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FEEDBACK INTEGRATION IN ARCHITECTURAL DESIGN: TOWARDS ENHANCING THE PROCESSES AND OUTCOMES

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ABSTRACT

Scholars have attributed the unsatisfactory performances of buildings and other built spaces planned, designed and constructed by architects to their poor attitude to built environment feedback as an important feedforward that should be integrated into the design process of future or new designs. Rather, many architects prefer to solely rely on the established or published best practice design guidance such as time savers standards, architectural data or other architectural archives in the architectural design process of subsequent projects or commissions. The achievement of sustainable buildings and environments with the current architectural design process required that architects generate built environment feedback from their buildings in use. This approach can greatly make the architectural design process more scientific and sustainability oriented with many lessons learnt for improvements of the built environment entirely. This study has examined what are built environment feedbacks, their significance as feedforwards and integration into the architectural design process by the architects in contemporary practice. The study further addressed the need for increased knowledge and awareness of built environment feedback as an important tool to achieving sustainability.

Keywords: Built Environment Feedback, Architects, Architectural Design Process, Conceptual Framework, Sustainability

Introduction

Scholars have proposed a systematic approach to architectural projects feedback as important feedforward to new projects in the delivery of sustainable built environment. Sustainability of buildings can provide social, economic and environmental benefits. In order to realise the full benefits of sustainability, it is important that necessary strategies for its achievements be incorporated into buildings throughout its lifecycle. Buildings are planned, designed and constructed to provide conducive, safe and functional environment for users. As such, the functionality of a building is defeated if it cannot provide the required environment for its intended activities. For buildings, fulfilling user needs is a key factor (Olanrele et al, 2013). As such, the improvement of user satisfaction quality in buildings has become a major target and requirements of built environment sustainability that professionals strive to

attain from inception through to completion up to occupation of the building.

Hassanain and Mudhei (2006) and Hassanain et al, (2020) have attributed the faulty performances of buildings designed and constructed by architects to their poor attitude to built environment feedback as an important user-based assessment that should be effectively integrated into the design process rather than solely relying on the generally established or published best practice design guidance such as time savers standard or architectural data in order to save design time. According to Rigolon (2011), this approach proposes a humanistic view to architectural design that reflects the preferred lifestyle of people at the centre of the design process, this will make the design process more scientific and research orientated with many lessons learnt for improvement of future designs and the built environment entirely. Collecting information inform of feedback from real and supposed users of a designed environment in use about its performances is gradually gaining prominence. This field of study is called post occupancy evaluation. Post occupancy evaluation (POE) provides a platform for a systematic and objective assessment of the performances of a built facility from the point of view of the users in form of feedbacks. According to Ibem et al, (2013), the feedback obtained identifies the attributes that users look for in any built environment or facilities. Gopikrishnan (2014) established that these attributes vary depending on the type of facilities like buildings, roads etc, but in the case of buildings, the indicators can cover the technical, functional and behavioural aspects of the building.

Statement of the Problem

Buildings designed by architects are expected to meet functional, environmental and user satisfaction demands. However, studies have found out that the failure of buildings to perform effectively on a long-term basis can be attributed to a number of factors including persistent cycle of design performance mismatches due to poor knowledge of post occupancy evaluation (POE) by architects or designers. Also, most times, designs often proceed with minimal or no user inputs that lead to solutions that do not align with user behaviour or needs. There is the need for a systematic appraisal of buildings that could assist to generate built environment feedbacks that can be used to improve existing buildings and environments and also inform new or similar designs. The task of getting the building users more engaged with the architect in the design process is difficult due to the nature of the architects' professional training which does not encourage interactions across other sectors beyond the built environment. Feedbacks can improve the built environment and provide data necessary to develop environmental guidelines, codes and standards for sustainability. This study proposes feedback driven architectural design process that relies on post occupancy generated insights.

Justification for the Study

After occupancy, buildings and other designed spaces need to be assessed especially from the point of view of the users since the buildings are designed and

constructed to meet their needs, desires and aspirations. However, in spite of the benefits in building appraisals, user satisfaction for improvements in the built environment is still facing neglect due to the unwillingness of stakeholders to advance it benefits. Gathering and dissemination of information or data on building in use can have immense benefits. Improved understanding of the relationship between people and their physical spaces could assist in the process of architectural design thereby increasing the quality of the final product (TavasoliAra and Bashiri, 2015). Feedback obtained from systematic appraisals can play important role to help us understand the human responses to the built environment.

Literature Review

The Architectural Design Process

Scholars have raised concerns about the attitude of practising architects to feedback obtained from the buildings they make. Oreszczyn (2004) and Dursun et al, (2008) established that feedback have been dissociated from the practice system and that architects rarely get involved in their projects after completion when their buildings start their operational lives and that the practice of collecting feedback from the existing buildings and environments in use as feedforward for future designs is still missing among architects and very few consistently collect information on whether or not their buildings work during their operational lives. The environmental impacts of such buildings nor the reality about its fitness for purpose are not assessed after occupation and the architect moves on from one project to another producing several designs throughout their professional career.

Rigolon (2011) observed that the designer needs to "listen "to what the people would like from their object or their spaces. Bordass et al (2001) argued that buildings particularly add value for clients, occupiers, the economy and the environment. In spite of this, opportunities are regularly missed and value needlessly subtracted because designers do not learn from the buildings they make. In order to avoid common pitfalls and make the most of the potential, architects need to obtain right feedback from previous projects and their performance in use and feed this forward into the product and into the procurement process. Some scholars, however have shared their opinions about the barriers or limitations to embracing feedbacks in the design and construction processes, Oreszczyn (2004) agreed that architectural training and practice have not aligned with current feedback techniques and mechanism that focused on performance metrics. Croome (2019) also believed that architects need to involve users more in the design of buildings and that we need a much broader based education of architects for the future. Also, Kelly et al (2011) have argued about the extent to which current feedback mechanisms matched architects' values and what new or revised mechanisms could be developed to respond to any identified disparities. Gorgolewski (2005) had also observed that the majority of the feedback techniques are currently client or user focused rather than designer focused as design feedback. Architects are human

beings, and as Swartz (1976) opined, human beings learn from their mistakes provided that they are aware of them. Efficiency increases with learning and the starting point of the learning process for architects is the feedback.

Post Occupancy Evaluation (POE)

Post occupancy evaluation (POE) has become a widely used method amongst other methods and techniques in the evaluation process and feedback generation in the built environment (Akuete, et al, 2021). Post occupancy evaluation is described as a more specific process of systematic data collection, analysis and comparison with explicitly stated performance criteria about the occupied built environment (Preiser, 2001). POE understanding lies in understanding space's performances based on it's technical aspects (spatial and space conditioning elements) and the functional aspects of end users' comfort regarding circulation and space planning. Akuete et al, (2022) agreed that quite often times, POEs are poorly implemented due to poor understanding and fragmentation of the knowledge by architects. The methodologies of applying POE as discussed in the literature include indicative, investigative and diagnostic. Indicative entails quick walkthroughs involving key personnel using a structured interview, group meetings with end users and inspection team. Investigative POEs required an in-depth analysis of users' requirements using interviews and questionnaires on similar projects and diagnostic POEs tend to be broader in scope and considers facilities that have similar features while adopting technologies and some other human behaviour research techniques. According to (Hassanain et al, 2021), the adoption of POE methodologies in built environment appraisals has given rise to improving the technical, functional and behavioural performances of buildings and facilities in meeting the needs and expectations of users. Formal assessment tools for POEs included questionnaire surveys, walkthroughs and focus group discussions to reveal how the built spaces is performing functionally, technically and behaviourally.

Systems Thinking in Architectural Design

This is a conceptual framework that emphasises relationships, feedback loops and dynamic behaviour overtime, rather than viewing design components in isolation. In architecture, it means designing with an awareness of: interdependence (how one decision affects others), whole building performance (energy, comfort and use), lifecycle thinking (design, use, maintenance, decomposition) and human and environment feedback (social behaviour, climate impacts). One of the key characteristics of system thinking in architecture is the feedback loop that incorporates the feedforward (proactive) and feedback (reactive) mechanisms to adapt and improve design (Monat and Gannon, 2015). The feedback loop is usually employed in human centred design where considerable attention is given to how spatial layout affects productivity, social interaction and well-being and the outcome is further fed into the system in achieving continuous improvements. Systems thinking architectural design helps to quickly identify unintended consequences early in the design process and can lead to more sustainable and

resilient designs while enhancing user satisfaction and building performance through informed and adaptive solutions. In the architectural design process, the feedforward and feedback loop mechanism is a system that ensures user centred, responsive and iterative design outcomes. It facilitates a two-way flow of information (anticipatory and reactive) that informs decision making at every stage of a building's lifecycle (Monat and Gannon, 2015)

The Feedforward Loop (Proactive Phase)

The feedforward loop involves the use of anticipatory information such as user needs, site analysis, historical data and predictive modelling to inform the design process before construction or implementation (Krut and Strycharz, 2017). Components of the feedforward loop include, user-needs assessment (surveys, interviews and behavioural mapping), environmental analysis (climate, site conditions and topography), simulation and forecasting (thermal modelling and space use prediction), and, regulatory and cultural inputs (codes, traditions, community expectations). Feedforward loop acts as a preparatory guide that shapes initial design concepts to align with projected performance and user requirements.

Feedback Loop (Reactive Phase)

The feedback loop is a process that captures real time or post occupancy data to evaluate how well the built environment meets its intended goals. It further enables designers to adjust or iterate future projects. Components of the feedback loop included post occupancy evaluation (user satisfaction, comfort and functionality), environmental performance metrics (energy use, daylighting and acoustics), behavioural observations (movement patterns and space utilisation) and stakeholders review and reflection (client, community and professional inputs).

Feedbacks represent systematically collected built environment or performance data for analysis and comparison with explicitly stated performance criteria about the occupied buildings. Built environment feedback represents the outcome of systematic appraisal or post occupancy evaluation on how buildings perform and how they are experienced by their occupants in use. Bordass et al (2001) gave a general overview of feedback as feeding knowledge of outputs back into inputs in order to improve outcomes. It connects activities including performance assessment and benchmarking, design quality assessment and whole- life value into achieving excellence in the procurement process and improving the completed facilities and its performance. But, why generating feedback in the architectural design process? Clements-Croome (2019) stated that built environment feedback can assist us to understand why architectural theory and practice employed by architects in the design process do not always agree and provides a platform for building appraisals for improvements. Accordingly, in order to save the built environment and users from the errors and problems witnessed in a particular environment from repeating itself simultaneously and continuously by the same or other architects, in same or other similar projects or environment, it is necessary to develop feedbacks. So, feedback has become

a systemised learning process which fills gaps in existing knowledge besides updating it for the architect and other stakeholders (Clements-Croome, 2019). Oreszczyn (2004) had further established that in order to achieve sustainable buildings and the provision of adequate environment that function well, current architectural practice need feedbacks. Feedbacks provides retrospective insights to refine existing designs or inform future ones. It further promotes adaptive and human centred design practices.

Loop Dynamics in the Design Process

In the architectural design process, feedforward and feedback loops establishes a continuous cycle of learning and improvement. This aligns the architectural output with both predicted expectations and actual performance thereby strengthening the relationship between design intent and user experience. As shown in Figure 1, the conceptual diagram shows the architectural feedback and feedforward loop in the lifecycle of a building. The loop is a representation of how proactive or anticipated design strategies and reactive adaptations interact for improvements in building performance, user satisfaction and environmental response. The feedforward loop represented decisions made before design and construction of the built space based on anticipated conditions. The building represents a physical realisation of all the proactive or anticipated strategies employed at the feedforward phase.

The feedback loop commences after the building is completed, occupied and put into use. It appraises the building's response to real-time and performances.

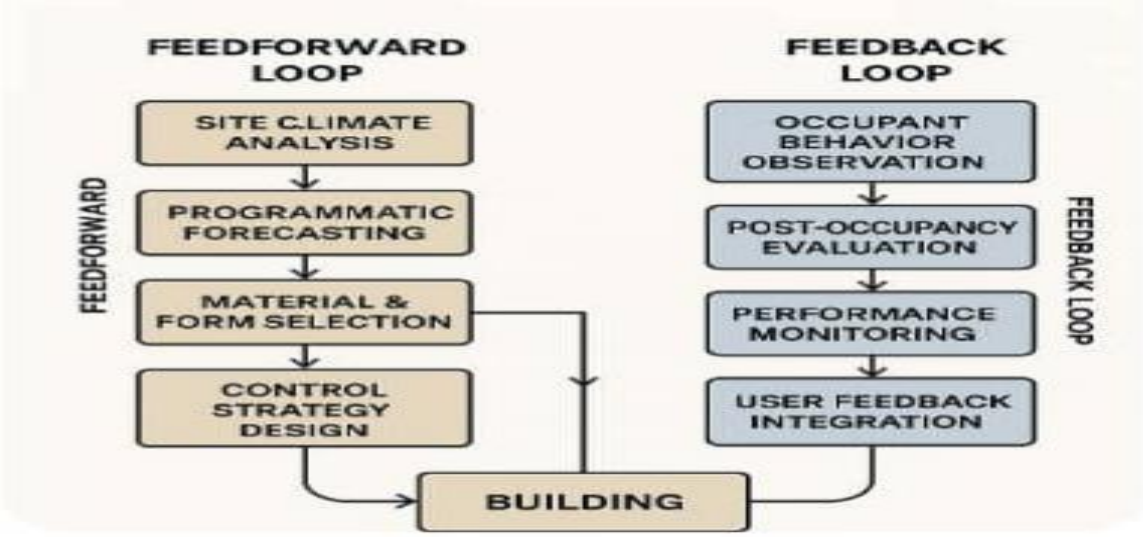


Fig. 1: Conceptual framework of the users' feedback integration (feedback and feedforward loop) in a building's lifecycle.

Methodology

The study has adopted a qualitative research approach relying on the review of outcome of a case study evaluation of three buildings in use designed by same architectural practice. The study had relied on the use of interview schedules and questionnaire survey to elicit relevant data from the stakeholders. It is insightful to bring out the methodology employed in this case so it can provide a veritable platform for future studies on the subject matter and the immense benefits it offers local architectural practices who are willing to embark on the same exercise. Moreover, it illustrated the practically of the feedback and the feedforward loop or mechanism of embarking on a successful POE exercise. For each case study, interviews with the designers were able to provide information on the preoccupancy phases (design and construction) of the buildings. Informal interview sessions provided information on key design decisions which in the opinion of the interviewees influenced the environmental performance of their buildings together with the development of the project during construction and commissioning. The exercise at the post occupancy phase (after occupation) compiled information on energy use, user comfort and satisfaction and some other conditions encountered. The architectural practices involved received acclaim with regards to their design and construction in relation to its use of brickworks and glass while the building users were questioned based on relevant issue. Questions were rated on a 7-point scale of various design parameters. The lessons drawn from pre and post occupancy studies were then fed back at a seminar which included the architects involved in the project from the inception. At this phase, questionnaire survey was used to obtain their judgement on the relevance and applicability of the feedback.

Findings and Discussion of Findings

The two main phases of the projects reviewed are the pre-occupancy and post occupancy phases. Pre-occupancy phase involved the design and construction. Findings from the evaluation and review of successes recorded on the three buildings in use and designed by the same architectural practice were recorded and the lessons obtained from there were documented.

Findings at this level revealed barriers to feedback generation in the built environment. These included uncertainty in funding if clients are unwilling to fund the project, perceived low value of the benefits gained, the breakdown of relationships between parties as the project is coming to an end and finally the designer's possible liability for any problems encountered while carrying out POEs. Findings further revealed that sometimes, design decisions are taken for aesthetic without considering their environmental impacts. The study further identified areas that need improvements. As a result of the findings, the architects involved in the study considered the feedback lessons as very relevant for their work and future projects. The process was tailored to achieve smooth information loop that promotes feedback and ultimate improvements.

At the post occupancy phase of the study, issues were centred around various design and environmental parameters of the buildings. Responses to them were compared with the published best practice guidelines (Andreu and Oreszczyn, 2004). For example, in the area of energy consumption, the architects did not give consideration to this aspect at the design stage.

Conclusion

This study concluded that embedding feedforward and feedback loops into the architectural process can elevate the quality and relevance of built environments. The feedforward loop is about designing with foresight while the feedback loop is about learning from reality. Together, they ensure that built spaces are responsive, resilient and user centred.

It empowers architects to move from static design thinking to dynamic, evidence-informed practice where each design is a hypothesis tested by reality and refined by experience. The outcome of the case study adopted in this particular study aggregated the views and opinions of participant architects and concluded that feedback was necessary and that there were no disadvantages to feedback generation. Also, issues of time and money may not be important compared to the benefits. They, however, agreed that considering feedback might curtail architects design freedom. Some of the advantages of incorporating feedback in the design process included improvement of future designs and informing new briefs, assessing building performance, getting user design input and providing a basis for discussing comfort with clients at an early stage.

Recommendations

The study recommended developing a positive change of attitude to feedback from architects. Architects must get involved in their projects after completion, that is the point buildings start their operational lives. Also, lessons learnt from the study should be widely applicable to architects in practice as it seems imperative that they revisit the buildings they have designed to obtain necessary feedbacks. These adaptations can feed into current building operations and inform future designs in achieving sustainability.

REFERENCES

Akuete, E., Nduka, D. O. & Ogundipe, K. E. (2022). Maintenance feedback mechanisms and limiting factors of post occupancy evaluation in students' residents of higher education institutions in Nigeria. *Journal of construction in developing countries, 27(2).*

Andreu, I. C. & Oreszczyn, T. (2004). Architects need environmental feedback. *Building Research and information, 32(4), 313-328.*

Bordass, B., Cohen, R., Standeven, M., and Leaman, A., (2001). Assessing building performance use 2: Technical performance of the probe buildings. Building research and information 29(2), 103-113

Clements-Crome, D. (2019). The role of feedback in building design 1980-2018 and onwards. *Building services, Engineering research and technology, 40(1), 5-12.*

Kelly, G. (2015). Understanding how improved feedback to architects can support design of more adaptable buildings (doctoral discretion, Loughborough University).

Dursun, P and Ozsoy, A. (2008) How can architects learn from their own experiences? *A/Z ITU Journal of the faculty of architecture, 5(2), 82-95.*

Monat, J. P. & Gannon, T. F. (2015). What is systems thinking? A review of selected literature plus recommendations. *American Journal of systems science, 4(1), 11-26.*

Presier, W.F. (2001) The evolution of post occupancy evaluation: Towards building performance and universal design evaluation. Learning from our buildings: a state-of-the art-practice, Summary of post occupancy evaluation, 9-22.

Rigolon, A. (2011). A space without meaning: Children's involvement in participatory design process. "Design principles and practices", 5(2), 151-163.

TavasoliAra, F., & Bashiri, S. (2015). The role of behavioural sciences in environmental design: An emphasis on the need for collaboration between psychologists and architects. *Journal of applied environmental and biological sciences. J. Appl. Environ. Biol. Sci. 359-364.*

Gorgolewski, M. T. (2005). The potential for fabrication in UK housing to improve sustainability. Smart and Sustainable built environment, 119-128.

Ibem, E. O., Opoko, A. P., Adeboye, A. B. & Amole, D. (2013). Performance evaluation of residential buildings in public housing estates in Ogun State, Nigeria: Users' satisfaction perspectives, Frontiers of architectural research, 2(2), 178-190.

Gopikrishnan, C. S, & Topkar, V. (2014). Questionnaire design for objective evaluation of performance of built facilities. In proceedings of CIB facilities management conference, (pp. 192-203).

Olanrele, O. O., Ahmed, A. & Olatomiwa, L. (2013). A study of user satisfaction of outsourced facilities management (FM) services in public residential towers in Nigeria. (A case study of Eko court towers and 27, Boyles street/Boyles street flats).

Swartz, R. (1976). Mistakes as an important part of the learning process. *The high school journal, 5(6), 246-257.*

Krut, R. & Strycharz, J. (2017). ISO 14001 and design for the environment: a strategy for proactive design in building design, construction and renovation. In *ISO* 14001 (pp. 240-250). Routledge.

Hassanain, M. A. and Mudhei, A. A. (2006). Post occupancy evaluation of academic and research library facilities. *Structural Survey, 24(3), pp. 230-239.*

Hassanain, M. A., Sanni-Anibire, M. O., Mahmoud, A. S. and Ahmed, W. (2020). Post Occupancy Evaluation of Research and Academic Laboratory Facilities. *International Journal of Building Pathology and Adaptation, 38(5), pp. 797-810.*

Hassanain, M., Kayak, M., Hamida, M. and Ibrahim, A. (2021). Post Occupancy Evaluation of the Built Environment: A case study of Mosque Facility. *International Journal of Built Environment and Sustainability (IJBES) 8(3), pp. 107-119.*