

Maintenance Feedback Mechanisms and Limiting Factors of Post-Occupancy Evaluation in Student Residents of Higher Education Institutions in Nigeria

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Abstract: A hostel facility's effective functioning and performance contribute significantly to advancing knowledge and technologies for a sustainable future. Therefore, post-occupancy evaluation (POE) offers the basis for promoting construction projects' future design and construction quality. The present study thereby examines the maintenance feedback mechanisms and limiting factors of POE to address future occupants' satisfaction in selected hostels in Nigerian universities. A quantitative research design method was adopted where 340 questionnaire instruments were administered to the student occupants and facilities managers. The data obtained were subjected to descriptive statistics using a mean score, relative importance index and ranking. The research findings revealed that the maintenance feedback mechanisms utilised both by the student and facilities manager respondents have direct communication channels with the relevant stakeholders. The limiting factors of POE analysed showed that non-availability of information on building facilities, the persistence of maintenance challenges in building, lack of commitment from school management and insignificant improvement on the maintenance challenges were severe factors to be tackled in the studied hostels. Therefore, it is recommended that Nigerian universities' regulating bodies conduct a building performance evaluation of existing hostel facilities in Nigerian universities and update the procedures guide and physical development manual for Nigeria's university system.

Keywords: Post-occupancy evaluation, Building performance evaluation, Hostels, User satisfaction, Academic performance, Higher education institutions

INTRODUCTION

Globally, higher education institutions (HEIs) are instituted to develop human capacity and national growth (Strelets et al., 2016). To attain these goals, HEIs demand working facilities for their operations. Aside from the spaces and facilities that support teaching and learning in HEIs, the student hall of residence, otherwise called a hostel, provides students with housing needs. Busch-Geertsema and Sahlin (2007) define a hostel as a communal facility with shared spaces possessing supervision with limited access to access that aids in building students' intellectual capacity. Vital qualities of hostels come in the form of providing a conducive

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learning environment, which, in turn, helps in increasing the chances of academic success (Kobue, Oke and Aigbavboa, 2017). Similarly, well-designed, built and maintained hostels would provide students with a quality and dynamic indoor environment supporting and appealing to better-qualified students' enrollment into the HEIs (Najib, Yusuf and Sani, 2012).

The establishment of hostel accommodation is traceable to the University of Oxford in the fourteenth century and was later embraced by Harvard University's accommodation policy (Sanni-Anibire and Hassanain, 2016). The authors further opined that the 1963 Higher Education Facilities Act also reinforces students' housing policy in the US. Accordingly, hostels' effective functioning and performance stay meaningful in expanding knowledge, technologies and tools to initiate an environmentally sustainable future.

Every hostel design and construction's fundamental requirements support the most healthy and comfortable indoor environment suitable for student habitation. These requirements will be defeated if the general performance conflicts with users' expectations (Mustafa, 2017). It is reported that students spent over 50% of their time in the hostels (Lai, 2013). The primary space components include bedrooms that serve to study and sleep, washrooms with bathrooms and toilets, a kitchen, laundry, recreational areas and access to internet services (Sanni-Anibire and Hassanain, 2016). These components' technical, functional and behavioural performances are prerequisites for a conducive, comfortable and favourable learning environment. However, irrespective of regulating and standardising the works involved in hostels' development, undesirable results still emerged. The ills may be due to designers and other construction professionals focusing on buildings' physical outlook while neglecting buildings' suitability in line with occupant's satisfaction (Jiboye, 2013).

Hostel facilities' design and construction considerations should be deemed fit for an occupation to users and perform its function in line with user satisfaction. It is reported that the lack of feedback from occupants or end-users on their changing needs and preferences to design and construction is a significant problem confronting the performance of occupied buildings (Ibem et al., 2013). Lack of maintenance of services and facilities in hostels brings reasons for the prevalence of sick building syndrome, threat to life and property from criminal invaders and overcrowding due to "squatters" and "floaters" (Adewunmi et al., 2011). Furthermore, the authors lament that hostels' economic potentials are often compromised because they are managed as social goods rather than commercial products for a sustainable future. Therefore, evaluating the actual users of a building on the performance through post-occupancy evaluation (POE) remains essential for improving future design and construction quality.

There are two primary goals of this study: (1) To examine the maintenance feedback mechanisms (MFMs) utilised by hostel facilities users and (2) To ascertain the limiting factors of POEs in hostel facilities in selected universities within Ogun State, Nigeria. The limiting factors are referring to barriers to the implementation of POE in hostel facilities. Therefore, understanding the link between MFMs and limiting factors of POEs in hostel facilities will help address future occupants' satisfaction in the hall of residences.

LITERATURE REVIEW

There is growing literature on the appraisal of HEI buildings using the POE technique in recent times. State-of-the-art analysis and practice review by Li, Froese and Brager (2018) of POE in buildings indicate that HEI buildings are among the most popular research interests besides residential and office buildings. The reasons given by the authors were centred on the rising interest of people spending most of their time living, working and studying in these buildings. Researchers have evaluated indoor climatic conditions of operating temperature, relative humidity, daylight ratio luminance, air velocity and indoor noise level as significant factors relating to POE in hostel facilities (Dahlan et al. 2009; Dhaka et al. 2013; Bonde and Ramirez, 2015; Alborz and Berardi, 2015). However, these factors are design-related issues that require continuous improvement during the building occupation. Hence the need for their assessment through the POE technique. The authors view that hostel buildings in HEIs and its environment should prioritise efficient functioning and productivity. However, the rapid expansion and proliferation of academic programs in Nigerian universities without corresponding hostel facilities placed a considerable burden on achieving a good learning environment (Olatunji, 2013). This scenario has brought unethical methods of learning. At the same time, the prime cause of this menace, as posited by Olatunji (2013), is the mismanagement of funds, lack of maintenance culture and an uprising student population in the Nigerian context.

Hostel facilities in various regions have been studied through the POE method to obtain satisfaction feedback from student occupants within the past decade. Indoor environmental quality (IEQ) parameters were chiefly studied either by objective or subjective measurements or by combining both methods (Dahlan et al., 2009; Dhaka et al., 2013). Several works of literature (Zuhaib et al., 2018; Tang, Ding and Singer, 2020; Akanmu, Nunayon and Eboson, 2020; Sadick, Kpamma and Agyefi-Mensah, 2020) have used the acronym "IEQ" to represent indoor environmental quality in assessing the human comfort and satisfaction in buildings. Zuhaib et al. (2018) defined IEQ as "the suitable levels of thermal, visual, acoustic and indoor air quality (IAQ) environments". The authors opined those four physical environmental factors that affect the thermal environment are air temperature, mean radiant temperature, air velocity and relative humidity.

On the other hand, clothing value and metabolic rate are regarded as personal factors. The visual environment is measured subjectively based on illumination, luminance and brightness, luminous range and menace of glare. Furthermore, the acoustic environment is a measure of speech privacy and satisfactory sound levels. Finally, IAQ is expressed in terms of ventilation and carbon dioxide concentrations. Thus, a lack of attention to IEQ issues could lead to low academic performance and higher medical bills for students and a poor reputation for the University.

In Malaysia, utilising the POE method in hostels, Dahlan et al. (2009) quantitatively examined the indoor climate's influence in a typical multi-story hostel. Their findings show explicitly that thermal conditions and acoustic and visual conditions were the most IEQ factors that affect student occupant satisfaction. The same POE study by Najib, Yusof and Abidin (2011) draws on their previous studies and added physical and social variables in developing a POE framework. Their study aimed to investigate the degree of user satisfaction within a hall of residence in one of the prominent universities in Malaysia. A similar study was undertaken by Najib, Yusof and

Abidin (2011) that involved three Malaysian universities. Finally, Bashir, Sarki and Samidi (2012) conducted a survey study that examines the students' perception of the three universities' hostel accommodation service quality. Their research focused on residential satisfaction with the development of bioclimatic design approaches. In this region, a new hybrid multi-attribute decision-making model for student hostel satisfaction analysis was proposed by Krishnan, Kasim and Bakar (2015) .

In Hong Kong, Lai (2013) investigated the POE of a nine-year-old 22-storey hostel building at Hong Kong university using walkthroughs and focus group meetings while adopting theory-based gap analysis. Another study in this region by Dhaka et al. (2013) embraced the objective and subjective methods of investigation on students' thermal comfort residing in six naturally ventilated hostels in India. The operating temperature was recorded as one of the thermal factors in conflict with Indian national standards and students' perceptions. In the US region, Bonde and Ramirez (2015) conducted a POE study using a semi-structured interview that formed general questions for occupancy surveys administered online to student occupants. Their study aimed to compare the differences in indoor environments between green and conventional halls of residence at the University of Arizona. A similar survey by Alborz and Berardi (2015) developed a framework for Leadership in Energy and Environmental Design, LEED-certified higher education building in the US. Their study findings show that energy, water and IEQ factors were the most adopted sustainability ratings in building without mandating occupants' feedback. Finally, a POE study by Sanni-Anibire and Hassanain (2016) assessed students' quality of housing facilities in top Saudi Arabian universities. Mixed research methods of walkthrough questionnaire surveys and focus group meetings were used to acquire data for students' satisfaction levels.

Nigerian researchers have also made useful contributions to POE studies towards hostel facilities. In this direction, Amole (2009) inferred that a student's hostel's morphological configuration significantly influences residential satisfaction. Adewunmi et al. (2011) identified significant technical and functional performance measures of a postgraduate hostel facility assessed through a self-administered survey and personal interview. Their study pointed out a lack of POE awareness among facility managers and recommended that POE be integrated into the built environment curricula. Finally, Olatunji (2013) presented an investigative POE of polytechnic facilities in Lagos. The author fused self-administered questionnaires and personal interview methods to arrive at noise levels and convenience deficiencies problems.

Similarly, Okolie and Shakantu (2012) substantiated that some HEI buildings in Nigeria are not fit for purpose, emanating from the lack of a structured system for measuring completed buildings' performance. In this article, the term "fit for purpose" tends to be used to refer to non-value addition to the learning and working experience between users and buildings. Researchers have not treated MFMs utilised by hostel facility users and the limiting factors of POEs in hostel facilities in much detail from the studies mentioned above. More of the POE studies on university buildings have been concentrated on the indoor climatic environment. This study pinpointed global MFMs and limiting factors of POEs concerning hostel facilities, thus obtaining pragmatic variables that can enhance students' satisfaction levels in Nigeria's tropical region. The present study's focus is not on the measurement of users' satisfaction levels. Still, there is a common notion that occupants are more satisfied in buildings with a high attribute of a maintenance management system.

Researchers have established a positive relationship between POE and MFMs in construction projects focusing on energy performance, IEQ and users' comfort and productivity in the last five decades. Interestingly, there is a suggestion by Bordass and Leaman (2005) to make POE and feedback an important routine in every occupied building facility. Feedbacks provide insight into the operations of a building facility in use enabling the client to acquire more information for future project investment. Furthermore, the design and construction team learn what to do and how to deliver improved products to their clients through MFMs reports. The facilities managers are poised to master MFMs techniques which are pivotal in improving their services and helping to ensure professional competence. Therefore, the outcome of this study demonstrates that the studied MFMs factors addressed POE concerns in the hall of residences in Nigerian universities. The data analysis allowed the establishment of a relationship evaluation between MFMs results and those obtained from the limiting factors of POEs in hostel facilities. Also, the study provided students, built environment professionals and university management with relevant information on the impact of MFMs on POE practices in the Nigerian HEIS.

Concept of POE

POE is one of the widely discussed themes in the building maintenance and facilities management field. From the earlier publications by Preiser et al. (1978), built environment scientists and other related disciplines have investigated this concept in numerous articles and projects, highlighting its benefits and likely development. However, to date, end-users' satisfaction and requirements in occupied buildings are still neglected, arising from a lack of POE assessment. This setback may be linked to the unwillingness of construction stakeholders to advance the POE concept during the procurement stage, the absence of POE in HEIs and professional bodies' curricula, financial burden responsibility and professional liability (Hadjri and Crozier, 2009). Despite the challenges, it is well documented that POE presents a holistic approach towards gathering and disseminating information pertinent to all stakeholders within a building life cycle. Therefore, the piece of information obtained could be beneficial to a particular stakeholder in various circumstances.

A popular definition given by Preiser, Rabinowitz and White (1988) defined POE as "a more specific process of systematic data collection, analysis and comparison with explicitly stated performance criteria about the occupied built environment". Ishak et al. (2020) averred that POE understanding lies in understanding space's performance according to its technical aspect (spatial elements and space conditioning elements) and the functional aspects of end-user comfort regarding circulation and space planning. The diverse definitions of POE have generated fragmented interpretations of POE in academic and professional communities resulting in poor POE implementation in building projects. Thus, this study addresses POE as a detailed independent assessment of an occupied building's architectural, technical and socio-psychological concerns via the end-users' lens.

In achieving the POE concept, three major methodologies have been propagated in the literature. These methodologies include indicative, investigative and diagnostic. Indicative involves the quick walkthrough evaluation involving the key personnel while adopting a structured interview and group meeting with end-users and inspectors. The investigative POE requires an in-depth analysis of users' requirements using interviews and questionnaires on several similar buildings. Also, diagnostic POE tends to be broader when compared with indicative and

investigative POEs. It considers some facilities having a similar feature while adopting various relevant technologies and human behavioural research methods. Further merits of this type of POE are its ability to produce high validity and generalizability of data and the potential to be converted to public guidelines (Hadjri and Crozier, 2009). Although various authors have suggested other methodologies for approaching POE, their identified methods are still a reflection of Preiser's (1995) and Preiser et al.'s (1998) methods (see Hadjri and Crozier, 2009).

Evidence has shown that applying the POE methodologies in built environment facilities has given rise to improving the technical, functional and behavioural performances of building facilities and end-users needs, respectively (Ishak et al., 2020). In specific terms, POE provides:

1. Useful information that will argue the desire for continuous improvement.
2. Improvement of design and construction skills.
3. Improvement of the commissioning phase.
4. Improvement of user requirements.
5. Improvement of management techniques.
6. Knowledge base for design and construction guides and regulatory practices (Hadjri and Crozier, 2009).

Therefore, POE will be beneficial to the users, owners of buildings, government and built environment professionals working on a similar building.

In addressing POE, feedback remains a vital evaluation tool for improving future construction projects' services. The relevance of this tool was well emphasised in the Royal Institute of British Architects (RIBA) handbook (RIBA, 1965). The broad use of the term "feedback" is sometimes equated to POE, emphasising the continual improvement of facilities and the dexterity of built environment personnel in achieving the client's desire. *Cambridge Advanced Learners English Dictionary* (2008) defined "feedback" as "information or statements of opinion about something, such as a new product, that can tell you if it is successful or liked". The opinion could be positive or negative obtained through forms, questionnaires, or surveys. For construction projects, feedback can be viewed as "learning from what you are doing or from what you and others have done to understand where you are and to inform and improve what you are about to do" (Bordass, Leaman and Eley, 2006). Thus, feedback mechanisms in the POE context are techniques by which information on an in-use construction project's requirements can be obtained.

In carrying out feedback in construction projects, Bordass, Leaman and Eley (2006) explained four feedback mechanisms that can be adopted. These mechanisms are observation, questionnaires, interviews, facilitated discussions, physical monitoring, measurement and performance statistics analysis. Observation involves the walkthrough activity in a building either by an individual or as a group using subjective (discussions and visual inspection) and objective (physical measurement). Questionnaires and interviews expand the feedback mechanisms' scope by obtaining information through structured questionnaires and interviews, giving valuable insight into standards. Facilitated discussions are an organised forum where experience and insight at the start of a project can be shared and reviewed.

Although the slight of this system lies in the ill-feeling, the discussions can generate. Physical measurement and analysis of performance statistics consist of objective measurement of factors pertinent to the assignment and subsequent interpretation of acquired results. These mechanisms are similar to the POE methodologies of Preiser (1995).

Ofide, Jimoh and Achuenu (2015) utilised a questionnaire containing six grouped complaints channels and three grouped hostel users to which complaints can be channelled in examining maintenance practices of HEIs in Nigeria. The complaints channels studied are memos, telephone, job requisition cards/forms, memos and job requisition cards/forms, telephone and memos. On the other hand, the hostel users to which complaints can be made are the school secretary/faculty officer/hall officer, school secretary/faculty officer/hall officer and students, staff and students, and head of department and school, secretary/faculty officer/hall officer. There are similarities between the identified variables and the POE methods found in the literature. Therefore, the current study expanded the variables used by Ofide, Jimoh and Achuenu (2015) in arriving at the 14 MFM factors studied here.

Limiting factors to POE implementation

Studies have reported major setbacks militating against the proliferation of POE in building projects. Hadjri and Crozier (2009), in their review, discussed various limiting factors of POE implementation. The identified limitations are highlighted as follows:

1. The unwillingness of construction stakeholders to advance the POE concept during the procurement stage.
2. Cost.
3. Professional integrity, time and skills.
4. Fragmented incentives and benefits within the procurement and operations process.
5. Lack of agreed and reliable indicators.
6. Potential liability for owners, exclusion from delivery expectations.
7. The absence of POE in HEIs and professional bodies' curricula.
8. Financial burden responsibility.
9. Professional liability.

Also, Stevenson (2009) detailed the setbacks for POE assessment in her review of the built environment including:

1. Clients' reluctance to commission POE for fear of budget to repair and treat to organisation image.
2. Fear of no guarantee of no return on investment when POE is budgeted.

3. Bureaucracy originating from top management may impose an unnecessary evaluation system rather than developing a system that will bring mutual understanding among the project team.
4. Lack of knowledge management that relies on POE that is still relatively new within the construction industry.

Furthermore, Okolie and Shakantu (2012) argued similar POE constraints while assessing Nigerian universities' building performance evaluation practices. The constraints of POE identified include:

1. The lack of POE in Nigerian universities stemmed from the lack of awareness and low perception of POE by construction stakeholders.
2. Lack of funding and skilled personnel to conduct POE assessment.
3. Absence of POE database.

Therefore, the current study drew on the POE barriers identified by Hadjri and Crozier (2009), Stevenson (2009) and Okolie and Shakantu (2012) and adapted them to the current study.

RESEARCH METHODS

This section outlines the procedures adopted in achieving the aim and objectives of the study. A quantitative research design method was employed to evaluate hostel facilities' performance in selected universities in Ogun State, Nigeria. Ogun state host the highest number of accredited HEIs in Nigeria, covering federal, state and private-owned (Omonijo et al., 2020). The questionnaire instrument collects data on the perceived MFMs and limiting factors of POEs via facilities managers and student occupants. The selected hostels were stratified into male, female and population capacity to ensure groups' uniform distribution. The purposive sampling technique was employed to select facilities managers and student occupants due to the respondents' characteristics. The research sample size was determined using Krejcie and Morgan's (1970) sample size table with a confidence level of 95%. However, 310 and 30 questionnaire instruments were administered to the student occupants and facilities managers in the studied universities. The study was conducted in three southwestern Nigeria universities, namely, the Federal University of Agriculture, Abeokuta (FUNNAB), Tai Solarin University of Education, Ijebu Ode (TASUED) and the Bells University of Technology, Ota (BellsTech). These universities were selected based on different stakeholders' sponsorship and adherence to National Universities Commission guidelines in designing and constructing hostel facilities in Nigeria. The questionnaires were physically administered by hand to have a high response rate. A total of 260 and 20 questionnaires were retrieved from student occupants and facilities managers, respectively. This figure represents 84% and 67% of the total surveys sent out by the investigators.

Two separate questionnaires were designed for the respondents' two groups: facilities managers and student occupants. For each group, the questionnaire contained three parts. Part A addressed demographic data relevant to each group, Part B addressed 14 MFMs, and Part C held questions on limiting POE factors

in hostel facilities. These factors were identified through a walkthrough and literature review. The scale of measurement for the factors was on a 5-point Likert scale of 5 = "Mostly Used", 4 = "Often Used", 3 = "Frequently Used", 2 = "Seldomly Used" and 1 = "Not Used", for Part A. Part B was on a 5-point Likert scale of 5 = "Strongly Agree", 4 = "Agree", 3 = "Neutral", 2 = "Disagree" and 1 = "Strongly Disagree".

The data collected in this study were analysed using descriptive statistics. Initially, the descriptive statistics used were frequency distribution and percentages. These effectively knew the respondents' delivery in line with their institution affiliations, years of working experience and academic qualifications for facilities managers. On the part of student respondents, institution affiliations, the discipline of study and the study level were characterised. Furthermore, mean scores, relative importance index, ranking of the MFMs and limiting factors of POE were used in measuring the performances of the hostel facilities. The results of these analyses are presented using frequencies, stacked bar charts and tables for easier understanding by readers.

RESULTS AND DISCUSSION

To examine the MFMs and limiting factors of POEs in hostel facilities in Southwestern Nigeria, it is pertinent to survey the real users of hostel facilities. An appraisal of the background characteristics of the hostel facilities users was carried out.

Demographic Data of Students

Figure 1 shows the percentages of participation from the three studied universities. As shown in Figure 1, most of the students came from BELLSTECH (44%) and FUNNAB (41%), while the least came from TASUED (15%). Figure 2 shows which academic disciplines the students are in and the results show that most students studied engineering (46%) and social science/management (26%). The level of study is shown in Figure 3. In Figure 3, most of the students are in Level 100 (37%) and Levels 200 and 300 (27%), respectively.

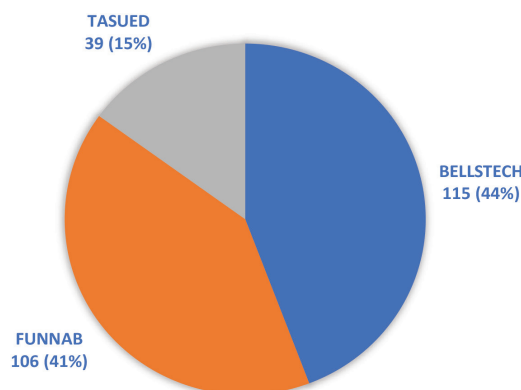


Figure 1. Percentages of participation from the three universities

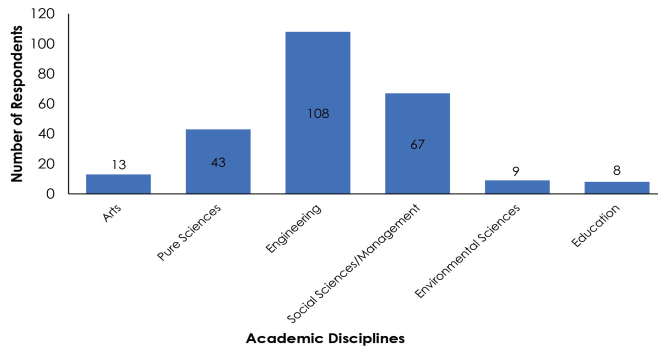


Figure 2. Academic disciplines of the students

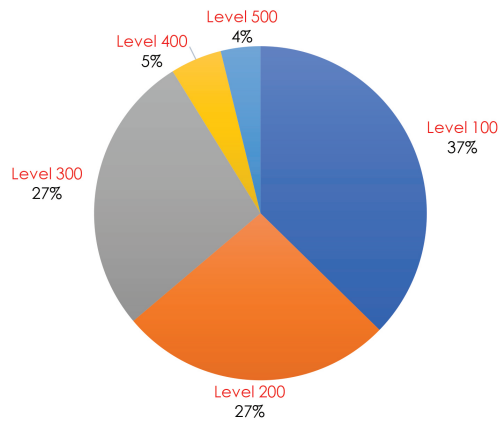


Figure 3. Level of study of the students

Demographic Data of Facilities Managers

The characteristics of the facilities managers were evaluated. The categories of staff involved are the non-academic staff and professionals in the maintenance department of the universities. Figure 4 shows the highest educational qualification of the respondents. From this figure, most of the facilities managers had a higher national diploma and bachelor's degree (70%). This result indicates that the respondents had the required academic qualification to respond adequately to the research instrument's questions. The hostel work experience of the facilities managers is shown in Figure 5. As shown in Figure 5, 45% had one year to five years of working experience, 30% had between six years to 10 years of working experience and 25% had between 11 years to 15 years of working experience.

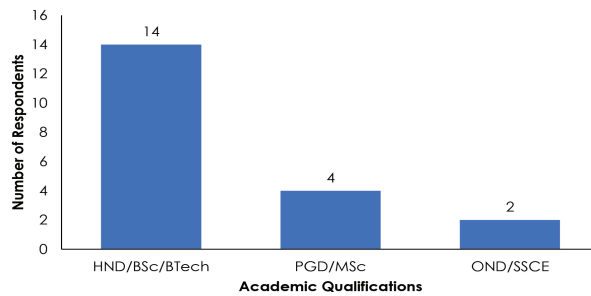


Figure 4. Highest academic qualification of managers

Note: HND = Higher national diploma; BSc = Bachelor's in science; BTech = Bachelor's in technology; PGD = Post graduate degree; MSc = Master's in science; OND = Ordinary national diploma; SSCE = Senior school certification examination

The respondents' length of service was sufficient for them to have adequate knowledge about the maintenance works and the building facilities' personnel can give reliable answers to the questions. Figure 6 shows the professional background of the facilities managers. As shown in this figure, the facilities managers have experience in built environment training. Hence, this indicates that they possess the required maintenance facilities knowledge across the three universities.

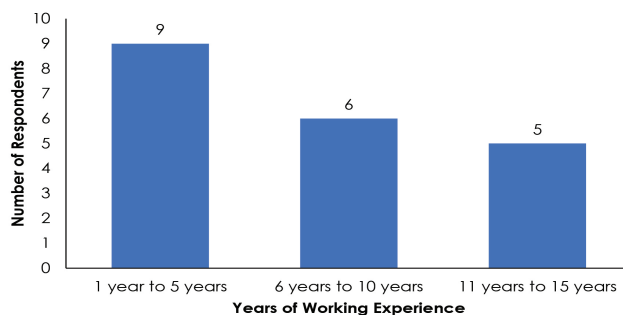


Figure 5. Hostel work experience of facilities managers

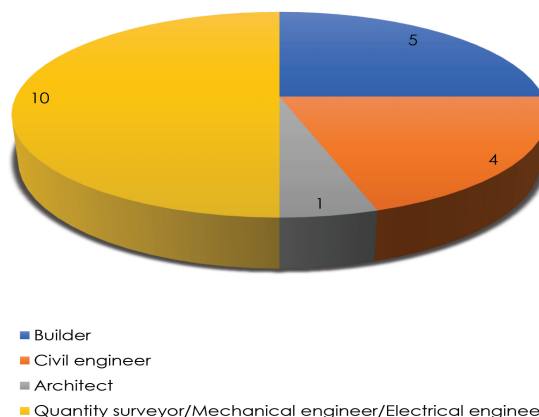


Figure 6. The professional background of facilities managers

MFMs Utilised by Hostel Users

This section identified the MFMs utilised by student occupants and facilities managers in hostel facilities. The 14 MFMs were identified from the literature as relevant to hostel facilities in a developing country such as Nigeria (Stevenson, 2009; Ofide, Jimoh and Achuen, 2015). It is worth identifying unique factors in the region to steer effective maintenance practices in hostel buildings to improve user satisfaction. This study's exceptionality uses actual users to identify the MFMs that will be incorporated into future renovation/maintenance works and hostel management.

MFMs utilised by hostel users from the perspective of students

Table 1 presents the student respondents' mean score rating of the MFMs for the adoption in hostel facilities based on the 5-point Likert scale used. The result in Table 2 was subsequently ranked accordingly. From Tables 1 and 3, most MFMs strongly influence hostel facilities' maintenance outcomes in the Nigerian university sector. The result from Table 1 revealed that MFM like "Through the hall manager" ranked 2nd with a mean score of 3.24 by BELLSTECH and 7th with a mean score of 3.04 by FUNNAB and TASUED, respectively, while "The management involving occupants in observation reports on the status of the building" ranked 1st with a mean score of 3.36 by TASUED, 5th with a mean score of 3.05 by FUNNAB and 7th with a mean score of 3.04 by BELLSTECH. The MFMs ranked lowest by the student occupants were "Through e-mails" at 13th with a mean score of 2.58 for BELLSTECH and 11th with a mean score of 2.69 for TASUED. Similarly, "Online maintenance portal" ranked 13th with a mean score of 2.58 by BELLSTECH and ranked 12th with a mean score of 2.95 by FUNNAB.

Table 1. Maintenance feedback mechanism for the adoption in hostel facilities: Students' perspectives

MFMs	BELLSTECH			FUNNAB			TASUED		
	Mean	Rank	RII	Mean	Rank	RII	Mean	Rank	RII
Verbal report of faults	3.26	1	0.652	2.97	10	0.594	3.18	6	0.636
Through the hall manager	3.24	2	0.648	3.04	7	0.608	3.08	7	0.616
Written reports of faults	3.21	3	0.642	3.05	5	0.610	3.03	9	0.606
Defining the scope of maintenance works by occupants' reports	3.21	3	0.642	3.03	8	0.600	3.33	2	0.660
Occupants and the facility management team should regularly have an interactive forum	3.17	5	0.634	3.08	3	0.616	2.85	10	0.570

(Continued on next page)

Table 1. *Continued*

MFMs	BELLSTECH			FUNNAB			TASUED		
	Mean	Rank	RII	Mean	Rank	RII	Mean	Rank	RII
Through the hall facility maintenance officer	3.05	6	0.610	2.95	12	0.590	3.05	8	0.610
The management involved occupants in observation reports on the status of the building	3.04	7	0.608	2.95	12	0.500	3.36	1	0.672
Through the student's union body	2.97	8	0.594	3.00	9	0.600	3.26	4	0.652
Through the dean of student affairs	2.97	8	0.594	3.15	1	0.630	3.33	2	0.652
Through a suggestion box	2.90	10	0.580	3.08	3	0.616	2.44	13	0.488
Through other university management officers	2.88	11	0.516	3.14	2	0.628	2.79	11	0.558
Through an interactive forum	2.81	12	0.562	2.95	11	0.592	3.26	4	0.652
Through e-mails	2.58	13	0.516	3.05	5	0.610	2.56	12	0.512
Through an online maintenance portal	2.58	13	0.516	2.95	12	0.590	2.05	14	0.410

Note: RII = Relative index of inequality

The study wanted further to identify the MFMs factors that would have a higher impact on the maintenance of hostel facilities in the three universities. Extraction was done using cross-tabulation on the 14 MFMs. The cross-tabulation of the result from Table 2 revealed that all the student respondents ranked "Occupants reports can help define the scope of maintenance works" 1st with a mean score of 3.15, "Through the hall manager" and "Verbal reports of faults" ranked 2nd, respectively, with mean scores of 3.13. The lowest-ranked factors are "Through suggestion box" ranked 12th with a mean score of 2.90, "Through e-mails" ranked 13th with a mean score of 2.77 and "Online maintenance portal" ranked 14th with a mean score of 2.65. These findings implied that the student occupants have direct communication with the facility's maintenance staff. This phenomenon could be a vital tool in promptly addressing faults and user information in the evaluation process of maintenance works. The findings agree with Okuntade (2014) that the building's deterioration can be addressed with essential information on the defects and faults from users.

Table 2. Cross tabulation analysis of MFMs utilised by hostel users: Students' perspectives

MFMs	Mean	RII	Rank
Defining the scope of maintenance works by occupants' reports	3.15	0.630	1
Through the hall manager	3.13	0.626	2
Verbal report of faults	3.13	0.626	2
Written reports of faults	3.12	0.624	4
Through the dean of student affairs	3.10	0.620	5
Regularly interactive forum with occupants and facility management team	3.09	0.618	6
Involving occupants in observation reports on the status of a building by management	3.05	0.610	7
Through the student's union body	3.02	0.604	8
Through the hall facility maintenance officer	3.01	0.602	9
Through other university management officers	2.97	0.594	10
Through an interactive forum	2.94	0.588	11
Through a suggestion box	2.90	0.580	12
Through e-mails	2.77	0.554	13
Through an online maintenance portal	2.65	0.530	14

MFMs utilised by hostel users from the perspective of facilities managers

Table 3 presents the facilities manager's mean score rating of the MFMs for the adoption in hostel facilities based on the 5-point Likert scale used. The result in Table 4 was subsequently ranked accordingly. The result from Table 3 revealed that MFMs like "Verbal report of faults" ranked 1sts for all the studied HEIs with mean scores of 3.80, 4.13 and 3.36 by BELLSTECH, FUNNAB and TASUED, respectively, and "Through the hall manager" ranked 2nd with mean scores of 3.40, 4.50 and 3.29 by BELLSTECH, FUNNAB and TASUED, respectively. "Occupants and facility management team should regularly have interactive forum" ranked 5th with a mean score of 3.36 by BELLSTECH ranked 3rd by FUNNAB and TASUED with mean scores of 3.38 and 3.14 respectively. The MFMs ranked lowest by the facility managers were "Through e-mails" and ranked 14th by BELLSTECH and TASUED with mean scores of 2.20 and 2.00, respectively. FUNNAB facility managers ranked "Through e-mails" 6th with a mean score of 3.00. Similarly, "Online maintenance portal" ranked 13th with a mean score of 2.20 by the BELLSTECH, ranked 14th with a mean score of 2.38 by FUNNAB and ranked 7th with a mean score of 2.43 by TASUED. "Through other university management officers" ranked 10th by BELLSTECH with a mean score of 2.40, 13th by FUNNAB with a mean score of 2.50 and 11th by TASUED with a mean score of 2.29.

Table 3. MFMs for the adoption in hostel facilities: Facilities manager's perspectives

MFMs	BELLSTECH			FUNNAB			TASUED		
	Mean	Rank	RII	Mean	Rank	RII	Mean	Rank	RII
Verbal report of faults	3.80	1	0.76	4.13	1	0.82	3.86	1	0.770
Written reports of faults	3.40	2	0.68	3.25	5	0.65	3.14	3	0.628
Through the hall manager	3.40	2	0.68	3.50	2	0.71	3.29	2	0.658
Defining the scope of maintenance works by occupants' reports	3.20	4	0.64	3.38	3	0.68	3.00	5	0.600
The management involved occupants in observation reports on the status of the building	3.0	5	0.60	3.00	6	0.60	2.14	12	0.428
Occupants and the facility management team should regularly have an interactive forum	3.00	5	0.60	3.38	3	0.68	3.14	3	0.628
Through a suggestion box	2.80	7	0.56	2.75	11	0.55	3.36	1	0.672
Through the student's union body	2.80	7	0.56	2.88	8	0.58	2.43	7	0.486
Through the hall facility maintenance officer	2.80	7	0.56	2.88	8	0.58	3.00	5	0.600
Through an interactive forum	2.40	10	0.48	2.88	8	0.58	2.14	12	0.428
Through other university management officers	2.40	10	0.48	2.50	13	0.50	2.29	11	0.458
Through the dean of student affairs	2.40	10	0.48	2.75	11	0.55	2.43	7	0.486
Through an online maintenance portal	2.20	13	0.44	2.38	14	0.48	2.43	7	0.486
Through e-mails	2.20	14	0.44	3.00	6	0.60	2.00	14	0.400

Extraction was done using cross-tabulation on the 14 MFMs to identify the MFMs factors that would significantly influence the studied HEIs. The cross-tabulation of the result presented in Table 4 revealed that all the facilities managers respondents ranked "Verbal reports" 1st with a mean score of 3.95, "Through the hall manager" ranked 2nd with a mean score of 3.40, written reports of faults were ranked 3rd a mean score of 3.25. The facilities managers ranked "Defining the scope of maintenance works by occupants' reports" and "The occupants and facility management team should regularly have interactive forum" factors fourth with mean scores of 3.20, respectively.

The lowest-ranked factors are "Through an interactive forum" ranked 11th with a mean score of 2.50, "Through e-mails" and "Through other university management officers" simultaneously ranked 12th with mean scores of 2.40, respectively. "Through an online maintenance portal" ranked the least with a mean score of 2.35 by BELLSTECH, FUNNAB and TASUED. These findings implied that the end-users must have a physical communication channel for the report of any concern on the studied facilities and in line with those found in the literature (Hadjri and Crozier, 2009; Stevenson, 2009).

Table 4. Cross-tabulation analysis of maintenance feedback mechanisms utilised by hostel users: Facilities manager's perspectives

MFMs	Mean	RII	Rank
Verbal report of faults	3.95	0.79	1
Through the hall manager	3.40	0.68	2
Written reports of faults	3.25	0.65	3
Defining the scope of maintenance works by occupants' reports	3.20	0.64	4
Occupants and the facility management team should regularly have an interactive forum	3.20	0.64	4
Through the hall facility maintenance officer	2.90	0.58	6
Through the student's union body	2.70	0.54	7
The management involved occupants in observation reports on the status of the building	2.70	0.54	7
Through a suggestion box	2.65	0.53	9
Through the Dean of Student Affairs	2.55	0.51	10
Through an interactive forum	2.50	0.50	11
Through e-mails	2.40	0.48	12
Through other university management officers	2.40	0.48	12
Through an online maintenance portal	2.35	0.47	14

The Limiting Factors to the POE of Hostel Facilities

The study sought to know the limiting POE factors restricting the POE method's implementation in hostel facilities, as shown in Tables 5 and 7. Facilities managers and students were required to rate the 13 identified factors in the order of their agreement derived from a 5-point Likert scale. The results in Tables 5 and 7 were

subsequently ranked accordingly. From the tables, most of the limiting factors of POE in the hostels greatly influence hostel facilities' maintenance outcomes in the selected Nigerian universities.

The limiting factors to the POE of hostel facilities from the student perspective

For the student respondents, the results in Table 5 revealed that out of 13 of the most identified limitations investigated, "Major maintenance challenges persistence in building" ranked 1st with a mean score of 3.34 by FUNNAB, ranked 2nd with a mean score of 3.59 by BELLSTECH and ranked fourth with a mean score of 3.62 by TASUED. "Poor feedback mechanism" was ranked 4th with a mean score of 3.10 by FUNNAB, ranked 7th with a mean score of 3.49 by BELLSTECH and ranked 9th with a mean score of 3.38 by TASUED, "Slow response to the rate of maintenance works" was ranked 5th with a mean score of 3.49 by BELLSTECH and FUNNAB and ranked 6th by TASUED.

Table 5. Factors limiting post-occupancy evaluation of hostel facilities: Students' perspectives

Variables	BELLSTECH			FUNNAB			TASUED		
	Mean	Rank	RII	Mean	Rank	RII	Mean	Rank	RII
Non-availability of information on building facilities	3.64	1	0.728	3.07	7	0.614	3.62	4	0.724
Major maintenance challenges persistence in buildings	3.59	2	0.718	3.34	1	0.668	3.620	4	0.724
Lack of commitment from school management	3.57	3	0.714	3.01	10	0.602	2.51	10	0.502
Lack of user input in the design processes of a new building	3.54	4	0.708	2.96	13	0.592	3.26	2	0.692
Ineffective maintenance works	3.49	5	0.698	3.05	5	0.616	3.51	6	0.702
The slow response rate to maintenance works	3.49	5	0.698	2.97	11	0.594	3.72	2	0.744
Poor feedback mechanism	3.47	7	0.694	3.10	4	0.620	3.46	6	0.652
Occupants not understanding the importance of prompt maintenance	3.43	8	0.686	3.22	3	0.644	3.38	9	0.676

(Continued on next page)

Table 5. *Continued*

Variables	BELLSTECH			FUNNAB			TASUED		
	Mean	Rank	RII	Mean	Rank	RII	Mean	Rank	RII
Unavailability of maintenance officers to retrieve occupants' report	3.43	8	0.686	3.04	9	0.608	3.67	3	0.734
Lack of communication between the maintenance officers and the occupants	3.43	8	0.686	3.08	5	0.616	3.38	9	0.702
Lack of records on user's complaints and needs	3.42	11	0.684	3.07	7	0.614	3.38	9	0.670
Insignificant improvement in the maintenance challenges experienced in new buildings	3.37	12	0.674	3.23	2	0.646	3.85	1	0.770
Insufficient knowledge of the benefits of post-occupancy evaluation	3.26	13	0.652	2.97	11	0.594	3.49	7	0.698

Extraction was also done using cross-tabulation on the 13 limiting POE factors. The cross-tabulation of the result in Table 6 showed that student respondents ranked "Major maintenance challenges persistence in building" ranked 1st with a mean score of 3.49, "Non-availability of information on building facilities" ranked 2nd with a mean score of 3.40 and "Insignificant improvement in the maintenance challenges experienced" ranked 3rd with a mean score of 3.38. Student respondents listed "Lack of records on users' complaints and needs" as 11th with a mean score of 3.27, "Lack of user input in the design processes of the new building" ranked 12th with a mean score of 3.25 and "Insufficient knowledge on benefits of POE" ranked 13th as the lowest factors. The findings implied a need for proper feedback on executed maintenance works and a prompt response rate on maintenance works. These results agree with Okuntade (2014) on the effectiveness of users' feedback on building maintenance works. Also, Agyekum, Ayarkwa and Amoah (2016) pointed out that practical evaluation and maintenance practices in buildings improved user satisfaction and comfort levels.

Table 6. Crossbar analysis of factors limiting post-occupancy evaluation of hostel facilities: Students' perspectives

Variables	Mean	RII	Rank
Major maintenance challenges persistence in buildings	3.49	0.698	1
Non-availability of information on building facilities	3.40	0.680	2
Insignificant improvement in the maintenance challenges experienced in new buildings	3.38	0.676	3
Occupants not understanding the importance of prompt maintenance	3.35	0.670	4
Ineffective maintenance works	3.33	0.666	5
The slow response rate to maintenance works	3.31	0.662	6
Lack of commitment from School Management	3.31	0.662	6
Unavailability of maintenance officers to retrieve occupants' report	3.31	0.662	6
Poor feedback mechanism	3.31	0.662	6
Lack of communication between the maintenance officers and the occupants	3.28	0.656	10
Lack of records on user's complaints and needs	3.27	0.654	11
Lack of user input in the design processes of a new building	3.25	0.650	12
Insufficient knowledge of the benefits of post-occupancy evaluation	3.18	0.636	13

The limiting factors to the POE of hostel facilities from the facilities managers' perspective

For the facilities managers respondents, the results in Table 7 revealed that out of 13 of the most identified limitations investigated, "Non-availability of information on building facilities" ranked 1st with mean scores of 3.64, 3.86 and 4.25 by BELLSTECH, FUNNAB and TASUED, respectively. "Lack of commitment from school management" ranked 2nd with mean scores of 3.20 and 3.63 by BELLSTECH and TASUED, respectively, while FUNNAB ranked it at 4th with a mean score of 2.71. "Ineffective maintenance work" was ranked 4th with a mean score of 3.00 by BELLSTECH, ranked 2nd with a mean score of 3.14 by FUNNAB and ranked 3rd with a mean score of 3.50 by TASUED.

The lowest-ranked limiting factors are "Lack of communication between the maintenance officers and occupants" simultaneously ranked 11th by BELLSTECH, FUNNAB and TASUED with mean scores of 2.20, 2.29 and 2.63, respectively. "Unavailability of maintenance officers to retrieve occupants' reports" ranked 12th with a mean score of 2.20, ranked 7th with a mean score of 2.57 by FUNNAB and ranked 9th with a mean score of 3.00 by TASUED. "Insufficient knowledge on the benefits of post-occupancy evaluation" ranked 13th with a mean score of 1.8 by BELLSTECH, ranked fourth with a mean score of 2.71 and ranked sixth with a mean score of 3.31 by TASUED. These findings established a lack of commitment to the advancement of POE in the studied hostel facilities. The findings conformed with Hadjri and Crozier (2009) and Stevenson (2009) identified POE limiting factors.

Table 7. Factors limiting post-occupancy evaluation of hostel facilities: Facilities manager's perspectives

Variable	BELLSTECH			FUNNAB			TASUED		
	Mean	Rank	RII	Mean	Rank	RII	Mean	Rank	RII
Non-availability of information on building facilities	3.64	1	0.728	3.86	1	0.772	4.25	1	0.850
Lack of commitment from School Management	3.20	2	0.640	2.71	4	0.542	3.63	2	0.726
Major maintenance challenges persistence in buildings	3.20	3	0.640	3.14	3	0.628	3.50	3	0.700
Ineffective maintenance works	3.00	4	0.600	3.14	2	0.628	3.50	3	0.700
Lack of user input in the design processes of a new building	2.80	5	0.560	2.71	5	0.542	3.13	6	0.626
Occupants not understanding the importance of prompt maintenance	2.60	5	0.520	2.57	7	0.514	3.38	5	0.676
Poor feedback mechanism	2.60	7	0.520	2.57	7	0.514	3.13	6	0.626
The slow response rate to maintenance works	2.60	8	0.520	2.57	7	0.514	2.57	10	0.514
Insignificant improvement in the maintenance challenges experienced in new buildings	2.20	8	0.440	2.29	11	0.458	2.50	12	0.500
Lack of records on user's complaints and needs	2.20	8	0.440	2.29	11	0.458	2.38	13	0.476
Lack of communication between the maintenance officers and the occupants	2.20	11	0.440	2.29	11	0.458	2.63	11	0.526
Unavailability of maintenance officers to retrieve occupants' report	2.20	12	0.440	2.57	7	0.514	3.00	9	0.600
Insufficient knowledge of the benefits of post-occupancy evaluation	1.80	13	0.360	2.71	4	0.542	3.13	6	0.626

The cross-tabulation of the result as seen in Table 8 showed that facilities manager respondents ranked "Non-availability of information on building facilities" 1st with a mean score of 3.90, "Major maintenance challenges persistence in buildings" ranked 2nd with a mean score of 3.30 and "Ineffective maintenance work" ranked 3rd with a mean score of 3.25. In contrast, "Lack of commitment from school management" ranked fourth with a mean score of 3.2. On the lowest-ranked POE limiting factors, facilities manager respondents ranked "Lack of communication between the maintenance officers and the occupants" 11th with a mean score of 2.40, "Insignificant improvement in maintenance challenges experienced in the new building" 12th with a mean score of 2.35 and "Lack of records on users' complaints and needs" 13th with a mean score of 2.20 as the lowest factors. The findings implied the need for proper awareness and interest in POE among built environment stakeholders. These results agree with Okolie and Shakantu (2012) on the POE database's effectiveness in building maintenance works.

Table 8. Crossbar analysis of factors limiting post-occupancy evaluation of hostel facilities: Facilities manager's perspectives

Variables	Mean	RII	Rank
Non-availability of information on building facilities	3.90	0.78	1
Major maintenance challenges persistence in buildings	3.30	0.66	2
Ineffective maintenance works	3.25	0.65	3
Lack of commitment from school management	3.20	0.64	4
Lack of user input in the design processes of the new building	2.90	0.58	5
Occupants not understanding the importance of prompt maintenance	2.90	0.58	6
Poor feedback mechanism	2.80	0.56	6
Unavailability of maintenance officers to retrieve occupants' report	2.65	0.53	6
The slow response rate to maintenance works	2.65	0.53	6
Insufficient knowledge of the benefits of post-occupancy evaluation	2.65	0.53	10
Lack of communication between the maintenance officers and the occupants	2.40	0.48	11
Insignificant improvement in the maintenance challenges experienced in new buildings	2.35	0.47	12
Lack of records on user's complaints and needs	2.20	0.44	13

CONCLUSION AND RECOMMENDATIONS

The study examined the MFMs and limiting factors of POEs for addressing future occupant satisfaction in the selected hall of residences in Nigerian universities. The study revealed the MFMs that have a significant influence on the maintenance outcomes of hostel facilities. MFMs utilised by both students and facilities managers showed a direct communication channel in reporting end-users concerns,

encouraging prompt attention to faults. Further analysis revealed that occupants' reports could help define the scope of maintenance works. Also, both students and facilities managers maintained that the online maintenance portal feedback and e-mail mechanisms are yet to be embraced by hostel users. These limitations may be ascribed to poor knowledge of online maintenance portal feedback, power and internet infrastructure deficiencies in Nigerian universities. An appraisal of the limiting factors of POEs showed that persistent maintenance challenges in building, non-availability of information on building facilities and insignificant improvement on the maintenance challenges experienced were severe factors to be tackled in the studied hostels. For quality and productive indoor environments to be sustained within hostel facilities, the evaluated MFMs and limiting factors of POEs in this study should be contemplated.

The study recommends proper documentation of faults and strict adherence to building maintenance guidelines as enshrined in the National Building Codes and the National Universities Commission Procedures Guide and Physical Development Manual. Establishing an effective communication route for POE among the building industry stakeholders should be embraced during the building procurement phase. The users of hostel facilities should be more actively involved in the evaluation process and planned maintenance works. Furthermore, the user's perception and input should be considered at the design, construction and maintenance stages to achieve a high level of user satisfaction. Finally, The National Universities Commission (NUC) should conduct building performance evaluations of existing hostel facilities in Nigerian universities and update the Procedures Guide and Physical Development Manual for the University System in Nigeria.

This study's input to knowledge is demonstrated in identifying MFMs relevant to hostel facilities needed for providing a conducive learning environment. It also discovers specific factors hindering the actualisation of the POE technique in hostel accommodation, leading to exploiting its benefits in the future design, construction and maintenance of the hostels. Therefore, the findings of this study anticipated adding to the relevance of the verbal and written feedback channels of POE in addressing maintenance issues in hostel facilities. It furthers the gains of end-users' involvement in achieving POE goals. It adds to the awareness of POE practices in Nigerian HEIs and the growing literature on POE in hostel facilities from the standpoint of a developing country.

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