

Implications

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Design Success: Occupancy Research and Building Performance

What do we mean when we ask the question, “Does design work?” This has been central to design since the beginning, but it has been answered in an intuitive way for much of its history. Whether we are talking about architectural, interior, or industrial design, the problems of evaluation are much the same. Candidates for common answers are:

- It worked well; there have been few complaints
- It worked well; the client contact has expressed satisfaction
- It worked well; I really like the way it works/looks
- It worked well; many designers like it/it won awards

The benchmarks for the evaluation of design are not always clear, because the definition of the problem to be solved is not always clear. We often work from the assumption that clients know what they want and can clearly articulate it—at least to the degree necessary for our interpretation. We then change it into design language and develop it into our understanding of what the client wants.

The Problems of Evaluation

As the forgoing suggests, we don't have a

clear practice of evaluating design nor, do we have clear benchmarks for its success. To move toward a clearer understanding of the success of design, we need to add some science to the mix; we need to ‘measure the design.’ And we need to add some definition to the mix; we need to ‘measure the occupant.’ First a couple of well founded facts:

1. The occupant (and the committee) cannot self-report on what they need or want. This is true because:
 - a. While they may know what they like, they don't know why
 - b. They don't know the ‘universe’ of possible solutions
 - c. They don't speak in the vernacular of the designer; there is no common language between occupant and designer
2. The occupant's opinions will often be contradicted by more formal 'testing' of the occupant via such methods as perceptual occupant programming and other experiential methods. These methods measure the occupant's responses through the administration of a quantitative ranking test (e.g., a semantic differential test where responses are measured along a continuum of opposites, such as “very high stress” to “very low stress”) rather than by asking direct questions.



IN THIS ISSUE

Design Success? The Problems of Evaluation

Related Research Summaries



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3. The designer and the occupant often want different things; testing both of them will often bring out contradictions in their views and orientation. Much like the occupant, designers cannot self-report their own preferences, as they cannot track the basis of their motivation any better than the occupant can.

As a result of confusion over how to define and measure the occupant, there is an essential breakdown in the design process in these ways:

1. The design may not work well, and yet this may not be apparent
2. The design may work well for the occupant and not for the designer
3. The design may work well for the designer but not for the occupant
4. The design may work well for all, but it may be unclear as to why or how it is working.

Designers must begin to understand what the occupant needs by measuring the occupant. This measurement must occur before and after the project, and can include occupancy research benchmarks and perceptual occupant programming.

Office Research and the Open Plan Working Group

Orfield Labs founded the Open Plan Working Group (OPWG) in 1998, with sponsorship from Haworth, Day-Brite and others to begin to research and support the value of building performance consulting and occupancy research in the office. Since that time, the OPWG has performed a number of studies which include these elements. These studies generally start with a CBPM (Certified Building Performance Measurement) Occupancy Study. This study measures the occupant and the current environment. With regard to the occupants, the on-line survey measures their evaluations of organizational quality, work task quality, compensation quality, environment quality, and workstation quality.

With regard to the current environment, the study physically measures acoustical, lighting, thermal, and indoor air quality components of building performance. Then these subjective and objective measures are correlated to begin to understand the occupants' motivation. Are they happy overall as employees? If they are not, is it due to poor organizational quality, low compensation, less than desirable work tasks, or in part, to the quality of the environment?

After this CBPM preoccupancy study, hypotheses must be developed with regard to improvements in areas where measured deficits occur, whether they are in the subjective occupant realm or in the measured building performance realm. The design team must then test the new environments to determine their success and must confirm with early and late post-occupancy CBPM studies that success has been achieved and what seems to be its main drivers.

Two recent studies have demonstrated the value of aspects of this approach. One study dealt with the perceived lighting preference and one with building performance issues.

Study 1: GSA Integrated Workplace Lighting

In the first of these studies, one design question that arose was regarding the appearance of lighting in an office space. Specifically, did the occupants prefer indirect lighting in offices when tested but not asked? Perceptual occupant juries were employed to test this question via the use of lighting images as part of a visual jury on perceived privacy and perceived preference. The occupants performed semantic differential rankings (evaluation based on opposites, see Figure 1) on pictures of office design features, but were informed as to the focus of the testing. The result was that the occupant had no clear preference for indirect lighting and in fact had a small preference for a particular direct lighting approach.

Implications



GSA Study: Indirect Lighting



GSA Study: Direct/Indirect Lighting (Perpendicular)



GSA Study: Indirect/Direct Lighting



GSA Study: Recessed Can Lighting with Wall Wash



GSA Study: 2 X 2 Lensed Lighting



GSA Study: Indirect/Direct Lighting with Wall Wash

Study 2: Building Renovation

In the second study, a CBPM pre-occupancy study was performed in an office renovation, and then the office design proceeded with occupant and building performance hypotheses. When the project was completed, it was discovered that some areas of the building did not follow the design documents and recommendations, but most areas did. Thus, we had an interesting case for comparative evaluation of the value of aspects of building performance. The pre-occupancy evaluation demonstrated that the occupants had a very high ranking for organizational quality, work task quality, and compensation quality, but rankings of the environment and the workstations were lower. The post-occupancy study showed two findings that were very different:

1. Where the building met the building performance measurement objectives during commissioning, the building was rated highly by the occupants. Interestingly, the occupants also rated organizational quality and compensation quality higher than in the pre-occupancy study, even though neither had changed.
2. Where the building did not meet the building performance measurement objectives during commissioning, the occupants rated the building lower. The occupants also rated organizational quality and compensation quality lower than in the pre-occupancy study, even though neither had changed, as noted above.

It was quite simple to look at each building performance variable in this study and to begin to understand what part it played in the occupants' satisfaction (see Figure 1). Thus, we understood both the failures and the successes of this project and could correct the failures. This was all done with client support in the context of a research-based project.

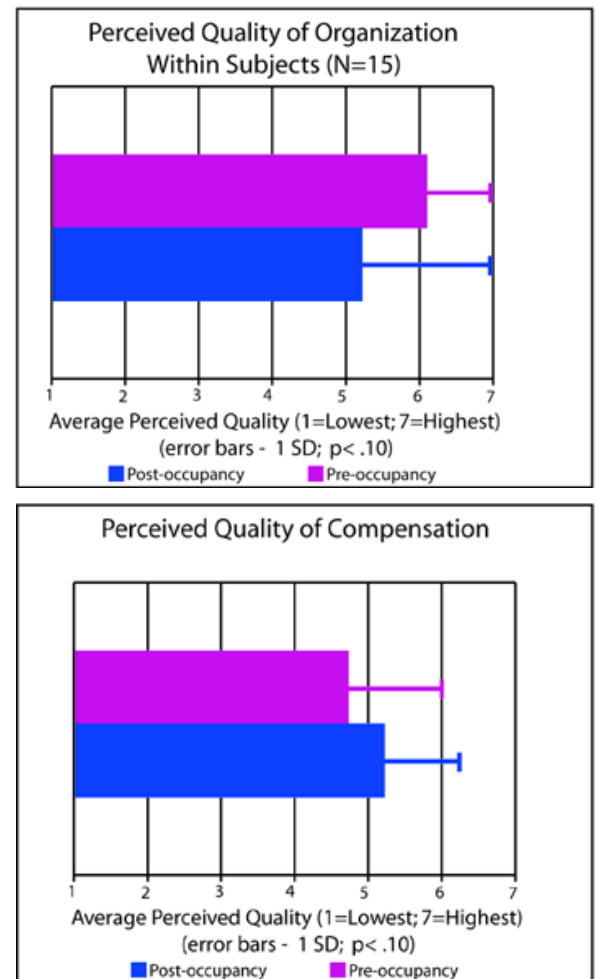


Figure 1: Graphs of Organizational Quality for Both Results

Incorporating Research into Design

In 2004, Dr. Jay Brand and I authored an ASID publication entitled, *Better Sound Solutions: Applying Occupant and Building Performance Measurement and Design to Improve Office Acoustics*. In it, we noted a set of steps that could be applied to the design of an office, incorporating research into the design process. This process, excerpted from the publication, is noted below:

Outline for an Open Office Project

The process and methods discussed in this manual can be easily and directly employed on any project to insure that acoustics (or other perceptual stimuli) will be positively perceived by the occupant and will provide a measurable economic benefit to the client.

These methods can be incorporated into the standard design phases in most projects, and they do not change the normal activities included in the design process but simply add substantial definition and performance to the project.

Schematic Design

1. Assemble full design team, including the acoustical consultant.
2. Perform occupancy studies of each relevant department or work group to draw baselines on current building performance and job quality rankings. (These studies should include human resource statistics and productivity statistics, if available.)
3. Based on the occupancy studies and other programming results, develop a building performance hypothesis and an occupancy performance hypothesis.
4. Employ visual juries, simulation, prototyping and acoustical engineering to test schematic designs for building performance and occupancy satisfaction.
5. Take iterative steps based on the results of step 3.
6. Finalize schematic design approach.

Design Development

1. Employ ongoing acoustical consulting to insure that the standards adapted in Schematic Design are followed and to suggest and test acoustical engineering solutions for the project.
2. Develop final acoustical applications that meet the performance standards of Schematic Design. Develop plans, specifications and performance standards for acoustical solutions.

Contract Documents

1. Review inclusion of plans, specifications and performance standards in the final contract documents.

Contract Administration

1. Assist design team and vendors to understand the specifications and to respond to the bids for the project. Review and accept/reject alternatives.

Commissioning

1. Perform early post-occupancy studies to determine issues which are problematic and in need of resolution.
2. Develop a list of compliance issues for contractors.
3. Retest to confirm compliance.
4. Perform late post-occupancy studies to determine outcomes of the project in terms of building performance, occupancy satisfaction and financial outcomes from changes in human resource values or productivity.

Conclusion

It is increasingly clear that we need to understand more about what the occupant really needs and more about how the building performs; both are now systematically possible, if the design team offers this possibility to the client in the design proposal. The results of this process have clear benefits for both parties and have an invaluable benefit to the design team in helping them to develop a knowledge base of what works for the occupant and what doesn't. This knowledge will lead to the ability to perform design as a profit center for the client, as the cost of people far outstrip the costs of facilities and design is thus most appropriately about people, and only indirectly about facilities.

Reference

ASID, *Better Sound Solutions: Applying Occupant and Building Performance Measurement and Design to Improve Office Acoustics*, Steven J. Orfield and Jay Brand, Ph.D., available as a PDF download from www.asid.org.

About the Author:

Steven Orfield founded Orfield Laboratories in Minneapolis, MN, in 1971. From an early interest in perception and measurement, he developed the firm into the only multi-disciplinary, subjective-objective research lab in the United States, serving clients here and abroad. He has also been instrumental in introducing new approaches to the acoustic and lighting fields with the founding of the Sound Quality Working Group (1991), the Open Plan Working Group (1998), and the Medical Facilities Working Group (2003). They are focused upon changing their fields in fundamental ways and moving them toward perceptual and occupant-based approaches to evaluation. Steve holds patents in both the acoustics and lighting fields, has published over 100 articles in the national press, and speaks locally and nationally.



“Functional and Aesthetic Lighting Design”

—*Lighting Research and Technology*

“Evaluation of Full-Spectrum Fluorescent Lighting”

—*Ergonomics*

“Work is Affected by Impact of Noise”

—*Journal of Environmental Psychology*

“Designer and User Roles in the Creative Process”

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“Impact of Office Workers Having Environmental Control”—*Journal of Environmental Psychology*

“Post-Occupancy Evaluation Informs Workplace Design”—*Environment and Behavior*

“Privacy is a Crucial Element in Workplace Design”

—*Journal of Environmental Psychology*

Photos and Graphics Courtesy of:

Mike Role, Orfield Laboratories, Minneapolis, MN
Sal Skog, University of Minnesota (p. 1)

Related Research Summaries

InformDesign has many Research Summaries about the workplace, acoustics, lighting, and related, pertinent topics. This knowledge will be valuable to you as you consider your next design solution and worth sharing with your clients and collaborators.



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