ABSTRACT

The purpose of this symposium is to describe recent developments in the field of post-occupancy evaluation. The five papers which follow, range from uses and boundaries of POEs and a performance-based conceptual framework for systematic POEs to advances in POE methods as well as applications. First, recent developments are noted and the developments that may represent advances for the field are identified. These include an apparent increase in the volume and acceptance of POEs, and shifts in the sponsorship and in the types of POE programs that are run by certain sponsors. Possible advances include the integration of behavioral and technical assessments, moving toward the application of "total building performance," and the development of greater sophistication in dealing with organizational issues and the clearer discrimination of multiple levels of POE.

TOWARDS A PERFORMANCE-BASED CONCEPTUAL FRAMEWORK FOR SYSTEMATIC POES

Introduction

This paper presents a more systematic and rigorous approach to POEs through the adoption of the performance concept in building evaluation. Reconceptualizing basic evaluation approaches can improve POE in fundamental ways, resulting in changes to current practice that will integrate previous improvements and proposed new ones. Increased methodological rigor and improved utility of POE results will benefit both the public and private sectors by enhancing the quality of their buildings.

This paper presents the two basic parts of a systematic framework for POEs: the concept of building performance, and the performance evaluation process. These aspects of a POE assume high-quality measures on a performance basis, a formal and rigorous methodology for evaluating measures against appropriate criteria, and a system of dissemination that is useful and accessible to practitioners and researchers alike.

For purposes of clarification, a definition of POE is offered: POE is subsumed by the higher order type of evaluation called "building diagnosis" which has both diagnostic and prognostic capabilities. POE evaluates buildings in use and has short, medium, and long-term implications, the latter being evolutionary, based upon feedforward of POE generated information. Furthermore, POE focuses on the requirements and performance of building occupants' needs, and therefore, technical performance is only considered in so far as it affects the occupants of buildings.
1. The Performance Concept in the Building Process

The “Performance Concept” proposes that POEs be built into design and construction programs of agencies from the beginning as an integral part of the building process. Planning for a POE should begin in the programming phase for a new facility.

Systematic and rigorous POEs are predicated upon the use of the performance concept in the building process. The performance concept facilitates an objective evaluation method by comparing explicitly stated performance criteria for buildings with the actual performance as measured or perceived by building occupants and evaluators.

The performance concept is based on the assumption that a building is designed and built to support, and enhance, the activities and goals of its occupants. Early work on building performance was conducted by Ezra Ehrenkrantz and his associates on the School Construction Systems Development Project in California (Educational Facilities Laboratories, 1967). This work had been inspired by concepts developed at the Institute of Advanced Technology of the National Bureau of Standards (Eberhard, 1966). Subsequent projects executed by the National Bureau of Standards for the Department of Housing and Urban Development and the General Services Administration built upon these initial efforts (Wight, 1971).

Performance Evaluation. Performance evaluation and feedback relates client goals and performance criteria to the actual, objectively and subjectively measurable building performance. The performance concept can help improve the evaluation process by increasing objectivity and clarity of measurement, enhancing communication, providing incentives for innovation, and development of alternatives, aiding decision making, and advancing professionalism. Performance criteria used in evaluation are developed from goals and objectives which in themselves are derived from values held by individuals, groups, and organizations. Frequently, there are differences in values among various groups or units of the same organization.

Building Performance and Evaluation. Because the performance concept in the building process views buildings as dynamic entities, it requires a comprehensive attitude in evaluation. Performance measures are compared to performance criteria, and the differences are used as feedback into improved planning, programming, design, and construction of future buildings, as well as the creation of data bases or information clearinghouses on building types, attributes, and occupant groups.

The elements of performance that are measured, evaluated, and used in POEs to improve buildings include three major categories: technical, functional, and behavioral. Although there are other building performance elements such as location and economics that influence physical performance and affect owners, organizations, and building occupants, these three elements are the most important.

2. The Performance Evaluation Research Framework

The performance evaluation research framework (Figure 1) contains the evaluation of buildings with: 1) measurement technology, 2) data bases and information systems (including clearinghouses), and 3) the development of performance criteria for buildings.

Measurement Technology. Measurement technology employs all those techniques and technological aids that are used in data collection and analysis of POEs. They include interviews, questionnaire surveys, direct observation, mechanical recording of human
behavior, measurement of light and acoustic levels, video recording, mapping of
behavior, and still photography.

Figure 1: The Performance Evaluation Research Framework

Programmatic Statements and Performance Criteria. It is essential that performance
measures collected by POEs be compared with specific performance criteria in the form
of programmatic statements which are contained in the program for a given facility. While
these criteria can be of a general nature describing the design intent as expressed in the
program (e.g., provide visual and acoustical privacy), a POE should document how the
design was expected to meet these criteria. In this way, the findings from each POE can
be compared to other POE findings which address similar issues.

Performance criteria and guidelines are usually developed from data bases and
information systems for a given agency and/or building type and from the programmatic
criteria for a given facility. These criteria and guidelines are usually documented in
technical manuals, design guides, or in specialized data bases. The criteria are
building-specific and address particular sets of occupants and building functions. As
such, they are an evolving and improving set of performance "benchmarks" for a given
building type. Performance criteria and guidelines feed the entire building process, and
thereby the cyclical process of improving building performance can be accomplished.

Performance Evaluation Criteria. Explicit performance criteria need to be developed for
purposes of evaluation and use in POEs. One needs to differentiate among the
following:

- Criteria concerning the current use of a building.
- Criteria pertaining to the original, intended use of a building, as documented in the
  program.
- Criteria that pertain to the state-of-the-art in a given building type.

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- Criteria which relate to management of the client organization versus those which pertain to the end users/occupants and
- Criteria as internalized knowledge and experience which the evaluators may apply as experts regarding certain building types.

A POE Process Model. General models of the POE process have been described by several authors in their writings (e.g., Dalash et al., 1980; Marans and Speckhaimer, 1981). While there are variations in the process, depending on the nature and objectives of the respective POEs, three levels of effort can be generally distinguished in POE work. Preiser and Pugh (1988) described this as the "POE Process Model" and used it to outline the levels of effort involved in a typical POE. Thus, the model presented in Figure 2 is a further development of that POE Process Model (National Research Council, 1987, and Preiser, Rabinowitz and White, 1988).

![Figure 2: A Post-Occupancy Evaluation Process Model](image)

Levels of effort refer to the amount of time, resources, and personnel, the depth and breadth of investigation, and the implicit cost involved in conducting a POE. The three levels are: 1) indicative, 2) investigative, and 3) diagnostic. Each higher level requires more data gathering and is more comprehensive than the previous level, as depicted in Figure 2.

1) Indicative POEs give an indication of major strengths and weaknesses of a particular building's performance. They usually consist of a walk-through and selected interviews with knowledgeable informants.

2) Investigative POEs go into more depth. Objective evaluation criteria are explicitly stated.

3) Diagnostic POEs require considerable effort and expense, they are time consuming, and utilize sophisticated measurement techniques. They correlate physical and environmental measures with subjective occupant response measures, thus providing a higher degree of credibility for the results.

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In carrying out a POE, there are three basic phases with three steps in each, as shown in Figure 2.

Benefits and Limitations of Current POE Practice. Each of these POEs can result in several benefits and uses. Recommendations can be tied back to the client to correct problems. Lessons learned can influence design criteria for future buildings, as well as provide information about buildings in use to the building industry. This is especially relevant to the public sector which designs buildings for its own use on a repetitive basis.

The many benefits which result from conducting POEs provide the motivation and rationale for developing POE programs for the following reasons:

1) Short-Term Benefits
- Identification and solutions to problems in facilities
- Pro-active facility management responsive to building user values
- Improved space utilization and feedback to building performance
- Improved attitude of building occupants through active involvement in the evaluation process
- Understanding of the performance implications of changes dictated by budget cuts
- Informed decision making and better understanding of consequences of design

2) Medium-Term Benefits
- Built-in capability for facility adaptation to organizational change and growth over time, including recycling of facilities into new uses
- Significant cost savings in the building process and throughout the building life-cycle
- Accountability for building performance by design professionals and owners

3) Long-Term Benefits
- Long-term improvements in building performance
- Improvement of design databases, standards, criteria and guidance literature
- Improved measurement of building performance through quantification

Conclusion
The performance concept and framework for systematic evaluation of the built environment as presented in this paper is a much needed and timely methodological approach toward achieving higher quality in buildings, accountability in the building process, and ultimately better building utilization and user satisfaction. Making explicitly the performance requirements that are expected from a building, designing a building accordingly, and eventually comparing the actual performance of the building with that which was initially stated in the building program is the basis of the performance concept advocated for use in POEs.

Notes
References


