Changing the agent of change: POEs for greater aesthetic and scientific data collection

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ABSTRACT: This paper presents a brief history of post occupancy evaluation methods. Analysis of evaluation techniques is brought into focus to illustrate both benefits and barriers within existing methods. Special attention is given to efficacy of methods in relation to pragmatics of information gathering: by whom, at what frequency, duration, etc. While functional and technical elements of building performance can be accurately measured through objective means such as energy audits, workflow analysis, acoustic and lighting measurements and other techniques, behavioral characteristics routinely rely on limited survey techniques, interviews, or focus groups susceptible to high levels of subjectivity or worse; specialization of questions/issues that are not equally accessible to building occupants.

With evidence of most POEs being conducted over the course of a day or perhaps a couple weeks, and typically only once about a year after construction, a new paradigm emerges to design methods of post occupancy evaluation that acquire building user information and deliver feedback to architects, building managers, or others in real time throughout the entire life cycle of the building. As POEs are most beneficial when information is made available to the widest potential audiences, the methods explored, here, attempt to translate high-level design principles into intuitive, graphical language for all to understand.

The presentation chronicles the process of integrating simulated three-dimensional environments, digital interfaces, and social media in a strategic shift in the discipline of conducting post occupancy evaluations. On-site installations, interactive software, and mobile applications are developed and simulated to test alternative advancements in POE orchestration. Conclusions address changes in a paradigm that seeks to fundamentally improve potential feedback quality and quantity through emerging technologies. Speculative simulations focus on buildings in the hospitality market but projections are applicable across multiple building types.

KEYWORDS: Post-Occupancy, Installation, Evaluation, Intuitive, Interactive

INTRODUCTION

In the digital and information age, many tools and techniques have been developed for the design, presentation, and fabrication stages of architecture. Here, the authors seek to apply some of these pre-occupancy means to post-occupancy evaluations. Emphasis is placed on the integration of intuitive technologies in hopes of fostering greater feedback from building users. Automation of translating user feedback into useful data sets for design team members and building owners is also sought through digital measures, which allow for long term analysis; tracking building performance over time.

An example of fixed-installation information gathering at a basic level has been implemented at the Changi International Airport in Singapore through a rating system displayed on iPads located throughout the building. These devices are placed in areas such as restrooms and immigration checkpoints and allow passengers to quickly input their feedback regarding both experience and efficiency with a quick tap of a finger to a correlating emoji that represents their level of satisfaction. This paper furthers the complexities of the information feedback loop by combining installations' camera capabilities with their interactive screens to invite critiques on the architectural context. We can now harness the power of data analytics combined with crowd sourced feedback to better understand how people interact with their physical environment.

1.0 CURRENT MEANS AND METHODS

POEs focus on building occupants and their needs. They provide insights into the consequences of past design decisions and the resulting building performance. This knowledge forms a sound basis for creating better buildings in the future. The performance of a building is evaluated regularly, although not necessarily in a self-conscious and explicit way. Post-occupancy evaluations are vital in our society because of the fundamental idea, which they are based on: better living space can be designed by asking users about their needs. Architecture, construction, building systems, environmental impact and programming are just a few examples of the thousands of factors that are involved in POE. The concept of building performance is at the core of post occupancy evaluations. POE is essentially a *statement of building performance*. POE can help organizations test new building ideas and operate more efficiently within their facilities.

There are three main elements of building performance to be evaluated in POE: functional, technical, and behavioral. Functional evaluations focus on the operational efficiencies and deal with the productive workflow between the building and its occupants activities. Technical evaluations deal with life, safety, and welfare issues such as the performance of building systems like structures, sanitation, fire safety, lighting, etc. Behavioral evaluations address occupant perceptions and psychological needs pertaining to building use and social interactions within spaces.

There are various obvious benefits to the conducting of POE. Facility managers gain insights on what needs attention in existing building stock. Organizations benefit from focused analysis on operational efficiencies. Professional/human benefits are among the most important outcomes of POE as a goal of the process is to positively influence the (re)creation of safe, comfortable, and productive environments for people. Among the current available methods of POE, common evaluation techniques for addressing people and their perceptions of the built environment include: walk through and observations, interviews, focus groups, workshops, questionnaires, and measurements.

According to a series of POE case studies documented by Bordass et al.,

> Relatively modest exercises can have large effects. User Group members found that they could learn a lot from asking occupants what they thought: often their perspectives were very different. 'Designers are not users, though they often think they are' (Nielsen, 1993, 13). For example, occupant comments on the internal environment can be a more useful and cost effective starting point than instrumented monitoring, as each occupant experiences their own specific environment; and perceptions of real buildings – particularly ones that make use of natural light and ventilation and incorporate good user control – can be very different from predictions based on work in climate chambers in which the subject tends to be a passive participant (Bordass et al. 2005).

However, these modest inquiries typically fall short of inviting occupants to put forth their own proposals to solve a particular problem in a particular place. Instead, most traditional surveys collect information about the occupants' perceptions. Then, the task of trying to match the feelings expressed on a survey to the architectural modifications available in the real world falls on a third-party to hypothesize.

1.1. Where to apply new means

While the current techniques offer a range of data collection opportunities, there are a number of barriers inherent in each that can keep valuable information from being attained by the evaluators. There is often a lack of user feedback in survey methods. Without significant participation, achieving statistically viable results is difficult. Often there is not enough incentive for participation or a clear understanding of how the feedback from users can be used to inform building improvements or adjust best-practices for future development. Wasted time and frustration in formulating guidelines for future design and construction can be the effect of reacting to non-critical building assessments and not ascertaining more informative insights. Technical language requires surveyors with a background in the architectural industry, yet translating technical information into concepts approachable to all occupants can be challenging and is occasionally the source of another impedance to the POE process.

Not only is it important for respondents to POE surveys, interviews, focus groups, etc. to understand graphical language and architectural representations, it is equally important for evaluators to understand and disseminate their feedback. The greatest benefits from POE come from closing the loop by connecting feedback to the industry at large (and not just the building being evaluated).

For reasons of greater participation and dissemination with POE, a process of developing an intuitive virtual 3D environment interface is proposed. The idea is to expand on existing methods of information gathering for the improvement of structures and community spaces through,

> wearable or handheld technologies that attempt to facilitate interactions between people, between people and computers or between people and artifact… and the use of large displays in shared contexts (McDonald et al. 2008)

As smart phones, tablets, and screens have become commonplace and social media connects people and ideas across great expanses of time and space, harnessing these opportunities for the tightening of data collection on the built environment represents the continued trend of better understanding design performance. These virtual world interfaces would integrate design features of the real world and allow users to interact with intuitive tools designed to accommodate respondents' instinctual desires to change aspects of their environment. The tool would be implemented in various parts of the built environment using Building Information Models of existing facilities and near limitless surveyor-developed design intervention opportunities.

1.2. The POE digital interface

Gamification has become an increasingly popular way to improve user engagement and motivation in real-world market research (Cechanowicz et.al. 2013, 58). The (next) trend in POE is the gamification of questionnaires, surveys, walkthroughs, and other evaluation techniques. As intuitively as phone apps have non-architect users designing virtual worlds and envisioning themselves in those spaces (ex. MineCraft, SimCity), the POE Digital Interface seeks to be the omnipresent application or integrated installation for building occupants to respond to and re-envision their real surroundings. It aspires to be the approachable alternative to the pen and paper text-based survey, and in the process, translate user feedback into more immediate architectural data. And as meaningful architectural analysis can be difficult to gather from static surveys, gamification has been shown to "increase creativity and participant interest" (Adamou 2012).

The methods of acquiring occupant feedback expand from a traditionally set timeframe (ranging from several minutes to a couple days about year after building completion) to a continuous period spanning the life of a building. The means of delivering information back to stakeholders happens in real time instead of requiring additional resources to collect and interpret data. Moreover, information does not have to stop at traditional stakeholders but can be shared beyond the institution whose building is being evaluated or beyond the architects and consultants involved. The information could be made easily available in educational settings, governmental agencies, or open source databases for the betterment of the industry.

1.3. Sample scenario

POE Design Interface is launched on location by opening a software application, which is accessed via smartphone or on site control panel. A three-dimensional scene of the immediate urban, building, or interior environment is rendered and the user is then prompted to select an area to address. From the menu screen, the user is immersed in the selected area with even greater detail. Details enable users to request different types of augmented visualizations to the virtual world. Input is visually expressed in three dimensions with the ability to alter form and function through manipulation of color, texture, scale, and object type.

Figure 1: POE Digital Interface Flowchart - Source: (Pejooh 2013)

Alternative scenarios generated by POE Design Interface users are archived as overlays corresponding to original (as-built) models in order to measure degree of variation and trends over time. Augmentations can include alternative circulation patterns (created by users vs. intended/existing), program planning, lighting, ventilation, landscape features, interior/exterior building materials/color/texture, etc. Suggested changes that critically impact the building could be instantly identified and assessed according to current industry standards, codes, cost analysis, and environmental impact among others. The ability of occupants to choose what to address about their building and where, when, and how to address it invites more feedback (and arguably more meaningful feedback) than a survey conducted at a prescribed place and time.

For more public engagement with individuals' POE Design Interface feedback, temporary or semi-permanent installations for design visualizations can be integrated into the building. Video-mapped surfaces can display user input, or design suggestions can be translated into various scaled models to elicit more comments. This can be especially useful when other aspects of the POE have helped to identify specific areas of a project that require additional analysis.

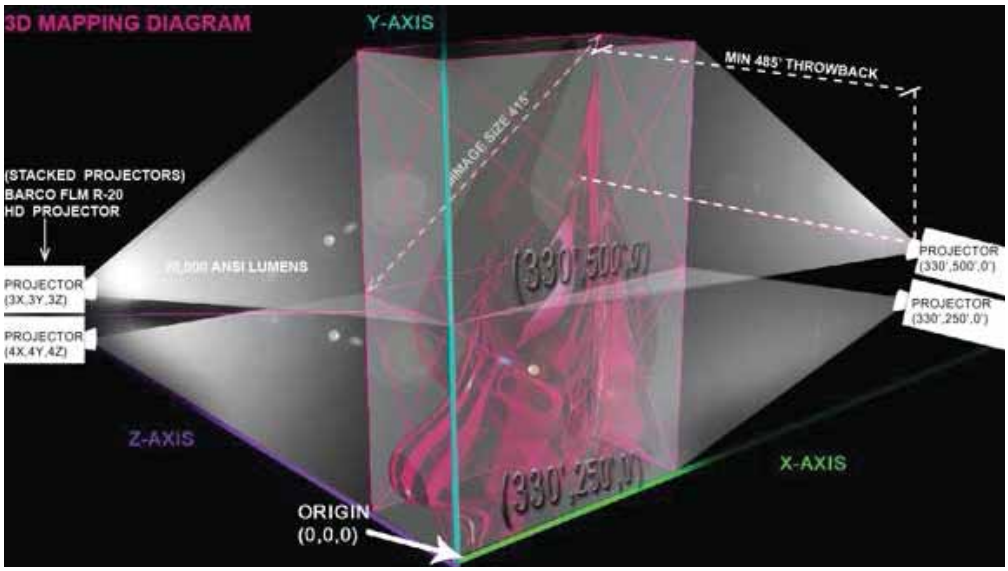

Figure 2: POE Digital Interface Optional Video mapping/installation - Source: (Pejooh 2013)

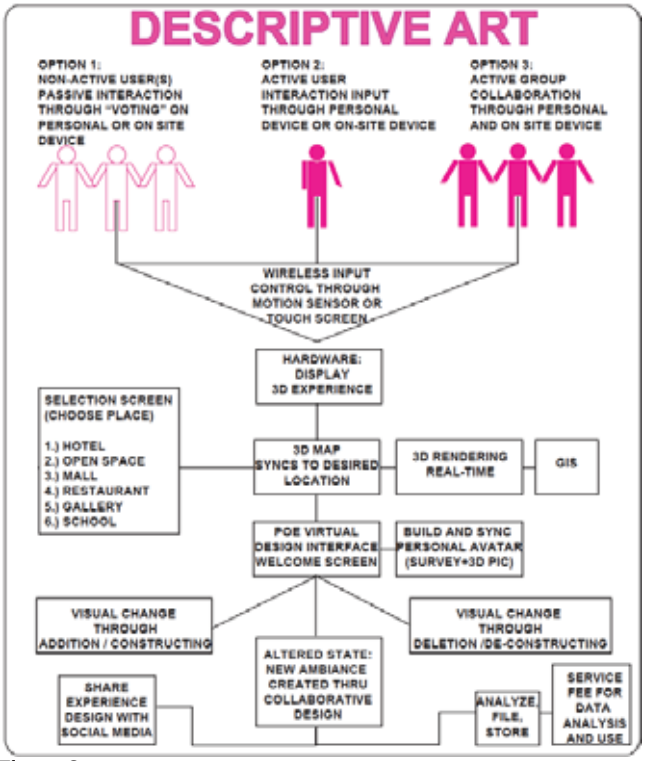

Figure 3: POE Digital Interface Flowchart - Source: (Pejooh 2013)

Integrated opportunities abound in establishing user-driven feedback loops that engage the spaces people spend most of their lives. End goals include three main items for consideration. The first is a post occupancy report card which visually and numerically evaluates data from individual user input in order to determine architectural performance against expectations and/or industry standards. The second is a digital copy of user input will be sent to the user when provided with an email address and/or social media tag. Users have the option of "sharing" their experience online on social media sites in real time and can collect

experiences and stitch them together in a portfolio format. And third, the goal of fosters social collaboration to inform design thinking is paramount to process of designing for people.

1.4. Example market/users

Public and private entities that can benefit from a POE Digital Interface include architects, urban planners, various building consultants, owners, developers, managers, franchises, governmental agencies, research groups, and individuals. While valuable data could be culled from implementing these practices in the most modest of dwellings, location based markets would likely produce the most cost-effective and insightful evaluations. Areas or building types that attract a diverse population ready to immerse themselves in their surroundings (and have fun reimagining those surroundings) are ideal candidates to test the application. Theme parks, boardwalks, the Las Vegas Strip, hotels, parks, high density areas, and large scale work places stand to benefit most.

At the time of this writing, fee structures have not be established for the POE Digital Interface. Important ethical considerations are being weighed between long-term service and information fees on one side and one-time installation costs on the other. Charges for data requested over time could include increasing premiums for type of feedback; moving from written summaries still requiring interpretation, to statistical analysis, graphical overlays, and video footage (user/crowd reaction) which would require less and less interpretation. However, with the core tenet of learning from all evaluations of our built environment, the POE Digital Interface may only seek compensation for initial download of the application software and/or installation of public presence video projections, on-site kiosks, and similar integration of smart screens into evaluation areas.

CONCLUSION

Information from POE can provide insights into problem resolution and provide useful benchmarks to which other projects can be compared. The POE Digital Interface provides opportunities for improving the effectiveness of building engagement, and it has the ability to more easily share post occupancy analysis with people outside any particular project being evaluated. The active participation not only creates a more dynamic environment but also fosters a sense of community within destinations. The technology has the potential as a powerful social tool to enable the public to educate themselves about design (through a participatory process of evaluation). It further educates architects and owners on what the general public may prefer in buildings in terms of design, program, and functionality. And, a more intuitive, user-friendly, real-time (all the time) feedback loop has the ability to collect more meaningful information about design effectiveness and the evolving character of a building throughout its life-cycle. Next steps to test the effectiveness of this tool would include an experiment, which compares the data retrieved from the interactive digital interface with the data retrieved by traditional survey methods. Integration of the technology is being explored for future use in hotel guest experience surveys.

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