



Evidence-Based Design of University Zoological Gardens: A Perception Study in South-west Nigeria

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ABSTRACT

Evidence-based design (EBD) has become an acceptable paradigm in environment-behaviour endeavours in recent years with documented benefits especially in healthcare facilities. However, little is known of its application to University Campus Open Spaces (UCOS) like University Zoological Gardens (UZGs) which accounts for the repetition of design mistakes. This study aims to assess the UZGs as a major component of UCOS in South-west Nigeria with a view to formulating EBD frameworks. It adopts a comparative post-occupancy evaluation (POE) approach through a Stratified Random Sampling protocol of users (n=3,016) of the gardens in Federal Universities in South-west Nigeria. Results of the quantitative data analyses suggest that while walk-ability is a primary satisfaction factor among thirty design considerations in the formulated model, legibility is the most primary cognitive factor for designing perceptible high quality UZGs. The study argues in favour of the developed framework as design tool-kit and recommends its application as a feed-back input into the design process of UZGs.

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1. Introduction

The university campus is the total physical environment, including all buildings, open spaces and landscape elements (Aydin and Ter, 2008). It is this combination of buildings and landscaped open spaces between buildings that functions as an organized whole with a distinctive identity (Gehl, 1987). Rapoport (2004) states that these environments are structured and composed of fixed (infrastructure and buildings), half-fixed (open spaces and their components) and non-fixed (users, user actions and vehicles) elements. Half-fixed open spaces and components are the important determinants of the environment's influence on

user attitudes (Aydin and Ter, 2008; Lefebvre, 1991; Abu-Ghazze, 1999; Dober, 2000).

The design qualities of these open spaces are related to their spatial, social, cognitive and affective characteristics (Adedeji, Bello and Fadamiro, 2011; Adedeji and Fadamiro, 2012). The spatial characteristics are the design considerations and include accessibility in terms

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of circulation systems, opportunities for spatial preferences, way-finding and location qualities (Helsper, Johnson, Johnson, Rubba and Steiner, 1990; Arenibafo, 2016; Heitor, Nascimento, Tomé and Medeiros, 2013; Payne, 2007; Muñoz, 2009; Ambler, Webb, Hummell, Robertson, and Bailey, 2013) and disability (Asadi-Shekar, Moeinaddini and Shah, 2014). University campus open spaces (UCOS) are thus learning spaces, natural settings associated with strong public culture, the form and symbol of integrated social relationship, open air communal museums, spaces for social interactions and great public activities in their utilization (Lyndon, 2005; Mumford, 1938, 1969; McHarg, 1969; Geddes, 1906; Sahraiyanjahromi, 2017). From the utilization perspective, campus open spaces have also been described as being arenas that allow for different types of activities encompassing necessary, optional and social activities (Gehl, 1987; Woolley, 2003; Swensen and Stenbro, 2013; Nia, and Suleiman, 2017). UCOS include zoological and botanical gardens, recreation parks, pedestrian linear corridors, sports pitch, playgrounds, courtyards, parking, waterfronts, squares and plazas.

A zoological garden is a park containing plant material, but primarily designed for exhibiting wild animals (Alan, 2005). UZG functions as "a cultural showcase of animals and nature" and its design is "a consequence of human interpretations of the way in which the natural world should be perceived and presented" (Couper, 2013: 235). She posits that "zoological architecture is the physical embodiment of cultural understandings of scientific knowledge" and its interpretation exists within a cultural context of place and "the stages of zoological garden as a scientific endeavour had an interwoven relationship with architecture and place" (p. 235). UZGs focus on public education and nature conservation. Wolf and Tymitz (1979:17) argue that

"education includes observation, perception, satisfying curiosity, making sense out of one's observation or experiences, accidental learning and, of course, direct efforts to collect or offer information"

According to Gewaily (2010), the five components of visitor experience in zoological gardens are "exploration, authenticity, aesthetics, education and recreation" (p. 45). UZGs are therefore of great academic significance while their recreational benefits as an opportunity for connection between their

non-human nature and human nature. Fadamiro and Adedeji (2014) discovered that recreational benefits are contingent upon experiences of users and relies on the quality of the zoological gardens which depends on design considerations and parameters.

Although research concerns on UCOS include the design, designers, design decisions, materials and construction, maintenance and management, and the users, this research focuses on the users of university Zoological gardens (UZGs) which is a major category of UCOS. The users are at the receiving end of all the processes and are thus very central. It is therefore pertinent to carry out a study on UZGs with a prism of post-occupancy evaluation (POE) focussing on the users as a feedback into the design process towards developing framework for sustainable UZGs in South-west Nigeria.

2. Statement of the Research Problem

Designers of UCOS including UZGs are not fully acquainted with the performance of the spaces during their use. This leads to repetition of design mistakes and the university community using the spaces in ways that were only partially predicted (Watson and Thomson, 2005; Venkat, 2011; Cubukcu&Isitan, 2011). As a result, the satisfaction of the users that can enable the formulation of EBD framework as a feed-back process is grossly missing.

2.1 Research Questions, Objectives and Hypotheses

Enhancing the performance of UZGs is contingent on users' satisfaction. This study's concern about users' satisfaction is guided by the following questions:

- i. What is the perception of quality and factors that underpin the users' satisfaction with the UZGs?
- ii. What aspects of user satisfaction can inform design frameworks for UZGs?

Accordingly, the study seeks to:

- i. Examine the perception of quality and factors influencing users' satisfaction with the UZGs; and
 - ii. Develop design policy framework for UZGs.
- To guide the study, the following hypotheses were formulated:

H₀₁ There is no significant difference in the perceptions of qualities of the UZGs among the Federal Universities in the study area.

H₀₂ Perception of quality is not contingent upon satisfaction of the users with the UZGs in the study area.

3. Research Methodology

The study area was the South-west region of Nigeria where the university campuses under study are located. The region comprises of the six states that make up the South-west Geopolitical zone of Nigeria (Figure 1).

Assessment of Zoological gardens of was carried out in the study. The study involved a survey research design with the use of questionnaires to evaluate the users' satisfaction with the Zoological gardens of the six Federal Universities in the study area. These include: University of Ibadan, Obafemi Awolowo University, Ile-Ife; University of Lagos; Federal University of Agriculture, Abeokuta; The Federal University of Technology, Akure and Federal University, Oye-Ekiti.

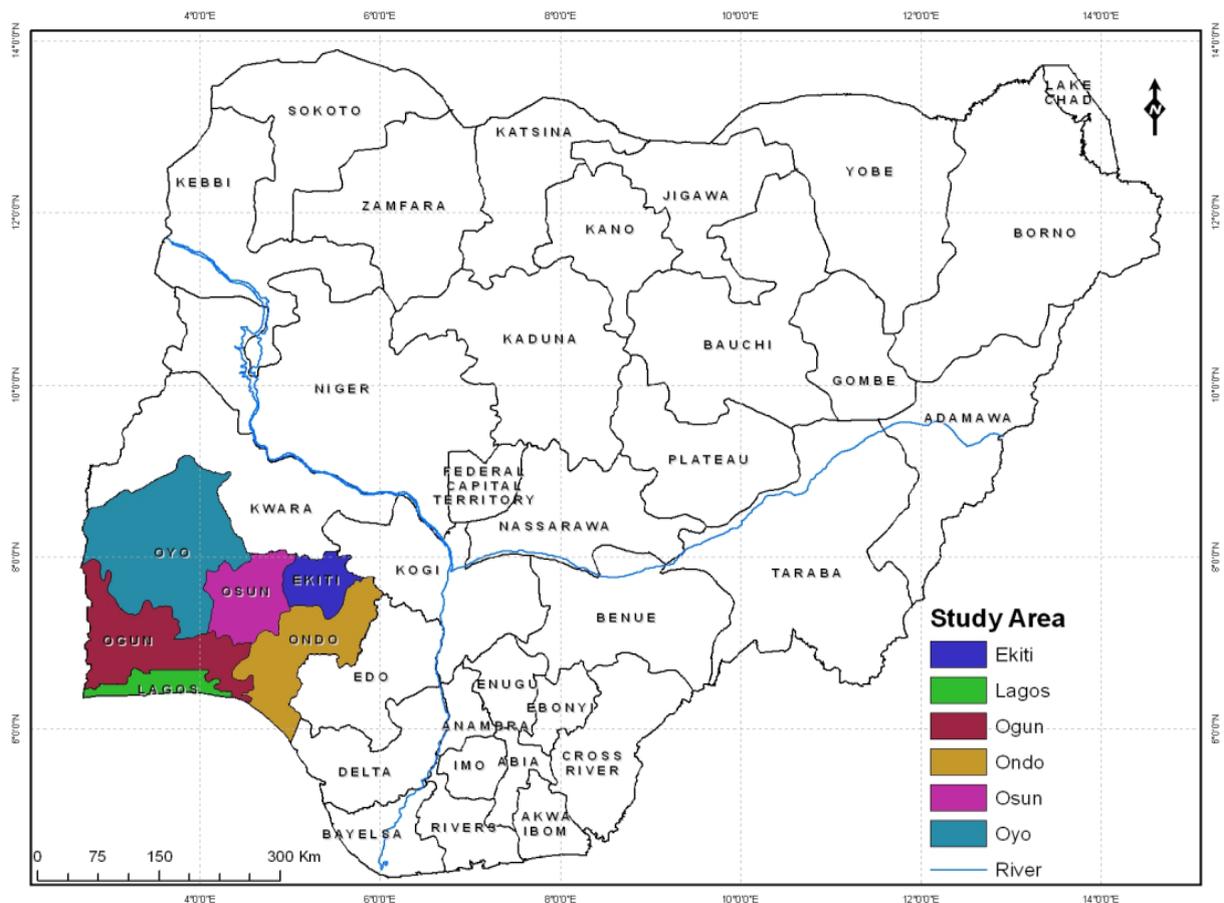


Figure 1. South West Map indicated on Map of Nigeria.
Source: Faleyimu & Agbeja (2012)

The choice of South-west was informed by the pioneering status of the region in university education in Nigeria hosting all typologies. Since formal lessons are sought, the Federal Universities are the most formally designed with the same proprietorship and source of funding. The target population for the study were the students and members of staff who are the formal users of the gardens.

Structured questionnaire designed in multiple choice and Likert-type scale were used to collect necessary information about the

respondents and other issues in the research questions, objectives and hypotheses. The questionnaire was subjected to pilot study carried out in order to perfect the research instrument and from the exercise, necessary adjustments were made. The pilot survey served as the model and dummy run of the main survey. Responses were coded with values from 1, 2, 3, 4 and 5 (Likert-type scale). This gave opportunity for ease of understanding and rationalization for statistical analyses.

The data obtained were subjected to statistical analyses and interpretations by using descriptive (Frequency table, Percentages, Charts) and inferential (Chi square, Correlation tests, Regression analysis) statistics. The processed data was used to identify the statuses of the users, evaluate their perception of quality of the open spaces, analyse the relationship between their statuses and perception of qualities, examine the factors influencing their satisfaction and develop policy framework for Zoological gardens in Federal Universities in South-west Nigeria.

4. Data Presentation and Analysis

4.1 Status of the users and perception of quality of the UZGs

Table 1 reveals the status of the users of the UZGs. The users are disproportionately males (62.3%) than females (37.7%), mostly undergraduates (87.5%) in the active age bracket of 19-45years (91.5%). That all categories of users are adequately represented suggests the result should be adequate for generalization synthesis. Their perception of quality of the UZGs as shown in Table 2 are also reliable since they are well acquainted with the gardens and therefore their value-judgments can be upheld.

Table 1. Status of users of the UZGs in South-west Nigeria.

Status Variable	Categories	Frequency	Percentage
Gender	Male	1095	62.3
	Female	664	37.7
	Total	1759	100
Age	Below 18yrs	121	6.9
	18 - 45yrs	1610	91.5
	46 - 65yrs	18	1.0
	Above 65yrs	10	0.6
	Total	1759	100
Educational status	Primary	5	0.3
	Secondary	7	0.4
	Undergraduate	1539	87.5
	B.Sc/HND/NCE	112	6.4
	PGD/M.Sc/Ph.	96	5.5
	Total	1759	100
Discipline	Basic/Applied Sciences	721	41.0
	Engineering and Technology	381	21.7
	Social Sciences and Humanities	288	16.4
	Arts and Commercial	169	9.6
	Environmental Sciences	198	11.3
	Total	1759	100
Class level (Student)	100L	333	19.0
	200L	432	24.6
	300L	434	24.7
	400L	250	14.2
	500L	175	10.0
	Postgraduate	133	7.6
	Total	1759	100
Physical challenge	None	1755	99.8
	Blindness	3	0.2
	Walking stick assisted	1	0.1
	Crutches assisted	-	-
	Wheel chair assisted	-	-
	Total	1759	100
Car ownership	No	1667	94.8
	Yes	90	5.1
	Total	1759	100

Table 2. Perception of qualities of UZGs of Federal Universities in South-west Nigeria.

Perception of quality	Freq.	(%)
Poor	285	16.2
Scanty	186	10.6
Averagely set	433	24.6
Well set	433	24.6
Excellent	333	18.9
Total	1670	94.4

4.2 Testing of Hypothesis

Ho1: There is no significant difference in the perceptions of qualities of the UZGs among the Federal Universities in the study area.

A Kruskal-Wallis H test was conducted to determine if the perceptions of qualities of the Zoological gardens is significantly different among the six Federal Universities and the results are as shown in Table 3. A Kruskal-Wallis H test showed that there was a statistically significant difference in the perceptions of qualities of the UZGs among the six Federal Universities. The results as shown in Figure 2 and explained with chart in Figure 3 indicate that Chi square, $\chi^2(df, 5) = 531.927, p = 0.000$, with a mean rank perception of quality score of 1207.46 for UI (Plate 1), 1022.45 for FUNAAB (Plate 2), 843.63 for OAU, 733.44 for FUTA (Plate 3), 604.23 for UNILAG (Plate 4) and 303.97 for FUYOYE in descending order with UI having the best and FUYOYE having the least. This implies the rejection of the Null Hypothesis Ho1 and implying that there is significant difference in the perceptions of qualities of the Zoological gardens among the Federal Universities in the study area.

To identify the pattern of the statistically significant differences in the perceptions of qualities of the Zoological gardens among the six Federal Universities, a Kruskal-Wallis post-hoc test was carried out. A Pairwise customised analysis result shows that all the Zoological gardens are perceived to be of different qualities except for OAU-FUTA ($p = .070$) as shown in Figures 3.



Plate 1. Entrance gate of University of Ibadan Zoological Garden, Ibadan, Nigeria

Source: Picture by authors, 2017



Plate 2. A pen in Federal University of Agriculture Abeokuta Zoological Garden, Nigeria



Plate 3. A pen in Federal University of Technology Akure Zoological Garden, Nigeria



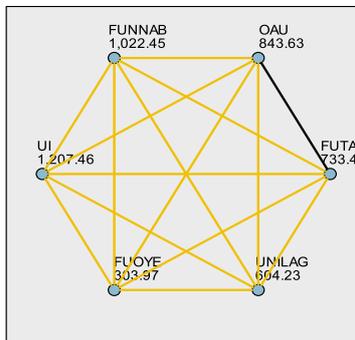
Plate 4. A pen in University of Lagos Zoological Garden, Lagos, Nigeria

Source: Picture by authors, 2017

Table 3. Kruskal Wallis H Test of significant difference in the perceptions of qualities of the University Zoological gardens in South-west Nigeria.

Null Hypothesis	Chi square	Asymp. Sig.	Decision	University	Mean Rank Perception of Quality Score
There is no significant difference in the perceptions of qualities of Zoological gardens among the Federal Universities in the study area.	531.927	.000	Reject the null Hypothesis	FUTA	733.44
				OAU	843.63
				UI	1207.46
				FUOYE	303.97
				FUNNAB	1022.45
				UNILAG	604.23

Pairwise Comparisons of Universities



Each node shows the sample average rank of Universities.

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
FUOYE-UNILAG	-300.259	46.637	-6.438	.000	.000
FUOYE-FUTA	429.475	47.366	9.067	.000	.000
FUOYE-OAU	539.666	46.510	11.603	.000	.000
FUOYE-FUNNAB	-718.481	46.535	-15.440	.000	.000
FUOYE-UI	903.497	46.173	19.568	.000	.000
UNILAG-FUTA	129.216	39.090	3.306	.001	.014
UNILAG-OAU	239.407	38.049	6.292	.000	.000
UNILAG-FUNNAB	418.222	38.079	10.983	.000	.000
UNILAG-UI	603.238	37.636	16.028	.000	.000
FUTA-OAU	-110.191	38.938	-2.830	.005	.070
FUTA-FUNNAB	-289.006	38.968	-7.416	.000	.000
FUTA-UI	-474.022	38.535	-12.301	.000	.000
OAU-FUNNAB	-178.815	37.923	-4.715	.000	.000
OAU-UI	-363.831	37.478	-9.708	.000	.000
FUNNAB-UI	185.016	37.510	4.933	.000	.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Figure 2. Result of a Pairwise customised Kruskal-Wallis post-hoc test for the perception of Quality of Zoological gardens in the study area.

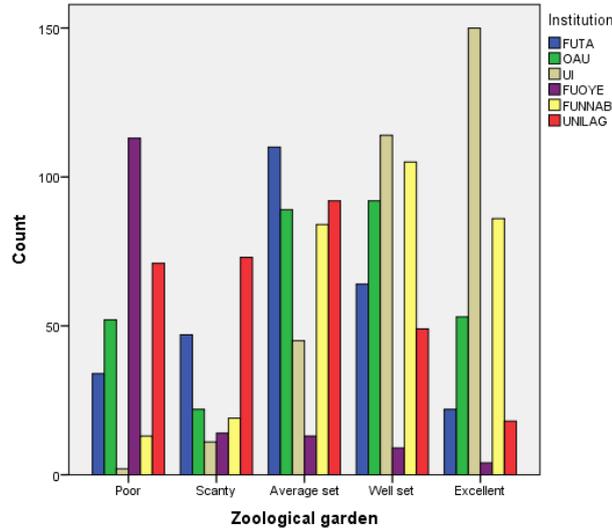


Figure 3. Differences in the perceptions of qualities of Zoological gardens among the six Federal Universities' campuses in South-west Nigeria.

3.3 Impact of Status of Users on Perception of Quality of Zoological gardens

Tables 4 and 5 show the result of the Cramer's V test between the status of the users and their

perception of qualities of the Zoological gardens. Only discipline (Cramer's $V=0.110$, $p=0.000 < 0.005$) has significant impact at 95% confidence level.

Table 4. Relationship between status (nominal variables) of the users and their perception of qualities of the Zoological gardens.

Status of users	Cramer's V Value	Approx. Sig. (p value)
Gender	0.046	0.464
Discipline	0.110	0.000
Impairment	0.049	0.447
Car ownership	0.065	0.135

Table 5. Relationship between status (ordinal variables) of the users and their perception of qualities of the Zoological gardens.

Status of users	Kendal tau Value	Approx. Sig. (p value)
Age	-0.007 ^c	0.717
Educational status	-0.025 ^b	0.240
Class level	-0.001 ^c	0.948

b: Kendal tau b because of the square contingency table

c: Kendal tau c because of the rectangular contingency table

3.4 Factors Influencing Users' Satisfaction

3.4.1 Use Factors

Cramer's V test was carried out to examine the 'use factors' influencing the satisfaction of users with the UZGs. The use factors are extrinsic to the UZGs since they have to do with the users themselves on how they use the gardens. The four use factors are common period of use, common purpose of use, mode of pedestrian use and hindrances to use. Table 6 shows that common period of use and mode of pedestrian use do not have significance on the perception of quality of the UZG (Cramer's $V=0.087$, $p=0.005$). Figure 4 shows that those who use the Zoological gardens for academic purposes had higher perceptions of their qualities than other users.

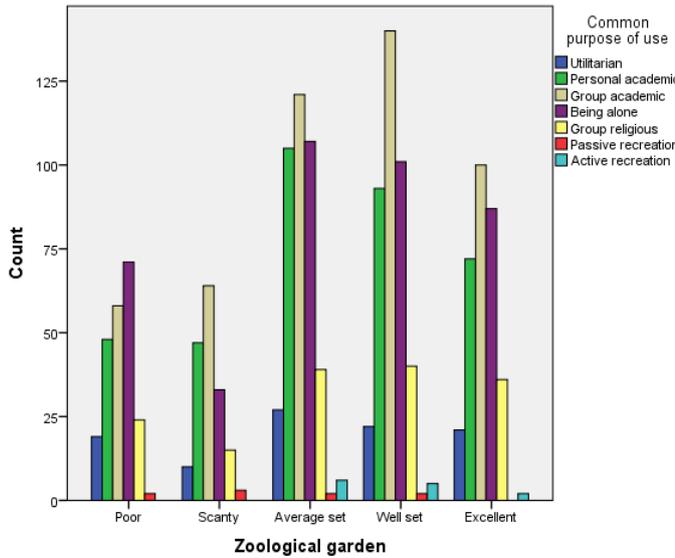


Figure 4. Influence of common purpose of use on the perception of quality of zoological gardens in federal universities in the South-west Nigeria.

Figure 5 shows that the perception of quality of Zoological gardens is influenced by the purpose of use. Those that use them for group academic, being alone and personal academic purpose perceive the gardens to be of higher quality than utilitarian and passive recreation.

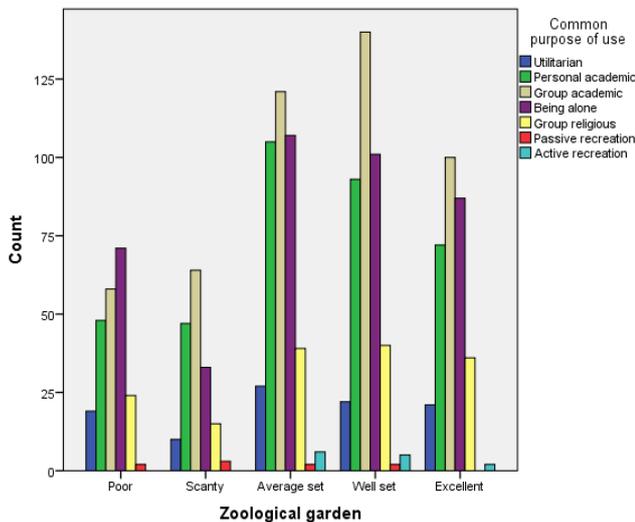


Figure 5. Influence of common purpose of use on the perception of quality of Zoological gardens in Federal Universities in South-west Nigeria.

Furthermore, hindrances to use significantly influenced the perceptions of qualities of the UZGs at 0.01 (99%) confidence level as shown in Table 6. Figure 6 shows that inclement weather and lack of visual privacy accounts for perception of qualities.

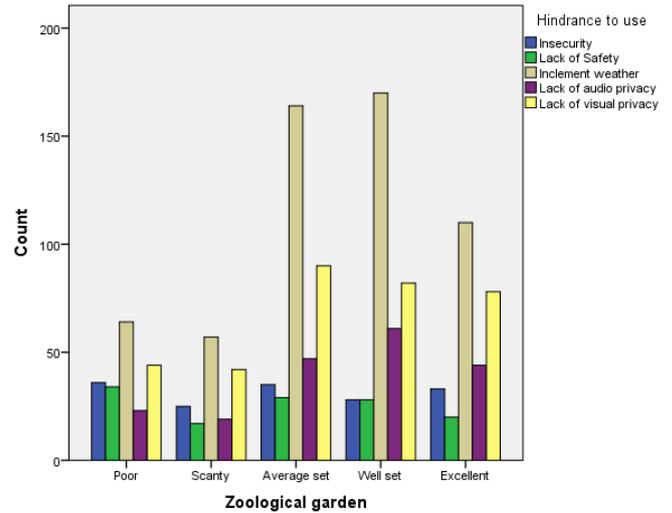


Figure 6. Influence of hindrances to use on the perception of quality of Zoological gardens in Federal Universities in the South-west Nigeria.

Table 6. Use factors influencing satisfaction of users with the university. Zoological gardens in the study area.

Use factors	Cramer's V	p-value
Common period of visit	0.058	0.421
Common purpose of visit	0.070	0.192
Mode of pedestrian use	0.058	0.181
Hindrances to use during visit	0.093	0.000

3.4.2 Cognitive Factors

Cognitive satisfaction factors are intrinsic to the UZGs since they have to do with the spaces. The other intrinsic factors are social, spatial and affective factors. A Spearman's rank-order correlation was run to determine the relationship between 1759 users' satisfaction with four cognitive factors (coherence, legibility, complexity and mystery) and perceptions of qualities of the UZGs, both measured in ordinal scales. There were strong, positive correlations between satisfaction with the cognitive factors and perceptions of qualities of the UZGs which was statistically significant as follow: coherence: $r_s = .355, p = .000$; complexity: $r_s = .349, p = .000$; mystery: $r_s = .315, p = .000$; and legibility: $r_s = .314, p = .000$, in descending order, as shown in Table 7 and Figure 7.

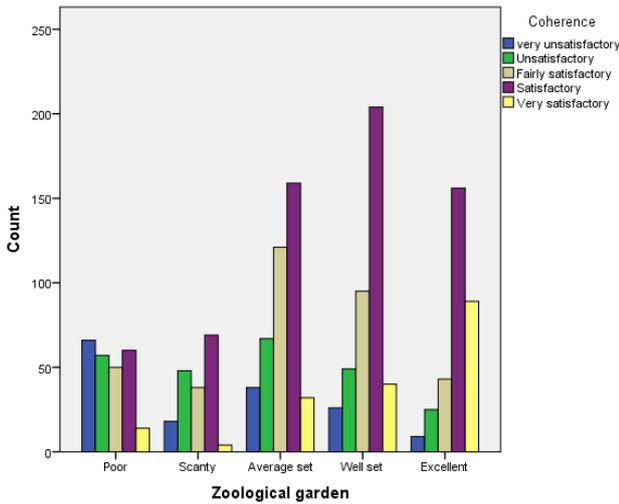


Figure 7. Influence of satisfaction with coherence on the perception of quality of Zoological gardens in Federal Universities in the South-west Nigeria

3.4.3 Social Factors

As shown in Table 7, in view of the high sample size, there were strong, positive correlations between satisfaction with the social factors and perceptions of qualities of the Zoological gardens which was statistically significant at 0.01 (99%) confidence level. Safety ($r_s = .330, p = .000$) has the highest correlation coefficient followed by social interaction spaces ($r_s = .312, p = .000$), security ($r_s = .277, p = .000$), conviviality and audio privacy ($r_s = .273, p = .000$), visual privacy ($r_s = .268, p = .000$), and open space for personal meditation ($r_s = .252, p = .000$) in descending order.

Table 7. Factors influencing users' satisfaction with the University Zoological gardens in the study area.

	Factors	Spearman Correlation	p value	-
Cognitive factors	Coherence	0.355	0.000	
	Legibility	0.314	0.000	
	Complexity	0.349	0.000	
	Mystery	0.315	0.000	
Social factors	Conviviality	0.273	0.000	
	Social interaction spaces	0.312	0.000	
	Visual privacy	0.268	0.000	
	Audio privacy	0.273	0.000	
	Open space for being alone	0.252	0.000	
	Safety	0.330	0.000	
	Security from crime/fear of crime	0.277	0.000	
	Spatial factors	Accessibility	0.285	0.000
Proximity	0.266	0.000		
Walk-ability	0.261	0.000		
Connectedness	0.294	0.000		
Continuity	0.265	0.000		
Convenience	0.314	0.000		
Affective factors	Relaxing-ability	0.297	0.000	

3.4.4 Spatial Factors

Six spatial satisfaction factors were investigated through Spearman's correlation as determinants of the perception of quality of the UZGs as shown in Table 7. Convenience ($r_s = .314, p = .000$) has the highest correlation coefficient and continuity ($r_s = .265, p = .000$) the least. Invariably, zoological gardens should be designed for convenience to enhance the movement of users from one section to another. However, they are not expected to be at continuity with other UCOS at the main activity areas but should be secluded since the proximity correlation coefficient is also low ($r_s = .266, p = .000$) compared with others. On the whole, the higher the satisfaction with the spatial factors, the higher the perception of quality of the UZGs.

3.4.5 Affective Factors

Table 7 shows the correlation coefficients between perceptions of qualities and affective satisfaction factors of UZGs. The results suggest that fascinating-ability ($r_s = .346, p = .000$) is the most important affective factor, followed by pleasantness ($r_s = .323, p = .000$) while recuperative-ability ($r_s = .252, p = .000$) is the least. This pattern suggests that satisfaction of users with the UZGs is premised upon specific affective factors which should be built into their designs.



Fascinating-ability	0.346	0.000
Enjoy-ability	0.310	0.000
Restfulness	0.265	0.000
Inviting-ability	0.292	0.000
Inspiring-ability	0.293	0.000
Beautifulness	0.321	0.000
Exciting-ability	0.313	0.000
Recuperative-ability	0.252	0.000
Therapeutic-ability	0.229	0.000
Restorative-ability	0.261	0.000
Pleasantness	0.323	0.000
Comfortableness	0.283	0.000

3.5 Testing of Hypothesis Ho2: Influence of Satisfaction Factors on Perceptions of Quality

Ordinal regression analysis was carried out to estimate the 30 intrinsic satisfaction factors (cognitive, social, spatial and affective factors) influencing the perception of quality of the UZGs. Accordingly, model fitting information and Pseudo R-Square were generated as shown in Table 8. The dependent variable which measures the perception of quality is the UZGs. UZGs is equal 1 if the respondent perceives the garden as poor, 2 as scanty, 3 as averagely set, 4 as well set and 5 as excellent. Since dependent/outcome variable is ordinal, and the satisfaction factors, SF (independent/predictors) are measured as ordinal variables (SF is equal 1 if the respondent is very unsatisfied with the performance of the open space based on the SF under consideration, 2 for unsatisfactory, 3 for fairly satisfactory, 4 for satisfactory and 5 for very satisfactory) the ordinal regression model is used to estimate the factors which influence satisfaction of the users. Only the 30 satisfaction factors that are intrinsic to the UZGs were included in the model. Use factors were excluded since they are extrinsic to the UZGs. The results in the Model indicate that as the ratings of the satisfaction factors increase, the perception of quality increases and the model is significant at the .01 level (99% confidence level). This is for Cox and Snell (theoretical

maximum value of less than 1), Nagelkerke (adjusted version of the Cox and Snell R² to cover the full range from 0 to 1) and McFadden's (based on the log-likelihood kernels for the intercept-only model and the full estimated model) Pseudo R², since it is not possible to compute a single R² statistic that has all of the characteristics in the linear regression model for regression models based on ordinal data (Tjur, 2009). According to Cox and Snell Pseudo R², Table 8 shows that the model predicts that the satisfaction factors, SF [Chi-square=3866.018, df=245, p=0.000, 2 Log Likelihood final=102.613] accounts for 95.0% of the variance in the perception of quality of UZGs.

Table 9 shows the Parameter estimates (beta coefficients) of the intrinsic factors influencing users' satisfaction. The estimates are based on scale models which depend on the main and interaction effects. Three intrinsic satisfaction factors are the best predictors of perception of quality as highlighted. Table 9 suggests that satisfaction with legibility (0.574) is the best predictor of perception of quality of Zoological gardens. This is followed consecutively by beautifulness (0.331) and walk-ability (0.325). Furthermore, satisfaction with social interaction space (0.434) is a better predictor of perception of quality, being the highest, than restfulness (0.423) and walk-ability (0.356) consecutively.

Table 8. Ordinal regressions of perception of quality of open spaces (dependent/outcome) and factors determining the satisfaction of the users (independent/predictors) in Federal Universities in South-west Nigeria

University	Model Fitting Information					Pseudo R-Square		
	Model	-2 Log Likelihood	Chi-Square	Df	Sig.	Cox & Snell	Nagelkerke	McFadden
Zoological gardens.	Intercept Only	3968.631						
Zoological gardens	Final	102.613	3866.018	245	.000	.949	.992	.950

Link function: Logit.

Table 9. Parameter estimates of the factors influencing users' satisfaction with the Federal Universities campus open spaces in the study area.

Satisfaction factors	Components	Parameter estimates
Cognitive factors	Coherence	-0.558
	Legibility	0.574
	Complexity	-0.342
	Mystery	0.060
Social factors	Conviviality	0.165
	Social interaction spaces	0.255
	Visual privacy	0.052
	Audio privacy	-0.214
	Open space for being alone	0.158
	Safety	-0.224
	Security from crime/fear of crime	0.112
	Accessibility	0.156
Spatial factors	Proximity	-0.286
	Walk-ability	0.325
	Connectedness	-0.542
	Continuity	0.186
	Convenience	-0.137
	Relaxing-ability	-1.442
	Fascinating-ability	-0.316
	Enjoy-ability	0.147
	Restfulness	0.280
	Inviting-ability	0.096
	Inspiring-ability	-0.219
	Beautifulness	0.331
	Exciting-ability	0.043
	Recuperative-ability	0.093
	Therapeutic-ability	-0.262
	Restorative-ability	-0.098
Pleasantness	0.095	
Comfortableness	0.062	

3.6 Evidence-based Design Framework for University Zoological Gardens

Figure 8 shows the framework developed for the design of UZGs. While all the satisfaction

factors are important to the perception of quality, satisfaction with legibility is the most crucial, followed by beautifulness, walk-ability and hindrances to use.

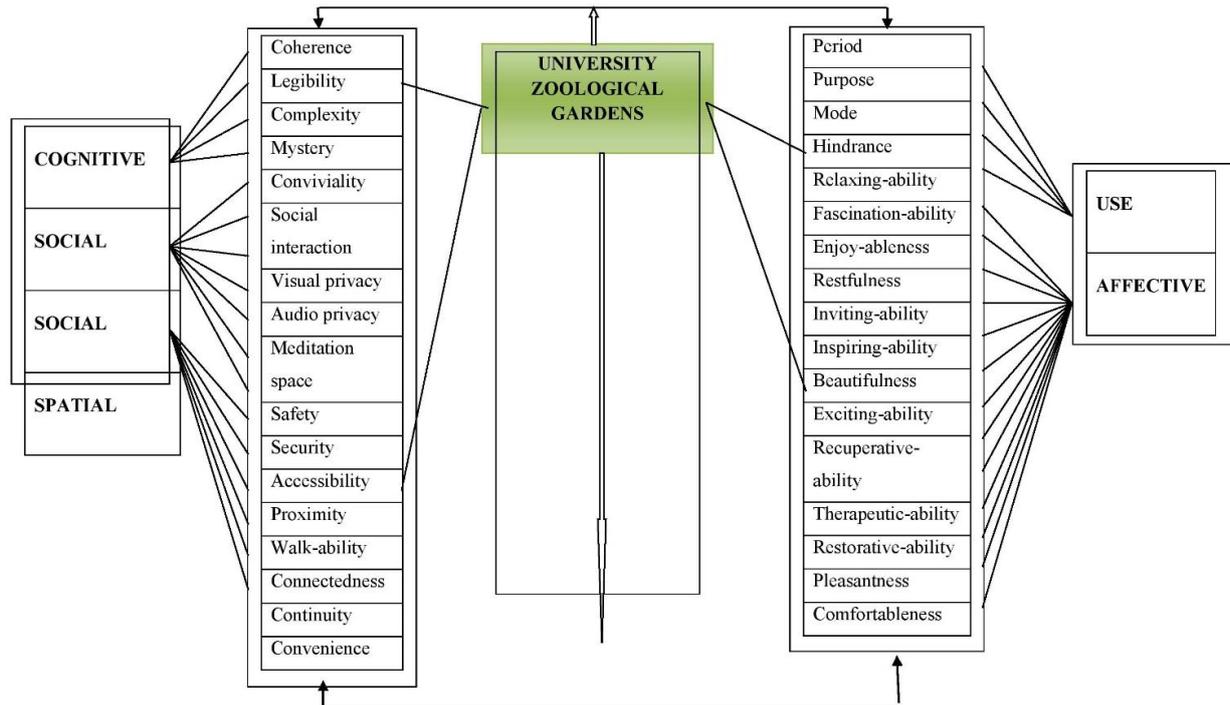


Figure 8. EBD framework for UZGs.

4. Discussion of Findings

An assessment of the UZGs in all the six Federal Universities in South-west Nigeria towards the formulation of EBD framework was carried out in this study. According to the findings of this study, the distributions of the users' status suggest both peculiarities and generalisations. The peculiar needs of the genders, impairment groups, disciplines and age groups are central to the successful provision of UZGs on the campuses. UZGs are discovered to be primarily used for academic activities and also for recreation and these differ from one discipline to another. This suggests that the UZGs are learning spaces and constellation arenas for psychological wellbeing in high disproportion compared with other uses. The UI Zoological garden was perceived to be of the best quality possibly due to the Zoology programme in the university, the garden being a vital learning space. Also, the UI Zoological garden doubles as a vital recreation facility of the city's and region's teaming urban populations and therefore may be admirable as the minimum standard for the design of UZGs in the study area. Those who use the Zoological gardens in the study area for academic purposes had higher perceptions of quality than other users. Furthermore, satisfaction factors are important to successful UZG delivery. While safety is a primary satisfaction factor, result implies that legibility is the most primary cognitive factor for designing perceptible high

quality Zoological gardens. This confirms the Kaplan and Kaplan's (1989) information processing matrix of landscapes. The framework suggests that legibility, beautifulness, walkability and hindrances to use are 'hot spots' satisfaction factors of UZGs.

5. Conclusion and Recommendation

This work has established that UZGs are important to the effective functional activities on the campuses. Their design should therefore be evidence-based. Evidence-based design can only be carried out through the instrument of post-occupancy evaluation (POE) for long-term benefit to serve as a feedback into the design process. For POE to produce this desired goal and wider-relevance application, geographical spread is germane. Accordingly, the set aim of this study on the Federal Universities campuses in South-west Nigeria can be appraised to have been achieved. However, the operational quality of the formulated framework can be appraised by engaging it as design tool-kit generally for all formally designable campuses of institutions of higher learning but primarily for university campuses in the study area. Also, medium term benefit can be achieved by applying the policy framework for minor adjustments of existing UZGs for better users' satisfaction. Contextually, the study was limited in scope to Federal Universities. Further work can be carried



out inclusively and exclusively with other proprietorships of universities within and outside the South-west Nigeria. Such can be for comparative purposes or case studies and can include considerations like maintenance and management of UZGs. In term of methodological approach, since this work is limited to quantitative research design on cross-sectional basis, qualitative and/or mixed method paradigms that can also be longitudinal can be further engaged on different spatial scales.

On the whole, the perception of quality is related to the satisfaction factors such that as the ratings of the satisfaction factors increase, the perception of quality increases. The satisfaction factors therefore account for the significant differences in the perceptions of qualities of the UZGs among the six Federal Universities in the study area. The satisfaction factors that account for the perceptions of qualities of UI Zoological should be programmed into the design of UCOS to avoid the misuse of spaces and best decisions to be taken during the design process.

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