
Architectural Office Post-Occupancy Evaluation

*Mardelle McCuskey Shepley, D.Arch., Texas A&M University
Kelly Na'amah Zimmerman, M.Ph., Shepley Bulfinch Richardson and Abbott
May M. Boggess, Ph.D., and You Jin Lee, M.S., Texas A&M University*

ABSTRACT

Researchers conducted a post-occupancy evaluation at the new location of a 174-person architectural firm in Boston. Interviews of the 11-member design team were conducted to determine the original primary design intentions for the project. Three design intentions were identified and tested in the completed office, openness, community, and flexibility, in addition to an evaluation of satisfaction regarding the two spaces. Seventy subjects responded to a six-page questionnaire. The evaluation revealed that the staff was more satisfied with the new office than the old and that the design intentions was generally met. Input was provided regarding potential modifications to the physical environment.

Introduction

A post-occupancy evaluation (POE) was conducted at the new location of a large architectural firm in Boston. The firm in question, Shepley Bulfinch Richardson and Abbott (SBRA), had been conducting informal POEs and case studies for several years; there was, however, limited documentation of these evaluations. Moreover, the case studies did not typically include building assessment data.

Interested in evidence-based design, the firm had been involved in two important research projects: the POE of the Hasbro Children's Hospital (1995) and the more recent patient room mock-up study for Boston Children's Hospital (2003). The Hasbro Children's POE (Children's Environments Research Group [CERP], 1995) is the most complete POE carried out at a children's hospital since Canter's (1972) seminal study at the Royal Hospital for Sick Children in 1972. The patient room mock-up at Children's Hospital Boston followed a model similar to that used by Jonathan King at the University of Michigan in 1982, and the Children's Hospital mock-up provided critical information in the design process.

In January 2006, the firm moved from its downtown Boston office (Figures 1–3) to its current location at 2 Seaport Lane in east Boston (Figure 4). The design

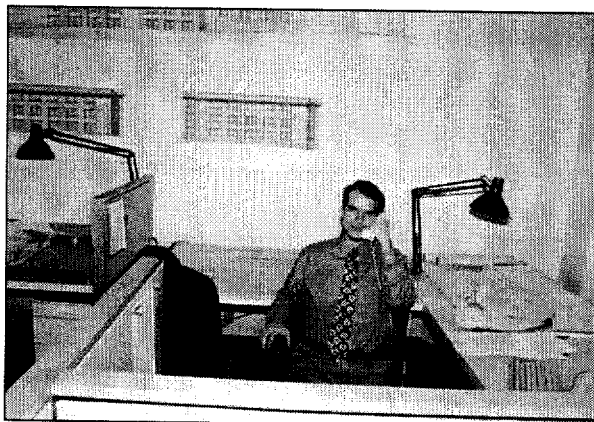
process associated with renovating the new space was lengthy and involved a large group charrette and multiple meetings by the design committee. In light of the firm's interest in POE, SBRA initiated a study of the new office design. This study was intended to serve as a model for future POEs for all building types conducted by the firm. While the results may not be generalizable to other architectural offices, the study added to SBRA's understanding of the implications of their design decisions and how well their design objectives were met.

There are three common goals for POEs conducted in private design practice: objectivity, inclusiveness, and distribution of the results (Harris et al., 2008). To achieve the goal of objectivity, the primary researchers were new to the firm and had not been involved in the design of the new office. Regarding inclusiveness, the questionnaire for the POE was distributed to all employees of SBRA. Regarding distributing the results, the firm decided that the POEs would be published in a peer-reviewed journal, rather than limit dissemination to SBRA staff.

The literature addresses the utility of POEs and potential research methodologies, including the usefulness of interviews and questionnaires (Zeisel, 2006). One of the first POEs was conducted by

The theory behind the research described in this paper was predicated on the notion that high satisfaction with the environment would result in high job satisfaction and greater retention of employees.

Figure 1. Workspace at the downtown office building site (photograph courtesy of SBRA).



van der Rijn and Hsia in the late 1960s. Subsequent to this, a vast reservoir of literature has been produced regarding occupancy evaluations (e.g., Kantrowitz & Nordhaus, 1980; Marans & Spreckelmeyer, 1982; Preiser, 1989; Preiser, Rabinowitz, & White, 1988; Preiser & Vischer, 2005; Shepley, 1996; White, 1986, 1992; Zimring, 1987; Zimring & Reizenstein, 1980). While other terms, such as building assessment or evaluation, are commonly used to describe this process, this paper will use the term “post-occupancy evaluation.”

POEs are most commonly conducted in institutional environments, such as hospitals (e.g., Shepley, 1995) and educational settings (e.g., James & Stewart, 1995; Nasar & Preiser, 2007). Evaluations have been conducted in offices (e.g., Al-Saleem, 1992), although no evaluations of architectural offices were identified by the authors of this article. This is unfortunate, as conducting an evaluation of one’s own office provides designers an excellent opportunity for exploring POE research techniques.

POEs have been used previously to study user satisfaction with office environments (e.g., Zagreus, 2004). Many focus on the impact of traditional versus open-office design. When employees transit from closed to open offices, they frequently express less

satisfaction; however, studies do not consistently suggest that one environment is better than the other (Ferguson, Horan, & Ferguson, 1997). As an example of a study that found low satisfaction in open offices, Brennan, Chugh, and Kline (2002) conducted a longitudinal study before moving from a traditional office to an open office and then later at 4 weeks and 6 months after relocation. In this study, satisfaction decreased in the move to the open office. On the other hand, Brooks and Kaplan (1972) found high satisfaction in an open-office arrangement regarding aesthetics and sociability.

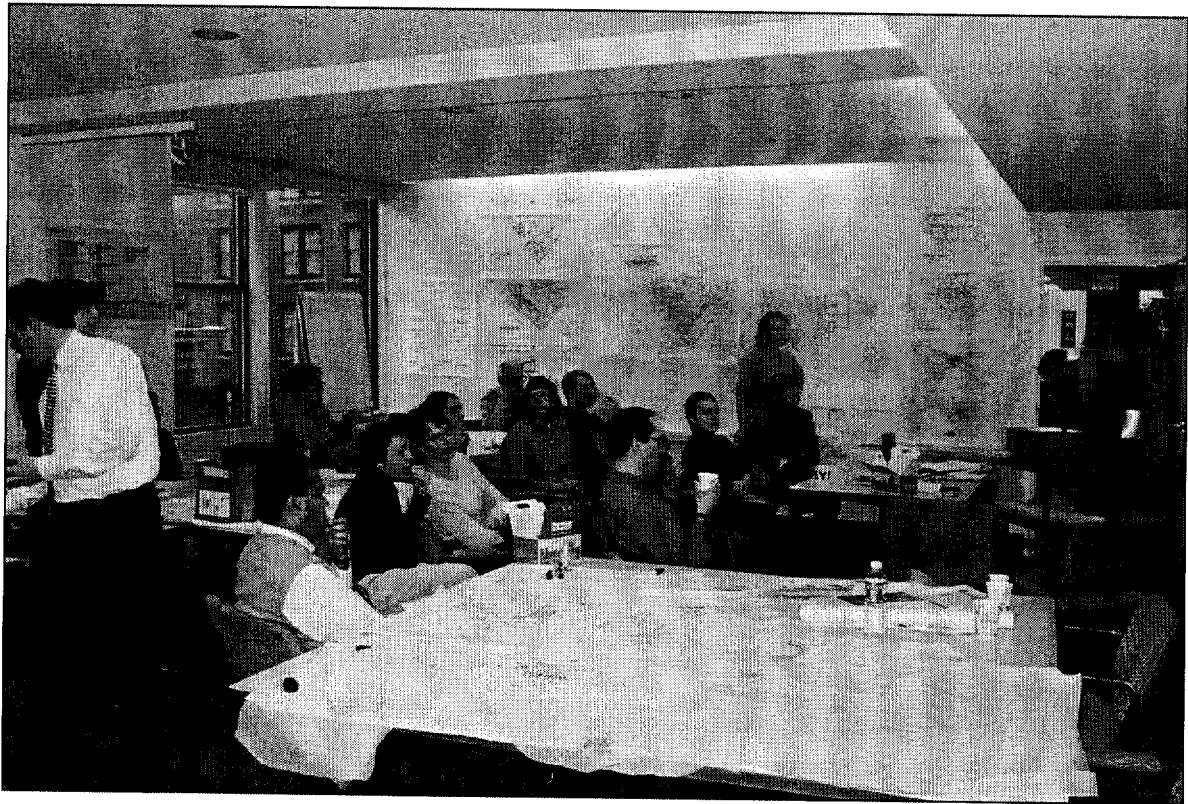
Both the new and old offices in this study were open offices, so the impact of traditional versus open offices was not a consideration.

Increased concern regarding the impact of indoor environmental quality (indoor air quality, thermal comfort, lighting, acoustics, office layout, office furnishings, and building maintenance) has generated a series of studies involving satisfaction. Zagreus, Huizenga, Arens, and Lehrer (2004) developed a survey that they tested on more than 70 office buildings, and they are using the data for the purposes of benchmarking. In a more recent study, researchers (Abbaszadeh, Zagreus, Lehrer, & Huizenga, 2006) investigated occupant satisfaction with indoor air quality in green buildings. While the office environment under consideration in this paper was a Leadership in Energy and Environmental Design (LEED) certified office, the survey did not focus on the topic of indoor air quality.

In addition to studies on the impact of office configuration (traditional versus open) and indoor environmental quality, other factors have been examined regarding their influence on the office experience including the impact of plants (Bringslimark, Hartig & Patil, 2007) and the opportunity to personalize one’s workspace (Konar, Sundstrom, Brady, Mandel, & Rice, 1982).

The theory behind the research described in this paper was predicated on the notion that high satisfaction with the environment would result in high job satisfaction and greater retention of employees.

Figure 2. Conference room at the downtown office building site (photograph courtesy of SBRA).



Veitch, Charles, Farley, and Newsham (2007) administered a questionnaire the purpose of which was to study the link between environmental satisfaction and job satisfaction. Designated the Cost-effective Open-Plan Environments project, they surveyed 779 office occupants evaluating satisfaction with lighting, privacy/acoustics, and temperature/ventilation. The results suggested that those subjects who were more satisfied with their physical environment were more satisfied with their jobs.

Method

Procedure

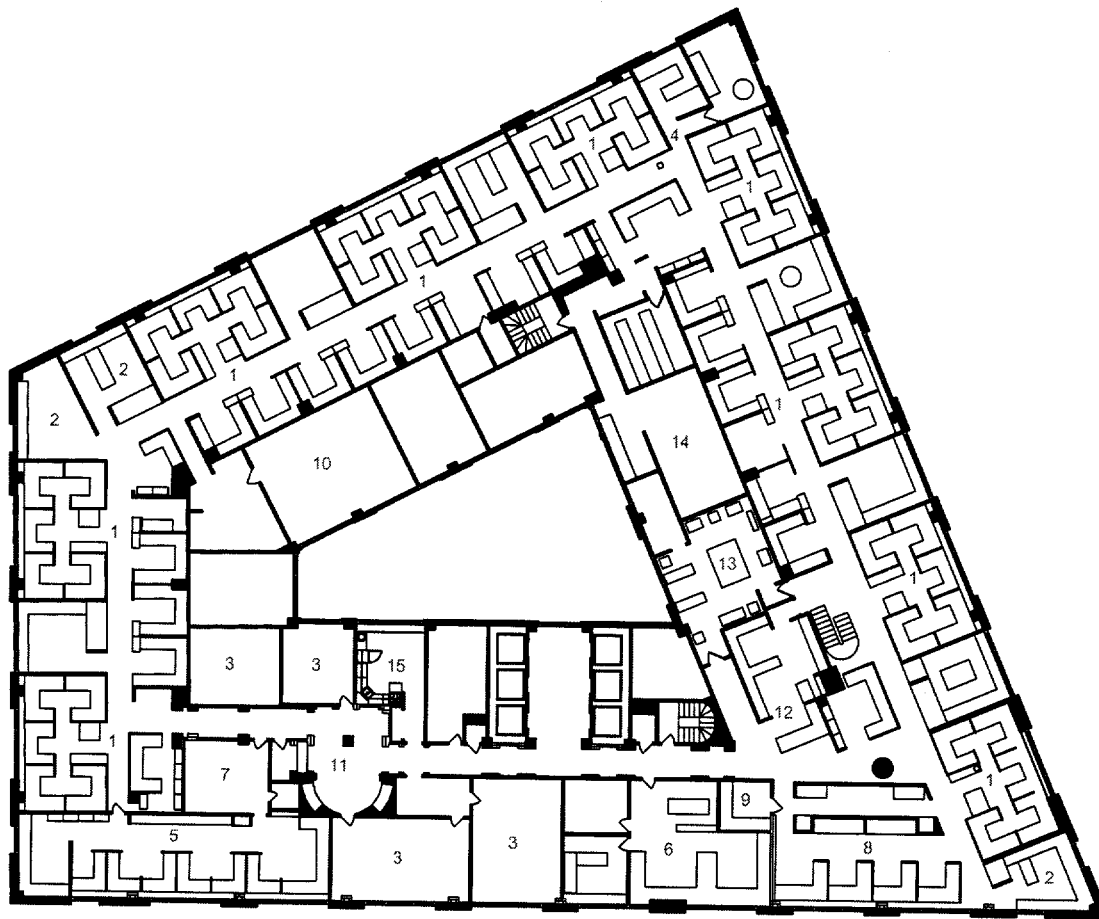
Structured interviews focusing on the design process and pros and cons of the completed environment

were conducted with members of the office design team ($n = 11$) shortly after the project's completion. Approximately 1 year later, these interviews were transcribed and analyzed by the authors of this article and used to determine the primary intentions of the designers. After the objectives were identified, the researcher met with the design team to confirm that these accurately represented the team's design goals.

To avoid bias, the study was conducted by two individuals who were external to the design team: a research consultant and new architectural intern. Participants in the design process did not provide input regarding the interpretation of the results.

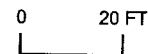
Three primary design objectives were found by examining the interview transcripts: openness, community,

Figure 3. Floor plan of the downtown office building site.



- | | |
|---------------------------|-------------------------------|
| 1. <i>Studio</i> | 9. <i>Server Room</i> |
| 2. <i>Office</i> | 10. <i>Model Shop</i> |
| 3. <i>Conference Room</i> | 11. <i>Reception</i> |
| 4. <i>Human Resources</i> | 12. <i>Shipping/Receiving</i> |
| 5. <i>Marketing</i> | 13. <i>Print/Copy</i> |
| 6. <i>Accounting</i> | 14. <i>Archives</i> |
| 7. <i>Library</i> | 15. <i>Kitchen</i> |

SHEPLEY BULFINCH
40 Broad Street, Floor 6
Boston, MA

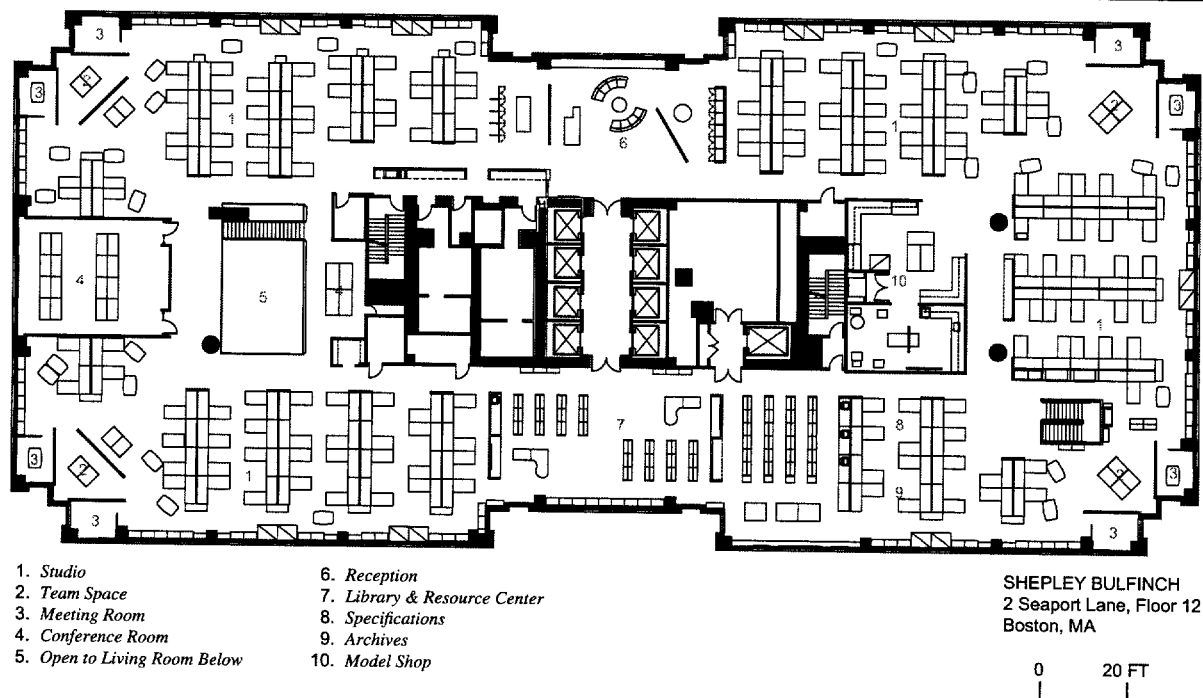


and flexibility. The researchers formulated a six-page questionnaire (including floor plans) using these three design intentions to investigate their

effectiveness and overall staff satisfaction with the new office space. These three concepts were explored as follows:

The survey was conducted approximately 1 year after move-in. This is the minimum time generally recommended by researchers, due to the “honeymoon effect.”

Figure 4. Floor plan of one floor of the Seaport office building site (drawing courtesy of SBRA).



- ‘Openness’ was evaluated by measuring overall openness, transparency of specific spaces, number of people seen from workstation, physical access to principals, awareness of adjacent team activity, and the presence of natural light.
- ‘Community’ was evaluated by asking how well specific spaces supported community, in addition to questions regarding how many people each staff member could identify by name, eating behaviors, and how frequently they participated in social events.
- ‘Flexibility’ was considered to be a function of the multipurpose quality of particular spaces and the frequency and duration of moves to new workstations.

Subjects were asked more generic questions, including their level of general satisfaction and suggestions

regarding modifications to the new office. In summary, the four hypotheses were:

1. Staff will be more satisfied with the new office than the old office.
2. Staff will perceive the new office to be more open than the old office.
3. Staff will perceive the new office to be supportive of community.
4. Staff will perceive the new office to be more flexible than the old office.

The survey was conducted approximately 1 year after move-in. This is the minimum time generally recommended by researchers, due to the “honeymoon effect.” Several studies have indicated that the response to a new situation is more positive than what is expressed several months later (e.g., Boswell, Boudreau, & Tichy, 2005; LaBarbera, 1985). Before having the survey distributed to the entire SBRA staff ($n = 174$) by e-mail, the researchers conducted a brief pilot

study ($n = 4$). Additional surveys were later distributed at a staff meeting to those who had not yet responded. Staff had approximately 2 weeks to submit the completed survey. The researchers input the numerical results into a database and analyzed the data. The narrative data were transcribed and summarized. The survey included Likert scale questions, plans that required graphic responses (circling spaces with particular characteristics), and open-ended questions, and took approximately 20 minutes to complete.

Participants

There were 70 respondents (33 male, 33 female, and 4 unidentified), who represented a response rate of approximately 40% of the firm's 174 staff members. The participants had been with SBRA from 1 to 360 months and had anywhere from 1 to 492 months of work experience. Of the 70 respondents, 16 were new hires and had no experience in the old office.

Results

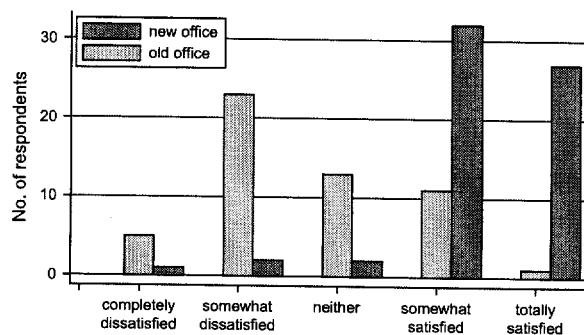
The authors used STATA version 10 statistical software to analyze the data. Paired t -tests were used to compare measures between the old and new offices. If the normality assumption was not met, the data were dichotomized (1, 2, and 3 = 0 and 4 and 5 = 1) so that a proportion test could be performed. Significance was determined at a 5% level and all confidence intervals (CI) are at the 95% level.

Satisfaction

Hypothesis 1: staff are more satisfied with the new office than the old office.

On a scale of 1–5 (5 high), new office satisfaction was rated 4.3 (95% CI [4.1–4.5]) as opposed to the old office that received a rating of 2.6 (95% CI [2.35–2.9]), which is a significant difference at the 5% level. Of the 53 people who experienced the old office and the new office, only 1 was more satisfied with the old office. The distribution of responses is shown in Figure 5.

Figure 5. Satisfaction with old and new office (number of respondents).



There was a marginally significant difference ($p = .057$) between men's and women's satisfaction with the old office design, with men more likely to be satisfied with the old design than were women. The number of years in professional practice was also a significant predictor of satisfaction ($p = .012$), with increasing time in practice increasing the likelihood of satisfaction with the old office.

The only significant predictor of satisfaction with the new office was satisfaction with the new office location ($p = .021$), with likelihood of satisfaction increasing as the rating of the new location increases.

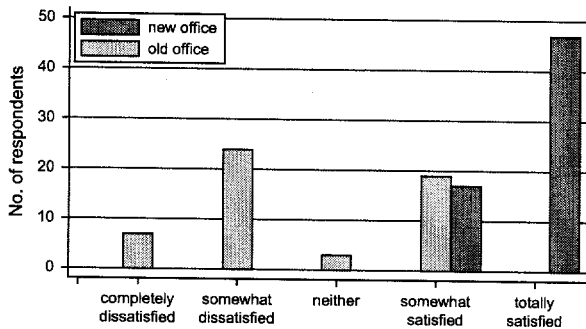
Openness

Hypothesis 2: the new office is perceived as more open than the old office.

On a scale of 1–5 (5 high), the new office visual openness was rated 4.7 (95% CI [4.6–4.85]) as opposed to the old office that received a rating of 2.6 (95% CI [2.3–2.9]), which is a significant difference at the 5% level. The distribution of responses is shown in Figure 6.

There was a significant difference ($p = .011$) between men's and women's perception of visual openness with the old office design, with men more likely to perceive the old office as visually open than women.

Figure 6. Satisfaction with old and new office openness (number of respondents).



The number of persons seen from one's workstation was another measure of sense of openness. In the new office, staff could see an average of 21.2 people (95% CI [17.9–24.5]), whereas in the old office staff, could only see 9.2 people (95% CI [6.9–11.4]), which is a significant difference at the 5% level.

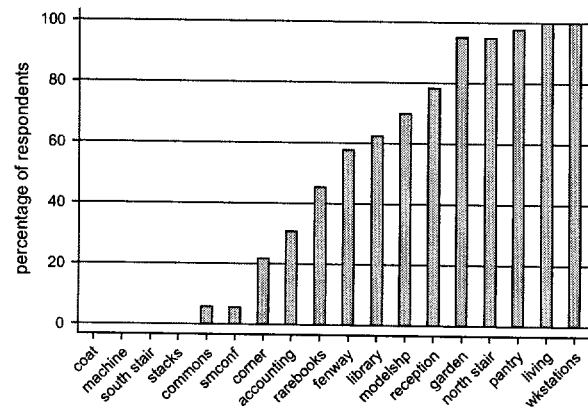
Access to principals was considered to be a measure of sense of openness. On a scale of 1–5 (5 high), the access to principals in the new office was rated 4.4 (95% CI [4.2–4.5]) as opposed to the old office that received a rating of 3.4 (95% CI [3.1–3.7]), which is a significant difference at the 5% level.

Awareness of adjacent team activity is another measure of openness in the new office with 72% (95% CI [61–83]) of staff “somewhat aware” or “completely aware” of the activities of adjacent teams.

Light was considered by the designers to be another factor in openness. Ninety-eight percent (95% CI [92–100]) of staff perceived lighting in the new office as good or very good.

The evaluation of individual spaces also demonstrated positive perceptions of openness/visibility. The pantry, workstations, north stair, and living room, which together constitute most of the floor area in the office, were identified by the vast majority of respondents as open spaces (see Figures 7 and 8).

Figure 7. Percentage of respondents who perceived specific spaces as open.



Community

Hypothesis 3: the new office supports a sense of community.

Three factors were considered measures of a sense of community: how many people each staff member could identify by name and eating behaviors, and how frequently they participated in social events. There was no significant difference in the number of people eating in groups between the old and new offices. However, in the new office, staff estimated they could name 109 coworkers (95% CI [98–121]) of a staff of 174, which was statistically significant.

The primary predictor of participation in social activity is how commonly an individual eats with another staff member. The probability that eating with others predicts participation in social activities is significant ($p = .022$).

Participation in social activities was also considered by researchers to be a measure of strength of community, and 55% (95% CI [42–67]) of staff participate frequently or always in social events at the new office.

The analysis of individual spaces (Figure 9) demonstrates the success of specific spaces. The “living room”

Figure 8. The north stair and living room (at bottom of photo) were consistently identified as very open spaces (photograph courtesy of SBRA).



space was determined to be particularly effective in supporting community (Figure 10).

Flexibility

Hypothesis 4: the new office is perceived to be more flexible than the old office.

The ability of staff to readily relocate to new workstations was assessed as a measure of flexibility in the old and new offices. The time required to change workstations in the new office was 96 minutes (95% CI [68–124]), much less than that required in the old office, 209 minutes (95% CI [154–265]), a difference that is significant at the 5% level.

Flexibility of the team areas is a measure of flexibility in the new design, and 73% of staff (95% CI [59–84]) rated this factor as “somewhat flexible” or “very flexible.”

The degree to which the primary spaces were thought to be multipurpose was also examined. Some spaces, for example, the living room, were seen as very flexible in purpose, while others, for example, the small conference room, were not (see Figures 11 and 12).

Likes/Dislikes and Remodeling Suggestions

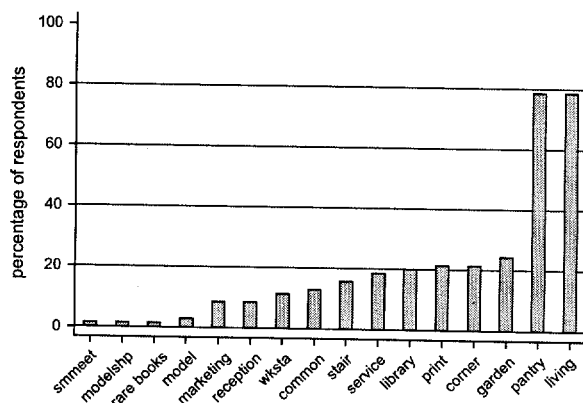
In terms of most preferred spaces, the following were identified:

- *Living Room (38 mentions)*
- *Kitchen (35 mentions)*
- *Corner spaces (8 mentions)*
- *Team spaces (8 mentions)*
- *Workstations (6 mentions).*

In terms of problematic spaces, the reception area was identified 10 times and the print room twice. Subjects were asked how they would improve the office in an open-ended question. The following suggestions were made one or more times:

The difference in satisfaction with the new office design between old hires and new hires may reflect the organizations' reaction or resistance to even a potentially positive change and new hires' excitement about novelty.

Figure 9. Percentage of respondents who perceived specific spaces as supporting community.



- Redesign reception area
- Provide extra desk pedestals for the workstations; more layout space; and raise dividers
- Enlarge conference rooms and provide built-in projection systems
- Provide sun shading devices
- Provide more acoustical control
- Provide lounge furniture in community spaces
- Improve acoustics and wireless network in corner offices
- Expand color palette of furnishings and finishes
- Provide more storage
- Provide more private spaces

Discussion and Conclusion

Subjects were more satisfied with the new office than the old. The primary design intentions, which were to provide a sense of openness, support for community interaction, and flexible space, were typically achieved as measured by statistical significance.

Satisfaction

Satisfaction is generally understood to be highly personal and subjective, yet our analysis suggests specific

elements (e.g., site location) may influence it. Future studies might focus on the degree to which flexibility, openness, and community impact satisfaction as well. Considering that satisfaction with the physical environment may be related to productivity (Tiglao-Torres, 1990), it may be of interest to the architecture community to further investigate the foundations of office environment satisfaction.

Researchers have noted that the self-reports of individuals do not always accurately reflect their behaviors (Wang et al., 2004), and feedback might be the result of dissonance reduction (Carp, 1975). Future questionnaires should include suitable proxy questions (e.g., the question "Assuming a comparable work culture, would you recommend a similar office design for other architecture firms?" is preferable over "Are you satisfied with this office design?").

The difference in satisfaction with the new office design between old hires and new hires may reflect the organizations' reaction or resistance to even a potentially positive change and new hires' excitement about novelty. Additionally, as new hires tend to be new to professional practice, they may have less of a basis for comparison. Furthermore, old hires may have more experience in establishing criteria for good design.

The relationship between satisfaction with the old and new office designs may be explained by respondents' overall positive attitudes. Furthermore, if the new office design is actually objectively better than the old office design, then those who were satisfied with the old office design would likely also be satisfied with the new office design.

Openness

One measure of openness was the perception of natural light. The difference in perception of the amount of natural light between old hires and new hires may be because new hires tend to have inboard workstations and actually are exposed to less natural light within the office. It is also possible, however, that new hires have no baseline for comparison, whereas

Gender differences in perception of visual openness in the old office may be accounted for by height differences, women being shorter than men.

Figure 10. The pantry (shown) and the living room were most frequently mentioned as spaces that support community (photograph courtesy of SBRA).



the old hires readily compare the new office with the old office.

Gender differences in perception of visual openness in the old office may be accounted for by height differences, women being shorter than men. Alternatively, women may simply be more sensitive to visual openness, although no research is available to support this theory. However, because other studies suggest that the relationship between office productivity and satisfaction vary by gender (e.g., LaPlante & Ambady, 2002), differences cannot be

ruled out and may have accounted for disparities in satisfaction.

In the new office, principals tend to have workstations near the windows at either the north or south ends of the building, overlooking the studios lengthwise. In the old office, principals typically had enclosed offices. These conditions may explain the difference between principals' and nonprincipals' responses to number of people seen from workstations, and the difference between the people seen in the old and new offices, respectively.

Overall satisfaction with open space design has been found to significantly correlate with communication...

Figure 11. Ratings of individual spaces regarding the degree to which they are multipurpose.

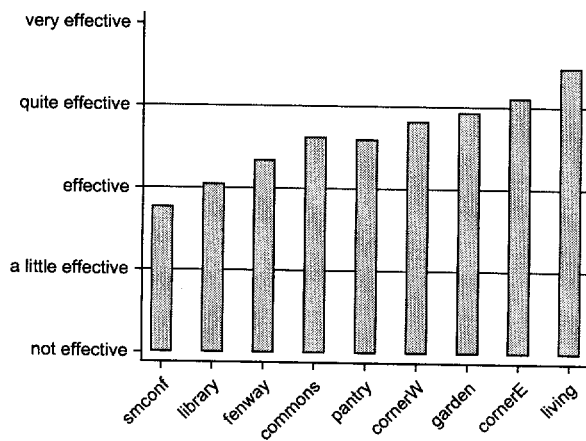


Figure 12. The living room was the highest ranked space regarding multipurpose activity (photograph courtesy of SBRA).



There was some concern regarding lack of privacy in an open environment and high noise levels; these issues, however, are a direct result of trying to provide an open office. Noise has been found to be a negative factor in open office settings, influencing productivity and health (Evans & Johnson, 2000).

Community

The difference in participation in social events between new hires and old hires may be confounded by age (the new hires have on average spent less time in professional practice and are thus likely to be younger and less likely to have families) and perspective (the new hires may not be aware of the number of social events the office holds). The survey, however, did not inquire about participation in social events in the old office; therefore new hires' responses may indicate a more socially participatory culture in the new office.

Overall *satisfaction* with open space design has been found to significantly correlate with communication (McCusker, 2002), and the openness in the new office may be leading to this positive response.

Flexibility

The evidence in this study suggests that the new office was perceived as more flexible. This study did not confirm whether perception positively or negatively impacted satisfaction. According to Ferguson, Horan, and Ferguson (1997) "the lack of personalization in workstations that must be used by multiple people conveys to occupants that they are part of a mobile and transient workforce. The portable partitions tell them that they may not be here tomorrow."

Limitations

In writing future POE questionnaires, researchers should consider the underlying reasoning for the

Obtaining evaluative data that address both the design intentions and their fundamental motives may help designers appropriately form future design intentions and subsequently meet them.

design intentions (e.g., improved public image or productivity). Obtaining evaluative data that address both the design intentions and their fundamental motives may help designers appropriately form future design intentions and subsequently meet them. It would be important to note, for example, that in deciding that the new design should be open and transparent, the designers may have believed that openness and transparency would enhance the firm's collaborative spirit and resultant productivity. This may be the case. According to Crouch and Nimran (1989), the audible presence of one's superior positively impacts performance. A more in-depth POE would gauge the firm's collaborative spirit and productivity in addition to assessing whether the office is physically open and transparent. Otherwise, the POE results may indicate that the proximal design intentions were met, yet ignored their effects on the owner's primary concerns.

Questions asking participants to evaluate their satisfaction with the new office design may have been too vague, and participants may have interpreted the word "design" differently; for example, some may have considered finishes, while others may have considered layout. Moreover, asking about satisfaction at the end of the survey, after priming subjects with questions about the three design intentions (openness, community, and flexibility) may have biased the results. Subjects may have at that point considered their satisfaction with respect to whether design intentions were met, rather than their individual criteria.

Lastly, it is important to remember that these are the results of a single case study and may not be applicable to other circumstances and settings.

It is rare that the results of POEs are shared outside of the architectural firms that produce them. As firms become more confident in the benefits of distributing this information, the data will become more widely distributed and physical environments will improve as a result of incorporating these data in the design of new facilities.

References

- Abbaszadeh, S., Zagreus, L., Lehrer, D., & Huizenga, C. (2006). Occupant satisfaction with indoor environmental quality in green buildings. *Proceeding of Healthy Buildings, Lisbon, Portugal*, Vol. 3, 365-370.
- Al-Saleem, Y. (1992). Evaluating the performance of government office buildings from the users perspective. Master's thesis, Texas A&M University, College Station, TX.
- Boswell, W., Boudreau, J., & Tichy, J. (2005). The relationship between employee job change and job satisfaction: The honeymoon-hangover effect. *Journal of Applied Psychology*, 90, 882-892.
- Brennan, A., Chugh, J., & Kline, T. (2002). Traditional versus open office design. *Environment and Behavior*, 34, 279-299.
- Bringslimark, T., Hartig, T., & Patil, G. (2007). Psychological benefits of indoor plants in workplaces: Putting experimental results into context. *Horticultural Science*, 42(3), 581-587.
- Brooks, M., & Kaplan, A. (1972). The office environment: Space planning and affective behavior. *Human Factors*, 14(5), 373-391.
- Canter, D. (1972). Royal Hospital for Sick Children: A psychological analysis. *Architect's Journal*, 156, 525-564.
- Carp, F. (1975). Ego-defense or cognitive consistency effects on environmental evaluations. *Journal of Gerontology*, 30, 707-711.
- Children's Environments Research Group (CERP). (1995). *Hasbro Children's Hospital Post-Occupancy Evaluation*. New York: The Graduate School and University Center of the City University of New York.
- Crouch, A., & Nimran, U. (1989). Office design and behavior of senior managers. *Human Relations*, 42, 139-155.
- Evans, G., & Johnson, D. (2000). Stress and open-office noise. *Journal of Applied Psychology*, 85, 779-783.
- Ferguson, S., Horan, H., & Ferguson, A. (1997). Indicators of permanence in workspace features: Perceived importance and relationship to workspace satisfaction. *Canadian Journal of Communication*, 22 (1). Retrieved October 22, 2008, from <http://www.cjc-online.ca.ezproxy.tamu.edu:2048/index.php/journal/article/view/976/882>
- Harris, D., Joseph, A., Becker, F., Hamilton, D., Shepley, M., & Zimring, C. (2008). *A practitioner's guide to evidence-based design*. Concord, CA: The Center for Health Design.
- James, D., & Stewart, S. (1995). Library design analysis using post-occupancy evaluation. *Science & Technology Libraries*, 15(2), 3-15.
- Kantrowitz, M., & Nordhaus, R. (1980). The impact of post-occupancy evaluation research: A case study. *Environment and Behavior*, 12, 508-519.
- Konar, E., Sundstrom, E., Brady, C., Mandel, D., & Rice, R.W. (1982). Status demarcation in the office. *Environment and Behavior*, 14, 561-580.
- LaBarbera, J. (1985). A honeymoon effect in child psychiatric hospitalization: A research note. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 26, 479-483.

- LaPlante, D., & Ambady, N. (2002). Saying it like it isn't: Mixed messages from men and women in the workplace. *Journal of Applied Social Psychology*, 32, 2435-2457.
- Marans, R., & Spreckelmeyer, K. (1982). Measuring overall architectural quality: A component of building evaluation. *Environment and Behavior*, 14, 652-670.
- McCusker, J. (2002). Individuals and open space office designs: The relationship between the personality and satisfaction in an open space work environment. *Dissertation Abstracts International: Section B*, 63(2-B), 1076.
- Nasar, J., & Preiser, W. (2007). *Designing for designers: Lessons learned from schools of architecture*. New York: Fairchild.
- Preiser, W. (Ed.). (1989). *Building evaluation*. New York: Plenum Press.
- Preiser, W., & Vischer, J. (Eds.). (2005). *Assessing building performance*. Oxford: Butterworth-Heinemann.
- Preiser, W., Rabinowitz, H., & White, E. (1988). *Post-occupancy evaluation*. New York: Van Nostrand Reinhold.
- Shepley, M. (1995). The location of behavior incidents in a children's psychiatric facility. *Children's Environments*, 12, 352-351.
- Shepley, M. (1996). Design evaluation. In S. Marberry (Ed.), *Healthcare design: An introduction*. New York: Wiley.
- Tiglaio-Torres, A. (1990). Work motivation and productivity of government workers. *Philippine Journal of Psychology*, 23, 30-38.
- Veitch, J., Charles, K., Farley, K., & Newsham, G. (2007). A model of satisfaction with open-plan office conditions: COPE field findings. *Journal of Environmental Psychology*, 27, 177-189.
- Wang, P., Benner, J., Glynn, R., Winkelmayr, W., Morgun, H., & Avorn, J. (2004). How well do patients report noncompliance with antihypertensive medications? A comparison of self-report versus filled prescriptions. *Pharmacoepidemiology and Drug Safety*, 13(1), 11-19.
- White, E.T. (1986). Post-occupancy evaluation. *CEFP Journal*, 24(6), 19-22.
- White, E.T. (1992). Post occupancy evaluation: A new component in the building delivery process. *Educational Facility Planner*, 30(3), 4-7.
- Zagreus, L. (2004). Listening to the occupants. *Indoor Air*, 14(Suppl. 8), 65-74.
- Zagreus, L., Huizenga, C., Arens, E., & Lehrer, D. (2004). Listening to the occupants: A web-based indoor environmental quality survey. *Indoor Air*, 14(Suppl. 8), 65-74.
- Zeisel, J. (2006). *Inquiry by design*. New York: W.W. Norton.
- Zimring, C.M. (1987). *Evaluation of designed environments: Methods for post-occupancy evaluation*. New York: Van Nostrand Reinhold.
- Zimring, C., & Reizenstein, J. (1980). Post-occupancy evaluation: An overview. *Environment and Behavior*, 12(4), 52-58.