Grounded Information for Responsive Designing: An Example of the Physical Environment of Work

Designers have consistently employed user surveys to construct a program of what users find desirable in their built environments. In a small investigation about the work environment, it was initially speculated that utilitarian ends would dominate over aesthetic ones in a list of desirable qualities of the work environment generated by respondents. 113 participants responded to a request to list up to five things they liked about the physical environment of their work place. In grouping responses, a new category of information became imminent: non-work-utilitarian ends. In a z-test of proportion, initial hypothesis about dominance of utilitarian ends was not supported. Of greater interest, however, was the relative prominence of the non-work-utilitarian category. A binomial test found that the number of responses indicating that category was not due to random occurrence (p < .001). The discovered lesson is that building designers may wish to re-evaluate this phenomenon that is meaningful to users in conceptualizing the physical environment of work.

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INTRODUCTION

If a designer will design responsively, she or he must come to the design project with grounded insights into the preferences or desires of users. There are different ways to formulate the conceptual questions necessary. The operational model employed in the current work matches utility (which is about directedness towards an end) against aesthetics (which is about an end in itself--or a non-utilitarian end).

Given the described working model, this author set out the purpose of the current exploration as finding out if either utilitarian or aesthetic ends would be given more significance in expressions of what people indicated that they liked about their work environment. Given that the work environment is intuitively utilitarian, it was hypothesized that utilitarian "likes" would be significantly higher in number than aesthetic "likes." A designer of work places, responsive to the desires of users, would certainly find that type of information valuable in carrying out her or his project.

It should be added at this point that the body of work that follows contains two explorations, the second being a discovery that emerged from the first. In terms of findings with substantive import for the kind of information upon which designers base their design interventions, however, it is should be remarked that the latter discovery is of more immediate significance. This latter discovery was unplanned and unanticipated, but its emergence raises a vital question about possible gaps in the kinds of information we employ in even well-meaning attempts to design the successful environment. It appears as if assumptions made about the experience of the user--assumptions that form bases of designing--might not be complete at times.

ON FUNCTION

The idea of function is significant. In the ideal case, it subsumes notions of utilitarian ends, formal ends and experiential ends. A designer's goal is often to create a physical environment that integrates utility, form, aesthetics, meaning, and so on.

A view of the preeminence of function has often been indicated by scholars and philosophers. In *Function and sign*, Umberto Eco [7] actually laid out the case *in support* of function. His statement that "an architect's belief in form that 'follows function' would be rather naive" (p. 186) must be read in context, for he immediately followed that with a definitive statement on the primacy of function: "The form of the object must, besides *making the function possible, denote that function clearly*" (p. 186). Form is to work in the service of function by communicating function. Eco made the distinctive case that function is not to be confined to a mechanistic arrangement of parts alone. Connotation is functional also, even if as a secondary function. The title, *function*, he explained, "should be extended to all the uses of objects of use"

(p. 187). The architect identifies, he continued, "a system of forms that would correspond to the functions" (p. 197).

In Heidegger's bridge metaphor, the essence of function as transcending mechanistic arrangement is, once again, broached. The bridge creates a relationship which enables making sense of the world. Thus, function does not *stop* at carrying people across the river. It is a vital player in the reconstituting of the world. Building, wrote Heidegger [8], receives its nature from dwelling. The "look" of a building, for example, is not the primary generator of building. It is the attaining of conditions that guarantee *dwelling* that makes building.

Kwinter [10] laid out a challenge:

Is architecture simply a branch of...history of movements and styles, the successive aesthetic solutions through which epochs, cultures, and entire civilizations express their indomitable "will to form"--or does it...belong to history in another way? If architectural thought and practice is to break out of narrow academicism on one hand and aestheticism on the other, it must conceive of itself as belonging to a different series of developments--to what recent parlance sometimes calls the "history of practices.
(p. 13)

As a result of this re-evaluation of itself, Kwinter continued, architecture will be

seen in its full proximity and intimacy with the system of forces that give shape and rhythm to the *everyday life of the body* [my italics]....Thus the object...would be defined now *not by how it appears, but rather by practices* [Kwinter's italics]: those it partakes of and those that take place with it. (p. 14)

When Hannes Meyer [13] wrote so forcefully about function, he, like some of the modernists, may have been a victim of his own language--as evidenced by those who have criticized his reflections on architecture. It is important, however, to recognize the implicit character of the idea that a writer is embedding in the discourse. Meyer did not call for a rejection of, for example, the psychological or cultural in architecture. He wrote that building is "organization," but elaborated quite categorically that this included, also, "social [cultural], technical, economic [and] psychological" dimensions (p. 120). The building, he wrote, is to serve "the needs of body and mind" (p. 117). In fact, he decried a non-humane practice. Instead, he showed how human existence should be at the core: "Modernness...does not consist of a flat roof and a horizontal-vertical arrangement of the facade, but rather of its direct relationship to human existence" (p. 120). Ultimately, narrow interpretation of his idea of function(alism) as mere mechanical layout of a building misses the mark. A functional attitude, from his viewpoint, is in resonance with the spirit of the culture--it is about public welfare and public-spiritedness, all cooperative and integrated (p. 120).

Adolf Behne's [1] writing at about the same time lends reason to this richer understanding of the idea of function. Behne saw the wholistic functional design approach as "concerned with solving a problem of general significance to our culture" (p. 122). This is not a narrow misinterpretation of function as mechanistic arrangement of parts. "The utilitarian," wrote Behne, "only asks: 'What is the most practical way for me to act in this case?' But the functionalist asks: 'How do I act most correctly in principle?'" (pp. 122-123). Behne added:

When the parts of a building are arranged according to a sense of their use, when aesthetic space becomes living space--and this is the kind of order we call dynamic--the building throws off the fetters of the old, fossilized, static order...and achieves a new starting point....And then, through this suitability to function, a building achieves a much broader and better inner unity. (pp. 119-120)

The architect, holds Behne, "can only grasp and carry out his truly artistic work, that is, creative work, when he addresses questions of his client's *attitude to life, way of living, business methods* [my italics]--something that of course he can only do with him, not without him or against him" (p. 120). Serge Chermayeff [16] observed that building must begin with definition of purpose, but also questions of general need. Functional design is broad, rich, need-oriented, dynamic and in tune with human existence.

In generating information that is intended to enhance the efficacy of the design project, among other ends, a model based on function is a useful framework to employ. It is imperative, however, that it be a model that recognizes the meaning of function in its full capacity and not one that narrowly equates function with mechanistic utility.

A FOCUS ON INFORMATION GENERATION

It is facilitative of realizing the focus of the current project to emphasize, as stated in the introduction, that it is ultimately a critique of deficiency in the nature of data that are generated for the purpose of integration into practice. Even though designers have often created solutions that are successful, we must continue to foster expressions of our solutions in multiple forms in order to facilitate global efficacy in the general augmentation of the body of knowledge (e.g. through concept development and abstraction). Designing does not exist in the substantial domain [4, 5] alone, it is eminently vigorous in a(n) conceptual/intellectual paradigm as well.

The essential questions at this point are about information (Are models of design information generation, as well as bodies of information that exist as a designer's critical bench-mark/reference, augmentable?) and teleology (Is it the designer's deliberate, manifest goal to address, specifically among other things, conceptually-clarified issues in her or his work? In the current case, the issue of the "*NU*" category is introduced.).[1] Elsewhere, this author has addressed the issue of determinism that once characterized an extreme functionalist approach to designing. Extreme interpretations of Modernist visions and conjoint translations into design-in-practice, of course, contributed to post-modern reactions. That tradition of the recognition of the former's deficiency (both justified, but also imputable on the basis of the critic's interpretation) is decades-old [e.g. see 6, 9, 11]. Lang [11], for instance, pointed out that architectural determinism is the belief that "changes in the layout of the three-dimensional, built environment and/or the human-manicured natural environment will result in changes in human behavior" (p. 148). That, of course, is simplistic. The role of the built environment in affording patterns of behavior, he continued, "is accommodative, not deterministic" (p. 150). The motivations of people, he continued, must be taken into consideration over dependence

on a speculative model of behavior that is dictated by architectural function. Such pointed critiques have, in the past decades, moved design awareness away from pure determinism. As architect Philip Johnson noted, the idea that rational design would independently determine the course of society was an illusion of the 1920s [9]. So, the current questions are not about a complete absence of design solutions that demonstrate sensitivity to human needs alongside other architectural needs. They are, once again, about deliberate intervention geared towards conceptually-defined ends-- interventions that are grounded upon discriminated empirical information/data.

ON BUILDING EVALUATIONS AS DESIGN DATA SOURCES

Building performance evaluations exist to enable designers and others to gather information about a building's life cycle and be able to use that information in informing future design projects [17]. Common dimensions of building performance evaluation are building use and experience. The ultimate goal of most building evaluations, wrote Zimring [20], is to produce better buildings. It is, he added, about usable knowledge. Vischer [19] observed that building evaluation enables us to judge whether assumptions made by designers during building planning and construction are ideal. It is important to note that the "value structure" of users should not be down-played in gaining insight into the built environment [14]. Proshansky, Ittelson and Rivlin [18] remarked that the physical environment evokes "complex human responses...and it is in this sense as well as in their known physical properties that their relationships to human experience and behavior must be understood" (p. 28). It is necessary for the designer to make effort to gain insight into the environment as experienced, the authors continued to suggest. It is important, they concluded, to understand the way in which the individual perceives, cognizes and creates the environment. They wrote:

> Clearly, a major task of any attempt to conceptualize the
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> human environment must include the relationship between
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> the person's physical world and the world he 'constructs'
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> from it, as well as between the latter and human behavior
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> and experience. (p. 28)

The human in the environment constructs the environment based on experiences, values, goals, and so on. When any one of these bases of human-environment interaction is not given adequate consideration, there might be an increased chance of compromising our efforts towards creating successful built environments.

ON CORRESPONDENCE BETWEEN PHENOMENA OF INTEREST AND APPLIED MEASURES

It is a difficult task to find out all answers pertaining to how physical contexts are experienced. Following the point made at the end of the preceding section, however, when our survey data are intended to tell us what users find desirable in their built environment, the more information excluded, the less effectively our derivations adequately match our knowledge goals. An emergent question is with regards to the content effectiveness of our data gathering tools. Content validity is an expression of "the extent to which a measure covers [a] broad class of behaviors or characteristics" [15, p. 136]; it is an indication that the contents of measurement instruments used are consistent with the range of attributes that characterize a phenomenon and the distribution of those attributes over the phenomenon [see 2]. Experience and behavior-related phenomena are often multi-dimensional. When specific events

are examined, it is facilitative to "adopt measures that sample from each region of the measurement universe" [15].

We often designate patterns of attributes or processes that seem to occur together by a construct [12]. In the current case, patterns of preferences reflecting aesthetic, utilitarian, personal and work values constitute what we term as a desirable work environment. One way that we generally operationalize our concept of the desirable built context is in terms of survey questions and responses provided to them. When questions on particular real-life patterns are omitted, the effectiveness of our measure is called into question. Brinberg and McGrath [4] noted that many validity concepts "hinge on the key idea of correspondence between two sets of things...[for example,] a set of concepts and a set of observations" (p. 12). Correspondence (or fit) represents "the degree to which there is a match between the values...that contain potential information in one domain, and the values...that contain potential information in another domain" [5]--as between the substantive domain of real-life experience of the work setting and the conceptual domain of indicators (i.e. constructs, questions and responses to questions about the work environment). Theoretical indicators should match empirical relations [3] because "inadequate specification of the theoretical concept can reduce its correspondence with a particular event" [4, p. 16]

Ultimately, we must be interested in the question of ecological validity, the degree to which our measures represent the substantive domain of how living is really experienced [4]. Of course, in any situation at all, current measurement is not a guarantee of future success, as unforeseen epistemological and contextual circumstances might intervene. Nevertheless, one of our most powerful current tools is the knowledge gleaned from concerted efforts to model the world as effectively as we can.

METHODS AND FINDINGS I

A sample of 113 people, randomly selected, who worked on a university campus were asked to freely indicate up to five things they liked about their work setting. They were restricted to physical environmental attributes or elements alone. The items were not to be ranked, but a simple list of the five things that primarily came to mind was to be generated. The intention was to see if, in the life-space, certain things bore enough immediate significance to be memorable. After all data were collected the author began to code the list of items into two categories (aesthetic or utilitarian) as indicated by the responses. As was indicated earlier, the original goal was to see if a preponderance of value was placed on utilitarian ends, as opposed to the aesthetic, that were found desirable in the physical environment. In the process of coding, however, it was discovered that there were within-category characteristic differences in the nature of utilitarian and aesthetic statements offered by the respondents. That necessitated a second investigative intervention (described in "Methods and findings II" below). Meanwhile, the current general coding into utilitarian and aesthetic ends was completed, yielding the proportion of utilitarian "likes" at 0.5349. A z-test of proportions (one-tailed) on an alternative hypothesis of utilitarian values being greater than 0.5 (i.e. a neutral 50-50% chance of equal aesthetic and utilitarian ends) was conducted. No indication was found to support the observed proportion as greater than that occurring by chance at an alpha level = .05. This suggested that utilitarian ends did not hold priority over aesthetic ends in the experience of users as hypothesized. For the designer who tends to privilege one end or the other, the lesson might be to consider both ends carefully.

METHODS AND FINDINGS II

As indicated above, it became apparent in the process of coding that there were characteristic differences within each primary category (i.e. aesthetic or utilitarian). In order to further discriminate the groups, four categories, grounded in how the data suggested them, were created:

Work-utilitarian (WU): statements about things that directly contributed to carrying out work tasks (e.g. "I have a computer that I can use to do my job.") and, also, things that were external to work tasks but were essential in performing work effectively (e.g. "I am able to find parking [in the middle of a congested campus].")

Work-aesthetic (WA): statements about things that appealed to feelings, emotions, values, etc. regarding necessary elements of the physical environment of work (e.g. "The comfortable chair I get to use" [Note that the point being emphasized was about the quality of the chair for a person who did not have an ailment requiring special seating.]) or intentionally-facilitative elements of the work/organizational environment (e.g. "I like the business-like look of the environment."

Non-work-aesthetic (NA): statements about aesthetic ends that, while they may boost positive feelings, are not essential to accomplishing work (e.g. "I like the view from the top floor.") or aesthetic ends that are not connected to task implementation at all (e.g. "I like that the walls are [this] color.")

Non-work-utilitarian (NU): statements about purposive ends that facilitate other areas of life that are not about work (e.g. "The location of my work allows me to reach other parts of the community easily.")

The non-work-utilitarian (NU) category was the surprise (sleeper) category. It became evident, as it appeared more often than expected, that it might be a dimension of which to be mindful, but not one typically found in the literature about assessing the work environment. Given apparent findings, the author hypothesized that the *proportion* of NU statements in the data (.0892; n = 516) was greater than that attributable to random occurrence alone and, hence, NU ends represented a category of information about the user's experience of the work environment to which the designer ought to devote some attention. To test that hypothesis, a reference proportion needed to be indicated. The author accomplished that by going through a convenience (but not systematically-chosen) sample of 30 existing building evaluation instruments that were usable for the work environment, identifying different questions as items. The proportion of items that addressed NU ends relative to all items was calculated. The result yielded a value of .0207. It should be remembered that these are instruments that designers and others interested in the built environment employ as generators of information about user experience and preference. A binomial test was performed (due to the rather extreme value of the hypothesized proportion) and a conclusion that the observed proportion was due to chance alone was strongly rejected (p < .001). It appeared as if, when enhancing other areas of life can be facilitated by the physical environment of work--if enhancing those other "areas of life" do not conflict with work ends--the designer interested in how humans construct and value their physical environment ought to consider the issue as a design question.

CONCLUSION

While the finding in the second investigation is instructive, it is necessary to take a few things into consideration and contemplate them as bases for further investigations. First, the data were collected in a university environment and a fraction of the respondents were students who worked as employees on campus. Do NU ends occur at the same rate among the general population as with students (as a population sub-group)? Do NU ends occur at the same rate across different types of employment (a monumental task to carry out)? It is understood that the thought processes (and considerations) of the designer might be different from those of the user, so, matching response items of the study to questionnaire items might not be a perfect ideal. Yet, there is sense in the comparison because something that is eminent in the former and important for the latter is largely missing in the latter. Perhaps that is even a greater lesson about a conceptual gap in existent information generation and synthesis. Respondents in the study were asked to list up to five items, so, another question might be this: If more items were allowed, would the findings be different? With regards to that question, it might be relevant to add that going up to five items seemed to be a high limit for some of the respondents (for whatever reason). In any case, while the findings of this study raise a useful call for the need to examine the dimensions of information brought to designing, it should be remembered that the possibility of broad generalization is, so far, limited.

Generating information that describes how users prefer the world (or, at least, perceive it most immediately memorably) is a vital strategy for advancing designing towards the goal of creating successful environments. Recognition of that project of efficacy has been existent for a long time. The issue of NU ends as criteria for consideration in designing the work environment, however, raised a concern due to its apparent limited consideration (and, perhaps, even less conceptual definition) within the practices of work-environment evaluation.

ENDNOTE

1. The author requests the reader's patience in light of indication of the "NU" designation here. The concept is discussed later in the paper. It is essential to insert this section of the paper here, however, in order to leave little doubt for the reader about where the discussion ultimately leads.

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