FUNCTIONAL AND TECHNICAL PERFORMANCE OF BUILDING IN HIGHER INSTITUTION OF LEARNING IN NIGER STATE, NIGERIA

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Abstract

The study was designed to assess the functional and technical performance of building in higher institution of learning in Niger State, Nigeria. Two research questions were raised and answered as well as two null hypotheses were formulated and tested at 0.05 level of significance. Cross-sectional type of survey research design was adopted to collect data for the study. The study was conducted in Niger State, Nigeria. The targeted population for the study was 67 facility managers in the six higher institutions in Niger State, Nigeria. Simple Random Sampling Technique (SRST) was used to select a sample of 59 facility managers. The instruments developed by the researcher were used for data collection they include: Questionnaire on Functional and Technical Performance of Buildings in Higher Institutions (QFTPBHI). The instrument was subjected to face and content validation by three experts. The reliability coefficient value of 0.85 and 0.86 were recorded respectively using Cronbach's Alpha statistical technique. The data collected were analyzed using descriptive and inferential statistics. Findings from the study among others revealed that: functional indicators performed fairly ($\overline{X}=3.14$) and technical indicators had poor performance ($\overline{X}=2.45$). The study also revealed that there is no significant difference (significant value ≥0.05) among the mean responses of respondents on building functional and technical performance. Based on the findings, the study recommended among others that: The administrator of higher institutions of learning in Niger State should regularly ensure adequate improvement through approval of funds for the conduct of renovation services to achieve conformance of buildings in meeting functional and technical requirements.

Key words: Functional, Technical Performance & Buildings

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 Federal Republic of Nigeria

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(FRN, 2014), the goals of higher institutions of learning include: contribute to national development through high level relevant manpower training; develop and inculcate proper values for the survival of the individual and society; develop 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 quality of education is dependent on the quality of instructions delivered by lecturers and the academic environment of students of any higher institution of learning of which buildings are major factors.

Buildings in higher institutions of learning constitute the structural enclosure that enables academic activities to run effectively. Buildings in higher institutions of learning in Nigeria including those in Niger State might not likely perform the expected function they are designed for. 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 on a continuous basis in order to enable academic activities to run effectively. Buys (2017) noted that, in order to improve the performance of buildings in higher institutions of learning, feedback should be obtained from occupants of the building on functional performance evaluation.

The functional performance of buildings deals with the functionality and efficiency level of the features of buildings in higher institution of learning. According to Preiser et al. (2018), the functional performance of a building is the degree to which the building features affects building activities and utilization by its users within its spaces. It could be measured using 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). These elements are required to be in conformity with the specific needs of the occupants of buildings in higher institution of learning to foster meaningful transfer of knowledge. Hassanain (2018) noted that, the functional performance of a building is largely affected by level of satisfaction with its technical performance.

The technical performance of buildings deals with the level to which technical features of buildings in higher institution of learning satisfy users' needs. According to Preiser et al. (2018), the technical performance of a building is the

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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 (Khalid, 2018). The importance of technical performance elements cannot be over emphasized as they determine the comfort level of building occupants. Bello (2017) stated that, technical performance of buildings in higher institution of learning received several complaints from the academic and non-academic staff as well as students who constitute the users of these buildings due to defects and shortcomings after occupancy.

Nevertheless, lack of buildings evaluation in higher institutions of learning may likely result to 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 lack of information to identify solutions to building problems, respond to user needs and improve building performance. Hence, this study sought to conduct a post occupancy evaluation of 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 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 learning process. This may likely be as a result of the physical state of buildings in higher institutions of learning. Adeniji (2018) stated that there is lack of sufficient feedback information from users to address the disrepair state of buildings in higher institutions of learning in Nigeria. The poor physical state of buildings in higher institutions of learning particularly that of Niger State could result to its poor performance and lack of satisfaction among the occupants that include students, academic and non-academic staff. Dilanthi and David (2020) stated that, poor performance of buildings in higher institution of learning may lead to discomfort or absenteeism, lower productivity of occupants which may affect the learning efficiency of students. Hence, this study intended to assess the functional and technical performance of building in higher institution of learning in Niger State, Nigeria.

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Aim and Objectives of the Study

The aim of this study was to assess the functional and technical performance of building in higher institution of learning in Niger State, Nigeria. Specifically, the objectives of the study were to determine the:

1. Extent of conformance of buildings in meeting functional requirements.

[text unclear] Extent of conformance of buildings in meeting technical requirements.

requirements.

Hypotheses

The following null hypotheses were formulated to guide the study and tested at 0.05 level of significance:

HO_1: There is no significant difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting functional requirements.

HO_2: There is no significant difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting technical requirements.

Methodology

The study adopted cross-sectional type of survey research design to collect quantitative data. The study was conducted in Niger State, Nigeria. The population for the study consisted of all the 67 facility managers (Engineers, Technologists & Technicians) in the six higher institutions in Niger State, Nigeria. The sample for the study is 59 facility managers in the six higher institutions in Niger State, Nigeria in line with Krejcie and Morgan (1970) Table for determining sample size. Though, Simple Random Sampling Technique was used to select six faculties in the higher institutions for the study. The instrument used for data collection are: Questionnaire on Functional and Technical Performance of Buildings in Higher Institutions (QFTPBHI). The QFTPBHI is designed to ascertain the functional and technical performance of buildings in higher institutions. The instrument were

subjected to face validation by three experts. The reliability coefficient values of 0.85 and 0.86 were recorded respectively using Cronbach's Alpha statistical technique in Statistical Package for Social Science (SPSS) version 27. Data for the study were collected by administering QFTPBHI to the respondents through hand delivery method. The descriptive statistics using mean was used to answer research questions and inferential statistics using Analysis of Variance (ANOVA) was used to test the null hypotheses.

Results:
Research Question 1

What is the extent of conformance of buildings in meeting functional requirements? Data for answering research question one is presented in Table 1.

Table 1: Mean Responses of Engineers, Technologists and Technicians on the Extent of Conformance of Buildings in Meeting Functional Requirements

N1=10, N2=24, N3=25, NT1=59

Cluster	Items	$\overline{X}_1$	$\overline{X}_2$	$\overline{X}_3$	$\overline{X}_A$	Remark
1	Reachability	2.84	2.85	2.89	2.87	Fair
2	Efficiency	2.85	2.88	2.82	2.85	Fair
3	Accessibility	3.81	3.90	3.91	3.89	Good
4	Proximity	3.81	3.91	3.91	3.89	Good
5	Lighting	1.85	1.76	1.85	1.82	Poor
6	Comfort	2.87	2.93	2.74	2.84	Fair
7	Sustainability	3.86	3.80	3.81	3.81	Good
	Grand Mean	**3.13**	**3.15**	**3.13**	**3.14***	**Fair**

Keys: N1=Engineers, N2=Technologists, N3=Technicians, $\overline{X}_1$=Mean of Engineers, $\overline{X}_2$=Mean of Technologists, $\overline{X}_3$=Mean of Technicians, $\overline{X}_A$= Average Mean of Engineers, Technologists and Technicians

Table 1 presents the mean responses of the respondents on seven clustered items posed to determine the functional performance of buildings in higher institutions of learning. The clustered items on accessibility, proximity and sustainability had average mean values between 3.81 and 3.89 which indicated good functional performance, the clustered items on reachability, efficiency and comfort had average mean values between 2.84 and 2.87 which indicated fair functional performance while clustered items on lighting had average mean value of 1.82

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which indicated poor functional performance. The average grand mean of 3.14 indicated fair functional performance of buildings in higher institutions of learning in Niger State.

Research Question 2

What is the extent of conformance of buildings in meeting technical requirements? Data for answering research question two is presented in Table 2.

Table 2: Mean Responses of Engineers, Technologists and Technicians on the Extent of Conformance of Buildings in Meeting Technical Requirements

Cluster	Items	N1=10, N2=24, N3=25, NT1=59				
		$\overline{X}_1$	$\overline{X}_2$	$\overline{X}_3$	$\overline{X}_A$	Remark
1	Safety and Security	2.80	2.88	2.91	2.87	Fair
2	Energy Efficiency	1.68	1.82	1.84	1.81	Poor
3	Water Use Efficiency	1.40	1.74	1.77	1.70	Poor
4	Indoor Air Quality	3.90	3.95	4.02	3.97	Good
5	Visual	2.92	2.04	2.98	2.61	Fair
6	Thermal Comfort	1.01	1.88	1.85	1.72	Poor
	Grand Mean	**2.29**	**2.39**	**2.56**	**2.45***	**Poor**

Table 2 presents the mean responses of the respondents on six clustered items generated to determine the technical performance of buildings in higher institutions of learning. The clustered items on indoor Air quality had average mean value of 3.97 which indicated good technical performance, clustered items on safety and security and visual had average mean values of 2.61 and 2.87 which indicated fair technical performance while the clustered items on energy efficiency, water use efficiency and thermal comfort had average mean value between 1.70 and 1.81 which indicated poor technical performance. The average grand mean of 2.45 indicated poor technical performance of buildings in higher institutions of learning in Niger State.

Hypothesis One

There is no significant difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting functional requirements. Data for testing the null hypothesis one is presented in Table 3.

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Table 3: Analysis of Variance for the Test of Significant Difference among the Mean Responses of Engineers, Technologists and Technicians on the Extent of Conformance of Buildings in Meeting Functional Requirements

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.004	2	.002	.038	.963*
Within Groups	4.222	64	.056		
Total	4.226	66			

Table 3 showed the ANOVA test of significant difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting functional requirements produced 2-tailed value of 0.963 which is greater than 0.05. Hence, the difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting functional requirements was not significant; the null hypothesis is retained.

Hypothesis Two
There is no significant difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting technical requirements. Data for testing the null hypothesis two is presented in Table 4.

Table 4: Analysis of Variance for the test of Significant Difference among the Mean Responses of Engineers, Technologists and Technicians on the Extent of Conformance of Buildings in Meeting Technical Requirements

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.028	2	.014	.407	.668*
Within Groups	1.684	64	.034		
Total	1.712	66			

Table 4 revealed the ANOVA test of significant difference among the mean responses of Engineers, Technologists and Technicians on the extent of

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conformance of buildings in meeting technical requirements produced 2-tailed value of 0.668 which is greater than 0.05. Hence, the difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting technical requirements was not significant; the null hypothesis is retained.

Findings

1. Buildings in higher institutions of learning in Niger State had fair conformance with reachability, efficiency and comfort requirements; had good conformance with accessibility, proximity and sustainability requirements; had poor conformance with lighting requirement.
2. Buildings in higher institutions of learning in Niger State had good conformance with indoor air-quality requirements; had fair conformance with safety and security, and visual requirements; had poor conformance with energy efficiency, water use efficiency and thermal comforts requirements.
3. There is no significant difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting functional requirements.
4. There is no significant difference among the mean responses of Engineers, Technologists and Technicians on the extent of conformance of buildings in meeting technical requirements.

Discussion of Findings

Findings on the extent of conformance of buildings in meeting functional requirements in higher institutions of learning in Niger State revealed that reachability, efficiency and comfort performed fairly; accessibility, proximity, and sustainability performed good and lighting performed poorly. The finding is related to the finding of Khalid (2018) on the extent of conformance of buildings in meeting functional requirements in the faculty of Architectural Engineering, Beirut Arab University that revealed reachability and parking facilities, efficiency, accessibility, flexibility, spatial orientation, and privacy performed Fairly good. However, the finding is contrary to the finding of Paul et al. (2017) that revealed poor functional performance in terms of reachability, efficiency, comfort, accessibility, proximity, and sustainability of new college of environmental studies building in Waziri Umaru Federal Polytechnic, Birnin Kebbi, Nigeria.

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Moreover, findings on the test for significant difference among the mean responses of Engineers, Technologists and Technicians on the extent to which buildings in higher institutions of learning in Niger State meet functional performance requirements revealed there was statistical significant difference. The finding concords with the finding of Faris (2017) that revealed no statistical significant difference between the mean responses of engineers and technicians on the post-occupancy evaluation of building in the architecture and software engineering departments in Salahaddin University-Erbil, Iraq. However, the finding is in disagreement with the finding of Hamad *et al.* (2021) that revealed statistical significant difference between the mean responses of building occupants and facility managers on the extent of conformance of buildings in meeting functional requirements in three schools in the West Midlands, UK with specific focus on building services.

Findings on the extent of conformance of buildings in meeting technical requirements in higher institutions of learning in Niger State revealed that indoor air quality performed good; safety and security, and visual performed fairly and energy efficiency, water use efficiency and thermal comforts had poor performance. The finding is in agreement with the finding of Abisuga (2013) that revealed deficiency in the level of noise and conveniences, energy efficiency, water use efficiency and indoor air quality of the building facilities in Lagos State Polytechnic, Lagos, Nigeria. The finding is contrary to the finding of Ardavan and Ryan (2015) that revealed good technical performance of buildings in University of Utah in terms of Indoor Environment Quality (IEQ) that include Indoor Air Quality (IAQ) and thermal performance. The poor performance of energy efficiency, water use efficiency and thermal comforts of buildings in higher institutions of learning in Niger State signified the need for facility upgrade to satisfy users' needs.

Additionally, findings on the test for significant difference among the mean responses of Engineers, Technologists and Technicians on the extent to which buildings in higher institutions of learning in Niger State meet technical performance requirements revealed there was statistical significant difference. The finding is similar to the finding of Akanmu *et al.* (2015) that revealed no statistical significant difference between the mean responses of highly and fairly experience facility managers on technical performance of school of environmental technology complex building in Federal University of Technology, Minna, Niger State, Nigeria. In other words, the finding differs from the finding of Ardavan and Ryan

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(2015) that revealed statistical significant difference between the mean responses of Architects and Builders on technical performance of buildings in University of Utah.

Conclusion

Based on the findings of the study, insights into the functional and technical performance of buildings in higher institutions of learning in Niger State are provided. The study identified the following: buildings in higher institutions of learning in Niger State had fair conformance with reachability, safety and security, visual, efficiency and comfort requirements; had good conformance with indoor air quality, accessibility, proximity and sustainability requirements; had poor conformance with lighting energy efficiency, water use efficiency and thermal comforts requirement. The findings of this study are particularly important as it revealed the barriers to functional and technical performance that failed to satisfy the educational needs in higher institutions of learning in Niger State. Hence, the study concluded that, in order to enhance the satisfaction of users of building in higher institutions of learning in Niger State, there is need to utilize the useful information identified on the functional and technical performance for ensuring improvement on the performance of the educational buildings.

Recommendations

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

1. The administrator of higher institutions of learning in Niger State should regularly ensure adequate improvement through approval of funds for the conduct of renovation services to achieve conformance of buildings in meeting functional and technical requirements.

2. The facility managers in higher institutions of learning in Niger State should strictly ensure renovation services on functional and technical performance indicators are carried out as soon as approval is granted in order to enhance the performance of buildings.

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