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USER-BASED PERFORMANCE EVALUATION OF BUILDING FACILITIES IN SELECTED UNIVERSITIES IN THE SOUTH EAST NIGERIA

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ABSTRACT

This study Identify and assess the types and availability of building facilities in selected universities in South-East Nigeria. Assess the performance of university building facilities using key indicators relating to functionality, space adequacy, accessibility, thermal comfort, lighting, ventilation, safety and security, cleanliness, maintenance, and the availability of essential building services, and Examine users' perceptions of and satisfaction with the performance of university building facilities in selected State and Federal universities in South-East Nigeria. A descriptive survey design was combined with Post-Occupancy Evaluation (POE). Data were obtained from 100 students and staff in six selected universities using a structured questionnaire and building observation checklist. Weighted mean, Performance Difference (PD) analysis, pair sample t-test were used to analyse the data at the 0.05 level of significance. The findings showed that the universities provided a wide range of academic, administrative, residential, recreational, health, security, and support facilities, although their adequacy varied. Nine of the 15 performance indicators recorded positive PD values ranging from 1.10 to 2.70. Libraries and resource centres recorded the highest positive gap (2.70), while dining facilities had the largest negative gap (−1.00). Thermal comfort, excessive heat, accommodation, recreation, and some ICT facilities also required attention. The hypothesis test indicated no statistically significant difference between respondents' ratings of building-performance indicators and user satisfaction, as all reported p-values exceeded 0.05, suggesting broadly similar views among respondents. The proposed model was based on the combined evidence from facility availability, performance gaps, user feedback, observed conditions, and POE findings. The study concludes that university buildings should be assessed by their ability to meet users' functional, comfort, safety, accessibility, and service needs.

Keywords: University buildings, building performance, user satisfaction, post-occupancy evaluation, South-East Nigeria.

1.0 INTRODUCTION

1.1 Background to the Study

Buildings are a major part of the environment in which people live, work, study, and interact. Their purpose is not limited to providing shelter; they are expected to support the activities for which they are designed. A good building should therefore provide a safe, functional, comfortable, healthy, accessible, and suitable environment for its occupants. In recent years, building performance has received greater attention because it is connected not only with the physical condition of buildings but also with energy use, environmental sustainability, and the well-being of occupants (Neyestani, 2017; Zhao et al., 2017). These concerns are particularly important in universities, where buildings provide the setting for teaching, learning, research, administration, accommodation, and other activities.

University facilities include classrooms, lecture theatres, laboratories, libraries, offices, workshops, hostels, health centres, and recreational areas. The availability of these facilities alone, however, does not necessarily mean that they are adequate or performing satisfactorily. Their usefulness depends on factors such as the amount and suitability of available space, functionality, accessibility, lighting, ventilation, thermal conditions, cleanliness, safety, maintenance, and the reliability of essential services. In this study, building performance refers to how effectively a university building performs the functions for which it was provided and how well it responds to the needs of its occupants. Building Performance Evaluation (BPE) involves examining the actual performance of a building against its intended functions and expected standards (Roberts et al., 2019). Closely related to this is Post-Occupancy Evaluation (POE), which involves assessing a building after it has been occupied, particularly by obtaining information from the people who use it. POE can reveal problems that may not be apparent from design documents or physical inspection alone (Preiser and Vischer, 2005; Ghiai et al., 2026). User satisfaction refers to the extent to which occupants consider the building and its facilities capable of meeting their functional, environmental, comfort, safety, accessibility, and service needs.

These issues have particular relevance to universities in South-East Nigeria. The region has experienced continuing growth in higher education, accompanied by increasing student enrolment and the expansion of academic

programmes and physical infrastructure. As the demand for university education grows, existing buildings are placed under greater pressure. Some facilities may remain physically usable while their level of comfort, functionality, accessibility, or environmental quality gradually declines. Problems associated with ageing buildings, overcrowding, inadequate maintenance, limited resources, and weak facility management can further affect how well university buildings serve their users. Dadzie et al. (2018) noted that building performance in developing-country settings needs to be considered in relation to local conditions, maintenance practices, available resources, and the experiences of occupants.

The ownership structure of universities in South-East Nigeria also provides an important context for examining building performance. Federal and State universities operate under different administrative and funding arrangements. Federal institutions may benefit from federal government funding and interventions such as the Tertiary Education Trust Fund (TETFund), whereas State universities depend considerably on state government funding, internally generated revenue, and other sources. Differences in funding, procurement, maintenance, and facility management practices may influence the condition and performance of university buildings. Although the National Universities Commission (NUC) establishes minimum standards for university education and infrastructure, meeting basic requirements at the point of provision does not necessarily ensure that buildings will continue to perform effectively throughout their service life.

Previous studies have identified several conditions that can shape users' experiences of institutional buildings. These include space adequacy, functionality, accessibility, lighting, ventilation, thermal comfort, safety, cleanliness, maintenance, indoor environmental quality, and the availability of essential building services (Ali et al., 2021; Hassanain et al., 2024). Advances in digital technologies, including sensors, the Internet of Things (IoT), and artificial intelligence (AI), have also created additional opportunities for monitoring building conditions and supporting facility management (Khatibi et al., 2021). Nevertheless, building performance cannot be fully understood by examining technical specifications or physical conditions alone. A building may perform differently from what its designers originally intended once it is occupied and subjected to everyday use.

Users' experiences are therefore an important source of information for determining whether facilities are actually meeting their intended purposes (Preiser and Vischer, 2005).

Although research on building performance and user satisfaction is growing, there is still limited comparative evidence on university buildings across Federal and State universities in South-East Nigeria. Much of the available research has concentrated on individual institutions, particular categories of buildings, or selected aspects of facility performance. Consequently, there is inadequate evidence showing how students and staff perceive the overall performance of university buildings across different ownership arrangements within the region. There is also limited understanding of how different performance dimensions combine to shape users' satisfaction. This leaves a gap in evidence that could assist university administrators and government authorities in making informed decisions about facility provision, maintenance, rehabilitation, and future building development.

The universities included in this study were selected to provide representation of Federal and State university ownership within South-East Nigeria and to allow comparison across institutions with differences in their institutional backgrounds, scale, academic activities, and physical development. Studying more than one institution also provides a broader basis for understanding building performance than would be possible through a single-university assessment. The selected universities therefore provide a suitable setting for examining how the condition and performance of facilities are experienced by the people who use them.

It is against this background that this study evaluates building facilities in selected Federal and State universities in South-East Nigeria. The study examines the types of facilities available, assesses their performance using relevant functional, environmental, safety, accessibility, and maintenance indicators, and considers users' perceptions and satisfaction. It also seeks to develop a performance-based planning and design model that connects users' experiences with building assessment, maintenance, management, and future planning. The expected contribution of the study is threefold: to provide empirical evidence on the actual performance of university buildings in South-East Nigeria; to provide a basis for comparing facilities across Federal and State universities; and to offer a user-centred model that can assist universities, planners, designers, and

facility managers in improving existing buildings and making better decisions about future facilities. In this way, the study seeks to support university environments that are functional, safe, comfortable, accessible, and responsive to the needs of their users.

1.2 Statement of the Problem

University buildings are expected to provide functional, safe, comfortable and accessible environments for teaching, learning, research and administration. However, studies in Nigerian universities have reported persistent problems including inadequate maintenance, deteriorating building components, overcrowding, inadequate teaching and laboratory spaces, poor ventilation and lighting, unreliable water and electricity services, inadequate sanitary facilities, and limited accessibility. Ugwu, Okafor, and Nwoji (2018) reported significant maintenance deficiencies in university buildings, while Ikediashi, Udo, and Ofoegbu (2020) identified the need to assess university buildings based on how they actually perform for their users.

A particular concern is that the physical provision of university buildings does not always translate into satisfactory performance during use. Some facilities may have adequate structural components but still experience problems with thermal comfort, lighting, ventilation, space adequacy, cleanliness, safety, accessibility, functionality and maintenance. Olukolajo and Mbazor (2021) found that users' satisfaction with university accommodation is influenced by several physical, environmental and service-related factors, indicating the importance of considering users' experiences in building assessment.

The major research problem is therefore the limited user-based evidence on the actual performance of university building facilities in South-East Nigeria. In particular, there is insufficient comparative information on whether students, academic staff and non-academic staff are satisfied with the adequacy, comfort, functionality, accessibility, safety and maintenance of university buildings, and whether these perceptions differ between Federal and State universities. Existing studies have largely focused on individual institutions or specific facility types, creating a gap in broader comparative assessment. This study therefore seeks to evaluate the performance of building facilities in selected Federal and State universities in South-East Nigeria based on users' perceptions.

1.3 Aim and Objectives of the Study

The aim of this study is to evaluate the performance of building facilities in selected universities in South-East Nigeria and develop a user-based framework for improving their planning, design, provision, and management.

Objective

1. Identify and assess the types and availability of building facilities in selected universities in South-East Nigeria.
2. Assess the performance of university building facilities using key indicators relating to functionality, space adequacy, accessibility, thermal comfort, lighting, ventilation, safety and security, cleanliness, maintenance, and the availability of essential building services.
3. Examine users' perceptions of and satisfaction with the performance of university building facilities in selected universities in South-East Nigeria.

1.4 Research Questions

The following research questions were considered:

1. What types of building facilities are available in Ebonyi State University in Abakaliki, Chukwuemeka Odumegwu Ojukwu University in Igbariam, Imo State University in Owerri, Alex Ekwueme Federal University in Ndufu-Alike, Nnamdi Azikiwe University Awka, and the Federal University of Technology in Owerri in South-East Nigeria?
2. What are the performance of university building facilities using key indicators relating to functionality, space adequacy, accessibility, thermal comfort, lighting, ventilation, safety and security, cleanliness, maintenance, and the availability of essential building services?
3. What are the users' perceptions and satisfaction with the performance of university building facilities in selected universities in South-East Nigeria?

1.5 Hypothesis

The following null hypotheses are formulated and tested at 0.05 level of significance at the course of this study:

H_{01}: There is no significant difference between the major performance indicators of university building facilities and user

satisfaction in selected Universities in South-East Nigeria.

2.0 LITERATUREREVIEW

Building facilities constitute an important component of the university environment because they provide the physical spaces required for teaching, learning, research, administration, accommodation and other institutional activities. The quality and condition of these facilities can influence users' comfort, satisfaction, productivity and overall experience within the university environment. Kim, Abdou, Abdou, and Altan (2022) noted that the quality of the indoor environment of university buildings is closely associated with occupants' satisfaction and wellbeing, highlighting the importance of evaluating building conditions from the users' perspective.

User-based performance evaluation focuses on the experiences, perceptions and satisfaction of building occupants. Rather than concentrating only on structural or technical conditions, it considers factors such as thermal comfort, lighting, ventilation, acoustics, spatial adequacy, accessibility, cleanliness, safety, functionality and maintenance. Zhao and Yang (2022) explained that occupant satisfaction is an important component of building performance evaluation because it helps reveal the extent to which actual building conditions meet users' expectations and the intended performance of the building.

Building performance is particularly important in university environments because classrooms, lecture theatres, laboratories, libraries, offices, hostels and other facilities are used intensively by large numbers of students and staff. Inadequate performance may result in discomfort, overcrowding, poor ventilation, inadequate lighting, insufficient services and dissatisfaction among users. Olukolajo and Mbazor (2021), in their evaluation of occupants' satisfaction with a university hostel in Nigeria, examined building components, accommodation, services and amenities, location and environmental conditions, demonstrating the importance of assessing different dimensions of university facilities from the occupants' perspective.

Post-Occupancy Evaluation (POE) is a widely used approach for assessing building performance after occupation by obtaining information from building users and examining how well the facility performs in actual use. It can involve questionnaires, interviews, observations and physical measurements to assess building conditions,

indoor environmental quality, functionality and occupant satisfaction. Ikediashi, Udo, and Ofoegbu (2020) applied POE to buildings at the University of Uyo and used questionnaire surveys involving students and staff to evaluate building performance. Similarly, Kim et al. (2022) combined indoor environmental quality assessment with occupant satisfaction in a university building, demonstrating the usefulness of POE in understanding actual building performance from the users' perspective.

In Nigerian universities, the evaluation of building performance is important because increasing student populations and pressure on existing infrastructure can affect the adequacy and functionality of university facilities. Issues relating to accommodation, services, maintenance, environmental conditions and other building attributes may influence users' satisfaction with university facilities. Olukolajo and Mbazor (2021) found that evaluating users' satisfaction with university accommodation requires consideration of several building and environmental attributes rather than focusing on a single physical component. This supports the need for a broader user-based assessment of university facilities.

Universities in South-East Nigeria operate within different institutional, environmental and socio-economic contexts, which may influence how students and staff perceive and experience their buildings. Therefore, evaluating university facilities from the users' perspective can provide evidence on whether existing buildings adequately meet their functional and environmental requirements. Ikediashi et al. (2020) demonstrated that POE can be used to obtain users' assessments of university buildings and identify areas requiring improvement in building performance and management.

3.0 METHODOLOGYAND STUDY AREA

3.1 Study Area

The study area comprised of three state universities (Ebonyi State University Abakaliki, Ebonyi State, Odumegwu Ojukwu University, Igboariam, Anambra State and Imo State university, Owerri, Imo State) and three federal universities (Alex Ekwueme Federal University, Ndufu Alike, Ebonyi State, Nnamdi Azikiwe University, Awka, Anambra State and Federal University of Technology, Owerri, Imo State) in South East, Nigeria.

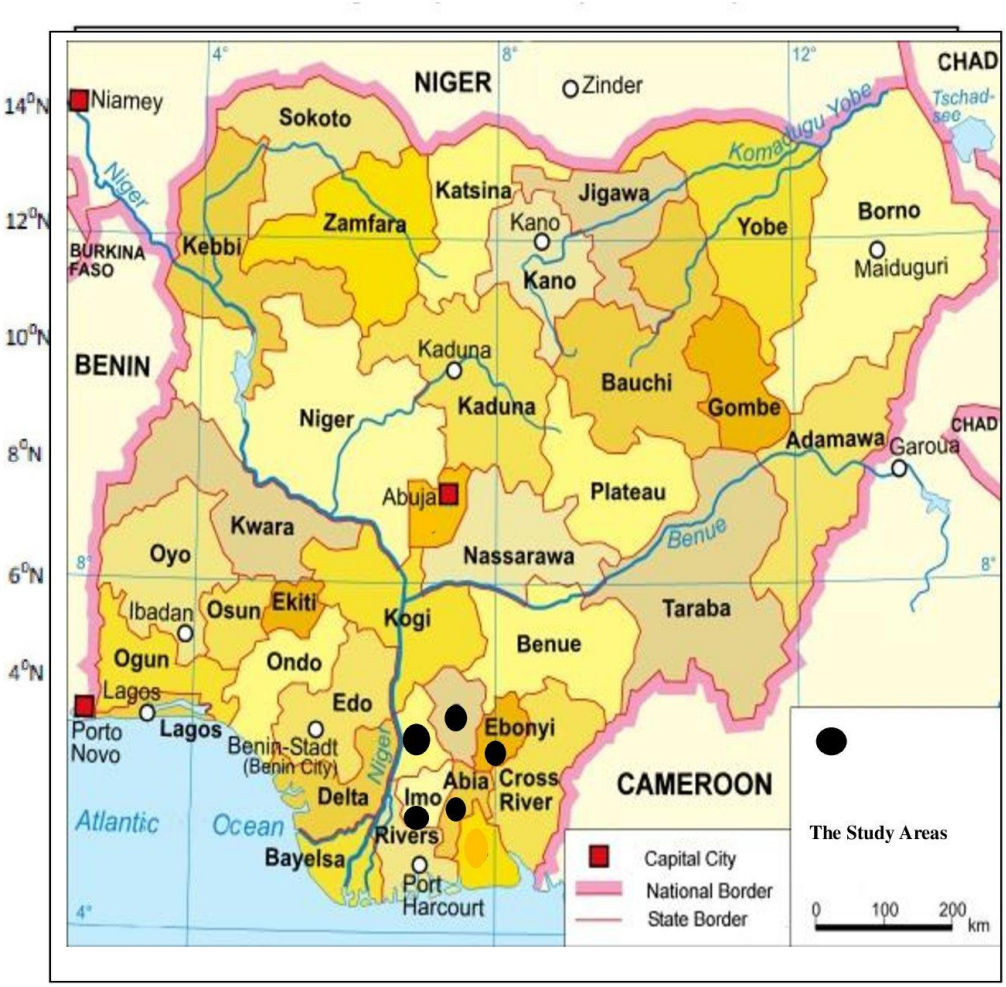


Figure 3.2: Map of Nigeria showing the South East

(Source: Ogunode & Abubakar, 2020)

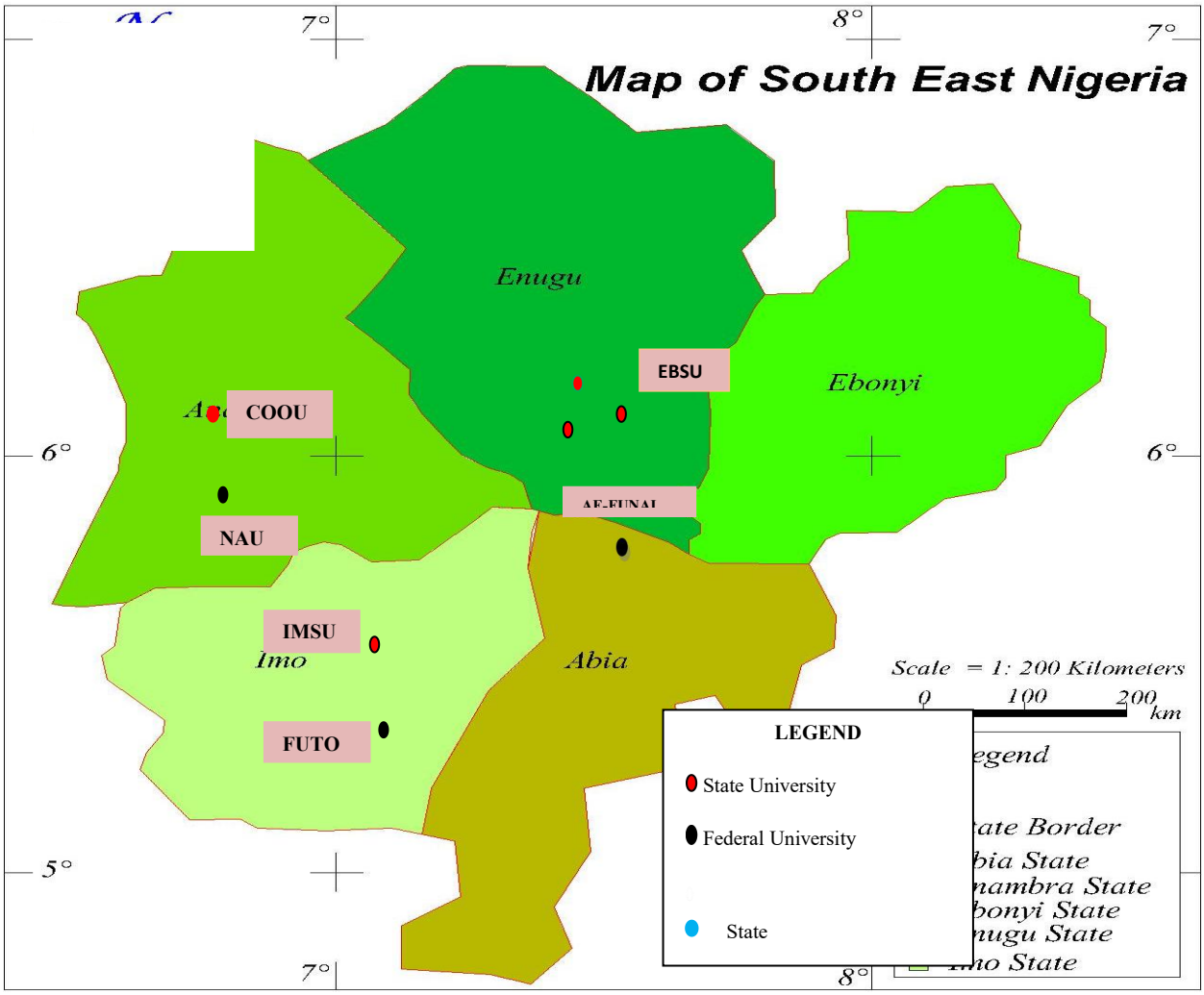


Figure 3.2: Map of South East showing the Study Areas
Source*:* Department of Surveying and Geoinformatics, Nnamdi Azikiwe University, Awka. (2025)

3.2 Research Design

The study adopted a descriptive survey design complemented by Post-Occupancy Evaluation (POE) to examine the performance of selected university buildings and users' satisfaction with the facilities in South-East Nigeria. The POE component provided an opportunity to assess the buildings in actual use, while the survey captured the experiences and perceptions of the people who occupy and use the facilities. Data were obtained through questionnaires administered to users and direct observation of the physical condition and functional performance of the buildings. The survey and observational data were initially analyzed independently and

subsequently considered together to provide a broader understanding of building performance and to inform the development of the proposed performance evaluation model.

3.4 Population of Study

The study population comprised students and staff who use the selected university buildings. A multistage sampling procedure was employed to select 100 respondents, comprising users drawn from the selected institutions.

3.5 Data Collection and Instrument for Data Collection

Primary and secondary source was employed in data collection. The instrument was a structured questionnaire. The questionnaire was used to elicit responses or information from respondents on the building facilities. It was structured (close-ended) and interspersed with open-ended questions, in a way that the respondents were expected to choose from the answers provided and also supply information on particular questions where answers were not provided. All the administered questionnaires were properly completed and returned, giving a 100% response rate. Two instruments were used for data collection: the University Building Performance Questionnaire (UBPQ) and the Building Performance Observation Checklist. The instruments covered major dimensions of building performance, including functionality, adequacy of space, accessibility, thermal comfort, lighting, ventilation, safety and security, cleanliness, physical condition, maintainability, indoor environmental quality, and essential building services. Responses to the questionnaire items were rated on a five-point scale ranging from Very Good Performance (5) to Very Poor Performance (1).

3.6 Method of Data Analysis

The data were analyzed using SPSS version 22. Descriptive statistics, particularly means and performance indices, were used to summarize respondents' ratings and describe the condition and performance of the university building facilities. The Performance Difference (PD) approach was used to determine the extent to which the perceived performance of the facilities differed from the expected or benchmark level. The PD was calculated as:

$$PD = Xp - Xn$$

where Xp represents the perceived or observed performance score and Xn

represents the expected or benchmark score. A positive PD indicates that the perceived performance exceeded the expected level, whereas a negative PD indicates that performance fell below expectations.

Inferential statistics were employed to test the study hypotheses at the 0.05 level of significance. Because the study compared two sets of ratings obtained from the same respondents namely, ratings of building performance indicators and corresponding ratings of user satisfaction the paired-samples t-test was used to determine whether the observed mean differences were statistically significant. The decision rule was to reject the null hypothesis where the Sig. (2-tailed) value was less than 0.05; where the significance value was greater than 0.05, the null hypothesis was not rejected.

4.0 DATA PRESENTATION AND ANALYSIS

4.1 **What types of building facilities are available in** in the selected Universities**?**

Table 1. Performance Gap Analysis of the Mean Responses of Respondents on the types of building facilities available in the selected Universities

S/N	Types of Building Facilities Available	N	Xp	Xn	$X_p - X_n$	Remark
1	Availability of adequate lecture theatres and classrooms for academic activities.	100	4.6	2.1	2.5	A
2	Presence of functional laboratories and workshops for practical training.	100	4.5	2.2	2.3	A
3	Availability of well-equipped libraries and resource centers.	100	4.7	2.0	2.7	A
4	Availability of on-campus hostels or student housing facilities.	100	2.1	2.3	-0.2	NA
5	Presence of sports complexes, courts, or fields for student recreation.	100	2.2	2.5	-0.3	NA
6	Availability of offices for university administration and support services.	100	2.6	2.5	0.1	NA
7	Presence of medical clinics or health facilities for students and staff.	100	2.4	2.3	1	A
8	Facilities for seminars, conferences, and large gatherings.	100	3.8	2.4	1.4	A
9	Availability of dining facilities for students and staff.	100	2.4	2.5	-1.0	NA
10	Security offices, surveillance systems, and security personnel facilities.	100	4.2	2.1	2.2	A
11	Availability and adequacy of sanitation facilities across campus.	100	3.6	2.2	1.4	A

12	Provision of parking lots for vehicles and bicycles.	100	3.7	2.2	1.7	A
13	. Facilities dedicated to maintenance, power supply, and water systems.	100	3.5	2.02	1.48	A
14	Presence of computer labs, internet centers, and communication hubs.	100	2.4	2.7	-0.3	NA
15	.Availability of facilities tailored to specific academic disciplines.	100	3.6	2.5	1.1	A

Available (A) Not-Available (NA)

Table 1 shows respondents' assessment of the building facilities available in the six selected universities using the Performance Difference (PD), calculated as perceived rating (Xp) minus expected rating (Xn). Positive values indicate performance above expectations, while negative values indicate shortfalls. The findings show that the universities provide a wide range of academic, administrative, residential, recreational and support facilities. Libraries and resource centres (2.7), lecture theatres/classrooms (2.5), laboratories/workshops (2.3), and security facilities (2.2) recorded the highest positive performance gaps, indicating relatively satisfactory provision. However, student accommodation (−0.2), sports and recreation (−0.3), computer/internet facilities (−0.3), and dining facilities (−1.0) recorded negative gaps. Dining facilities had the largest shortfall, suggesting that their provision does not adequately meet users' expectations. The findings indicate that the universities generally have most major facility categories, but their adequacy and performance vary considerably. Academic facilities appear relatively satisfactory, while accommodation, recreation, dining and ICT facilities require greater attention in future planning, maintenance and infrastructure investment.

4.2 What are the performance of university building facilities using key indicators relating to functionality, space adequacy, accessibility, thermal comfort, lighting, ventilation, safety and security, cleanliness, maintenance, to the Users satisfactory?

Table 4.2. Performance Gap Analysis of the Mean Responses of Respondents for the university building facilities performance and user satisfaction.

S/N	**Building Performance and User Satisfaction**	N	Xn	Xp	$X_p - X_n$	Remark
16	The suitability of building spaces for their intended activities influences my satisfaction.	100	4.6	2.1	2.5	S

17	Adequate space for users contributes to my satisfaction with the building.	100	4.5	2.2	2.3	S
18	Ease of access and movement within the building affects my satisfaction.	100	4.7	2.0	2.7	S
19	Comfortable indoor temperature contributes to my satisfaction with the building.	100	2.1	2.30	-0.2	NS
20	Protection from excessive heat influences my overall satisfaction.	100	2.2	2.50	-0.3	NS
21	Adequate lighting contributes to my satisfaction with the building.	100	2.5	2.50	0	NS
22	Good ventilation and fresh air influence my satisfaction with the building.	100	2.4	2.30	-1.0	SN
23	The level of safety provided by the building affects my satisfaction.	100	3.8	2.40	1.4	S
24	Adequate security measures contribute to my confidence and satisfaction as a user.	100	2.4	2.50	-1.0	NS
25	Prompt repair of damaged building components contributes to my satisfaction.	100	4.2	2.10	2.2	S
26	The cleanliness and general condition of the building affect my satisfaction.	100	3.6	2.20	1.4	S
27	Good indoor air quality and acceptable noise levels contribute to my satisfaction.	100	3.7	2.20	1.7	S
28	Reliable electricity, water, and sanitation services influence my satisfaction.	100	3.5	2.02	1.48	S
29	The availability of other essential services, such as internet connectivity, affects my satisfaction.	100	2.4	2.70	-0.3	S
30	Overall, the performance of the university building has a significant influence on my satisfaction	100	3.6	2.50	1.1	S

Satisfactory (S) **Not Satisfactory (NS)**

The results in Table 2 show that nine of the fifteen indicators recorded positive performance gap scores, ranging from 1.1 to 2.7. This suggests that the selected university buildings facilities generally performed well in areas such as space suitability and adequacy, ease of movement, safety and security, cleanliness, maintenance, indoor environmental conditions, noise control, and overall usefulness. These results indicate that the buildings were largely able to support the activities for which they were designed. However, six indicators recorded negative performance gap scores, ranging from −0.3 to −1.0, showing that some aspects of the facilities did not fully meet users' expectations. The main areas of concern were thermal comfort, excessive heat, lighting,

ventilation, fire-safety provisions, emergency exits, and the reliability of electricity, water, and sanitation services. The findings suggest that the buildings were generally functional and satisfactory, but important shortcomings remain in environmental comfort, safety provisions, and essential services.

4.3. What are the users' perceptions and satisfaction with the performance of university building facilities in selected universities in South-East Nigeria?

Table 4.3. Performance Gap Analysis of the Mean Responses of Respondents on users' perceptions and satisfaction with the performance of university building facilities

S/N	**Users' perceptions and satisfaction with the performance**	N	Xn	Xp	$X_p - X_n$	Remark
16	The suitability of building spaces for their intended activities influences my satisfaction.	100	4.6	2.1	2.5	S
17	Adequate space for users contributes to my satisfaction with the building.	100	4.5	2.2	2.3	S
18	Ease of access and movement within the building affects my satisfaction.	100	4.7	2.0	2.7	S
19	Comfortable indoor temperature contributes to my satisfaction with the building.	100	2.1	2.30	-0.2	NS
20	Protection from excessive heat influences my overall satisfaction.	100	2.2	2.50	-0.3	NS
21	Adequate lighting contributes to my satisfaction with the building.	100	2.5	2.50	0	NS
22	Good ventilation and fresh air influence my satisfaction with the building.	100	2.4	2.30	-1.0	SN
23	The level of safety provided by the building affects my satisfaction.	100	3.8	2.40	1.4	S
24	Adequate security measures contribute to my confidence and satisfaction as a user.	100	2.4	2.50	-1.0	NS
25	Prompt repair of damaged building components contributes to my satisfaction.	100	4.2	2.10	2.2	S
26	The cleanliness and general condition of the building affect my satisfaction.	100	3.6	2.20	1.4	S
27	Good indoor air quality and acceptable noise levels contribute to my satisfaction.	100	3.7	2.20	1.7	S
28	Reliable electricity, water, and sanitation services influence my satisfaction.	100	3.5	2.02	1.48	S
29	The availability of other essential services, such as internet connectivity, affects my satisfaction.	100	2.4	2.70	-0.3	S

30	Overall, the performance of the university building has a significant influence on my satisfaction	100	3.6	2.50	1.1	S

Satisfactory (S) **Not Satisfactory (NS)**

Table 3 shows users' assessment of university building performance and satisfaction. The results indicate a generally favourable perception, with positive gaps recorded for most indicators. The highest positive gaps were recorded for ease of access and movement (2.7), suitability of spaces (2.5), adequacy of space (2.3), and prompt repair of damaged components (2.2). Positive results were also recorded for indoor air quality and noise levels (1.7), essential services (1.48), safety (1.4), and cleanliness/general condition (1.4). However, comfortable indoor temperature (−0.2) and protection from excessive heat (−0.3) recorded negative gaps, indicating that thermal comfort remains a major area of concern. Lighting recorded a zero gap (0.0), suggesting no difference between perceived and expected performance. The findings present a generally satisfactory but mixed level of building performance. While space adequacy, accessibility, maintenance, safety and general building conditions performed relatively well, thermal comfort requires greater attention in the planning, design and management of university buildings.

Hypothesis

4.4. H_{01}: There is no significant difference between the major performance indicators of university building facilities and user satisfaction in selected Universities in South-East Nigeria.

Table 4.4: Performance Indicators of University Building Facilities and User Satisfaction

S/N	Performance indicators of university building facilities and user satisfaction	$\dot{X}1$	$\dot{X}2$	Sig	Sig(2-tailed)	LO	UP	Remark
1	Users' views should be obtained regularly to determine whether university buildings meet their needs.	2.97	3.6	0.08	0.08	-0.23	0.23	NS
2	Students, academic staff, and non-academic staff should all participate in evaluating university buildings after occupation.	2.87	3.22	0.06	0.09	-0.73	0.03	NS
3	The functionality of building spaces should be assessed to determine how well they support teaching, learning, research, and administrative activities.	3.03	3.54	0.38	0.21	-0.06	0.08	NS
4	Adequacy of space should be considered when evaluating the performance of university buildings.	2.94	3.58	0.12	0.31	-1.05	-0.23	NS
5	Thermal comfort, ventilation, and indoor air quality should be included in post-occupancy assessment.	2.71	2.92	0.01	0.29	-0.59	0.17	NS

6	Lighting and natural ventilation should be evaluated because they influence users' comfort and productivity.	2.94	3.58	0.12	0.24	-1.05	-0.23	NS
7	Safety, security, accessibility, and emergency facilities should form part of the POE process.	2.71	2.92	0.01	0.29	-0.59	0.17	NS
8	The condition, cleanliness, and maintainability of university buildings should be regularly assessed.	2.87	3.22	0.01	0.09	-0.73	0.03	NS
9	Users' complaints and suggestions should be used to guide maintenance, renovation, and improvement decisions.	3.03	3.54	0.38	0.26	-0.06	0.08	NS
10	Findings from post-occupancy evaluations should be used to improve the planning and design of future university building projects	2.71	2.92	0.01	0.29	-0.59	0.17	NS

S=Significant difference NS = No Significant difference

Table 4 compares the mean ratings of major university building performance indicators with users' satisfaction. The performance ratings ranged from 2.71 to 3.03, while satisfaction ratings ranged from 2.92 to 3.60. Although differences existed between the two sets of mean ratings, the p-values ranged from 0.08 to 0.31, all of which were greater than the 0.05 significance level. Therefore, none of the observed differences was statistically significant. Consequently, the null hypothesis (H_{01}) is not rejected. The finding indicates that there is no statistically significant difference between the mean ratings of university building performance indicators and users' satisfaction in the selected universities in South-East Nigeria at the 5% significance level.

5.0 DISCUSSION OF RESULTS/FINDING

According to Table 1, most of the essential campus facilities are available, with notably high positive gaps seen in libraries and resource centers (2.7), lecture halls and classrooms (2.5), and laboratories and workshops (2.3). Conversely, negative gaps were observed in areas such as student housing, sports facilities, dining areas, and ICT infrastructure. This pattern indicates that universities tend to prioritize the development of academic spaces that directly support teaching and research activities, often at the expense of residential, recreational, and support services. Similar (Ogunmodede and Oladipo, 2012; Adebisi and Oladipo, 2020). Have observed that in Nigerian higher education institutions, where facility quality and performance are closely linked to students' overall experiences and satisfaction levels. (Ogunmodede and Oladipo, 2012; Adebisi and Oladipo, 2020). In their research

conducted in northern Nigerian universities also highlights that both tangible and intangible facility features significantly influence students' perceptions of satisfaction with campus amenities. This pattern aligns with the broader body of post-occupancy evaluation research, Abubakar et al., (2018), Preiser and Vischer, (2014), Zuo et al. (2019) stresses that just because a facility exists does not mean it functions effectively for its users. Davis et al., (2017). POE is especially valuable because it assesses how buildings perform once they are in active use, rather than relying solely on initial design standards or construction quality. The identified deficiencies in student accommodations, dining, recreational facilities, and ICT suggest that future investments should focus on areas driven by actual demand and user experiences, rather than merely counting the number of facilities. Effective campus planning, therefore, according to Nnamani et al., (2020) requires a holistic view that encompasses academic, residential, social, digital, and support facilities Regular assessments of facility adequacy are essential for identifying gaps where investment can make the most impact, especially where user expectations are not being met

Moving to the insights from Table 2, nine out of fifteen key performance indicators showed positive gaps, indicating that many aspects of building performance such as space adequacy, accessibility, safety, cleanliness, and overall functionality are generally satisfactory. Nonetheless, negative gaps persisted around thermal comfort, lighting, ventilation, fire safety measures, and essential services. These findings suggest that while many campus buildings support their intended functions, certain indoor environmental quality issues remain problematic. According to Ogunyemi and Akinwale, (2021), Osagie and Eboh, (2019),Factors such as local climate conditions in southeastern Nigeria, aging infrastructure, lack of passive environmental controls, inadequate maintenance, or inconsistent utility services may contribute to these challenges. In the view of Akinbami and Oladipo,(2021). Literature consistently indicates that indoor environmental quality covering aspect like temperature regulation, airflow, lighting, and air purity according to plays a crucial role in users' comfort and satisfaction . The findings also resonate with Kamaruzzaman and Zain, (2010); Zuo et al., 2019).POE study, which identified indoor climate as a key factor affecting building performance. It was noted that limited awareness of POE practices and insufficient

technical capacity hinder systematic evaluation of university facilities. This according to Oloruntoba et al. (2022). underscores the importance of incorporating design strategies such as orientation, shading, natural ventilation, daylighting, and thermal management in future building projects. (Ogunyemi and Akinwale, 2021).opined that existing structures should also undergo periodic performance reviews to detect and address deficiencies early, preventing costly repairs or major renovations later

Table 3 presents user perceptions, which were generally positive especially regarding ease of movement (2.7), space suitability (2.5), adequate space (2.3), prompt repairs (2.2), and indoor air quality, noise levels (1.7). The overall satisfaction measure also reflected a positive gap of 1.1. These results highlight that daily functionality and the physical condition of campus buildings strongly influence user satisfaction. According to Ogunmodede and Oladipo, (2012); Nnamani et al., (2020). Thermal comfort remains an issue, with negative gaps in perceived indoor temperature comfort (−0.2) and protection from excessive heat (−0.3). Interestingly, lighting conditions showed no gap, indicating that user expectations and perceptions align for this aspect. This reinforces the idea that occupant feedback is vital for assessing actual building performance. As stipulated by Preiser and Vischer, (2014); Zuo et al.,(2019) that a building might meet all technical standards but still fall short in providing comfort and usability Adebisi and Oladipo, (2020). confirmed that environmental characteristics significantly impact user satisfaction, emphasizing the need to include end-user input during planning and design From a planning standpoint, it's crucial that university buildings are designed with actual usage patterns and user needs in mind. Factors such as thermal comfort, circulation pathways, space allocation, maintenance responsiveness, and indoor environmental quality should be integrated into the design and operational processes. Universities should also establish regular channels for collecting feedback from students and staff, and actively use this information to inform maintenance, renovation, and future development projects.

Finally, Table 4 examined the differences between building performance indicators and user satisfaction. While some differences in average ratings were observed, none were statistically significant at the 0.05 level; all p-values exceeded this threshold. This means that, based on this data, there isn't enough evidence to confirm a significant link between

the specific performance measures and user satisfaction within this sample. However, according to Field, (2013) this does not imply that building performance is unimportant; it simply indicates that the particular differences tested in this study were not statistically conclusive. Prior research, including studies in Erbil, Al-Kayiem et al., (2018) and Nigerian contexts, has demonstrated strong correlations between certain building attributes and satisfaction, highlighting the value of comprehensive POE approaches, The divergence between these findings and earlier studies might be attributed to differences in research design, sample size, geographic location, or the specific variables measured. Unlike studies that explore correlations among individual building features and satisfaction, this study focused on comparing performance indicators directly with overall satisfaction ratings. Therefore, caution should be exercised in interpreting these results; they do not suggest that building performance is irrelevant to user satisfaction, but rather that the specific differences tested were not statistically significant in this context.

Data from these tables demonstrate that the universities examined have a broad spectrum of facilities, and many perform adequately in key areas. Nonetheless, certain weaknesses, especially in student accommodation, dining, recreational, ICT facilities, and thermal comfort, need attention. These insights according to Davis et al., (2017); Zuo et al., (2019) have practical implications for strategic planning future infrastructure investments should be driven by systematic POE, integrating physical assessments with user feedback to optimize facility management and development. Universities should establish ongoing, user-centered evaluation programs, prioritize addressing facilities with performance gaps, strengthen preventive maintenance, enhance indoor environmental quality, and involve users in the planning process. Such a shift from a simple provision-focused approach to a performance and user-centered model will improve the overall quality and effectiveness of university infrastructure, ensuring that facilities support teaching, research, administration, and daily campus life effectively

5.1 Conclusion and Recommendation

The study established that the selected universities have a wide range of facilities for academic, administrative, residential, recreational, health, security and other institutional activities. However, the adequacy

and performance of these facilities varied. Core academic facilities generally performed well, while student accommodation, dining, recreational and some ICT facilities showed notable deficiencies. This indicates that the major challenge is not only the availability of facilities but also their adequacy, capacity, condition and functionality. The study also identified space adequacy and suitability, accessibility, thermal comfort, lighting, ventilation, safety, cleanliness, maintenance, indoor environmental quality and essential services as important indicators of university building performance. While several indicators recorded favourable performance, thermal comfort and protection from excessive heat remained notable areas of concern. The findings further indicate that users generally had favourable perceptions of the performance of the university buildings. However, the negative performance gaps associated with thermal comfort and excessive heat show that some environmental conditions require improvement. This demonstrates the importance of incorporating students' and staff members' experiences into the assessment of building performance. Based on the findings, the study concludes that a user-based performance evaluation model should incorporate functionality, space adequacy, accessibility, comfort, safety, maintenance, environmental quality and essential services, supported by regular feedback from building users. Such an approach can assist universities in facility management, maintenance, rehabilitation, planning and future building design.

Based on the findings of the study, the following recommendations are made:

1. Improve Thermal Comfort and Essential Services: Universities should improve thermal comfort through climate-responsive building design, adequate ventilation, shading and appropriate building materials. Reliable electricity, water supply and sanitation should also be prioritised to improve users' comfort and building functionality.
2. Strengthen Preventive Maintenance and Post-Occupancy Evaluation: University management should adopt regular preventive maintenance programmes and periodic Post-Occupancy Evaluation (POE) to identify and address problems relating to building components, ventilation, safety, cleanliness and essential services before they become serious.
3. Adopt a User-Centred Approach to Facility Planning: Universities should

establish regular mechanisms for obtaining feedback from students, academic staff and non-academic staff. Users' feedback and building-performance evidence should be incorporated into decisions on maintenance, renovation, expansion and the design of future university buildings.

5.2 Contribution to Knowledge

This study contributes to knowledge in the following ways:

The study provides empirical evidence on the performance of building facilities in selected Federal and State universities in South-East Nigeria. It identifies areas of satisfactory performance as well as specific deficiencies, particularly in thermal comfort, student accommodation, recreational facilities, dining facilities and ICT facilities. The study also demonstrates the importance of incorporating students', academic staff's and non-academic staff's experiences into building performance assessment. This provides a basis for using user feedback alongside physical inspection in maintenance, renovation, planning and design decisions for university buildings.

5.3 Areas for Further Research

Future studies should extend the investigation to a larger number of universities across the six geopolitical zones of Nigeria to determine whether similar patterns of building performance and user satisfaction occur in different environmental and institutional settings. Longitudinal studies are also recommended to monitor changes in building performance over time and assess the effect of maintenance and renovation interventions.

5.4 AI Declaration

Artificial Intelligence (AI) tools, specifically ChatGPT, were used solely to provide editorial assistance, improve language and clarity, organize content, and enhance the presentation of the manuscript. The research data, analysis, interpretation, findings, conclusions, and recommendations were independently generated by the author from the study conducted. The author retains full responsibility for the accuracy, originality, integrity, and overall content of the work.

5.5 Conflict of Interest

The author declares that there is no conflict of interest regarding the conduct, analysis, interpretation, or publication of this research.

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