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Post Occupancy Evaluation in Higher Education

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Abstract

Post-occupancy evaluation (POE) is a process of assessing building performance for its users and intended function during occupation. User satisfaction impacts the performance of educational environments and their users: students, faculty and staff. In addition, buildings are maintained and managed by teams that spend large amount of time and capital in their long-term sustenance. By evaluating the feedback from users of higher education facilities, university planning departments are more prepared to understand the inputs for programming and future project planning. In addition, university buildings will be closer to meeting user and maintenance needs.

This paper reports on research team made up of academics, facility personnel and users that have developed a plan to improve the quality of campus facilities through a POE exercise on a recently built project. This study utilized a process of focus group interviews representing the different users, and subsequent survey. The paper demonstrates both the theory and practice of POE in higher education and learning environment through the case example of the University of Utah POE exercise.

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1. Introduction

Apart from relevant zoning or building codes, all universities have their own internally agreed upon design standards that guide all construction on campus. When universities plan to construct a new building, an architect will design and contractors are expected to build based on these standards. These standards are usually codified in a manual that has been with the university for ages and is being constantly updated. The purpose of this manual is to build functional and proper buildings for that specific campus. However, there are many cases when a building does not perform as expected, despite such design guidelines. Based on discussion with high ranked people on campus, universities have faced issues related to the poor performance of recently constructed buildings which have cost millions of dollars to fix. The question is; what is the problem? How is it possible to build a building, based on codes and design requirements, and still it doesn’t perform as well as it is expected? What is the best practice to find these errors, and what are the solutions?

These questions constitute the hypothesis of this research. To find strength and weaknesses related to design phase, this paper tries to depict what is, and is not, working properly and to describe the consequences. Dealing with similar problems over and over is waste of time and resources for universities. This paper’s effort is to show that universities need an evidence based plan to fix their issues permanently in the form of revised design standards and oversight processes. Universities can learn from their past in order to improve their building’s functionality and efficiency in the future. One of the best practical ways to find and realize obstacles and errors is through Post Occupancy Evaluation.

Post occupancy evaluation is a tool for facility managers to identify and evaluate the behaviour of a building. POE can then provide design guidance for future facilities. With the help of POE, facilities can have better space utilization and save time and money in operation and upkeep costs.[1] One of the purposes of POE in higher education is to determine whether Facilities Managements (FM) is meeting the goals of building and maintaining buildings and spaces to serve the educational vision of the University. POE is the collection and review of occupant satisfaction, space utilization, and resource consumption of a completed constructed facility after occupation to identify key occupant and building performance issues. POE can also be used to analyse trends over time, and to identify ways in which to better on-going processes and outcomes. Implementing POE process increases accountability for facilities managers, standardizes best practices, and helps the university to understand opportunities for future project improvements.

2. Post Occupancy Evaluation

Buildings are designed for several main purposes such as protecting people from our surroundings, wind, and water and so on. However, today people expect more from their buildings; they want more benefits or they want it to be more suitable or efficient for its users. They want buildings to be functional for specific uses, safe, comfortable, and adaptable to new uses. The idea of sustainability, green buildings, energy efficiency has made the construction industry and owners strict about how their buildings perform. Building performance can be defined as the degree to which a building can meet any or all of these expectations.

There are hundreds of theories and tools that have been developed to evaluate a building from environmental compliance to energy performance. Post Occupancy Evaluation is one of these existing methods.. [2] In 1990 a group of specialists gathered to discover ways of monitoring and measuring the general facility performance to find an answer to the question “What is an effective building” and how they can measure its effectiveness. They called their process “Post Occupancy Evaluation”. [3] In other words, POE is the process of evaluating the building in a systematic and rigorous way after it has been occupied. According to Lushington and Kusak, POE establishes accountability in the complex and costly process of creating a new building relying in a formal report and survey [4] which this paper will benefit from.

As with any specific method of evaluation POE has its own advantages and disadvantages. Recognized benefits of POE include: continued development, an improved fit between occupants and building, enhanced comfort for its users, and a reduction of energy usage. While barriers to POE include: disagreed and reliable indicators, potential liability of the owner, exclusion from current delivery expectation, and segregation from professional curricula. [5] Subjective differences like a lack of agreement or personal feelings during interviews or surveys can also affect POE studies. Thus, it is valuable to limit, control, and otherwise account for these variables in any POE study.
3. Post Occupancy Evaluation and learning environment

Post occupancy evaluation of school buildings and educational environments has a nearly fifty-year history. The Building Performance Research Unit (BPRU) at the University of Strathclyde assessed over fifty comprehensive schools in Scotland in the late 1960s. This study provided one of the seminal examples of the post occupancy evaluation of school buildings. Methods that related space and its organization, to people's responses to the building, space use, costs, services and movement were all established. [6] All these areas together show how wide POE can be. Yet, all of these areas of study, whether qualitative or quantitative, follow similar tactics the use of which will be discussed below.

For the first time in 1986, there was an effort to regulate the evaluation of educational facilities by the Council of Educational Facility Planners International (CEFPI). Twenty years after first attempt of POE these regulations were introduced in response to significant problems experienced in building performance with particular emphasis on the building occupant perspective.[8] CEFPI provides evaluative criteria for school administrators and community leaders to evaluate the quality of a school facility for common circumstance and suitability for learning. [7] According to Preiser, over 125 items affect the functioning of school buildings in the following areas: school site structural and mechanical features, plant maintainability, school building safety and security, and educational adequacy and environment for learning. Based on his research Non-technical language was advanced in the creation of three evaluation instruments (elementary, middle and secondary school) to enable educators and community leaders, in addition to technical experts, to be able to conduct appraisals. The stated goals of these assessments were to: perform a post occupancy evaluation, formulate a permanent record to document deterioration, highlight specific assessment needs, examine the need for new facilities, and evaluate the need for renovation, as well as to serve as an instructional tool. [7]

Within the milieu of school facilities, post occupancy evaluation is most concerned with the degree to which the building supports the goals of the educational process by measuring the physical environment's educational capability. Educational adequacy is the degree to which a school's facilities effectively support educational goals and activities. This form of assessment is very close to traditional post occupancy evaluation methodology in that it emphasizes user need, experience and value. [8] Studying and evaluating educational environments in academic institutions has always played a main role in the on-going development of POE methods. Since the 1960s universities have been always a main part of a POE exercise partnering with design practitioners. A few examples in the United States include: The University of Wisconsin-Milwaukee [9]; The University of Cincinnati [10]; University of Washington's Centre for Architecture and Education; University of North Carolina-Charlotte [11]; North Carolina State University; Georgia Institute of Technology and the University of Minnesota. Many other examples exist of post-occupancy evaluations accompanied by university researchers in schools of architecture and engineering. [12] Despite the appearance of activity of various academic centres around the U.S. and the world in conducting POEs, it is generally assumed that the POE is "widely acknowledged but rarely practiced". [13]

In reviewing the documents and data from the above case studies and other previous work in this area, it becomes clear that they all have focused their research on specific projects like: “post occupancy evaluation on Oregon Health & Science University”. [14] It is unfortunate that there has been no inquiry to make comparisons and connections between them. While there are design standard handbooks for each educational centre or university, and there are climate guidelines and many other manuals in the construction industry, there is no general design standard for higher education as a whole. It is this paper’s goal to first raise the question and consequently draw an answer from previous case studies. Second make a logical argument to depict the essential role of POE in higher education based on a POE case study in progress at University of Utah. This research will discuss the on-going POE study at University of Utah before it draws any conclusion from previous cases. Following are the methodology done to accomplish this research.

4. Research Methodology

The tools employed in POE include: plan analysis, monitoring of indoor environment quality (IEQ) (such as indoor air quality (IAQ) and thermal performance), and surveys of users including walkthroughs, observations, user satisfaction questionnaires, and semi-structured and structured interviews with building’s users. POE serves as a way of providing both subjective and objective feedback that can inform planning and practice throughout the
building’s life cycle from the initial design to occupation. The benefits from POE can be in the short, medium and long term, and it is the same for this paper. The short term goal in this POE exercise is to recognize the existing errors and try to fix them. The medium term objective for this study is to develop a POE plan for the University of Utah. The long term goal is to spread the word about the importance of POE in higher education. Since there is no actual written POE plan for universities, this study has started with the purpose of developing a POE plan for higher education.

As it was stated above, this study strives to determine the role of POE in higher education, especially at the University of Utah. It tries to indicate strength and barriers related to their design standard through a POE exercise on “Beverly Taylor Sorenson Art Building,” which is recently been built. However, for the sake of time and budget, it concentrates on some essential variables to start the process. It is clear that one case study is not enough to make a strong argument. Yet, it is just the foundation and it is strong enough to make an assumption and hypothesize for future study. The idea here is that because of this paper, researchers around the nation and academic institutions get together to develop a POE plan and make a standard design for higher education. Tactics using for this exercise is look like other methods in POE such as focus group, interview, survey, and monitoring, which will be discussed here.

Following figure shows the methods and tactics using in this paper.

![Fig. 1. Methods and Tactics.](image)

4.1. Defining the scope

This paper has already talked about the flexibility of POE and how wide it is. It is possible to cover variety of topics through POE while it is almost impossible to start a POE without knowing what the reason of study is. That is why even here the very first step to develop a POE plan is to outline its scope. Hence, in order to achieve its goal, this study has started its research to identify the current and common complains around the University of Utah’s campus. Knowing these key factors will assist this study to organize and provide appropriate tactics based on the findings.

This research through its literature study and gathering data from interviewing people at the University of Utah has found out that one of the main concerns and complaints at University is their Facility Management department for
each school. Based on campus planning department at University of Utah, cost of maintenance and repair in facility management department in each school is among the highest expenses. These maintenance and expenses consist of HVAC, electrical system, heating water system, and lighting system. Consequently, this study will start its purpose with focusing on this section to find FM’s place in The University of Utah design standard. It seeks to find out what are the issues related to FM and how it could effect on design/construction process. To do that, this study will first interview FM supervisors to find their main concerns, and then try to find out how these elements would impact on other divisions like educational.

4.2. Focus group / Interview

One of the best techniques in POE to collect information is through focus group. This paper divides its focus groups to 3 divisions: a) Facilities Management; b) Custodians; and c) Educational which is consists of faculties, students and staff.

The group of people who attend this meeting is limited consequently; it is more manageable than other parts of study. For groups “a” and “b” people and supervisors who are in charge of these sections are recognized and limited, hence meeting with these people as focus groups changing to an interview. Interviewing these people is really valuable because they are professionals in charge and information gathered in this method is being collected directly from these people. On the other hands, supervisors are identified, therefore they are more cautious in order to provide feedback and if they don’t feel safe their answer might affect the study and make it unreliable. Thus, it is always better to provide them with agenda and questions in advance. The other advantage of this action is people who are attending the meeting are already prepared so it is more probable to receive all the necessary answers.

FMs are one of the main concentrations of this study. Thus, it should be part of conversation with groups “b” and “c” to see how it would affect their job or activity. For instance, the location of mechanical equipment is important to FM’s because they need to have easy access for maintenance and repair. However, tools like pumps for pumping water through chiller systems makes noise that disturb people working in offices or classrooms, or lecture halls. In that case it would have distracts students and people who are presenting. POE is a valuable study which would identify such issues to prevent them from happening in future.

People in group “b” like group “a” are limited. Hence it is more probable for the focus group to become an interview which would have the same benefit as group “a” However, group “c” is different. There are hundreds of faculty, staff and students in the chosen building, which makes it impossible to interview them all in a short amount of timeframe of this study. Thus, focus groups for this cohort include a random assortment of faculty, students and staff to share their experience and perspective regarding provided topics. This exercise would support questioner to expand his vision around the missing topics to fill the gaps. Instead of interview for large group like educational, survey is a logical action.

4.3. Survey

In order to get data from the educational group beyond the focus groups, this research will ask its questions through survey. A survey allows examiners to collect a great amount of data in a relatively short period of time. Surveys are less expensive than many other data gathering procedures, and can be created quickly and managed easily. Also, a survey can be used to collect information on a wide range of themes, including aesthetics, Indoor air quality, acoustics, lighting, etc. On the other hand, it has its own disadvantages; poor survey construction and administration can challenge the study. Moreover, the answer choices provided on a survey may not accurately reflect how the participants truly feel. One way to enhance the chance of accuracy is to provide answers that assess the level of agreement of contributors. Hence, establishing an adequate survey is crucial and useful to this research.

The survey for this POE study will start with general questions and move towards more specific questions. The purpose of the survey is to cover areas discussed or discovered in the focus groups and interviews to find their accuracy and their impact on the educational users. However, that is not the only goal of the survey. The survey can reveal points previously hidden in focus groups. This can help a researcher to structure a future pilot study or other interviews to analyze the data with more precision.
4.4. Direct Observation

With pilot monitoring the researcher relies on their own direct observations. This essential step serves to: A) fill in the gaps in collected materials, and B) Evaluate the accuracy and validity of information collected through other methods. One of the main benefits of direct observation is that it is the most reliable system; because personal interest doesn’t affect the observant which distinguishes this system from other strategies. However, it is a supplementary practice to other studies as the researcher doesn’t have all the technical and professional knowledge. Also, it is a time consuming method as researcher needs to record and collect data over time during day and night. Yet, gathered evidences through this step are trustworthy to support and prove results gained from other systems.

All these methods are related and complementary. Each checks the reliability of the other. However, it is important to practice these methods in order because as it was mentioned they are all related and are trying to measure and complete other steps. Also, previous step is always part of next step. For example, there are points highlighted in FM focus group which is a part of questions in survey. Thus, skipping the focus group would jeopardize the survey.

5. Conclusion

This paper benefits from qualitative research methods to make a logical argument for its hypothesis regarding the role of POE in higher education. Within this case study, this research demonstrates why there is a need for POE at University level. Also, by providing examples it depicts how POE improves the quality of design standards in higher ED in order to have better, healthier environment and more efficient buildings as they all are affecting learning and working performance.

Exercising POE in higher ED helps a variety of people. Above all, it would be City indirectly and University directly which would benefit from this study through clarifying the weaknesses and strength of current situation. This way they can save money by being ready in face of problems, or prevent errors from happening in advance. Second group of people who would value this study are university users such as students, faculties, staff, FM, custodians and so on. They are the actual users and are using these buildings during day and night.

The POE process can be wide ranging and time consuming. Because of a tight timeline and schedule the scope of this study is narrowly focused on a single building. The purpose of this study, and the accompanying critical analysis of previous POE case studies, is to determine the importance role of POE in higher ED and its consequences for design standards. This research is just opening the door to the infinite world of POE. For instance, one of the main areas of concentration of this paper is to clarify the influence of FM in diverse divisions. Finally, evidence collected through the POE exercise described here is one way to evaluate this assumption and the methods explained in this paper is a practical way to do that.

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