



Functional and Technical Performance Indicators for Post-Occupancy Evaluation of Higher Institutions in Niger State, Nigeria

¹Udoh, C. E., ²Akanmu, W., ¹Okwori, R. O. ¹Dauda, I.

¹Department of Industrial and Technology Education
Federal University of Technology, Minna

²Department of Building Technology
Federal University of Technology, Minna

ABSTRACT

The study identified the functional and technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning in Niger State, Nigeria. Two research questions were raised and answered. The study adopted a qualitative method using face-to-face interviews. The study was conducted in Niger State, Nigeria. The population for the study consisted of all the six Directors of physical planning in the six higher institutions in Niger State. Due to the manageable size of the population, there was no sampling. The instrument used for data collection was the Interview Protocol for Post Occupancy Evaluation of Buildings in Higher Institutions (IPPOEBHI). The IPPOEBHI was subjected to face and content validation by three experts. The reliability of IPPOEBHI was achieved as the respondent agreed with the transcribed contents of the face-to-face interview to have corresponded to their exact responses. Data were collected by conducting a face-to-face interview. The data collected was analyzed using data transcription, coding, categorization and thematic analysis using percentage. Findings from the study revealed: reachability, efficiency, accessibility, proximity, lighting, comfort and sustainability as functional performance indicators and safety and security, energy efficiency, water use efficiency, indoor air quality, visual and thermal comforts as technical performance indicators post-occupancy evaluation of buildings in higher institutions of learning in Niger State. The study recommended among others that facility managers in higher institutions of learning in Niger State should utilize the identified functional and technical performance indicators in conducting a post-occupancy evaluation of buildings in higher institutions of learning in Niger State to ensure functional and technical satisfaction among the occupants.

ARTICLE INFO

Article History

Received: January, 2022

Received in revised form: January, 2022

Accepted: January, 2022

Published online: February, 2022

KEYWORDS

Functional, Technical, Building,
Performance & Indicators

INTRODUCTION

Higher institutions of learning are post-secondary institutions where students are trained to acquire relevant knowledge and skills in different occupations for employment in the world of work. According to the Federal Republic of Nigeria (FRN, 2014), the goals of higher institutions of learning include: contributing to national development through high-level relevant manpower training; developing and inculcating proper values for the survival of the individual and society; developing the intellectual capability of individuals to understand and appreciate their local and external environments; and acquire

both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society among others. The attainment of the stated goal is dependent on the quality of instructions delivered by lecturers and the academic environment in which buildings are major factors.

Buildings in higher institutions of learning constitute the structural enclosure that enables academic activities to run effectively. According to Okolie (2011), buildings in higher institutions of learning are designed to facilitate the learning process which involves knowledge transfer by providing a conducive and user-friendly environment for academic activities.

*Corresponding author: Udoh, C. E. ✉ charlessudoh2003@gmail.com ✉ Department of Industrial and Technology Education, Federal University of Technology, Minna. © 2022 Faculty of Technology Education, ATBU Bauchi. All rights reserved



Emuze *et al* (2018) disclosed that buildings in higher institutions of learning do not perform according to the satisfaction of the occupants, hence negatively affecting their morale, productivity and performance. This implied that higher institutions of learning must improve in the provision, management and performance of their building infrastructure continuously to enable academic activities to run effectively. Buys (2017) noted that to improve the performance of buildings in higher institutions of learning, feedback should be obtained from occupants who have the closest experience of building needs and maintenance requirements through post-occupancy evaluation.

Post occupancy evaluation could be seen as a performance assessment methodology, which can be applied to any building facility to determine the level of user satisfaction. Watson (2016) defined post-occupancy evaluation as a systematic evaluation of opinions about buildings in use, from the perspective of users after they have been built and occupied for a duration of 3 to 6 months (operational review); 12 to 18 months (performance review); and 3 to 5 years (strategic review). Post occupancy evaluation in higher education could determine whether facilities management is meeting the goals of building and maintaining buildings and spaces to serve the educational vision of the higher institutions of learning. According to Asiyai (2018), the focus of a post-occupancy evaluation can be considered in terms of two major categories that include technical and functional performance.

The functional performance of buildings deals with the functionality and efficiency level of the features of buildings in higher institutions of learning. According to Preiser *et al.* (2018), the functional performance of a building is the degree to which the building features affect building activities and utilization by its users within its spaces. It could be measured using a functional performance element. The functional performance elements include reachability, efficiency, accessibility, flexibility, lighting, safety, spatial orientation, privacy, health and physical well-being and sustainability (Preiser *et al.*, 2018). Asiyai (2018) stressed that dissatisfaction with the functional elements of building performance is the reason for its receipt of noteworthy attention in post-

occupancy evaluation. Hassanain (2018) noted that the functional performance of a building is largely affected by the level of satisfaction with its technical performance.

The technical performance of buildings deals with the level to which technical features of buildings in higher institutions of learning satisfy users' needs. According to Preiser *et al.* (2018), the technical performance of a building is the degree to which the survival features of buildings affects the safety and security of its users. It could be measured using technical performance elements. These elements include safety and security, energy efficiency, water use efficiency, indoor air quality, visual environment, acoustics and thermal comfort (Cho *et al.*, 2015). According to Dilanthi and David (2020), poor satisfaction of technical performance elements of buildings may cause reduced concentration, discomfort or absenteeism, lower productivity of occupants; affect the learning efficiency and choices of education of students. Nevertheless, evaluating the technical and functional performance elements require building performance indicators.

Building performance indicators enables measurement and analysis of actual building performance and provide the possibility to benchmark building performance across the property portfolio. Esmir and Morten (2018) stated that indicators put limits on measurements since each of them focuses on a specific impact parameter, making it alone insufficient to provide a more holistic performance analysis. According to Amole (2019), similar indicators are often grouped into categories that can provide a more general picture of building performance within the given context such as in higher institutions of learning. This implied that appropriate building performance indicators guarantee the conduct of the effective post-occupancy evaluation.

In order words, the lack of post-occupancy evaluation of buildings in higher institutions of learning may likely result in a lack of vital feedback information from the occupants on the performance and satisfaction of buildings. According to Bordass (2018), this lack of information may lead to a lack of information to identify solutions to building problems, respond to user needs and improve building performance. Hence, this study seeks to conduct a post-occupancy evaluation of

*Corresponding author: Udoh, C. E. ✉ charlessudoh2003@gmail.com ✉ Department of Industrial and Technology Education, Federal University of Technology, Minna. © 2022 Faculty of Technology Education, ATBU Bauchi. All rights reserved



buildings in higher institutions of learning in Niger State, Nigeria.

Statement of the Research Problem

Buildings in higher institutions of learning are designed and developed to facilitate the learning process which involves knowledge transfer by providing a conducive and user-friendly environment for academic activities. Unfortunately, buildings in higher institutions of learning in Nigeria including those in Niger State seem not to facilitate the learning process.

The poor physical state of buildings in higher institutions of learning particularly that of Niger State could result in its poor performance and lack of satisfaction among the occupants that including students, academic and non-academic staff. However, the management of higher institutions has spent a huge amount of money to address issues related to the poor performance and satisfaction of constructed buildings. Despite these efforts, Son and Yuen (2020) confirmed that the challenge of buildings in higher institutions not facilitating the learning process persists. The persistence of this shortcoming is harmful to the process of achieving the goals of higher institutions of learning as it affects the overall performance and productivity of students, academic and non-academic staff. Hence, this study sought to identify the functional and technical performance indicators post-occupancy evaluation of building in higher institutions of learning in Niger State, Nigeria.

Aim and Objectives of the Study

This study aimed to identify the functional and technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning in Niger State, Nigeria. Specifically, the objectives of the study are to determine the:

1. Functional performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning.
2. Technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning.

Research Questions

The following research questions are raised to guide the study:

1. What are the functional performance indicators for the post-occupancy

evaluation of buildings in higher institutions of learning?

2. What are the technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning?

METHODOLOGY

The study adopted a qualitative method using face-to-face interviews. The face-to-face interview is a structured interview that involves the use of standardized interview protocol and a standardized set of responses for recording participants' responses. The face-to-face interview was considered suitable for this study because it allows for the in-depth collection of qualitative data and probing for explanations of responses (DeFranzo, 2021). The study was conducted in Niger State, Nigeria. Niger State was chosen for this study due to the manifested lack of sufficient empirical data on the extent to which buildings in higher institutions satisfy the educational needs of both students and staff towards achieving the goals of higher institutions. The population for the study consisted of all the six Directors of physical planning in the six higher institutions in Niger State. The Directors of physical planning were chosen for this study because; they are experienced in ensuring buildings are in usable conditions and are considered suitable to provide feedback information on the functional and technical performance indicators of buildings. Due to the manageable size of the population, there was no sampling.

The instrument used for data collection was an Interview Protocol for Post Occupancy Evaluation of Buildings in Higher Institutions (IPPOEBHI). The IPPOEBHI was subjected to face and content validation by three experts. The reliability of IPPOEBHI was achieved as the respondent agreed with the transcribed contents of the face-to-face interview to have corresponded to their exact responses. Qualitative data for the study was collected by conducting a face-to-face interview. The qualitative data collected was analyzed using data transcription, coding, categorization and thematic analysis using percentage. Any response with a 70% score and above was regarded as acceptable while a response with less than 70% score was regarded as not acceptable. The 70% benchmark is in line with

*Corresponding author: Udoh, C. E. ✉ charlessudoh2003@gmail.com ✉ Department of Industrial and Technology Education, Federal University of Technology, Minna. © 2022 Faculty of Technology Education, ATBU Bauchi. All rights reserved



the acceptability of responses as stipulated by Laed (2020).

Research Question 1: What are the functional performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning?

RESULTS

Table 1: Summary of the qualitative responses of Directors of Physical Planning on the functional performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning

Theme	Content	Number	Percentage
1	Reachability	5	83%
2	Efficiency	5	83%
3	Accessibility	6	100%
4	Flexibility	4	66%
5	Proximity	6	100%
6	Safety	4	66%
7	Spatial Orientation	4	66%
8	Privacy	3	50%
9	Lighting	5	83%
10	Comfort	6	100%
11	Sustainability	6	100%
12	Cleaning and Maintenance	3	50%

Table 1 revealed that all the 6 Directors of Physical Planning (100%) mentioned themes: 3 (accessibility), 5 (proximity), 10 (comfort) and 11 (sustainability); 5 out of the 6 Directors of Physical Planning (83%) mentioned themes: 1 (reachability), 3 (efficiency) and 9 (lighting); 4 out of the 6 Directors of Physical Planning (66%) mentioned themes: 4 (flexibility), 6 (safety) and 7 (spatial orientation); while 3 out of the 6 Directors of Physical Planning (66%) mentioned themes: 8 (privacy) and 12 (cleaning and maintenance) as the functional

performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning. Based on the stated (70%) acceptability criteria, only themes 1, 2, 3, 5, 9, 10 and 11 were considered functional performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning in Niger State.

Research Question 2: What are the technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning?

Table 2: Summary of the qualitative responses of Directors of Physical Planning on the technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning

Theme	Content	Number	Percentage
1	Safety and Security	6	100%
2	Energy Efficiency	5	83%
3	Water Use Efficiency	5	83%
4	Indoor Air Quality	6	100%
5	Visual	5	83%
6	Thermal Comfort	6	100%
7	Acoustics	2	33%
8	Building Envelope	2	33%

Table 2 revealed that all the 6 Directors of Physical Planning (100%) mentioned themes: 1 (safety and security), 4 (indoor air quality), and 6 (thermal comfort); 5 out of the 6 Directors of Physical Planning

(83%) mentioned themes: 2 (energy efficiency), 3 (water use efficiency) and 5 (visual); while 2 out of the 6 Directors of Physical Planning (33%) mentioned themes: 7 (acoustics) and 8 (building envelope) as the

*Corresponding author: Udoh, C. E. ✉ charlessudoh2003@gmail.com ✉ Department of Industrial and Technology Education, Federal University of Technology, Minna. © 2022 Faculty of Technology Education, ATBU Bauchi. All rights reserved



technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning. Based on the stated (70%) acceptability criteria, only themes 1, 2, 3, 4, 5, and 6 were considered technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning in Niger State.

FINDINGS

1. Reachability, efficiency, accessibility, proximity, lighting, comfort and sustainability were found as functional performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning in Niger State.
2. Safety and security, energy efficiency, water use efficiency, indoor air quality, visual and thermal comforts were found as technical performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning in Niger State.

DISCUSSION OF FINDINGS

Findings on the functional performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning in Niger State revealed reachability, efficiency, accessibility, proximity, lighting, comfort and sustainability. The finding entailed that the reachability, efficiency, accessibility, proximity, lighting, comfort and sustainability indicators need to be evaluated for the conduct of effective post-occupancy evaluation of buildings in higher institutions of learning in Niger State. The finding is similar to the finding of Preiser *et al.* (2018) that revealed accessibility, comfort and lighting as the functional performance indicators for conducting the post-occupancy evaluation of higher institutions. The finding is in support of Asiyai (2018) who opined that the most vital functional performance indicators for the post-occupancy evaluation of educational buildings include, reachability, efficiency, accessibility and proximity. This implied that for effective post-occupancy evaluation of buildings in higher institutions of learning in Niger State, the identified functional performance indicators must be evaluated.

Findings on the technical performance indicators for the post-occupancy

evaluation of buildings in higher institutions of learning in Niger State revealed safety and security, energy efficiency, water use efficiency, indoor air quality, visual and thermal comforts. The finding entailed that the safety and security, energy efficiency, water use efficiency, indoor air quality, visual and thermal comforts indicators need to be evaluated for the conduct of effective post-occupancy evaluation of buildings in higher institutions of learning in Niger State. The finding is in agreement with the finding of Cho *et al.* (2015) that revealed visual and thermal comforts, energy and water use efficiencies as well as indoor air quality as technical performance indicators for the post-occupancy evaluation of educational buildings. Furthermore, finding concurs with the postulation of Dilanthi and David (2020) that opined post-occupancy evaluation of buildings in higher institutions of learning can not be effective without evaluating the technical performance indicators such as thermal comfort, energy efficiency and indoor air quality. Hence, the identified technical performance indicators must be evaluated for effective post-occupancy evaluation of buildings in higher institutions of learning in Niger State.

CONCLUSION

The study provided insights on the performance indicators for the post-occupancy evaluation of buildings in higher institutions of learning in Niger State. The finding that emerged from the study identified the suitable functional and technical performance indicators for conducting the post-occupancy evaluation of buildings in higher institutions of learning in Niger State. Though, the finding is limited to the qualitative responses of the Directors of physical planning in the selected higher institutions in Niger State, Nigeria. Hence, it is concluded that the identified performance indicators will guarantee the conduct of effective post-occupancy evaluation of buildings in higher institutions of learning in Niger State.

RECOMMENDATIONS

Based on the findings from the study, the following recommendations were made:

1. Facility managers in higher institutions of learning in Niger State should utilize the identified functional and technical

*Corresponding author: Udoh, C. E. ✉ charlessudoh2003@gmail.com ✉ Department of Industrial and Technology Education, Federal University of Technology, Minna. © 2022 Faculty of Technology Education, ATBU Bauchi. All rights reserved



performance indicators in conducting the post-occupancy evaluation of buildings in higher institutions of learning in Niger State to ensure functional and technical satisfaction among the occupants.

2. The administrators of higher institutions of learning in Niger State should ensure that maintenance priority is given to the identified functional and technical performance indicators to obtain the desired performance of the indicators as well as satisfaction among the occupants which is capable of facilitating learning.

REFERENCES

- Amole, D. (2019). Residential satisfaction in students' housing. *Journal of Environmental Psychology*, 29(9), 76-85.
- Asiyai, R. I. (2018) African Research Review. *An International Multidisciplinary Journal, Ethiopia*, 6(2), 192-205. DOI: <http://dx.doi.org/10.4314/afirrev.v6i2.17>
- Bordass, B. (2018). Learning More from our buildings - or just forgetting less? *Building Research & Information*, 37(5), 406-411. doi:10.1080/0961321031000108825.
- Buyis, N. S. (2017). Building maintenance management systems in South African tertiary institutions. *Unpublished Doctor of Philosophy thesis*. Nelson Mandela Metropolitan University, Port South Africa.
- Cho, S. H. & Lee, T. K. (2015). Indoor environmental quality related to residential satisfaction in old multi-family housing. The 3rd International Symposium on Sustainable Healthy Buildings was held on 27 May 2010. Seoul, Korea, pp. 443-456.
- Dilanthi, A. & David, B. (2020). Facilities management performance in higher education properties. *Facilities*, 18(7/8), 293-301.
- Emuze, F., Mashili, H. & Botha, B. (2018). Post occupancy evaluation of office buildings in a Johannesburg country club estate. *Act a Structilia*, 20(1), 89-110.
- Esmir, M. & Morten, B. (2018). Indicators for quantifying environmental building performance: A systematic literature review. *Journal of Building Engineering*, 19(4), 552-560. <https://doi.org/10.1016/j.jobe.2018.06.006>.
- The Federal Republic of Nigeria. (2014). *National policy on education*. Lagos: NERDC Press.
- Hassanain, M. A. (2018). On the performance evaluation of sustainable student housing facilities. *Journal of Facilities Management*, 3(4), 212-225.
- Laed, K. (2020). *Pearson product-moment correlation*. Retrieved on 1st November 2021 from: <https://statistics.laerd.com/statistical-guides/pearson-correlation-coefficient-statistical-guide.php>
- Okolie, K. C. (2011). Performance Evaluation of Buildings in Educational Institutions. *Unpublished PhD Thesis*, Port Elizabeth Mandela University, South Africa.
- Preiser, W. F., Rabinowitz, H. Z. & White, E. T. (2018). *Post-occupancy evaluation of residential buildings*. New York: Van Nostrand Reinhold.
- Son, L. H. & Yuen, C. S. (2020). *Building Maintenance Technology*, London, Macmillan Press.
- Watson, C. (2016). *Review of building quality using post-occupancy evaluation, PEB exchange programme on the educational building*. Madrid: Organization for Economic Cooperation and Development Publishing.