on the place of residence' is adopted as 95% confidence level.

Correlation analysis

The results of the simple correlation coefficient for eight factors are as follows. The Pearson Correlation value for landscape performance and environmental performance was 0.608 and the significance level for both tests was 0.000.

In addition, landscape importance is related to social importance, and landscape performance has a correlation with both social performance and recreational performance. In addition, the environmental importance is related to the social performance and the environmental performance, and the social importance and the recreational importance are correlated with the social performance and the recreational performance respectively.

Borich's needs are prioritized

In order to determine the priorities for each item of the urban forest composition attribute, the t - test alone has limitations, so the demand for Borich is calculated.

Borich demand value showed the highest value with 0.049 for biological preservation effect and 0.020 for culture and artistic function. In general, the higher the t value, the higher the demand value of Borich, but not always. The t values and the demand values of the five items (landscape minor, environmental socioeconomic factor, social factor, recreational factor, comprehensive factor) were ranked differently. In the t test, only the difference between the required level (importance) and the current level (satisfaction) is verified. In the requirement formula, the difference between the required level (importance) and the current level (satisfaction) (Joe 2009).

Table 2. Borichi's needs analysis results of 16 attributes (n=107)

Variable		t	Requirement	Demand ranking
Landscape	Ecological form of plant composition	8.878	0.035	7
	Planting form of landscape	8.296	0.033	11
	Landscape composition and facility layout	6.041	0.026	16
	Nature friendly town design	8.057	0.035	8
Environmental	Biological resource preservation effect	10.667	0.049	1
	Ecological connection channel effect	9.784	0.048	2
	Effect of restoration of surrounding environment	7.389	0.034	9
	Purification function effect	9.099	0.042	5
Social	Establishment of foundation for combined Forest industry and art	6.352	0.024	18
	Positioning as a forest business model	7.191	0.026	17
	Local tourism development effect	6.169	0.026	15
	Local job creation effect	8.398	0.038	6
Recreational	Experience of forests	7.136	0.033	10
	Cultural and artistic functions	5.728	0.020	20
	Connecting tourist resources around	6.263	0.027	14
	Visitors living facilities	9.516	0.043	4
Synthesis	Landscape factor	7.851	0.030	12
	Environmental factor	11.418	0.044	3
	Social factor	6.112	0.022	19
	Recreational factor	7.740	0.030	13

Locus for focus model analysis

The average value of the difference between the required level (importance) and the present level (performance) of each item of the urban forest composition attribute is -0.19, and the average value of the required level (importance) is 3.88. The X axis is the mean of the required level (importance), and the Y axis is the average of the difference between the required level (importance) and the current level (performance). The attribute items corresponding to each quadrant are as shown in (Table 3) and visualized as shown in (Fig. 2).

Table 3. Priority results of locus for focus model

Quadrant	Attribute item
First quadrant (8)	Biological resource preservation effect
	Ecological connection channel effect
	Purification function effect
	Visitors living facilities
	Environmental factor
	Ecological form of plant composition
	Nature friendly town design
	Experience of forests
Second quadrant (3)	Local job creation effect
	Effect of restoration of surrounding environment
	Planting form of landscape
Third quadrant (5)	Positioning as a forest business model
	Establishment of foundation for combined forest industry and art
	Landscape composition and facility layout
	Social factor
	Cultural and artistic functions
Forth quadrant (4)	Connecting tourist resources around
	Local tourism development effect
	landscape factor
	Recreational factor

The first quadrant is the area where the recognition of the required level (importance) is high but the level of discrepancy with the current level (performance) is high and should be considered as the priority area. On the other hand, the items in the third quadrant are the least conspicuous items in the priority order because the level of inconsistency with the current level (performance level) and the level of importance (importance) are also low.

Priority item derivation

As a result of determining the degree of redundancy between the items of the first quadrant of the Locus for Focus Model and the ranking items of the ranking requirements of Borich, the highest ranking and the lowest ranking were determined. As a result, the Borich requirement was ranked in the top 8 and the first quadrant of the Locus for Focus Model There were 7 priority items, which are overlapping items among the items, which are biological nature conservation effect, ecological connection channel effect, envi-

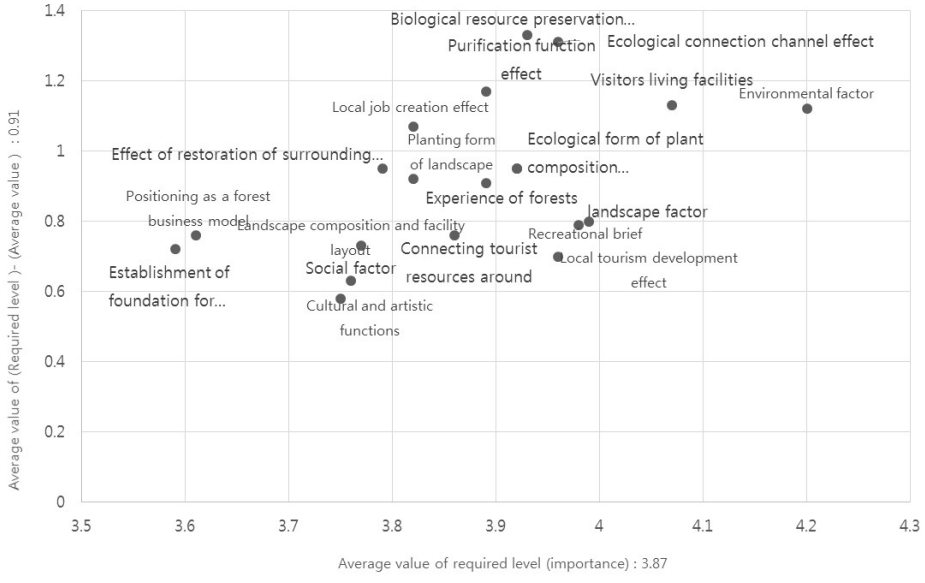

Fig. 2. Locus for focus model analysis.

Table 4. Compare with Borich's requirements and locus for focus priority

No		Borich's needs value and priority	Locus for focus 1 quadrant	Top priority
1	0.049	Biological resource preservation effect	Biological resource preservation effect	O
2	0.048	Ecological connection channel effect	Ecological connection channel effect	O
3	0.042	Environmental factor	Environmental factor	O
4	0.043	Visitors living facilities	Visitors living facilities	O
5	0.044	Purification function effect	Purification function effect	O
6	0.035	Local job creation effect	Local job creation effect	×
7	0.035	Ecological form of plant composition	Ecological form of plant composition	O
8	0.033	Nature friendly town design	Nature friendly town design	O

ronmental burden, visitor living facility, purification function effect, ecological form planting, and environment friendly village design (Table 4).

Conclusions

This study was conducted to survey 130 visitors and villagers in order to find out the priority demand for establishing urban forest strategy in Paju Heyri village. In total, 107 people The data were analyzed.

The purpose of this study is to find out the priority of concrete urban forest formation through the difference between the current level and the required level. To do this, the needs analysis was conducted using the prioritization process using the questionnaire technique of Joe (2009). The statistical analysis results using the statistical program SPSS version 24 are as follows.

First, Cronbachs alpha value is 0.770 as a result of sample reliability analysis and it is reliable.

Second, the difference between the mean of the current level (performance level) and the level of t-test (level of importance) was statistically significant.

Third, ANOVA analysis showed that there was a difference in gender, job, and residence except for age.

Fourth, as a result of the correlation analysis between four categories (economic, environmental, social, and recreational), the performances of landscape factors are related to the performances of environmental factors and the performance of environmental factors there was. In addition, the importance of social factors is related to the importance of recreational factors, the performances of social factors, and the importance of environmental factors and recreational factors are correlated with the importance of social factors.

Borich's needs were also prioritized and the top eight items were derived and the seven items that were overlapped with the priority item in the first quadrant were selected as the priorities.

In this study, we collected samples through randomized questionnaires, but there were limitations of in-depth analysis due to lack of relevant expert opinions and lack of sample groups (n=107). In addition, the data on the dependent variables such as the impact of the identified needs for urban forests were insufficient and the structural equation could not be analyzed.

It is expected that this study will develop into basic research and construction strategy for urban forest activation.

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