

Functionality of Post Occupancy Evaluation as a Measure for Performance in Public School Buildings

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Abstract: *Post occupancy evaluation as a well established building performance method, provides acceptable balance between aesthetic and functionality of the building. This paper focuses on POE as measure for the performance of public school buildings in Nigeria and how its application contributes to building functionality. The study draws data from earlier research conducted by the authors using questionnaires and semi-structured one-on-one interview. A total numbers of 27 respondents drawn from the management cadre of Rivers State Ministry of Education spread through 12 selected schools in 6 Local Government Areas of Rivers State. The data was quantitatively and qualitatively analyzed using descriptive statistical tools with thematic content analysis. The study found out that the POE process in building functionality include delivery and completion of successful building operation and maintenance, improvement in maintenance operation and lesson learnt feed into future maintenance and management practices. The study showed that the functions of POE as to ensure building functionality are conveying information on buildings eliminating unrepeated errors during and in future maintenance plan, collect data in actual settings and described performance rather than manipulation with mean score of >3.00. The findings further showed the purposes of POE in building functionality as consideration end-users' opinion onsite inspection of existing facilities, proffer building improvement solutions, and manage, improve and establish better building and maintenance standards with means score >3.00. The study thus recommends the application of POE as to reflect changing needs and expectations of the real estate industry by optimizing cost/benefit relationship with end-users' in mind. Its application functionality will enhance productivity satisfaction and efficiency of activities around the building increasing capacity to operate building features optimally.*

Keywords: *Functionality, Measures, Building Performance, POE, Public Schools*

1.0 INTRODUCTION

Post Occupancy Evaluation (POE) surpasses the collection of information about buildings and its facilities technical performance, functionality, operational processes and the examination of buildings as they are actually used by the various professionals. In the case of public school buildings, this information can be then compared to the original maintenance management intentions to determine the extent to which these goals were met based on the end-user's evaluation of how effectively the building functions (Nkpite, 2017). Therefore, POE can help the ministry of education owner of public school building collect and use timely, relevant, and well-disseminated information to impact on the maintenance management of future facilities

(Nkpite and Wokekoro, 2018). According to Nkpite and Wokekoro (2017), the actual functioning of public school buildings and its facilities to end-user's satisfaction are not met where the buildings are very rarely visited and assessed once they are handed over to the users as well as not functioning to the end-users' expectations. To ensure efficient functionality of public school buildings, post occupancy evaluation is vitally needed to reduce maintenance and operating cost, clarifying building objectives and improving general building performance.

The functionality of public school buildings currently in Nigeria do not meet specific standards of operation from government failure to manage and maintain public school buildings. Government is responsible to ensure that public buildings are functional; safe, secure, sustainable, accessible, cost effective to operate, and maintain, motivate and engender services delivery for its work force (Preiser, 2002). This is not the case with the Rivers State Government model primary school buildings which are in its poor functional state.

The school buildings are not only unhealthy, but they inhibit premature but steady and rapid deterioration, decay and dilapidation due to poor maintenance management. In response to this problem, our study proposes to investigate the functionality of public school buildings through POE for making the building more habitable. The study will carry-out an investigation into options for making public school buildings functional to the end-users. The study will also consider the functions of POE as to mitigate the problems of poor functionality of public school buildings. The scope of this study is limited to public school buildings, particularly, the newly built prototype Rivers State Government model primary school buildings in all the 23 Local Government Areas of the state. The schools were constructed at different started dates across the state; from 2007 to 2010, and occupied from 2011 to 2015 to use as a test case for public school buildings in Nigeria.

2.0 LITERATURE REVIEW

2.1 Understanding the Concept of Functionality

Functionality is described the Oxford Advanced Learner's Dictionary as, "the purpose that something is designed for or expected to perform" (Hornsby, 2003). The quality in public school buildings being very suitable for the purpose it was designed and built, when the maintenance management is performed in accordance with prescribed procedures and resources (Nkpite, 2017). In concluding and deducing from the above definitions, functionality in the context of this paper is seen as "a maintenance management characteristics; qualifying maintenance management with respect to needs and expectation of the end-users regarding the standard of management and maintenance of the buildings by government (Nawawi and Khalil, 2008; Ibem, Opoko, Adeboye and Amole, 2013).

2.2 Functionality of Public School Buildings

A completed and functional building should able to perform its functions in the way that ensure satisfaction to the end-users (Nawawi and Khalil, 2008). Generally, to ensure that the building is functioning well at all times, regular maintenance programmes are conducted after the building has been occupied (Nawawi and Khalil, 2008; Olagumju, Adedayo, Ayuba and Abiodun, 2013). By execution of maintenance programme the end-users will be able to use and utilize the facilities as the provision of facilities supports the business operations of the end-users (Nkpite and Wokekoro, 2017). In short, the buildings, facilities and services must be fit for the purposes of the end-users to prove its functionality. To ensure buildings functionality, POE provides a system for achieving the mutual interaction process between buildings and end-users' needs and

for recommending the manner of improving the environment necessary to accommodate these needs (Ibem et al, 2013). The evaluation of completed buildings ensure that the building efficiently fulfils the purpose for which it was built and also ensuring the end-users' satisfaction when the building is functioning (Olagunju et al, 2013). On the other hand, the maintenance aspect of buildings is carried out over a period of time after a building has been occupied in order to sustain and preserve its functionality.

○ **Building Functionality Failure**

A number of reasons may be deduced on why building performs poorly in meeting end-users needs and expectations in public school buildings. According to Ibem et al (2013), the reasons are: (i) lack of adequate knowledge of end-users' changing needs and preferences by experts who design, construct and manage buildings,(ii) inadequate research on this subject (POE).

Typically, public school buildings need to provide physical protection to its end-users and assets including protection from crime, vandalism, terrorism, fire, accident and environment elements (Khalil et al, 2015). The failure of building functionality concerns on matter of not prioritizing POE as the main aspect among previously established criteria in public school building performance assessment such as maintenance, energy issues, environmental issues, and facilities management which affected the activities of its end-users' (Olanrewaju et al, 2012b). To sustain the performance and anticipate long-term performance, building diagnostic has the potential of rapidly becoming a major tool in building appraisal as to evaluate the functionality and to assess suitability (Almeida et al, 2010). Wong and Jan stated that building evaluation is the first priority before one can effectively predict future building performance as it is imperative to know the status quo of the building functionality.

2.4 Functions of Post-Occupancy Evaluation

POE functions relate to client's goals and performance criteria set by experts to measure the effects of buildings and the surrounding environment and end-users. To understand how the end-user feels about their buildings (Preiser, 1999). POE helps to provide basic information on users' needs, preferences and satisfaction (Vischer, 2002). Succinctly put, POE primarily seeks to improve quality maintenance and management of buildings and by extension promote sustainable built environment. Meir et al (2009) stated that bringing conceptions and aspiration of building in use closer to actual practices and functionality, POE has the ability to bridge the static performance conceived for the building versus the dynamic functioning when real end-users' interact with and modify these static features.

○ **Process of Post-Occupancy Evaluation**

The process of POE provides an extension to other technical assessment such as energy audit, building audit, maintenance and operation review security, inspections and other programmes developed by building and facility management in the public schools (Preiser, 2002). Simmerman and Martin (2001); Nkpote and Wokekoro (2018) asserts that POE test generic and specific aspects of the planning and detailed maintenance of building and facilities; where their impact is tested on building end-users' with respect to several parameters of functions, indoor environment quality, health and safety and security. The process of POE in building functionality is the requirements of technical performance that are normally established in specification and its performance as best measured by the degree of variation from those listed in specification (Nkpote, 2017). Shohet (2002) also claimed that functionality is an important measure for building maintenance activities through POE. According to Khair et al (2012), the main processes to POE include those that focus on the; (i) functional suitability of buildings that

is space utilization, physical condition, safety and statutory requirements, (ii) quality assessment of buildings, (iii) serviceability of building with respect to end-users' needs and facilities provided, (iv) environmental performance in terms of IEQ, AQ, intrusion control appearance and lighting, (v) users' satisfaction with design and construction of and services in building.

This appear that at the inception of building occupation; end-users build on various expectations of the performance of their building, functionality, it will provide the needs it should meet as perceived. However, in order to overcome some of the barriers to the widespread of the building use and level of proper maintenance management, POE need to be incorporated as a necessary step in building functionality in the project production and delivery, and portfolio and asset management processes. In addition, functional issues that traditionally have limited the effectiveness of POE need to be addressed, and that may require major structural and organizational changes with respect to how POE are defined and conducted. Hence, this study was an attempt to bridge the gap in research through examining the functionality of POE in public school buildings in Nigeria.

3.0 RESEARCH METHODOLOGY

This study involves a number prototype buildings built by the Rivers State Government, the investigative POE was adopted as the most suitable technique. The study was conducted on 138 completed and functional Rivers State Government model primary schools across the 23 Local Government Areas of Rivers State, Nigeria. This study utilizes one-one- one structured questionnaires interview questions with key stakeholders from ministry of education. The study population consists of 27 high ranking officials responsible for the maintenance and management of school buildings in the ministry. It includes UBE secretaries, head teachers, maintenance officers, Directors of project, procurement and primary school services departments. Non-probability purposive sampling technique was adopted to select 6 universal basic education secretaries from 6 local government 12 head teachers from 12 schools, 4 maintenance officers, 1 procurement Director, 1 project Director, and 1 primary school services Director and taking 2 schools from each of the 6 local government areas as detailed in Table 1.

Table 1: Characteristic of Study Respondents (Population)

| Officials Ranking | Frequency | Percentage % |
|-------------------------------------|-----------|---------------|
| UBE executive secretaries | 6 | 22.2 |
| Head teachers | 12 | 44.5 |
| Director of project | 1 | 3.7 |
| Director of procurement | 1 | 3.7 |
| Director of primary school services | 1 | 3.7 |
| Chief maintenance officer | 2 | 7.4 |
| Maintenance officer | 4 | 14.8 |
| Total | 27 | 100.00 |

Source: Author's Field Survey, 2017

Excluding the executive secretaries and head teachers, most of other respondents were building professionals made up of architect, estate surveyors, quantity surveyors and civil engineers. They

were persons who are well experienced in the built environment professions, so their opinions about the building that work well and best would be counted reliable

The structured questionnaire interview were analyzed using the thematic content analysis; a process that is aimed at producing and issues addressed in the interviews will links the themes and interviews together under a reasonably exhaustive category system (Burnard, 1991). The themes, also referred to as codes are drawn from existing theoretical ideasthat the researchers brought to the data (deductive coding), or from the raw data itself (inductive coding) (Marks and Yardley, 2004). The study employed both the deductive and inductive coding systems. On the other hand, the content analysis approach results is a numerical description of features of a given text or series of images, whereas, the thematic analysis emphasizes the qualitative aspects of the materials analyzed (Marks and Yardley, 2004).

4.0 RESULTS AND ANALYSIS

The results of the study are presented below.

4.1 Processes of POE in Public School Functionality.

It is essential to ascertain the process of POE in public school buildings functionality. Table 2 showed that 85.2% respondents agree that the process of POE is lesson learned applied to future projects, while 81.5% agree as providing potential for further improvement, 70.4% as completion of development successfully, and 62.9% as delivery of building maintenance successfully. With an average of 75.0% of the respondents agreeing to the listed items below; it implies that POE has a functionality process of identifying the major strengths and weakness of public school buildings from end-user’s perspective. An in-depth interview with the respondents revealed that the understanding of the entire process of POE is essential, as it enables analyses of interfaces between stages and the use of POEs for feedback; based on quality indicators.

Table 2: Process of Post-Occupancy Evaluation

| Process of POE | YES | | NO | | TOTAL | |
|--|-----------|-------------|----------|-------------|-----------|------------|
| | Freq | % | Freq | % | Freq | % |
| Delivery of building maintenance successfully | 17 | 62.9 | 10 | 37.1 | 27 | 100 |
| Provides potential for further improvement of building | 22 | 81.5 | 5 | 18.5 | 27 | 100 |
| Completion of project development successfully | 19 | 70.4 | 8 | 29.6 | 27 | 100 |
| Lesson learned applied for future maintenance works | 23 | 85.2 | 4 | 14.8 | 27 | 100 |
| Average | 20 | 75.0 | 7 | 25.0 | 27 | 100 |

Source: Author’s Field Survey, 2017.

4.2 Functions of POE in Public School Buildings Functionality

The respondents were required to state their feelings regarding the listed items on functionality of POE in public school buildings. Table 3 indicates the various functions of POE in public school buildings functionality as identified by the respondents. The major functions are; convey the buildings that work well and best with mean of 3.56, eliminating unrepeated errors in future maintenance of building with mean of 3.41, described the performance of building rather than manipulation of process with mean of 3.14, and data collection is done in actual settings with

mean of 3.00 respectively. It implies that the actual functioning of public school buildings play a vital role in determining end-users’ satisfaction with their environment that enhances teaching and learning.

Table 3: Functions of POE (N= 27)

| Option | 5 | 4 | 3 | 2 | 1 | Sum | Mean \bar{x} | Remarks |
|--|---|---|---|---|---|-----|----------------|---------|
| Convey buildings that work well and best | 8 | 7 | 6 | 4 | 2 | 96 | 3.56 | Agree |
| Eliminate unrepeated errors in future building maintenance | 7 | 6 | 8 | 3 | 3 | 92 | 3.41 | Agree |
| Described performance of building rather than manipulation | 5 | 6 | 6 | 7 | 4 | 85 | 3.14 | Agree |
| Data collection done in actual settings | 5 | 5 | 7 | 5 | 5 | 81 | 3.00 | Agree |

Legend: < 3.00 Disagree, > 3.00, Agree

Source: Author’s Field Survey, 2017.

4.3 Purposes of POE in Public School Building Functionality

Table 4 shows the purpose of POE in public school building functionality in the case study. The major purposes identified are systematic consideration of end-users’ opinions about building in use with a mean score of 3.70, onsite inspection of existing infrastructure with mean of 3.56, prescribed possible ways of improving these facilities with mean of 3.48, developing new facilities management ideas with a mean score of 3.41, managing and improving on existing buildings with mean of 3.14 and established better building and maintenance standards with mean score of 3.00.

Table 4: Purposes of POE (N = 27)

| Purposes of POE | 5 | 4 | 3 | 2 | 1 | Sum | Mean \bar{x} | Remarks |
|--|---|---|---|---|---|-----|----------------|---------|
| Systematic consideration of end-user’s opinions about used buildings | 9 | 7 | 7 | 2 | 2 | 100 | 3.70 | agree |
| Onsite inspections of existing infrastructure | 8 | 7 | 6 | 4 | 2 | 96 | 3.58 | agree |
| Prescribing possible ways of improvement of these facilities | 8 | 6 | 6 | 4 | 3 | 94 | 3.48 | Agree |
| Developing new facilities ideas | 7 | 6 | 8 | 3 | 2 | 92 | 3.41 | Agree |
| Managing and improving on existing building maintenance plan | 5 | 6 | 6 | 7 | 4 | 85 | 3.14 | Agree |
| Establishing better building and maintenance standards | 5 | 5 | 6 | 6 | 5 | 81 | 3.00 | Agree |

Legend: <3.00 = disagree, >3.00 = Agree

Source: Authors’ Field Survey, 2017.

4.4 Usefulness of POE in Public School Buildings Functionality

Table 5 reveals the usefulness of POE in public school buildings functionality. The major usefulness of POE in public school building functionality identified are; planning/budgeting or

additional furnishings and equipments correct representing 81.4% that agree, while 18.6% disagree. Planning/budgeting for rectification, modification to correct short coming was 85.2% of the respondents that agree, while 14.8% disagree. Incorporating findings into future facilities maintenance and management standards was 74.1% of the response that agreed, while 25.9% disagree. Informing government about infrastructural failure of its significant findings with proffered solution was 70.3% that agree, while 29.7% disagree. Then, formulation and implementation of government policies to develop new theories on the performance of building was 63%, of the respondents that agreed, while 37% disagree. It implies that the dissemination of information on the performance of building spaces and fabrics are useful to stakeholders of the building industry as well as to the public.

Table 5: Usefulness of POE

| Options | Agree | | Disagree | | Total | |
|--|-------|------|----------|------|-------|--------|
| | Freq | % | Freq | % | Freq | % |
| Plan/budget for additional furnishing and equipments | 22 | 81.4 | 5 | 18.6 | 27 | 100.0 |
| Plan/budgets for rectification, modification to correct short comings | 23 | 85.2 | 4 | 14.8 | 27 | 100.0 |
| Incorporate finding into future facilities maintenance and management standards | 20 | 74.1 | 7 | 25.9 | 27 | 100.00 |
| Inform government on infrastructure failure from its significant findings with proffered solutions | 19 | 70.3 | 8 | 29.7 | 27 | 100.0 |
| Formulation and implementation of government policies as to develop new theories on performance | 17 | 63.0 | 10 | 37.0 | 27 | 100.0 |

Source: Author’s Field Survey, 2017.

5.0 DISCUSSION OF KEY FINDINGS

The study investigated the functionality of post-occupancy evaluation (POE) of Rivers State Government Model Primary School Buildings in Rivers State, Nigeria. The study reveals that the process of POE in public school functionality include deliver of successful building maintenance, provide potential for further building maintenance works, and lesson learnt applied to future maintenance works. The process of POE serves feedback in order to eliminate defects reduces future maintenance cost once the building has been put into operation. When public school buildings are involved in POE process, the systematic approach can aid the strategic planning of each stage of maintenance by optimizing the cost/benefits relationship, and always having the end-users of the building in mind to ensure the functionality of the school buildings.

The study further showed that more than half of the end-users with a mean of >3.00 agree the functions of POE are conveying information on buildings that work well and best, eliminating unrepeated errors in future maintenance, plan of public school buildings, does not manipulate data collected, but described performance, in actual settings data are collected. The fundamental aim of building maintenance management is to enhance productivity, satisfaction and efficiently of activities taking place around the building with inputs available from POE that

can identify where the behavior of buildings end-users undermines their functioning and enlightenment of users that are critical to prevent and increase the capacity to operate the building features optimally.

Furthermore, as shown in the study, more than half of the respondents with mean score >3.00 agree the purposes of POE in public school building functionality include systematic consideration of end-users opinions about the building used, onsite inspection of existing infrastructure, prescribing possible ways of improvement of these facilities, developing new facilities ideas, managing and improving on existing building maintenance plan and establishment better building and maintenance standards. POE reflect the changing needs and expectation of the real estate industry significantly with the evaluator's desire to make tight, unequivocal and scientific arguments to control as possible real life situation of building components and its facilities using field data.

6.0 CONCLUSION AND RECOMMENDATIONS

The study has examined the functionality of post-occupancy evaluation (POE) of Rivers State Government Model Primary School Buildings in Rivers State, Nigeria. The study reveals that the process of POE in public school functionality include deliver of successful building maintenance, provide potential for further building maintenance works, and lesson learnt applied to future maintenance works. The study concludes that the usefulness of POE to public school buildings functionality cannot be undermined, since POE seeks to plan/budget for rectification and modification of buildings to correct short comings, incorporate findings into future facilities maintenance and findings into future facilities maintenance and infrastructures failures from its significant findings with proffered solutions and formulate and implement policies as to develop new theories of on building performance.

The study therefore recommended that in order to gain comprehensive knowledge of the overall performance of the public school buildings, its functionality should be assess with the use of POE. Therefore, it has become imperative for the school buildings to meet the needs, expectation and aspiration of end-users with the fail state of performance due to lack of maintenance. It is also recommended that POE be adopted for analyzing the maintenance of the buildings, as well as serving as a building asset and facilities management tool for effective building functionality.

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