PATTERNS AS HYPOTHESES: AN EMPIRICAL TEST

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ABSTRACT

A Pattern Language contains a wealth of interesting assertions about environmental design. This material has had only limited impact on the field and is considered to be rather controversial. One way to capitalize on this richness while avoiding fruitless controversy would be to treat patterns as hypotheses rather than as established facts. The present study implemented this approach through an empirical test of the "Window Place" pattern.

A photoquestionnaire sampling, in particular. the sense of enclosure and window aspect of the Window Place pattern was created for this purpose. Two samples, differing in whether they had design training. were asked to rate each of the scenes in terms of preference. The results indicated that scenes with windows were favored by the "designer" sample, while for the "general" sample enclosure was a central concern. Both groups were greatly influenced in their preferences by two additional factors, namely visual texture and foliage. A nonmetric factor analysis indicated that Window Place was indeed a unitary concept, one of the five categories to emerge. Interestingly, it was significantly preferred by the "designer" sample. Thus the environmental preference methodology seems to be an effective technique for the empirical analysis of patterns: conversely, the patterns stand as a rich source of research ·potheses awaiting test.

LES EFFETS CONSIDÉRÉS COMME DES HYPOTHÈSES: UN TEST EMPIRIQUE

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RÉSUMÉ

A Pattern Language contient une profusion d'affirmations intéressantes sur l'aménagement de l'environnement. Par contre, cet ouvrage n'a eu qu'une incidence limitée dans le milieu, où il est plutôt considéré comme un sujet de controverse. Une façon de tirer profit de cette somme de faits nouveaux tout en évitant une controverse stérile consisterait à traiter les effets comme des hypothèses plutôt que comme des faits établis. La présente étude a adopté cette approche dans l'application d'un test empirique portant sur "l'effet de fenêtre".

À cette fin, on a élaboré un photoquestionnaire représentant en particulier des exemples du sens de l'univers clos ou ouvert apporté par l'effet de fenêtre. Deux échantillons ont été constitués, selon que les personnes interviewées avaient reçu ou non une formation en design, et ces personnes devaient attribuer une cote préférentielle à chaque scène figurant sur le photoquestionnaire. Les résultats ont indiqué que l'échantillon des designers a préféré les scènes avec fenêtres, tandis que pour l'échantillon "général", l'univers clos a été une préoccupation importante. Les deux groupes ont tous deux été fortement influencés dans leurs choix par deux autres facteurs, à savoir, la texture visuelle et le feuillage. Une analyse des facteurs non mesurables a révélé que l'effet de fenêtre était en effet un concept unitaire, l'une des cinq catégories à ressortir. Autre fait intéressant à signaler, l'échantillon des designers lui a accordé une nette préférence. Par conséquent, la méthodologie visant à déterminer la préférence en matière d'environnement semble être une technique efficace pour effectuer l'analyse empirique des effets; inversement, les effets représentent une source précieuse d'hypothèses de recherche qui attendent d'être testées.

INTRODUCTION

Alexander, Ishikawa and Silverstein's (1977) *A Pattern Language* has created much interest, controversy, and frustration. On the one hand it is curious that such a rich and thoughtful compendium of material has had so little impact on architectural theory and practice (cf., S. Kaplan, 1985). On the other hand there are those who feel that it constitutes a "cook book," and, as such, detracts from architectural creativity.

From our perspective, this volume consists of a set of assertions about the built environment that is for the most part based on keen observation and careful scholarship. Thus, quite independent of the design process to which one subscribes, there is a wealth of content here that should not be dismissed out of hand. We thus believe that this work is appropriately considered as a set of interesting and intuitively attractive hypotheses, constituting a rich and fascinating challenge for empirical research.

In *The Timeless Way of Building* (Alexander, 1979) there is a strong emphasis on the individual's direct, unreflective reaction. Whether one likes something or not is considered far more useful information than whether one finds it "interesting" or "unique." There is a strong parallel here to the findings of research on environmental preference (S. Kaplan, 1987). Here too the immediate, intuitive preference reaction turns out to convey much useful and important information.

It seems reasonable, therefore, to adopt the methodology of environmental preference research for the testing of patterns-as-hypotheses. In other words, one might select scenes showing the presence or absence of certain pattern properties, and ask individuals to rate these scenes in terms of preference. Although by far the greatest use of this procedure to date has been in studies of the outdoor environment, there is in principle no reason why it could not be applied in a more architectural context, that is to the indoor as well as to the outdoor environment.

The pattern selected for this initial study of patterns-as-hypotheses is the Window Place (#180). This is an important pattern for Alexander: not only is it given two stars (the highest confidence rating) in *A Pattern Language*, but it also serves in his *Timeless Way of Building* as a key example of "patterns which are alive." This pattern incorporates three components: the window, the associated seat, and the enclosure in which the seat is placed.

In exploring this hypothesis, there is both the question of whether this configuration is preferred, and of whether it is even experienced as a unitary concept. The methodology chosen for this study made it possible to examine both questions. Because the pattern is based on the observations and insights of design professionals, the study also explores whether preferences for the pattern are influenced by design training.

METHOD

An important aspect of preference methodology is the careful sampling of stimuli. Interior settings were selected to represent two types of public places: 1. lobbies, lounges, hallways and waiting areas; and 2. restaurants. In each case, photographs were selected which varied in terms of presence or absence of windows and whether or not there was a sense of enclosure. Between 6 and 12 scenes representing each of the combinations of these two qualities were included for restaurants and for public places. (Two scenes lacking any seating were also used but are not included in this analysis).

Black and white photographs taken (by FDD) in Ann Arbor, MI, Cambridge, MA, and in Europe were used in the study. The 63 scenes finally selected were randomly distributed over eight pages in a photo-questionnaire, so that each page included both vertically and horizontally composed photographs. Four different orders were used for the sequence of pages in the book-lets which were distributed to participants on a random basis. The cover page explained that the study is "about the feelings people have about different physical environments" and asked for preference ratings ("How pleasing do you find the setting? How much do you like it?") using a 5-point scale (1=not at all to 5=very much).

A sample of 97 participants was drawn from introductory psychology courses. A second sample consisted of 25 students in an architecture design theory class, also at the University of Michigan.

RESULTS: PREDICTION OF PREFERENCE

The correlation between preference ratings for the two samples was very high (r=.88).

suggesting that design training may have only a limited effect on preference. This statistic, however, obscures the fact that for 12 of the 61 scenes the "designers'" preferences were significantly higher (p<.05) than the "general" sample and that for the scenes as a whole the difference between the two groups is highly significant ($t=6.41$, df=59, p<.001). The difference between the two groups was generally small for restaurant settings and much greater for the other public places. Given these strong differences, further analyses were carried out separately for the two groups.

Windows and enclosure are two components that are featured in the description of this pattern. (The third component, seating, was held constant by including only scenes with seats.) For the "general" sample, the presence of enclosure had a significant effect on preference ($t=2.41$, df=59, p<.05), while the presence of windows had no significant relation to preference. For the "designer" sample, the opposite was the case: windows were a significant predictor of preference ($t=2.63$, df=59, p<.05), while enclosure was not.

Further examination of the most and least preferred scenes suggested that other factors were influencing the results. This exploration led to the addition of two new potential predictors of preference: visual texture and foliage. A panel of five judges rated each scene using a 6-point "texture" scale. Higher values were assigned to scenes that were hard (rectilinear or planar) while lower values reflect the presence of softer (curvilinear) shapes in the scene. Foliage was rated for presence or absence. Both soft visual texture and foliage were found to be highly significant predictors of preference, both for the "general" and the "designer" samples (p<.001 in each case).

Since windows, enclosure, visual texture and foliage appear in different combinations in each scene, stepwise regression analysis was performed to determine the relative strengths of these factors as predictors of preference. For the "general" sample, foliage and visual texture were each significant, accounting for 43% and 23%, respectively of the variance. For the "designer" sample, these were again the strongest predictors ($R^2=.28$ and .15, respectively) and windows added another 8%. The combination of these three factors accounted for 51% of the total variance in the case of the "designers," while for the "general" sample the two factors led to $R^2=.66$.

Thus of the Window Place components studied here, enclosure was favored by the "general" sample and windows by the "designer" sample. Further exploration yielded two additional factors: foliage and visual texture. Both of these were powerful predictors of preference for both samples, although particularly so for the "general" sample. For both groups foliage was by far the stronger of these two additional factors.

RESULTS: CATEGORIZATION OF SCENES

The previous section involved comparisons based on the level of preference as a function of various qualities in the scene. The preference methodology lends itself to another form of analysis as well. By examining the patterns of relationships among the preference ratings one can determine the perceived categories for the set of scenes used in the study (R. Kaplan, 1985a). Thus, one can ascertain whether there are different types of Window Places and whether the lack of such features as enclosure or windows suggests a different pattern (in the Alexander sense). Using the Guttman-Lingoes nonmetric factor analysis (SSA-III, Lingoes, 1972) procedure led to the identification of five categories (using the criterion of loadings >.40, with scenes loading on more than a single factor excluded). Figure 1 provides examples for each of the categories.

● The largest of the categories included 16 of the 26 restaurant scenes and only one public place. While windows are present in about half these scenes, a sense of enclosure is a strong component in almost all of them. With a strong sense of enclosure, and chairs or benches with a table, these scenes are well characterized by the concept of BOOTHS.

● A second category of 8 scenes might appropriately be labeled WINDOW PLACE. All but one of these entail seating by a window and almost all of them provide a sense of enclosure. Several of these scenes featured rounded windows and the surfaces were generally more detailed, even ornate.
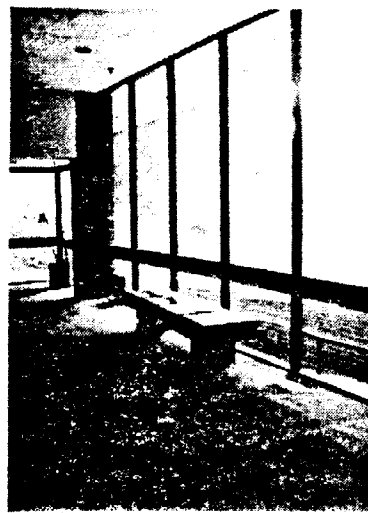
● In contrast to these were 9 scenes that lacked a sense of enclosure, although most had windows. The lines in these settings were all extremely rectilinear, with strong vertical or horizontal emphasis. The lack of enclosure gave an open appearance and the general impression was stark, hence the label OPEN, STARK.

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BOOTHS

WINDOW PLACE

OPEN, STARK

WOOD PANELING

LIGHT THROUGH WINDOW

FIGURE 1 - EXAMPLES OF EACH CATEGORY (BASED ON NONMETRIC FACTOR ANALYSIS)

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● Surface texture seemed to be the dominant feature in a category of 9 scenes which shared an emphasis on WOOD PANELING. The wood differed in height and in configuration but was in all cases prominent in the scene. None of these scenes had a window, but they were about equally divided in terms of enclosure. .

● The final category consisted of three scenes that have in common a strong light source through the window or door. The three differed in terms of other considerations, but the ephemeral LIGHT THROUGH WINDOW characteristic was dominant.

In Table 1 the mean preference rating for each of these five categories is presented in order of decreasing preference for the "general" sample. The BOOTHS and LIGHT THROUGH WINDOW categories were both relatively preferred by each sample. That these were equally preferred but separate categories shows the sensitivity of this analytic procedure to similarities in patterns of reaction, rather than to magnitudes of ratings per se.

Category	Sample			
	General	Design	t	p
Booths	2.98	2.97		
Light through window	2.90	3.05		
Window Place	2.34	2.82	6.96	.001
Wood paneling	2.20	2.34		
Open, stark	1.93	2.36	6.42	.005

TABLE 1 - PREFERENCE MEANS FOR EACH
        EMPIRICALLY-DERIVED CATEGORY

For two of the categories the two samples differed significantly in their preference ratings. WINDOW PLACE was one of the most preferred categories for the "designers," while the OPEN, STARK category was far least preferred by the "general" sample.

DISCUSSION

In many respects the Window Place pattern turned out to be an appropriate starting point for the study of patterns as hypotheses. The factor analytic procedure makes it clear that Window Place, at least in the context of public settings, is indeed a coherent concept, that it matches a category that people use in the way they perceive the indoor environment. There also is support for the preference value of the pattern, although here the results are not uniformly positive. Certainly the "designers" favor this pattern substantially more than the rest of the sample.

The factor analytic procedure also points to the possibility that additional patterns might be discovered in studies of this kind. Certainly the BOOTH category is a strong candidate for pattern status, given its coherence and high ratings by both designers and the public. This category is related to two of Alexander's patterns, "Eating Atmosphere" and "Sitting Circle," both of which emphasize seating in a roughly circular pattern in the context of enclosure.

Other influential factors uncovered in this study did not lead to coherent clusters and as such apparently do not constitute patterns. Such factors might be called "moderating variables" since they are independent of any particular patterns and at the same time influence the preference. Foliage and soft visual texture are both examples of such variables: the first of these was a particularly strong factor in this study.

Foliage has played a moderating role in other studies as well, although at a quite different scale. Herzog, Kaplan and Kaplan (1982) found foliage to be a powerful predictor of preference for the outdoor urban environment. This was also a factor in the quality of the view from the window that predicted neighborhood satisfaction in R. Kaplan's (1985b) study of multiple family housing. The present study indicates that foliage has no less a powerful infuence on the indoor environment.

There is another difference between the "designers" and the rest of the sample that is worthy of a brief comment. As mentioned previously, enclosure played a greater role in the "general" sample's preference than for the "designers." There is an interesting resonance here to A Pattern Language, where enclosure is an often repeated theme. As a difference in outlook that might be responsible for a considerable mismatch between the user and the designed environment, this topic richly merits further research. Further, A Pattern Language constitutes, once again, a valuable catalyst and starting point.

This study has attempted to explore two central issues. First, is it appropriate to consider patterns as hypotheses? And second, is the photoquestionnaire preference

rating methodology an effective means of
testing hypotheses of this kind? On both
counts it appears that this preliminary
venture was reasonably successful. It
provided both confirmation and reservations
concerning the Window Place pattern, and
proved to be a useful means of discovery of
potential new patterns and moderating
variables as well. It also points to some
differences in outlook between designers and
others that urgently call for further study.
Perhaps through empirical approaches such as
these the wealth of hypotheses contained in
A Pattern Language will receive the interest
and study they deserve.

REFERENCES

Alexander, C. (1979) A timeless way of
building. New York: Oxford.

Alexander, C., Ishikawa, S. & Silverstein,
M. (1977) A Pattern Language. New York:
Oxford.

Herzog, T. R., Kaplan, S. & Kaplan, R.
(1982) The prediction of preference for
unfamiliar urban places. Population and
Environment, 5, 43-59.

Kaplan, R. (1985a) The analysis of
perception via preference: A strategy for
studying how the environment is experienced.
Landscape Planning, 12, 161-176.

Kaplan, R. (1985b) Nature at the doorstep:
Residential satisfaction and the nearby
environment. Journal of Architectural and
Planning Research, 2, 115-127.

Kaplan, S. (1985) Review of Christopher
Alexander: The search for a new paradigm in
architecture by S. Grabow. Environment and
Behavior, 17, 405-408.

Kaplan, S. (1987) Aesthetics, affect and
cognition: Environmental preferences from an
evolutionary perspective. Environment and
Behavior, 19, 1-29.

Lingoes, J. C. (1972) A general survey of
the Guttman-Lingoes nonmetric program
series. In R. N. Shepard, A. K. Romney & S.
B. Nerlove (Eds.) Multidimensional scaling
(Vol. 1). New York: Seminar Press.

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