Adaptive Architecture and *Building Performance Evaluation* in the Context of Social Equity – A Tribute to Wolfgang F. E. Preiser

Co-Chairs: Andrea E. Hardy and Ulrich Schramm

Wolfgang F. E. Preiser was an active member of the Environmental Design Research Association (EDRA) and the International Building Performance Evaluation (IBPE)-consortium since their conception. While *Adaptive Architecture (2018)* and *Building Performance Evaluation (2018)* were in the final stages of reviewing and going to press, Wolfgang Preiser, senior editor of both books, passed away. For the co-editors of the books, most of the contributors, and many of the books' readers, Wolf Preiser's work influenced the practice of architecture, as well as social science research into building user behavior around the world. As his work is strongly related to the conference overall theme *Social Equity by Design*, the session is a tribute to Wolf and is divided in three sections: past, present, and future.

Section 1: Past
We celebrate Wolf's life – 40 plus years of experience in teaching, research and consulting in architectural programming and evaluation of environments. This section serves as an introduction to the session by identifying Wolf's work (25+ publications), with many other collaborators, that is mirrored in the books, research projects or articles mentioned above.

Section 2: Present
We celebrate the publishing of two books – *Adaptive Architecture* and *Building Performance Evaluation*. Many of the contributions directly relate to the topic the EDRA49 conference's theme, *Social Equity by Design*, through relating to social equity reflected or addressed in the built environment, identified through post-occupancy evaluations (POE) and building performance evaluations (BPE).

Section 3: Future
We focus on the future of BPE and the advances that are moving our discipline forward including: tools and techniques, life cycle analysis, and increasing richness of physical environments. Can diversified study targets within the BPE model help to mitigate the effects of inequality?

Sections 2 & 3 will conclude with panel discussions and Q & A.

POE/Programming Knowledge Network supports session.

Viewing Submission

Title:
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Abstract id# 4241
WOLFGANG F.E. PREISER'S HABITABILITY PARADIGM: THEORIES IN STUDY AND PRACTICE

Andrea E Hardy, Creo Architects, Phoenix, AZ
This presentation outlines Wolf's publications building up to one of his final books on the theories adaptive architecture through the eyes of his habitability paradigm. With each new publication, Wolf was striving for equity in design through performance and accessibility.

Following the development of "the Habitability Paradigm" as defined by the recently passed Dr. Wolfgang F. E. Preiser, the presenter will outline Wolf's publications and demonstrate the long link to habitability. "Habitability refers to those qualitative and quantitative aspects of the built environment which support human activities in terms of individual and communal goals" (Preiser 1983). The progression of the theory and studies behind this concept is tracked in each of Wolf's publications, including some of his last publications: *Adaptive Architecture: Changing Parameters and Practice*, and *Building Performance Evaluation: From Delivery Process to Life Cycle Phases*.

The presentation will conclude by drawing parallels to the way he conducted his research as a mentor, using the Emeritus College at Arizona State University to actively seek new voices to contribute to the fields of building performance and evaluation. This passing of information allows for the compounding of knowledge from one generation of academics and professionals to the next.

Abstract id# 4242
FROM DELIVERY PROCESS TO LIFE CYCLE PHASES: BUILDING PERFORMANCE EVALUATION OF AN INTELLIGENT CAMPUS BUILDING

Ulrich Schramm, Bielefeld University of Applied Sciences, Minden, Germany
While building delivery, traditionally, is seen as a linear, end-product oriented process, building performance evaluation (BPE) is considered as a dynamic and evolving model representing the complex nature of performance evaluation throughout the entire life cycle of buildings. The potential and benefits of applying BPE over the lifetime of a building like feeding forward information and knowledge help to streamline all stages of building design and management, including avoiding costly mistakes. Using the case study of the new intelligent building on Minden Campus, Bielefeld University of Applied Sciences, Germany, already introduced in *Adaptive Architecture* (chapter 19) and *Building Performance Evaluation* (chapter 6), the presentation will:

- illustrate the six phases and the respective internal feedback loops of BPE
- analyze the role of significant stakeholders within the building's life cycle
- explore issues of social inequality that can be reflected, in part, in the built environment
- explain the outcomes of various studies and other pre-occupancy evaluations like usability-testing

- discuss the results of the investigative post-occupancy evaluation (POE), performed after a settling-in period of an entire year
- compare these POE results with the pre-occupancy evaluation outcomes
- summarize the lessons learned from these evaluation processes and techniques
- offer short, medium, and long term perspectives on how to improve the specific situation and to promote social equity, well-being, and acceptance of intelligent campus buildings.

In conclusion, the author will elaborate on the significance of *user involvement and feedback* in general and on the need of *information for building users* in particular that seem to be the key terms in the given context.

Abstract id# 4243
FEEDING KNOWLEDGE FORWARD: ADVANCEMENTS IN POST-OCCUPANCY EVALUATION APPLICATION THROUGH COLLABORATION

Lindsey Fay, University of Kentucky, Lexington, KY
The evidence-based design process identifies the use of post-occupancy evaluations (POEs) as a significant methodology for testing the applicability of research findings to the built environment. Yet too often literature describing POEs simply ends with the reporting of findings rather than suggesting how this knowledge feeds forward. This raises the question: how can we re-envision the translation of evidence to better incorporate it into design practice and thus increasing the equity of users within our designs? This presentation will illustrate a collaborative, full cycle POE conducted in an academic emergency department (ED) to demonstrate methods of planning a POE, capturing meaningful data, and applying outcomes through the use of a design charette to address issues uncovered by the research.

Evidence from the POE was gathered using a conceptual framework that assessed the interrelationship between the built environment, user experiences, and operational outcomes of the ED. Data collection and analysis utilized objective and subjective measures yielding both qualitative and quantitative data. Research findings from behavioral mapping, physical measurements, questionnaires, and focus groups yielded significant insights that framed the scope and focus of the design charette. In analyzing the use of the charrette to link POE findings to design application, it was determined that the charrette should include an all-inclusive, collaborative process, easily interpreted evidence, active participant engagement, and feasible outcomes grounded in research. Taking the POE process full cycle is critical in bridging the gap between research and practice. The charrette process offers a mark of completion to the POE and helps participants gain sensitivity to the importance of evidence-based decision-making.

Abstract id# 4244
EVALUATING WORKPLACE CONSTRUCTS USING SPACE SYNTAX TECHNIQUES IN PROFESSIONAL PRACTICE

Linda Nubani, Michigan State University, Lansing, MI
Previous literature on space syntax showed how workspace layout generated boundaries that created relationships of accessibility and visibility (Rashid et al., 2005). These measures in turn regulated occupants' behavior and activities. Previous research also measured the impact of spatial layouts and various organizational constructs such as employees' performance,

satisfaction, and face-to-face communication levels. However, there is little research that documents whether these techniques are implemented in professional practice. Within this presentation, the author discusses and compares the visual properties of eight different semi-government and private offices in Dubai regarding their terms of intelligibility and their expected level of face-to-face communication among employees. The author provides a comparison between these offices and mainstream workplace concepts using visibility graph analysis, one of the space syntax techniques. The goal of using these techniques is to establish a systematic and an objective way in describing the relationship between organizational constructs and office layouts. The author explores the importance of using such techniques by professionals in interior design and architecture practice as it is possible to explore different behavioral outcomes associated with difference space planning solutions.

Abstract id# 4245
THE COLLABORATION AND DESIGN OF THE SCOTTISH CRIME CAMPUS

Gordon Murray, Ryder Architecture, 75 Montrose Street, United Kingdom
The Scottish Crime Campus, as featured in *Adaptive Architecture***,** was to find an architectural form and pattern language which would provide a semiological basis for the essence of the building's operational techniques and give outstanding environmental performance. By defining a new semiology for buildings that reflect the ethos behind the brief and satisfy the technological requirements of the client, the campus achieved equity in design with built environmental performance, stimulating interdisciplinary interactions.

Two years after completion, a post-occupancy evaluation was performance and workshops were held for senior leaders, managers and operational/support staff. Within these workshops the findings from the POE were discussed with overall feedback from all three workshops being positive with and that the principles had indeed engendered collaboration. The focus of the workshops was to identify ways in which collaborative working could be further facilitated. Five themes were identified: efficiency, familiarisation, privacy, identity, and suitability.

- Efficiency – the building has made it more efficient for people to meet. This has led to greater sharing of information and faster than previously.
- Familiarisation – an accessible directory of people and their expertise and specialisms on an intranet would enhance familiarising procedures.
- Privacy – Senior managers felt that concerns about people from other agencies seeing or hearing what they were doing was not an issue yet operational and support staff are wary of people from other agencies and the degree of access they have to their spaces.
- Identity – overall people feel a sense of ownership of the spaces in the building. This was clearly manifested in people's use of meeting areas within the atrium.
- Suitability – open plan working appears to offer better over sight, encourages people to talk to one another and facilitated quick exchange of information and informal clarifications.

Abstract id# 4246
IMPORTANCE OF PARTICIPATING IN THE CONSTRUCTION OF ARCHITECTURE IN THIRD-WORLD COUNTRIES

Allison Lenell Magley, DWL Architects + Planners, Phoenix, AZ

The human capacity to travel and experience diverse geographies represents the increasing realization of the global condition. With global travel more financially accessible, and more individuals able to travel worldwide, the impact of place on regional architecture becomes more influential. As individuals travel to more remote areas previously inaccessible, the immediate experience of diverse cultures will increasingly spread and appear as regional translations or adaptations in the built environment. This consideration makes the human global condition through placemaking more complex, and architecture becomes multi-lingual.

The current trend of architectural interventions in the developing world represents a significant movement toward globalization of social equality through design. The majority of activity is seen in Non-Governmental Organizations (NGO's), collaboration through academic institutions, professional involvement at the corporate level, and the ability for individuals to access personal involvement at the professional level. This section focuses on critical evaluation of the Habitat for Humanity Global Village project in Ethiopia including assessment of residential housing, scale of project intervention, impact of local community in participating in construction and mortgage programs, and the importance of incorporating architectural and engineering professionals in similar global endeavors. The approach explores the accessibility through non-profit organizations for young professionals to explore the meaning of architecture personally and professionally, and thus advancing the role of architecture in influencing equality.

Abstract id# 4247

THE DRIVING FORCE OF SOCIAL INTERACTION WITHIN THE ADAPTIVE REUSE OF LARGE HISTORIC BUILDINGS

Karin Liljegren, Omgivning, Los Angeles, CA

Adaptive reuse of large scale existing buildings from a single user to multiple occupancies creates unique opportunities for building rehabilitation. The notion of social interaction though placemaking becomes paramount to the success of the redesign.

Two such cases studies are the Broadway Trade Building and the Sears Building in urban Los Angeles. The Broadway Trade Building served as the flagship store for the May Company and was, at the time, the largest department store west of Chicago totaling over 1 million square feet. The Sears Roebuck Distribution Center, almost 2 million square feet, was one of six Sears distribution centers in the United States. The buildings originally had single functions: one a large retail store, and the other a retail distribution center. The new uses will be infused with a myriad of new functions such as hotel, housing, office, food market, retail, outdoor parks, pools and social commerce.

In these two cases, the new users have a cohesive culture that is decidedly urban, progressive and sustainably minded while at the same time uniquely diverse in racial, ethnic and socioeconomic makeup. The interjection of social engagement in redesign is the driving force. The rooftops will be alive with the energy of gathering, socializing, playing, and commerce. New carvings into the building or 'light courts,' make dramatic cuts through the building shell, bringing natural daylight to the building's interior. They also break up the enormous mass of these buildings by connecting people and spaces both horizontally and vertically. Each space is linked through a path of exploration to invite the users to explore, connect, and engage with each other.

Abstract id# 4248
CAN BIM, MULTI-TASKING ARCHITECTURAL COMPUTER PROGRAMS, HELP THE PLANNING AND DESIGN OF MIXED-USE DEVELOPMENT OF TRAIN STATION BUILDINGS?

Akikazu Kato, Mie University, Tsu, Japan
Is traveling on a train becoming obsolete? Certainly not, especially in Japan. Thus, a railway station building is becoming a huge multi-functional mixed-use complex of various commercial facilities including shopping stores, hotel, and office. The biggest merit of combining multiple tasks might be the creation of extra services and/or a new way of city life by providing access both amenities and transportation at the same location for ease of access. However, so often the result is simple accumulation of functions rather than their holistic integration. A group of high rise towers might simply house individual functions and features without any relations or coherence to another. Moreover, because railway is a land bound system, an impact of station building is quite significant in the urban planning and design. The project of landing the air rights may require careful considerations.

In such a controversial project, the challenge of using BIM (Building Information Modeling) System is becoming an important issue. BIM enables a front-loading decision-making in the planning and design phase, enhancing the quality of planning and design. BIM provides a holistic picture for the general contractors, where in the conventional construction process the information was scattered in architectural, structural, mechanical and electrical drawings, increasing the productivity in construction. When the information for management and operation of the building is suitably extracted before the actual completion as in the virtual hand over stage, BIM supports the efficiency in Facility Management. BIM enables simulations by use of multiple evidence achieved in the research, benefiting the building performance assessment.

Equity by design is identified through discussions on the multipurpose programming of train stations and the quality of their design and construction, with the use of BIM systems.

Abstract id# 4249
ACADEMY OF ARCHITECTURE FOR JUSTICE COURTHOUSE POE TOOLKIT

Erin Persky, Facility Planner/ Architectural Associate, San Diego, CA
Justice architects and planners are tasked with ensuring that courthouses meet the functional and security needs of many different user groups, including the entity that owns the building, court staff, judges, litigants, attorneys, public visitors, jurors, and those in custody, among others — each with distinct concerns, requirements, and expectations for the building. More than ever, social equity is of the utmost importance, and it is essential that courthouses represent the diverse communities they serve. One way to discern whether or not courthouse features are responsive to these needs is by conducting a post-occupancy evaluation (POE) of the courthouse. To this end, the American Institute of Architects (AIA) – Academy of Architecture for Justice Research Committee developed a Post-Occupancy Evaluation "Toolkit" for courthouses. This toolkit will be made widely available to architects and court systems for evaluating their courthouse facilities. The POE Toolkit is part of a broad effort by the AIA to develop and disseminate knowledge pertaining to best practices in justice facility design, and results obtained by use of the Courthouse POE Toolkit will be aggregated into a searchable database of information. The database will have information from the different stakeholders mentioned above in an effort to achieve social equity in the responses. The data

will be traceable in a way that will also allow any differences in response from different groups of stakeholders to be identified and further investigated. Toolkit adaptation for use in countries all over the world is also underway so that best practices can be implemented based on diverse national and cultural requirements. Courtroom processes are changing rapidly due to advances in technology. The toolkit is acknowledging this development and will continue to be updated to respond to the use of technology and its relationship to the delivery of justice.

Abstract id# 4250
FROM OCCUPANTS' SATISFACTION TO HEALTH AND WELL-BEING: ADVANCES IN BUILDING PERFORMANCE EVALUATION AND ASSESSMENT IN THE CONTEXT OF HIGH PERFORMANCE LEED™ BUILDINGS

Ihab Elzeyadi, University of Oregon, Eugene, OR
The aesthetic and functional appeal of high performance green-certified building is daunting. It creates a hyped expectation of better energy and indoor environmental quality (IEQ) performance that is usually hypothesized to improve occupant's health and productivity. Despite the favourability of this hypothesis, most recent studies have failed to prove these linkages leading to non-conclusive evidence of green building performance. Most previous limitations point to methodological deficiencies in quantifying occupant's experience, as well as the comprehensive measurements of physical and behavioural environmental factors of place in an integrated and comparative approach. The specific question of this project is whether a well-planned evaluation study with pre-post occupancy analysis of a retrofitted green-certified building could lead to more conclusive findings related to the impacts of green buildings, in general, and those with specific high IEQ on occupant's well-being, health, and productivity.

This presentation reports on an assessment of a commercial high performance LEED™ double platinum retrofitted building. The building houses 800 employees working within 270,000 sq.ft. of open-concept office space. The buildings were monitored for IEQ parameters of visual, thermal, acoustical, indoor air, and spatial comfort over a period of one year before occupancy and retrofit as well as a year after occupation. Continuous and intermittent measurements were performed and pre- /post-occupancy evaluation surveys were conducted. Results show strong correlations between improved visual, acoustical, and indoor air qualities of the retrofitted green environment that is well correlated with improved employee's productivity and satisfaction. Implications and spatial visualization are discussed as well as a continuous commissioning approach to improve the thermal environment through additional retrofits and occupant's behaviour. Proving that, for high performance buildings both the occupants and the buildings require on-going dialogue to ensure the occupants are able to adjust to the building systems and achieve its desired levels of performance.

Abstract id# 4251
BIG DATA AND THE BPE STATISTICAL METHODS WORKING TO BENEFIT DISADVANTAGED POPULATIONS

Jennifer Senick, Rutgers, The State University of New Jerse, New Brunswick, NJ
Even as big data has claimed its place in building performance evaluation (BPE), the challenge of systematically capturing this data in a reproducible format and of scaling up building-specific findings continues. Over the past decade, a team at Rutgers Center for Green Building (RCGB) has sought to introduce statistical methods to overcome these obstacles. First, in *Enhancing Building Performance* (2012), Andrews et al. demonstrated the potential

of incorporating occupant perceptions and behavior into building information modeling (BIM), as a means to prospectively assess building user behavior. An agent-based simulation model of lighting in a mid-Atlantic office building demonstrated both the capabilities and shortcomings of this approach. Next, in *Building Performance Evaluation* (2018), Senick et al. introduced a statistical technique for creating synthetic populations of office occupants and behaviors. An advantage of this approach is its conduciveness to pairing with representative databases such as the American Community Survey of the US Census Bureau, or the US Department of Energy's Commercial (or Residential) Energy Consumption Survey. Combined, these databases and synthetic modeling approach show promise for making efficient use of data drawn from disadvantaged populations be they individuals within a larger context (e.g., office workers with lower incomes than peers) or studies of lower-income housing residents. For example, RCGB researchers have applied an agent based modeling (ABM)-driven approach to an on-going BPE of low-income seniors living in public housing in Elizabeth, NJ, with emphasis on energy use and indoor air quality during heatwaves.

Abstract id# 4252
PRE-RENOVATION STUDY OF A RESIDENTIAL CARE UNIT FOR PERSONS LIVING WITH ALZHEIMER'S AND RELATED DEMENTIA

Shauna Mallory-Hill, Ph.D, LEED AP, University of Manitoba, Winnipeg, MB, Canada
According to the Alzheimer's Society of Canada, an estimated 564,000 Canadians are living with dementia, with the number expected to rise by 66% to 937,000 by 2031. The combined cost to care-givers and the health-care system is estimated at $10.4 billion per year. Research by Zeisel and others suggests that people living with dementia are likely to have a higher quality of life when living in less institutional, more "homelike" settings. This study involves the building performance evaluation of an existing specialized residential care unit before and after a substantial renovation- incorporating new design features to improve the quality of life for the 60 residents living with advanced dementia, their families, and care-givers. It is undertaken by a multidisciplinary team of social science, medical and building design researchers. A key aim of the research team was to develop a comprehensive multi-modal research protocol to evaluate, pre- and post-renovation, the impact of the new features introduced by the design team. The research protocol had to be 1) as unobtrusive as possible 2) flexible to account for real-world changes that occur in the renovation design process; and 3) focused on the goals of the new design. The resulting protocol includes: occupant satisfaction survey (staff), quality of life in late stage dementia questionnaire (residents), walk through interviews (staff), document analysis (design, patient chart and human resource data), spatial utilization study, photo-voice interviews (family), dementia care mapping (residents), and field measurement of indoor environmental quality parameters (e.g. lighting level and colour, acoustics, air quality, thermal comfort). The authors will present the protocol and discuss how it was deployed in the pre-renovation phase.

All contributors to this research include: Mallory-Hill, S.; Porter, M.; Borges, B.; De Luca, T.; Dunn, N.J.; Grisim, K.; Kelly, C.; Kuo, I.; Roger, K.; Funk, L.; Guse, L.; Millikin, C.

Abstract id# 4253
SPACE PLANNING, PROGRAMMING, AND POST-OCCUPANCY EVALUATION TOOLS FOR ADAPTIVE REUSE

Bonnie Sanborn, Cornell University, Brooktondale, NY

Stakeholder engagement, space planning/programming, and post-occupancy evaluation are all recognized tools for creating and evaluating architectural projects. When projects are completed in phases, it offers planners the opportunity to evaluate a work-in-progress, gathering stakeholder input from one phase to inform subsequent designs. This presentation will focus on one such project, a two-floor business incubator – Rev: Ithaca Startup Works -- in an adaptive reuse project involving both renovation and new build.

This project transformed a two-story, 1928 brick building into a seven-story mixed-use project including street level retail, two floors for Rev, and five floors of apartment housing. The project was funded by private investment and capital revitalization grants, and relied on collaboration between three local institutions of higher education (Cornell University, Ithaca College, and Tompkins-Cortland Community College) as well as a local developer.

Listeners will hear about the challenges of a phased project – including temporary relocation, construction barriers, and acoustic concerns – as well as the positive outcomes from using a Phase I POE to inform the Phase II program. Special circumstances posed by the funding structure will be addressed. The audience will see tools used to gather stakeholder input and hear about the ongoing feedback cycle employed at Rev to ensure the space and space-use policies support staff and member needs. Because each planning and evaluation project is unique, the speaker will include general tools and best practices.

Abstract id# 4255
BUILDING EVALUATION TO BUILDING PERFORMANCE EVALUATION AND BEYOND

Jacqueline Vischer, University of Montreal, Winchester, MA
Along with Wolfgang Preiser, I have been involved in teaching, research and practice around and about Post-Occupancy Evaluation and Building Performance Evaluation since the earliest years of edra. My work and Preiser's are complementary and we worked together on numerous conference panels, edra events and several books.

Now that POE and BPE are well-established concepts not only in the field of environment-behavior studies but also in design practice and building management, it is timely to think about the future of these and related activities, both in terms of their theoretical evolution and of their effects on and adaptations to practice.

My presentation looks at advances in tools and techniques of measurement, increasing diversity of building types and environments that can benefit from a BPE approach, as well as increasing numbers of types of practitioners who are using POE and BPE in their own projects, and the increasing complexity of building technology and other effects on the building delivery cycle. The paper discusses some of the challenging questions going forward, such as managing the competing interests of diverse user groups, the broader societal impact of building decisions in the context of climate change, and how changing communications technologies impact building use.

The paper will link some of the major themes of Preiser's work with my own experiences and will offer lessons learned and explore where we go from here.

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