Evaluation of Canaanland Camp House B, Ota, Ogun State

Dare-Abel O.A., Izobo-Martins O.O. and E.A. Ayo-Vaughan

Abstract- Post Occupancy Evaluation (POE) has been identified as one of the key methodologies in identifying the performance of buildings. It is important for building industry professionals as well as end users to understand the efficiency and effectiveness of their buildings through proper analysis of feedback. The purpose of POE is to improve how buildings are constructed by reducing design and maintenance costs, enhancing occupant satisfaction, comfort, and performance, and to increase return on building owners' investments. This paper adopts a strategic review using POE in an investigative format with particular focus the Camp House B which served as accommodation for post-graduate students of Covenant University and lodging for groups on spiritual programmes. A survey was carried out using a structured questionnaire as research instrument. The 48 Masters students of architecture representing 30.57% of the total of 157 Post Graduate students were chosen as the sample. The study variables were analyzed using descriptive statistics, tests for correlations and significant relationships were established. The results show significant correlation between the time spent in the rooms and the perceived air quality of the building and significant relationship between adequacy of room space and change in needs of the occupant. The paper concludes with results that show relative user comfort in the buildings and rated the buildings condition as good with a rating of 2.88/4.00. The paper recommends concerted efforts towards improving plumbing services and the inclusion of passive cooling features in design solutions.

Index Terms: Conditions, Evaluation, Feedback, Maintenance, Performance, Post-Ocupancy and User-Comfort.

1. INTRODUCTION

Building maintenance and management is crucial to keeping a sustainable and healthy environment at all times. Organizations, governments and individuals invest either consciously or unconsciously in maintenance annually to the extent that it becomes a major budgetary element. Zubairu [1] recommended three ways to develop a national maintenance policy. One vital recommendation is the need for post-occupancy evaluation towards tackling the issues emanating from poor design and specifications. Other recommendations of the study included the creation of a forum for the discussion of the national policy on maintenance and the establishment of a centre of excellence on material study. Post-occupancy evaluation is gradually becoming the norm for all public and commercial buildings especially in Europe as noted by [2]. Zubairu [3] found the two main factors responsible for maintenance problems in public buildings to be natural depreciation due to age and misuse by occupants and users.

The purpose of a POE is to improve how buildings perform their functions and satisfy the users by reducing maintenance costs, enhancing occupant satisfaction, comfort, and performance, and to increase return on the building owners' investments. Evaluation reports have proved to be helpful in determining best practices and effective policies to be adopted by organizations and building owners for the maintenance and sustenance of their buildings and facilities [3], [4], [2].

This paper is aimed at evaluating the Camp House B of which two blocks were used as accommodation for post graduate students of Covenant University for two sessions, with a view of obtaining feedback for the improvement of the buildings and extending the lifespan. The evaluation uses performance indicators that are related to general user-needs and comfort of occupants. The strategic POE was embarked upon over 10years after the completion of the buildings. An investigative review format was utilized.

2. EVALUATION AND BUILDING MAINTENANCE

Building structure, components and services are usually inspected for defects and failures to develop best practices for desired outcomes and prolonged building life as presented by [4]. Planned preventive maintenance that is well executed and managed certainly gives an assurance of the elimination of crisis conditions and frequent emergency maintenance works. Evaluation of Hostel and lodging building types produce improvements in building quality and helps to identify the aspects of the building that are functional and those that need modifications. It also helps determine costs and benefits that accrue from the execution of the scheme [5], [4], [2], [6] and [7]. Cobbinah [6] in a study of the maintenance of public buildings in the Ashanti region of Ghana found several factors including lack of funding and proper maintenance culture responsible for maintenance works to be deferred thereby resulting in serious consequences. Such resultant conditions are exposed and hanging foundations posing serious structural safety implications. Others include poor wall decoration conditions, cracks in walls, broken timber components, poor floor screed conditions. Kaiser [8] argues that many tertiary institutions naturally adopted deferred maintenance due to several overwhelming defects and failures observed during the post-world war II in Europe. Most of the facilities evaluated in [6] were found to have depreciated due to age; pressure on the facilities by over-use; and multiple users; and delayed maintenance decisions and poor funding.

Simulating the effect of design and building material choices on the energy efficiency, user comfort and expected toxic behaviour of a building at the pre-design or design stage is useful as presented by [9]. This paper argues that this exercise prevents costly mistakes at the design decision stage but when a design has been executed and put to use by occupants in a real life scenario, it is crucial to embark on POE for proper assessment of the success of the design and choice of materials. In real life cases,

material use are not irreversible therefore improvements and replacements can be made to enhance user comfort.

The personnel that are responsible for building maintenance works may hold the key to the quality and extent of success attained by any maintenance team. This prompted [10] to examine maintenance personnel and organizational structure of maintenance departments. It was found that building maintenance management is highly complex since it involved interaction between technical, social, legal, and fiscal determinants that control building use. It is therefore necessary to engage proper organization of management structure; skill improvement of maintenance personnel and creation of a platform for all necessary government structure to participate in the maintenance processes.

3. DATA GATHERING/ METHODOLOGY

A combination of qualitative and quantitative research methods was adopted for this study. A structured questionnaire was developed as the data gathering instrument for the survey. The 48 Masters students of architecture representing 30.57% of the total of 157 Post Graduate students of the university at the time of the survey were selected as the sample. A total of 40 questionnaires were returned from the 48 distributed to M.Sc. 1 and MSc. 2 students of Architecture of Covenant University in November 2012. The post graduate students of architecture constitute the majority of the candidates in the Masters programme of the university. They also constitute the majority of those who live in the camp house B. The M.Sc. Architecture students were appropriate for the survey respondents because of their familiarity with building maintenance practices; the subject matter and the fact that the nature of the programme makes them to be available on campus throughout the two academic sessions. The responses were therefore expected to be reliable. The variables investigated include Room size, energy utilization, structural safety, safety-in-use, passive cooling, design quality, perceived air quality, materials, finishes, day lighting, cleaning, repairs, waste disposal and maintenance. The data gathered were subjected to analysis using the Statistical package for Social Sciences SPSS 17, adopting mainly descriptive statistics, Pearson's moment correlation and the Chi-Square test of independence. In addition, an observation schedule was prepared to assist in gathering observed conditions and appearance of the components and functional spaces that constitute the buildings. Three professionals from the building industry rated the physical conditions of elements and components of the building on a scale of 1 to 4. The individual ratings were harmonized and reported in table 2. Pictures were also taken to validate and enhance the observed data.

4. BUILDING DESCRIPTION

The World Mission Agency also known as the Winners Chapel International are the owners of the Camp houses built for the purpose of housing visitors, worshipers and ministers who come for services, special programmes and academic related issues in the various educational arms of the ministry. Simply put, the facilities were provided for lodging and spiritual camping. The

Camp Houses of the blocks A and B were constructed and delivered in the year 2000. The seven buildings are 13 years old and have been fully utilized all through the period. This paper evaluates two of the three buildings (blocks) in Camp House B which were approved for the use of the Covenant University Masters students from 2011 to 2012. Each building contains 40 rooms designed in two rows of double banked rooming arrangement separated by a narrow courtyard. Twenty rooms are located on the ground floor while the other twenty are located on the first floor.

The buildings were constructed with reinforced concrete post and beam structural system. Floors of the internal spaces were tiled with vitrified ceramic tiles at the entrance lobby, lobbies and wet area while the rooms were tiled with enamelled ceramic tiles. The windows are dark anodized aluminium projected windows while entrance doors are also glazed dark anodized aluminium double swing doors. The doors to the rooms are painted hardwood timber panel doors. Long span aluminium roofing sheets adorn the roof of the building. The external walls are rendered with cement/sand rendering and decorated with textured paints, other interior spaces such as lobbies and lounges were also decorated with textured paints. The room walls were however decorated with emulsion paints.

Fig. 1: View of the Camp House B (block 1) showing the physical condition of the building

Fig. 2: View of the Courtyard of the Camp House B

5. DISCUSSION OF RESULTS

The data analysis covered descriptive statistics of the data regarding the factors of building performance; the user perception of the importance of these factors to user-comfort; Rating of the factors of building performance; and the relationships between user-comfort and selected factors.

5.1 Characteristics of Respondents

The respondents are Masters Students of Architecture in their first and second (final) years of the programme in the 2011/2012 academic session. Out of a total of 62 students, 58 of them were resident in the Camp House B. This number was made up of 15 female students and 43 male students. The survey respondents were 14 females (35%) and 26 males (65%). Since the building has 2 floors, 16 of the respondents were accommodated on the ground floor while the other 24 were accommodated on the first floor. The occupant per room was a maximum of 2 which constituted 65% of the number while the single occupant room were 35% of the respondents. As a measure of user comfort the time spent in the room per day was examined. Time spent in the room during the daytime outside the lecture/studio periods will be less if the occupants found better and more comfortable places to stay at that time. It will however be more if the occupants can continue the activities of the day in the room. The analysis revealed 60% of respondents spending 8hours and more in the rooms during the day between 6am and 10pm. The least percentage (5%) of respondents spends 7 hours in their rooms during the stipulated period while 25% of them spend 6 hours. Only four students representing 10% of the respondents spend 4 hours of the period in the room, but rather spend more time in the architectural design studio and other locations they consider comfortable.

The nature of the respondents' academic programme encourages reading, some drawing, and relaxation in the rooms if the spaces are found comfortable. The study confirmed 90% of the respondents spending substantial time in the rooms daily. The factor of Adequacy of room space was also examined and 30 of the respondents representing 75% agree that the spaces provided was adequate, 8 (20%) disagree while 2 (5%) were undecided.

Generally it is agreed by respondents that the spaces provided are adequate and it can be deduced from the results that the spaces offer appreciable user comfort.

5.2 Factor Rating for Building Evaluation Criteria

The factor rating executed in the data analysis presented the ranking of the factors using the mean score in the following order: Accessibility, cleanliness, security/privacy, general surroundings, flooring, leakages, spatial configuration, storage, components, room design, day lighting, toilets, aesthetics/furnishing and ventilation. The mean scores range from between 5.75 and 3.10 as seen in Table1 below.

TABLE 1

USER RATING FOR BUILDING EVALUATION CRITERIA

s/n	Building Evaluation Criteria	Mean	Standard Deviation
1	Accessibility	5.75	1.19
2	Cleanliness	5.65	1.79
3	Security and Privacy	5.30	1.47
4	General Surroundings	5.00	1.40
5	Flooring	4.90	1.72
6	Leakages (Roof/Plumbing)	4.70	2.42
7	Spatial Configuration	4.70	1.98
8	Storage	4.30	1.57
9	Building Components	4.15	1.96
10	Design	4.15	1.67
11	Day Lighting	3.90	1.19
12	Toilets and Sanitary functions	3.75	1.97
13	Sound Insulation	3.65	2.17
14	Aesthetics/furnishing	3.65	1.96
15	Ventilation	3.10	1.53

5.3 Analysis of User Experience

The problems experienced by the users in the building include the following in the order of severity: plumbing issues in the toilets, ventilation and room design as the major ones while others include spatial configuration, components, door locks, furnishing and appearance. A chart indicating these problems is shown in figure 3.

space can accommodate increasing needs of occupants but may not necessarily accommodate entirely new uses or functions. Time spent in the rooms is seen to be substantial but the thermal comfort within the spaces is derived from a combination of natural and electrically powered ventilation systems.
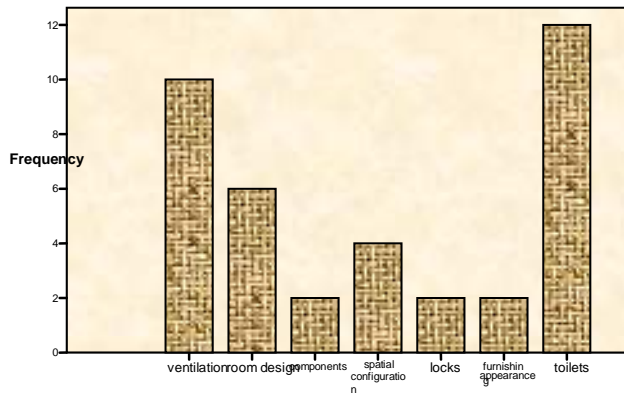

Fig. 3: Maintenance and User-Satisfaction problems identified by Users

The double banked arrangement of rooms naturally does not provide cross ventilation, hence the use of mechanical cooling systems and fans to support the thermal comfort of the interior spaces. The availability of regular and steady power supply makes this workable in the study context. Components such as timber panel doors and dark anodized projected windows need repairs and replacement in few cases. The fact that the respondents are knowledgeable in design makes the rating of the room design factor stringent. Notable among the omissions causing detailing challenges is the absence of ceramic skirtings in some areas. The challenges experienced with plumbing services within the toilet spaces agree with the findings of Zubairu (2001) therefore special attention should be devoted to plumbing services within lodging and public facilities, because of aging of components and the building itself and misuse by occupants.

5.4 User Comfort and Related Factors

The study examined the relationship between the time spent in the rooms and the perceived air quality and found a significant correlation. The results obtained from the analysis are presented: Pearson's $R= -0.451$, and $p < 0.5$. There exists no significant correlation between time spent in the room and the maintenance repairs executed in the buildings. The analysis report shows $R = -0.228$, and $p > 0.5$. This implies that the maintenances repairs on the rooms were minimal, reduces with the increase in the time spent in the rooms. The correlation coefficient was negative and insignificant. The maintenances repairs on rooms/ buildings did not determine the user perception of the comfort of the rooms. Chi-Square test of independence was executed between Adequacy of Room Space and Change in Functional Needs, the report shows a significant relationship between the factors with values: $X = 40.214$, $df = 4$ and $P < 0.5$. The chi-Square test results between Adequacy of room space and Adaptability to other uses show no significant relationship between the factors: $X = 2.828$, $df = 2$ and $P > 0.5$. The respondents' perception of the adequacy of the space provided is acceptable, therefore it implies that the

TABLE 2

CONDITION RATING OF THE BUILDINGS BASED ON PROFESSIONAL ASSESSMENT

1= Poor: requires immediate attention, 2= Marginal: Requires attention within 3Yrs, 3 = Good: Suitable for approx. 5 to 10 Yrs, 4 = Very Good: Suitable for 10+ Yrs		
S/N **Criteria**	Camp House (B Block 1)	Camp House B (Block 2)
1 Building Structure	**4**	**4**
2 HVAC	**3**	**3**
3 Fire	**3**	**3**
4 Roof	**3**	**3**
5 Floors	**4**	**4**
6 Electrical Installations	**3**	**3**
7 Plumbing Installations	**1**	**2**
8 Building Exterior	**3**	**3**
9 Interior	**3**	**3**
10 Windows	**3**	**3**
11 Doors	**2**	**2**
12 Landscape/External works	**3**	**3**
	2.88	

6.   CONCLUSION AND RECOMMENDATIONS

The Maintenance problems deduced from the data analysis and those observed appear in the areas that were not properly attended to by previous renovation works (Plumbing). Ventilation is poorly rated because of the inadequacies of the design, but this is however complemented by artificial ventilation systems installed in the building. The physical assessment of the buildings using the Condition rating approach concludes that the buildings are generally in a good condition requiring no major maintenance works within 5 to 10 years. Some plumbing problems observed have been recurring even after several maintenance repairs pointing to poor initial workmanship of the service. Furthermore, the building is structurally stable and materials are relatively durable and the environment is well landscaped and kept tidy at all times. The electrical services, structural safety, roof and the harmonious combination of materials and components of the Camp House B however are in a reliable and satisfactory state. The paper therefore recommends concerted efforts towards the training of plumbing services maintenance officers. Procurement and installation of high quality door locks and plumbing fittings have become necessary since good quality products may not last long enough in facilities provided for multiple users. Finally architectural design should satisfy passive ventilation and lighting systems to enhance low energy utilization in such facilities.

ACKNOWLEDGMENT

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