

Post Occupancy Evaluation, Performance Building Tool: Case of University Facilities in Algeria

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ABSTRACT: This paper explores post occupancy evaluation (POE) strategies with regard to performance of university buildings in Algeria. Essential methods of post-occupancy evaluations are reviewed. Implementation of broad principles of POE in the specific context of university facilities was applied. It endeavours to underline how post occupancy evaluation strategies can assist central government and local authorities in the higher education sector to respond to the challenge of developing a better built environment. Finally, key findings through a field work are presented. Last but not least, it aspires to hand over the capacity to provide consistent 'evidence based' information to be incorporated into design guidelines, and inform future higher education facility decisions makers. Arguably tough, the potential as well as the limitations of the scope will require further exploration in use.

KEYWORDS: Post Occupancy Evaluation (POE), Feed Back, Assessment, University Facilities, Building performance.

1 BACKGROUND

The provision of university buildings has always been a major interest of the central government. Since the early days of independence, Algeria has faced an immense growth of student numbers, increasing from 5,000 on the eve of the independence (1962) to over 1.200.000 students at present, (MESRS, 2014). A vast expenditure is still being allocated to university buildings in Algeria, regardless of what have been achieved so far, over the last thirteen years, and neither post occupancy evaluation (POE) studies, nor appraisals or assessments studies have been made available to those who are involved in designing university buildings.

There is little specialised work and literature about post occupancy evaluation and appraisals of university buildings in relation to their various architectural aspects. Evaluative studies, for which the Architectural Branch of the Ministry of Higher Education is held responsible, have always been characterised by being unable to encompass the different variables entering into the design process of universities. Many gaps has yet to be bridged; the provision of continuous and specific information which derives from rigorous evaluative works (POE) and empirical evidence to architects and other mainly concerned with the design of this building type are either unreliable or non-existent. Reliable statistical data, documented university briefs and plans are either non-existent or inaccessible to architects, (Krada. 2005).

At present there exists an exceptional opportunity for improvement in practically all spheres connected with university buildings in Algeria. Universities are attempting by various means to meet the challenge of a socio-economic 'take off'. The urgency to quest for a sustainable and yet performance based buildings is an ultimate goal and an utmost requisite constraints of a today information based society that aspire for best in a world of ferocious contest in an unforeseeable paths.

University buildings are highly dynamic institutions. Furthermore, studies surrounding this subject indicated that university accommodation is most prone to change as well as most expensive to provide, enhance, renovate and run

2 NEED FOR POST OCCUPANCY EVALUATION STUDIES

As noted by Zimmerman and Martin, "The over-arching benefits from conducting POEs are the provision of valuable information to support the goal of continuous improvement". Implicitly then, that conducting a POE within the Algerian context would become an urgent task in order to set forth any sound basis for enhancement of the quality of the built environment in relation to university facility, (Zimmerman and Martin, 2001).

As will be discussed the opportunity to assess building performance versus design objectives. However a more essential, but equally forceful reason is the need to demonstrate a commitment to continuous quality improvement of both the project procurement process and its outputs.

Literature unveiled that Post Occupancy Evaluation (POE) is an important factor of the building process. (Preiser, 2002). There is logic to the argument that one purpose for the evaluation of buildings in-use must be the provision of essential feedback to inform future actions.

Post-occupancy evaluation (POE) is a diagnostic tool and system which allows facility managers to identify and evaluate critical aspects of building performance systematically.

This system has been applied to identify problem areas in existing buildings, to test new building prototypes and to develop design guidance and criteria for future facilities. Outlines the numerous benefits of POE, including better space utilization, as well as cost and time savings. Highlights the primary effect of POE database development outcomes on Academic Facility Performance Feedback.

In the forgoing article we shall review the specialised literature in order to unveil some aspects relating to POE as a Performance Based Approach.

At thorough literature search undertaken for this purpose tends to pin out that at present, the debate about a one all encompassing definition on POE performance based approach is far from having found the consensus in both terms concepts and applicability alike. Nonetheless, literature evidence stressed that information gained from POEs can provide not only insights into problem resolution but also provide useful benchmark data with which other projects can be compared, (Stanley, L. 2001).

This shared learning resource provides the opportunity for improving the effectiveness of building procurement where each institution has access to knowledge gained from many more building projects than it would ever complete. In doing so, methods in current use and their relevance to the design of university building will be highlighted. Another concern along these lines will lie on the identification of major POE methods liable to enhance quality of the built environment.

International experience in the field of POE is opportunely taken into account for the sake of making better living and built environments. Furthermore, concepts and tools in current use are specifically discussed; this to underscore the venues capable to set forth a POE performance based approach framework in relation to meet evaluation objectives in relation to the forgoing topic, (Preiser and Vischer 2005).

3 POST-OCCUPANCY EVALUATION: A CHRONOLOGICAL GLANCE

Post-occupancy evaluation of educational buildings and has nearly a forty-year history. The Building Performance Research Unit (BPRU) at the University of Strathclyde appraised over fifty comprehensive schools in Scotland during the 1960s. The bulk of data generated since then provided seminal determinants of post-occupancy evaluation applied to school buildings. Techniques that related space and its organization to people's responses, space use, costs, services and movement were developed. (S.S.B.R.T., 1976)

In the United States, Rabinowitz reported on a diagnostic post-occupancy evaluation conducted in four schools in Columbus, Indiana that looked comprehensively at technical, functional and behavioural aspects of each school. Data collected through observation, photography and surveys was compared to existing standards (Preiser, Rabinowitz & White, 1988).

In an effort to standardize the evaluation of educational facilities, a guide was first developed by the Council of Educational Facility Planners International (CEFPI in 1986) that provides evaluative criteria for administrators and community leaders to measure the quality of facility for general condition and suitability for education. Over 125 items affecting the functioning of educational buildings are offered in six areas: sitting, structural and mechanical features, plant maintainability, school building safety and security, educational adequacy and environment for learning.

The stated purpose of the appraisal includes the performance of a post-occupancy evaluation, to formulate a permanent record to document deterioration, to highlight specific appraisal needs, examine the need for new facilities or to evaluate the need for renovation, as well as to serve as an instructional tool. (Lee, A. and Barrett, P, 2003).

Since that, the concept has gained universal approbation and is nowadays frequently used. There are also many other abbreviations meaning same process: Building Evaluation (BE), Facility Performance Evaluation (FPE), and different types of customer satisfaction surveys. In connection with customer surveys certain aspects have to be taken into daylight.

4 WHAT IS POST OCCUPANCY EVALUATION?

Post Occupancy Evaluation (POE) is acknowledged and longed-for as a process that can “enhance, and help to describe, the performance of the built environment “, (Preiser, 1989). Briefly, it’s a process of “evaluating buildings in a systematic and accurate way after they have been occupied for some time, (Gonzales et al, 1997).

It is also characterised by all-inclusive and yet thorough assessment of a building. However, POE methods spin around the study of the efficiency lying in the users / environments interface. (Bechtel et. al. 1987).

POEs are more than “customer surveys”; they are absorbed in the profound building essence. It is obvious but this systematic investigation and analysis of the structure and relationships between design objectives and occupants’ experiences is taken into consideration in future development efforts.

Another way of looking is the verification purposes. We need to be sure that the intensions of the design have really become true.

We need to determine whether the finished building actually meets the specified attributes. Therefore, post occupancy evaluation methods are needed (Margulis 1996). As mentioned earlier, POEs are useful to everyone who comes into contact with a building. POE is a powerful diagnostic tool that allows people to learn about their past, mistakes and successes alike (Preiser 1988).

The purpose of the POE tool is simple: it helps practitioners to avoid repetitive mistakes.

Evaluation and feedback are the cornerstones for the continuous improvement in building procurement. Good feedback is an intrinsic part of good briefing and design of buildings.

Preiser and Vischer argued that post occupancy evaluation concentrate mainly on user satisfaction.

“It is essentially a systematic process guided by research covering human needs, building performance and facilities management”, (Preiser and Vischer 2005).

5 POST OCCUPANCY EVALUATION PROCESS.

The specialized literature brought to light three types of POE’s: Diagnostic, Indicative and Investigative. They all serve purposefully the enhancement of building performance. (Preiser, W., Rabinowitz, H., and White, E 1988)

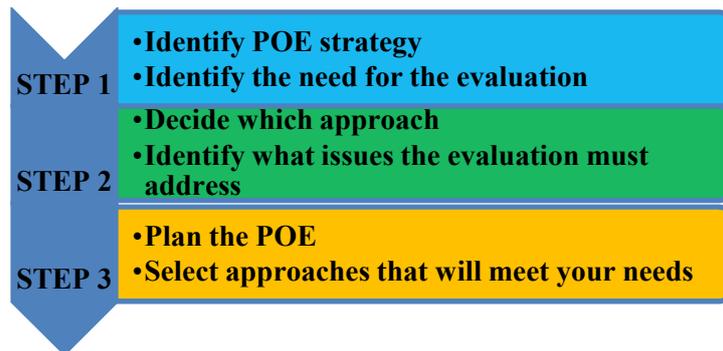
POEs can be used no matter what is the building type? Whether applied on newly achieved buildings or on a retrofit basis, Zimring stated “that POEs are flexible enough namely in terms of: scale, resources, goals, methods, evaluator expertises, and evaluator interests”. Most POE’s are backboneed on a four key drivers: defining goals, data collection, and data analysis and, Outcomes presentation. (Zimring et al. 1980).

Evidence driven from table 1 below tends to suggest that most POE’s methods hub around user satisfaction in both aspects: functional performance and building performance.

Table 1. Overview of existing POE approaches

Designation Method	Tools and techniques used	Focus
De Montfort method	- Forum - Walkthrough	Broadly covers the process review and functional performance
CIC Design Quality Indicators	- Questionnaire	Functionality, building quality/impact
Overall Liking Score	- Questionnaire ; (Hardcopy/web based) - 7 point scale	Occupant survey. Sectors incl. educational Diagnostic tool
PROBE	- Questionnaire/- Focus groups/- Visual surveys - Energy assessment - Evaluation Performance of systems	User satisfaction / occupant survey Systems performance Benchmarks developed
BUS Occupant survey	- Building walk -through - Questionnaire backed up by focus groups	Occupant satisfaction productivity
Energy Assessment Reporting Methodology	- Energy use survey - Data collection e.g. from energy bills	Energy use and potential savings
Learning from experience	- Facilitated group discussions or interviews	Team learning from its experience

Table 2. Post Occupancy Evaluation Process Overview



Source: Blyth, A and Worthington J, *Managing the brief for better design*, Spon Press, 2001

6 CASE STUDY PRESENTATION

The arch vaulted stressing the ultimate use of POE in the context of university facilities in Algeria is “to consider the extent to which a building or facility satisfies the needs of its end users and to identify ways in which design, performance and fitness for purpose can be improved”, (Turpin-Brooks and Viccars, 2006).

Cooper has made the case clear that “without a process in place to obtain feedback from a building’s performance, having been constructed with new systems, in new ways with unknown outcomes, then it effectively remains a prototype”, (Cooper, 2001).

Moreover he stressed that “to fully understand if a building is truly effective, feedback needs to be sought by those using it.

Bordass and Leaman underscored that a major technique or tool when undertaking case studies, lies in the use User satisfaction / occupant survey, (Bordass and Leaman, 2005).

Examination of the relevant literature, pointed that Constantine campus remained the most comprehensive case that could arguably be worth studied so as to induce generic design and technical data that could be applied nationwide with regard university facilities.

The choice of Constantine campus site appeared to be most suitable, in many respects, regarding student's population, academic pattern and scientific activities, the many visits on, brought up us to conclude

- Second largest student population of the country.
- Comprehensive enough to offer suitable data base with regard to User satisfaction / occupant survey.
- There seems to be that initial design schemes obeyed to an extent to most detailed guidance,
- Availability of resources to conduct the present field work.

In order to investigate what lessons can be learned, three broad aims were defined for the proposed case study. These were:

- To examine whether the array of standards and norms found in the relevant literature and official guides complies with those in current use.
- To assess user satisfaction and attitudes with regard to both functional requirements and environmental sustainability.
- To examine the extent to which the initial design has allowed for flexibility and adaptability.

According to the Social Services Buildings Research Team (S.S.B.R.T) Report on the 'Appraisal of Buildings', methods and approaches of evaluating the performance of a building vary in relation to the type of appraisal to be undertaken, such as: descriptive, environmental, technical, model or psychological. In congruence with the lines suggested by the S.S.B.R.T the model approach seemed most likely to achieve the three aims set out above.

This evaluation strategy combined several techniques of data gathering, which are: observations, interviews, questionnaires and physical measurements. These were also mentioned in various studies involving evaluation of buildings such as those by D. Canter, D. Manning and R. K. Yin., (Canter,1966), (Manning,1968) and (Yin,1984). However, before discussing the techniques outlined above it is first necessary to lay down the criteria which made possible the choice of laboratory sample to be studied.

The significance of a POE strategy depends strongly on "what is to be reviewed, the level of detail that is needed and when the evaluation is to be carried out. The focus of a POE can be considered in terms of three broad areas: **Process, Functional Performance and Technical Performance**", (Blyth and Worthington, 2001).

6.1 CHOICE OF SAMPLE

As the scope of the prevailing discourse could not encompass all university facility (for practical reasons as well for resources) the criteria of size and academic pattern, were decisive in selecting the type of pedagogical space within which the case study took place. The paper's main focus is on laboratory facilities, contacts were made with different university users' in order to arrange formal visits to a number of laboratory facilities. Consequently 30 laboratories were selected from the chemistry and the physics schools respectively. Their choice was completely random as none of the laboratory sizes found in use conforms to the standard size of Algerian university laboratory facilities of 30 students. While chemistry Laboratories were organic chemistry (average 40 students) and inorganic chemistry (64 average students), physics Laboratories were general physics (38 students) and electronics (20 students). The prime reason for dismissing biology laboratories was simply the difficulty of getting in touch with the Head of the Biology School during the course of the preparation of the study. Many contacts were unfruitful though we showed a strong willingness and many appointments were aborted for unreleased reasons. It was felt prudent not to take any step further without due permission. Particular attention should be drawn to the interest showed by various members of staff of both schools visited.

6.2 OBSERVATION

For the first source of collecting data, direct observation in a given environment can be carried out using various techniques. The choice of a particular technique is argued to be connected to the type of information sought. According to Zeisel there are five devices suited to recording behaviour observation including notations (verbal description and diagrams), precoded checklists, maps and floor plans, photographs and video or films, (Zeisel J., 1984). Further, Yin reckons that whether it is a casual or a formal observation, in order to increase the reliability of observational evidence, the procedure must be conducted with more than one observer, (Yin R. K., 1984).

In the present case study, observations were made of both components of the laboratory facility built environment (space and activity), to gain access to the events and groups involved and ultimately to record both the physical features of the laboratories and users' attitudes. These were achieved by means of a combination of different tools. Checklists for every

laboratory were used to provide a better understanding of some of the physical requirements of the visited laboratories. Additionally, floor plans and maps of the corresponding premises were found useful in locating several physical items (furniture, equipment, fenestrations, etc.). Finally, in order to palliate possible shortcomings of the above two devices (i.e.: checklists and floor plans), photographs were taken to capture subtleties that naked-eye based methods may not record.

6.3 INTERVIEWS

Yin argued that 'one of the most important sources of case study information is the interview'. There are different forms of interviews in use, of which the most common are the open-ended and the focused interviews respectively. For this particular case, focused interview, also called semi-structured, were chosen rather than the former type since the chief aim was to corroborate or dismiss certain points already made in previous chapters, (Yin R. K., 1984).

6.4 INTERVIEWS WITH HEADS OF SCHOOLS

Focused interviewed with Heads of the chemistry and physics schools respectively were carried out. The overriding aims were first to identify the range of scientific activities that take place within each school's laboratories and second, to establish the level of use of laboratory space. Finally, to show any request for change made by either school or the extent of its fulfilment.

6.5 INTERVIEWS WITH THE USERS

The same procedure was followed with members of staff including tutors, technicians and the estates officer as well as with students. These helped to examine students' attitudes towards the working conditions in terms of health, safety and convenience standards. The other intention was to find out the nature of change that could possibly have taken place since the laboratories were built and subsequently what are (were) the laboratory's compartments most prone to change and how often do (did) these changes (if any) occur.

6.6 MEASUREMENTS OF PLANS

Measuring plans is another form of compiling data. It involves the measurement of various physical attributes of laboratory space, so that they can be compared against the recommended ones. The main aim was to investigate whether there were any variations or affinities with the standards and norms found in the relevant literature and other official guides.

6.6.1 SPACE ALLOCATION IN LABORATORIES

- 1. Area of room
- 2. Area of lab
- 3. Acoustic
- 4. Services:
- 5. Elect, Gas, water,
- 6. Fire safety
- 7. Benches
- 8. Finishes
- 9. Doors
- 10. Fenestration

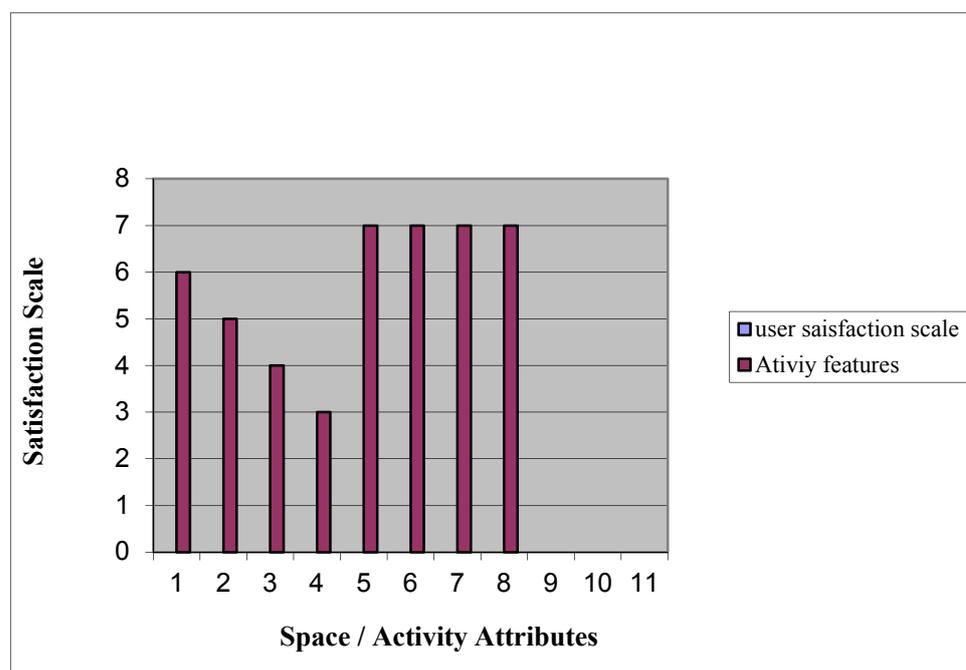


Fig. 1. User's satisfaction

Table 3. Comparison of the Recommended Usable Areas per Student with those Currently in Use. in Four Laboratories Types.

Discipline	Recommended standard (sq. ft)	Standard in Use (sq. ft)	Above/ below recommended standard (sq. ft)
Organic chemistry	45	13.07	Below
Inorganic chemistry	45	12.94	Below
General physics	45	19.62	Below
Electronics	45	20.93	below

6.6.2 THE SERVICES

Table 4. Comparison of Recommended Bench Dimensions With Those in Current Use in the Four Laboratories.

Bench features	Standard in Use (m)	Recommended Standard (m)	Above/ Below Recommended Standard (m)
Length	3.6	3.05 / 3.95	Match
Width	0.8 (double)	0.6 (single)	Below
Height	0.8	0.7	Below
Gangways	0.9	1.8	Below

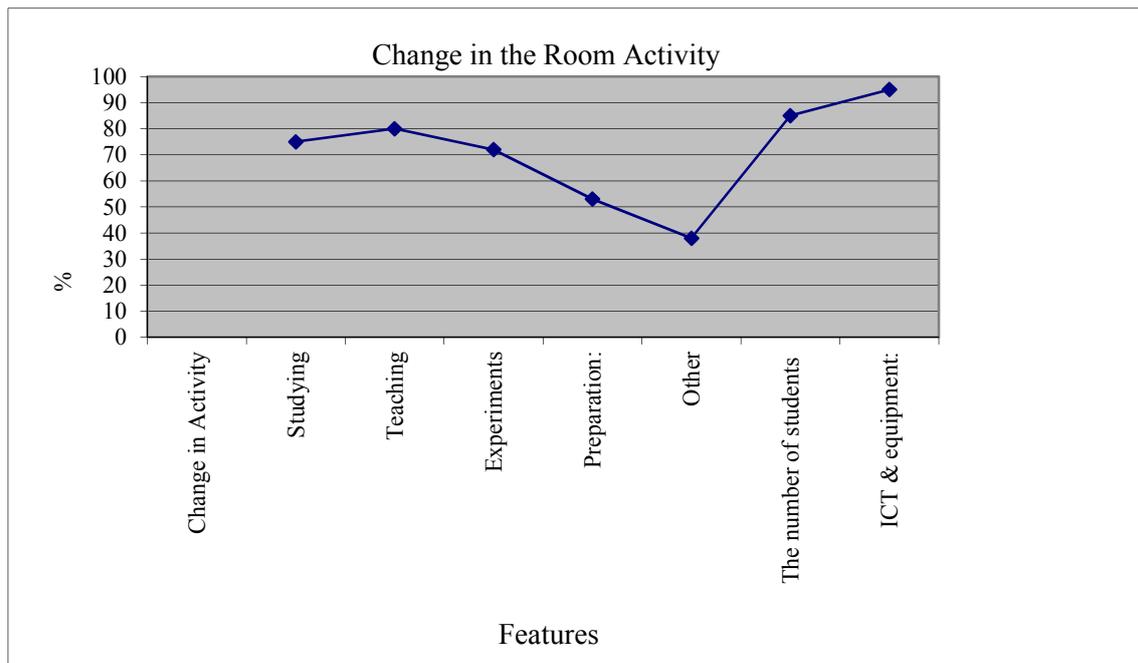


Fig. 2. Recurrent change in activity

7 CONCLUSIONS AND FINDINGS

Although the sample of laboratories assessed during the course of this of this case study was small, and thus bound to limit the extent of the evidence derived from it, it has nevertheless given a fruitful insight that post occupancy evaluation strategy is an utmost valuable process. We made the case clear, to identify ways in which design, performance and fitness for purpose can be improved.' (Turpin-Brooks and Viccars, 2006).

The physical survey showed that, the usable area per student as well as some bench measurements appeared to be inadequate in most places visited. The environmental survey, on the other hand, brought to light that fume extractions and room temperature control were liable to create environmental discomfort such as disagreeable smells and over-heating. As far as the second aim is concerned, the user's survey indicated that the range of facilities provided as to support laboratories procedures seemed to respond satisfactorily to users requirements.

Finally, the study inferred a key issue, that the building stock failed in many instances to meet the activity's changing requirements. Further, it was found that the link of the services to the fabric acted as a serious constraint to flexibility and adaptability in use.

This paper set out the urgency to undergo post-occupancy evaluation as a method of evaluating the performance of university buildings and facilities within the Algerian context.

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