Incorporating Environment-Behavior Knowledge into the Design Process: An Elusive Challenge for Architects in the 21st Century

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Abstract

This keynote speech is an attempt to point out the development of environment-behavior knowledge as potentially valuable information in the two major phases of the design cycle – namely programming and post-occupancy evaluation. The underlying constraints and enhancements are discussed in connection with various players involved in the process, as well as the emerging social concerns of designers. The concluding remarks introduce two more factors related to the intrinsic nature of human behavior – adaptation and culture – as topics for further and more intensive investigation. By gaining better understandings of the environment-behavior transactions, such formative inputs incorporated into the design process would lead to the formulation of more people-centric design guidelines.

Keywords: Environment-behavior transaction relationships; programming; post-occupancy evaluation; formal design; social design

“……..Without collaborative effort from the behavioral sciences environmental assessment will remain in its present primitive stage.”

Robert Gutman and Barbara Westergaard (1974).

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1. Introduction

I would like to begin by referring to my previous experiences related to the emerging development of ENVIRONMENT AND BEHAVIOR studies, dating back as early as the late 1960s. My article, Semantic Dimensional Structures: A Methodological Approach, published in Environment and Behavior (Vol. 10 No. 4, December 1978) was one of many other studies that have contributed to putting environment-behavior knowledge to work to improve our built environment.

During my study in the Ph.D. Program at Princeton University, I had the opportunity to be involved in a research project regarding the behavioral aspects of the renowned Louis Kahn’s Richards building at the University of Pennsylvania medical school (Horayangkura, 1972). The post-occupancy evaluation study was undertaken by the revered Professor Robert Gutman. Surprisingly, it was found that “one of the greatest buildings of modern times” was denounced in scientific circles as “an edifice which has ……seriously impeded the progress of medical science” (Gutman and Westergaard, 1974: 320).

It was also found that another laboratory building, built some seven years later for the same medical school, was highly successful for performing scientific research. The latter building, which has not gained any recognition in architectural circles, was actually programmed according to utilitarian criteria – a reaction against the Richards building among some scientists who had previously worked in this acclaimed architectural monument (Fig. 1).

The conflicting evaluation of both laboratory buildings reflects the prolonged tradition of architectural practice. Architects have been trained to favor a formal design approach and so usually attach different meanings to a building compared to non-architects (Devlin, 1990). The latter in general belong to the non-design culture, which is essentially more popular.

Fig. 1. (a, b) Richards building, Pennsylvania, (c) Inside environment impossible for scientific research

Fig. 2. (a) Pruitt-Igoe housing project, Missouri, (b) the Gallery in use, (c) and under demolition in 1972
Many of us may recall the incident of the Pruitt-Igoe urban housing project in the U.S. city of St. Louis, Missouri. Its 33 buildings of 11 stories each, accommodating up to 2,870 apartments, were finally demolished, despite the admirable design of the architect (Minoru Yamasaki) as well as its excellent intentions – to provide decent housing for the urban poor. However, the anticipated and actual uses of the gallery corridors were very different. What was once applauded as “a close safe playground” became after a decade “an unpoliceable turf for violent youths” (Montgomery, 1966) (Fig. 2).

Nowadays, however, after decades of knowledge-based endeavors, there is evidence of a shift towards more and more responsive design. Increasingly, designers are incorporating environment-behavior knowledge to design a more humane and habitable built environment. The increased involvement of social sciences in architectural design confirms Dr. Francis Duffy’s contention on the need to incorporate the challenging issue of environment and behavior relationships, raised as early as 1968 (Duffy & Hutton, 1998: 8-21). To this end, the various fields of psychology related to environment and environmental psychology in particular have rather positive implications for creating a more sustainable society and improving the world at large (Koger and Winter, 2010; Gifford, 2002).

The following viewpoints aim to present the environment-behavior knowledge as potentially valuable information in the two major phases of the design cycle – programming and post-occupancy evaluation – to enhance the design/renovation of built environment (Fig. 3).
2. Programming as a potential generator of environment-behavior input in design process

A review of the movement towards a more social approach to environmental design, in the decades since the first meeting of the Environmental Design Research Association in 1969, has revealed major advances in the design process. These are evident in the enormous body of research conducted within the field of environmental design and related human sciences, together with the growing volume of studies focused specifically on environment-behavior relationships (EDRA, 1969–2011).

Previously, the scope of programming in a given project was more concerned with the technical aspects of design – primarily, the studies of sites, project size, spatial demand, cost and financial constraints, regulations, etc. However, social/behavioral design approach as distinguished from formal design has been involved in the study of behavioral settings that can best serve human needs and requirements (Gifford, 1997: 381-394, Deasy and Lasswell, 1985: 9 – 16; Heimsath, 1977). Social conditions in office buildings, for instance, are the concerns of architects to increase work performance (Duffy & Hutton, 1998: 8 – 21). Ultimately, the idea of the ‘social cushion’ has emerged. Since no individual exists outside the social context of a culture, the social cushioning effect becomes increasingly vital in industrial and urban society. “So immersed in the social cushion does each person become that the physical environment is lost as a separate reality. The social cushion becomes the only eyes through which to see the world” (Bechtel, 1997: 57).

Social design practitioners have played vital roles in matching behavior and settings to improve the habitability of the built environment. Consequently, the psychological outcomes regarding the levels of satisfaction, personal control and performance/productivity as well as social interaction and support can be evaluated during the design process.

Programming is the first of several important steps in the design cycle, which includes not only programming but also the subsequent design, construction, utilization and evaluation of the built environment. Programming provides the opportunities to incorporate the necessary information inputs of the occupants and the social context into the design. If the spatial needs and arrangement are considered as requirements of the specific behavior settings within the main project, the individual needs and activities of related occupants are more likely to be researched and incorporated into the design of the built environment. A careful behavioral program would result in a more responsive environment, for example: a kitchen that would facilitate family cohesion; a bedroom that would guarantee ‘no divorce’ for a couple. Perhaps, with better programming, we would not find so many plenary halls with low ceilings which obstruct proper visual presentations. Programming can have a profound effect on the final design solution (van der Voordt & van Wegen, 2005: 73 – 76; Peña & Parshall, 2001: 14 – 19; Hershberger, 2002: 191 – 200, 1999: 1 – 34; Cherry, 1999: 3 – 19; Kumlin, 1995: 1 – 12).

However, certain practices and constraints that are intrinsic to the design process should be pointed out:

- The task of programming in the design profession is still conditional, highly determined by the nature of the project, the architects involved, the paying client and the building users.
- At this point in time, in Thailand as well as in many other developing countries, there are few professional programmers – and even fewer who are capable of putting environment-behavior knowledge to work in the programming process. Most likely, some specific issues of the interest of researchers involved in environment-behavior transactions would be investigated, leading to the only partial integration of relevant data into the design.
- It should be noted that there are technical constraints among professional architects to embark on behavioral-based architectural programming. The methods in gaining the necessary behavioral information for programming - as discussed in Hershberger (2002) - are beyond the expected expertise of most architects.
Most of the users or occupants of a facility are ‘unknown’ prior to the construction and occupation of the building. It may be problematic to treat surrogate users as truly representative of the expected future users. For a housing project, for example, future residents may be from various urban locations and cover a wide range of socio-economic groups. Ideally, user participation in the programming process would contribute significantly to design solutions tailor-made to specific user requirements (Peña & Parshall, 2001: 48 – 49). Strategically, those users who have a stake in the project and will ultimately use the facility should become program participants (Hershberger, 1999: 323 – 331; Kumlin, 1995: 13 – 23).

There seems to be a large gap between architects and building users. Though there has been increasing user participation in the design process, in general designers barely communicate with building users. Paying clients (owners, a board of directors or facility managers) are more likely to work closely with architects and programmers. However, they fail to arrange proper linkages between the latter group and the future occupants.

In general, through their rigorous training architects have rather unique aesthetic criteria and, more importantly, emphasize formal design to win professional recognition – mainly structural integrity and appearance – sometimes at the expense of the setting’s functional value. Until recently, the annual architectural awards bestowed by the Association of Siamese Architects (ASA) were based significantly on the aesthetic dimensions of architecture. Only in the last decade has ‘green design’ been increasingly recognized as an important professional criterion. Previously, many architectural designs were awarded prizes through misguided criteria. A glazed house with a steel structure, for example, won an ASA Architectural Design Award 2004: the style, while perhaps pleasing to the eye, was hardly well-suited to Thailand’s climate (Fig. 4). Architects tend to operate according to their own formal standards of excellence influenced by the Great Masters of Modern Architecture (Fig. 5).

Consequently, the role of social design research has been rather limited when it comes to programming, which is mainly concerned with technical inputs to design. As discussed earlier, social design can be distinguished from technical design in that it focuses on designing settings that can best serve human needs and activities. Through understanding occupants and their related contexts, as well as involving them in the programming and design process, this approach can lead to the formulation of more people-centric design guidelines with more human-environment concerns. For example, an organization’s characteristics, according to Duffy & Powell (1977), could also be reflected in the building’s characteristics as well – for example, in the relationship between the number of professionals and the length of the building perimeter so that private cellular offices with windows can be accommodated into the design.

Fig. 4. (a) ‘Peaceful Garden Home’: A glazed house won ASA Award (2004), Bangkok; (b) Farnsworth house, Illinois, 1951
However, at present user participation as viewed by many advocates of professional programming and design is largely overlooked as a source of information inputs. This is not only because of the formal and technical concerns of the designers and paying clients, but also due to the mostly ‘unknown’ status of users or occupants. Moreover, as Hershberger (2002: 294) has pointed out, in most cases effective behavioral-based programming tasks can hardly be achieved in the context of time and budget limitations.

To more effectively integrate behavioral criteria into the design process, a comprehensive behavioral program should be incorporated as a supplement to the programming. It should be proposed with precise human behavior goals: “A behavioral supplement is not a place for vague generalities. It should be as precise in its own way as the building program itself” (Deasy and Lasswell, 1985: 15).

The task of programming for a facility project can be both a facilitator and a resistant to gaining user information and involvement, depending on the deterministic nature of the architects and paying clients during the design process. Moreover, the elusive nature of human behavior also implies that the behavioral consequences cannot be predicted intuitively or spelled out precisely (Deasy and Lasswell, 1985: 11 – 16).

3. Post-occupancy evaluation as a potential mechanism for testing the goodness of fit between environment and behavior

To achieve the goal of creating a responsive environment, it is virtually essential to include a post-occupancy evaluation (POE) of the built environment. POE is a system of quality control through which environment-behavior transactions are investigated. The inseparable connection between environment and behavior essentially follows the transactional viewpoint of Barker (1968) – the proponent of ecological psychology.

In the design cycle, the design decisions necessarily satisfy the behavioral criteria set forth by programming. The true test of whether this has occurred in reality comes after the occupants have moved in and adapted the environment, as well as themselves been influenced by the surrounding context. In many instances, the specific needs of the occupants have not been adequately served. Unanticipated outcomes are evident in many rather obvious instances, for example:

- The beautiful façades of residential complexes in the eastern part of the world, covered with clothes hung out to dry from the balconies;
- Flourishing consumerism, as reflected in the rapid growth of modern shopping malls, causing the spillover of limited storage spaces in most residential units. This accumulation has become a longstanding practice among occupants;
- Work settings overloaded with belongings, documents and cabinets, as in many government offices, potentially resulting in stressful environments and poor work performance;
- Street shopping along sidewalks adjacent to heavy vehicular traffic in Bangkok and other Thai cities, but with little in the way of health and safety measures.

In the attempt to examine the effectiveness for users of occupied designed environments, POE monitors the designed product in terms of goals / objectives and use. In the final stage of the design process, its outputs are hopefully applied to improve the building and ideally then translated into future design concepts and criteria. The essence of post-occupancy evaluation has been described with case studies of various functional environments and with some international examples in van der Voordt and van Wegen (2005: 141 – 168), Hershberger (1999: 448 – 451), Gifford (1997: 403 – 410), Bechtel (1997: 311 – 331), Deasy & Lasswell (1985: 40 – 139). However, in reviewing the background and the
development of the scope of post-occupancy evaluation, one would find rather diversified aspects of POE in serving many different purposes related to different actors and practitioners (Zimring, 2002: 306 – 308). Based on Zimring (2002: 307)’s proposed redefinition of POE, it implies the systematic and multidimensional assessment of the process of building delivery and building performance. By responding to the needs of the organization and the individuals occupying the built environment, it aims to improve the process or the settings for a specific project, as well as inform similar projects in the future.

For this particular discussion on post-occupancy evaluation as a potential mechanism for testing the goodness of fit between environment and behavior, the focus is on the assessment of environment-behavior transactions while the settings are actually in use.

POE is essentially a complement of programming which is now more regularized in practice. It should be noted at this point that post-occupancy evaluation is still an emerging discipline, and furthermore an obscure part of the design cycle. Critically, the following limitations and improvement measures should be spelled out:

• POE in general is the concern of a rather limited number of architects, in part because it is outside the interests of most architects and also because of the nature of evaluation, which requires specialized expertise that most outstanding designers do not possess. Yet in the search of inputs for the improvement of a particular setting, such as increasing work performance in a nurse station, banking hall, or the service area of a shopping mall, a POE is essential.

• The evaluations of buildings undertaken by operators or owners are mainly based on technical / managerial considerations rather than the issue of social design – that is, the goodness of fit between environment and the behavior of users. For example, lighting and air quality and more critically energy consumption are carefully monitored while less concern is given to the environment-behavior transactional aspects such as user satisfaction, preference, social interaction and privacy. Moreover, the specific outputs produced often only focus on certain aspects of a particular building and are mostly not applicable to any other buildings.

• However, owners and occupants who are more concerned about their well-being also require critical evaluation of the spiritual dimension of the built environment, especially in relation to Feng-Shui – a belief system that explores the well-being of occupants as determined by the appropriate arrangement of a physical setting (Bruun, 2008). To this end, there is a surprising congruence between this spiritual system and the scientific / practical basis for achieving comfort, privacy and behavioral effectiveness in daily life through well-considered spatial planning, which ultimately contributes to the individual strength and progress of families or organizations.

• In recent decades, there has been considerable research on various aspects of building performance, including environment-behavior interrelationships. In essence, they are not serving the purpose of post-occupancy evaluation which is to provide useful renovation-based or knowledge-based design information. Both the research and evaluation of various building issues should provide valuable information for guiding designers with their next building. Collecting data over the building’s lifespan would help establish design criteria for similar buildings. This is the rather neglected contribution of the final stage of the design cycle. Is there a temptation at this point among designers simply to guess the environment-behavior relationships, rather than practically assess them?
4. Conclusion and discussion

In conclusion, I would like to discuss further the need to address the ongoing neglect of environment-behavior knowledge in the design process.

- Design practice should incorporate social design as a complement to the holistic task of architectural practice. Social design information should be streamlined into the programming process in a similar fashion to the technical design data. Questions regarding environment-behavior transactions are becoming significant inputs; behavioral issues such as safety and security, privacy and personal control, communication and imageability, physical and psychological comfort, expected lifestyle and social change, for example, should be treated with more relevance and validity in design practice. More critically, human-environment concerns should be extended to substantiate the knowledge relevant to urban planners—about people, their needs and their preferences related to the urban context. The challenge to alert planners to the complexities of human behavior and attitudes has already been put forward in “Environmental Psychology and Urban Planning: Where Can the Twain Meet?” (Churchman, 2002).

- Social design should be the fundamental task of an architect. The eventual design product should be humane and habitable, serving the goals and objectives of the occupants of a specific built environment. In essence, social design envisions the creation of an envelope for spatial behavior. How accommodation areas are designed can be equally or even more instrumental to the realization of a responsive environment for the occupants as standard ‘technical’ spatial criteria such as the square meterage per person. Thus, in order to put environment-behavior knowledge to work in the design process, designers must be formally educated in behavioral setting design and research. At present, one must admit that the social aspects of design are treated rather lightly, partly because many architects lack the genuine concern and understanding to deal with environment-behavior issues. In this context, it is relevant to note that with the approaching implementation of the ASEAN community in 2015, overwhelming efforts have already been invested in the development and realization of the ASEAN Economic Community (AEC). On the other hand, much less interest has been taken in the structuring of the ASEAN Socio-Cultural Community (ASCC).

- Post-occupancy evaluation has been an even more elusive task in the design cycle, not only because it is beyond the direct responsibility of the design architect but also because the post-occupancy evaluation task requires an expertise other than design. However, post-occupancy evaluation output can be translated into design criteria for future facility development, as well as formulated into a more solid theoretical framework. It is a necessary link in the design cycle, aiming to improve the process of creating a more responsive built environment.

- Accordingly, the architectural education system should break new ground in producing architects with added value in terms of environment-behavior expertise to undertake the tasks of both programming and post-occupancy evaluation. Multiple categories of architects with a range of professional specializations would best serve the various specific tasks of the design process. According to the Architect Council of Thailand, ten different types of designated professional services have already been planned for Thai architects. Programming and hence the application of environment-behavior knowledge are one of the main tasks of architectural management.

- An even more vital transformation could be achieved by reducing the enormous gap between the attitudes and values of designers and those of the general public concerning the designs of various facilities. The conceptions of both are strikingly at variance with each other. While popular culture dominates the urban scene—from fanciful gates and grilles, to colorful and decorative temples, to neo-classical features—architects, generally more reserved in spirit, dot the skyline with structures in a modern/international style. I expect that, through better user/public participation, the gap could be
reduced. I would see more actual people, more signs of human life, in the illustrations of acclaimed buildings in the architectural magazines. I would see more ‘glocal’ architecture in an attempt to maintain local identity under globalization.

- Specific research should be focused on the adaptation of users to a newly built environment. Certain adaptations usually occur to make the best of the situation. Individuals may adapt to certain levels of stimulation (noise, glare, heat or crowding) in certain contexts. They may try to improve the comfort of the physical settings. In unsuitable conditions, occupants improvise adaptations: the rearrangement of seating (Fig. 6), the addition of a shield to cut glare from outside or disturbance along a corridor, the use of cabinets or closets to provide privacy in public housing units (Horayangkura, 1983: 19 – 20) (Fig. 7). The research findings would reveal how occupants use the environments, as well as how successfully the programming and design have incorporated the necessary behavior settings to allow the occupants to achieve their desired goals, with a minimum of frustration and a maximum of satisfaction.
My last point is about the multiple influences of culture on behavior settings. For instance, the complexity of modern living favors the segmentation of interior spaces, with separate rooms demarcating different activities. As sociological complexity increases, so too does spatial segmentation (Kent, 1991). For lower income housing in Thailand, multipurpose spatial planning of units would serve the behavioral needs of residents according to their affordability (Horayangkura, 1983: 24 – 35). This approach to spatial arrangement is in fact similar to traditional living patterns, as Cornwel-Smith (2005: 105) has succinctly noted: “Our forefathers did not live in such divided territories. They would eat and sleep and entertain under that very same roof, ……” Other influential cultural dimensions of behavior settings should be investigated in future research. In particular, public places and communities of historic importance should be considered as cultural resources and managed in accordance with human-environment concerns (Pimonsathean, 2007: 11 – 24) (Fig. 8).

Epilogue

Having given my perspective on what environment and behavior is all about in the built environment creation process, I would like to end with a few words on their importance to the future of design. Though challenging, it is essential that environment-behavior development inputs guide and inform each stage of the design cycle. So far, after nearly half a century of behavioral recognition and contribution to facility design, our discipline is still at the periphery of core professional practice. Yet ultimately it is the nature of human behavior that matters. However, the fundamental issues of environment-behavior transaction are subtle, partly because of the adaptation that occurs in individual settings and partly due to the cultural factors underlying behavior in general. This has served as a barrier to the inclusion of environment-behavior as an established element of mainstream architectural practice.

On a positive note, I am hopeful that the emerging discipline of ENVIRONMENTAL PSYCHOLOGY could provide a comprehensive theoretical basis for environment-behavior inputs to be channeled into the design of the built environment in the years to come. A better understanding of the interrelationships between environment and behavior would serve as a prelude to greater spatial design creativity. We must invest our full efforts into putting cutting-edge environment-behavior knowledge at the forefront of architectural design.
Notes

1 Bruun (2008) provides a good overview of the history and principles of Feng-shui.
2 The past decades have witnessed a considerable volume of published work on the topic of ENVIRONMENTAL PSYCHOLOGY and related studies. The followings are some additional recommended readings not mentioned earlier in the text: Steg, van den Berg, & de Groot (2012); Hensel (2012); Hutchison (2010); Schriver (2010); Zastrow, & Kirst-Ashman (2009); Franck, & Lepori (2007); Zeisel (2006); Nickerson (2002); Bell, Greene, Fisher, & Baum (2001); McAndrew (1993).
3 It is critical to note that in the search for environment-behavior inputs for architectural programming one underlying challenge is the concern of research methodology in investigating environment-behavior interrelationships. At present there are increasing methodological concerns as it is evident in the emerging discipline of ENVIRONMENTAL PSYCHOLOGY and environment-behavior research.

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Website:
- http://ameblo.jp/thomas-penfield/entry-11147359376.html : Fig. 2. (a, c)
- http://www.keasthood.com/firm/milestones.php : Fig. 1. (b)
- http://content.lib.washington.edu/cdm4/item_viewer.php?CISOROOT=/buildings&CISOPTR=5259 : Fig. 1. (a)
- http://www.alepaint.com/board_reply.php?txtNo=TURBd01EQXdNREExTkRnPQ==&txtroom : Fig. 5.

Others:
- Lang et al. (1974: 3, 6) : Fig. 1. (c), Fig. 2. (b)
- ASA (Journal of the Association of Siamese Architects), (2004). Issue 06-07, pp. 40 : Fig. 4.
- Department of City Planning, Bangkok Metropolitan Administration. (2005). Revitalized Banglamphu District, pp. 9, 23 : Fig. 8.