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INVESTIGATING CHANGES IN SPACE USAGE PREFERENCES BY CHANGING AESTHETIC ENVIRONMENTAL VARIABLES

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ABSTRACT

When investigating links between the physical environment, experience and behavior, the theoretical framework of space syntax prioritizes the geometry related properties of space to explore the social function of that space. The present research aims to draw attention on other, aesthetic properties linked to materials. For this, the article explores how patterns in spatial choices of users are related to the qualities of a sub-space in a spatial system both in terms of geometry (configuration) and material quality (surface structuring). Changing the qualities of the physical environment (either configurational features of spaces or surface structuring) will affect the functional and aesthetic mental representation of space by the user and therefore influence behavior. The paper looks at the inter-relations between the factors above through an experiment, which is designed to map changes in user preference in space usage by changing the aesthetic material-related variables, while fixing the ones related to geometry (configurational variables).

KEYWORDS

spatial cognition, architectural aesthetics, design research

1. RESEARCH TOPIC AND MAIN THEORETICAL ASSUMPTIONS

1.1. RELATIONSHIP BETWEEN SPATIAL CONFIGURATION, MATERIAL QUALITY AND USER BEHAVIOR

There is a threefold relationship between variables related to (1) the geometry of space such as spatial configuration involving the structural relationships between spatial units (Hillier and Hanson, 1984, Hillier, 1996), (2) variables related to material quality (physical variables such as colors, textures, 2 dimensional shapes - collectively referred as surface structuring variables in the present research) and (3) user behavior and experience. Changing the qualities of the physical environment (1,2) above (either configurational features of spaces or surface structuring) will alter the experience of a certain space and will affect spatial choices made by the users.

1.2. THE FUNCTIONAL AND AESTHETIC MENTAL REPRESENTATION OF SPACE

The functional and aesthetic mental representation (cf. Eysenck and Keane, 1995) of space of the user is induced by both geometry related and material related environmental features, and also dependent on the subject's previous knowledge, experiences and other psychological conditions. The functional and aesthetic mental representation of space are concepts that the authors wish to include in theorizing links between objective environmental variables (geometry, material quality) and observed behavioral effects - giving the opportunity to involve certain theoretical standpoints of affective psychology (related to emotions, associations, etc.) in the investigation of the relationship between spatial choices and spatial/aesthetic variables. Nonetheless, this paper is not touching upon specific theories of affective psychology.

1.3. TWO LAYERS OF THE ENVIRONMENTAL VARIABLES

When investigating links between the physical environment, experience and behavior, the theoretical framework of space syntax prioritizes the geometry related (configurational) properties that are linked to the social function of space (Hillier and Hanson, 1984; Hillier, 1996; 1999), and developed indicators and measures to describe those properties. Nevertheless, other variables also need to be considered when exploring connections between space, experience and behavior, including some rather aesthetic features linked to material quality (Valtchanov and Ellard, 2015, Berlyne, 1974, Nasar, 1994, Bafna, 2012). The present research aims to draw attention on the latter factors.

Based on this, two major layers of environmental variables are explored in the present research, the functional and aesthetic ones (labels used by virtue of simplification). Both sets of variables have an influence on the mental representation of space (Eysenck and Keane, 1995) of the user, potentially influencing patterns of spatial choices. The functional layer includes the variables that are in the focus of the traditional methods of space syntax (Peponis et al.,1997; Turner et al., 2001), that is the configurational geometry of the spatial system. As for the aesthetic ones (Bafna, 2012), the research looks at the physical features of vertical and horizontal planes such as texture, material quality, color patterns, reflectivity, etc. The research investigates the dynamic in which one or the other layer may become dominant depending on various situations (the situations in this paper are elaborated in detail in section 1.5 and 3.) exploring to what extent geometry and material related spatial qualities influence the functional and aesthetic mental representation of space in the user.

1.4. SPATIAL UNITS IN THE RESEARCH

An initial assumption is that users identify subjective sub-spaces based on one hand on environmental variables, on the other hand on their motives of visit, former spatial experiences, perception, social background, etc. The psychological effects of the qualities and relations of subjective spatial units can be mapped by examining behavior - in this case spatial choices of users. For methodological considerations the authors also assume that the user's subjective sub-spaces are corresponding the rooms in the office environment used as a case study, and the participants make their spatial choices based on this division - as a result the participants choose rooms first and position within that room subsequently.

1.5. THE GENERATION OF CREATIVE IDEAS AS A SOCIAL FUNCTION OF A WORKING ENVIRONMENT

The research investigates environments that are beneficial for the generation of creative ideas. Our focus is the office environment with organizations where creative ideas (Duffy, 1974, Peponis et al., 2007) are important for the productivity of the organization, which can be regarded as one of the social functions of a working environment. Creative ideas need a special inner psychological state, and beyond this a particular type of social interaction, which is "the casual, non-threatening encounter that makes it easy for relative strangers to talk to each other" (Gladwell, 2000:2). Based on the work of Peponis (1987, Peponis et al., 2007) and Gladwell (2000) we assume that the psychological state of mind needed in the context of creative ideas is - among others - an openness for encounter, which is the degree of presumed openness of the user to have physical encounter that is either coincidental or initiated by the other users in a moment that is not entirely controlled by the subject. In the present research we call this the "degree for openness for coincidental encounter". In the present study we assume that the non-space related psychological conditions linked to openness for encounter in the context of creative office work are time pressure and the level of focus needed to perform a certain task (beside others).

According to Hillier (2004), spaces with different syntactic qualities are providing different types of social experiences. Patterns of certain permeabilities are offering a definite set of potential relations: the disposition and number of entrances of a sub-space in a spatial system is critical in terms of privacy, the level of control offered by that sub-space. Spaces with high permeability such as passages, shallow spaces (Hillier and Hanson, 1984) are maximizing the number of encounters. A space with better visibility and accessibility may generate more face-to-face interactions (Rashid, 2009). In the present research we investigate the behavioral effects – effects on spatial choice – of a certain type of social experience, which is the one of the creative workplace. The relevant syntactic variables investigated in this research are presented later in section 3.1.

2. RESEARCH HYPOTHESIS

The research explores how patterns of spatial choices made by users of a creative office environment are related to the qualities of the sub-spaces in terms of spatial geometry (configuration) and material quality (surface structuring). In the experiment the program of the building is represented with experimental social scenarios and users need to make spatial choices in the context of this program. The initial research hypothesis is that when users are put in scenarios (social situations) opened for encounter to a higher degree, they are more likely to choose more integrated locations (geometry-related measure) (See 3.3. and Table 2 for geometry/configurational related measures used in the research), while in scenarios with a lower degree of openness for encounter participants are less likely to choose integrated locations due to the perceptual and functional affordances (Gibson, 1977) of the configuration (geometry) of space; Nevertheless, material related environmental variables can become dominant in the subjective process of creating a mental representation of space and alter patterns of spatial choices that would exist if only geometry-related variables were considered.

3. METHODOLOGY

3.1. GENERAL DESCRIPTION OF THE EXPERIMENT

The office environment used as a case study is a spatial system composed of 6 sub-spaces (5 rooms and a corridor, as shown on Figure 1). The case study environment is based on a real-life project - the reconstruction of a heritage building in Budapest, Hungary -, which is at the time of writing in the design development phase, and will give space for a creative research organization. Certain architectural characteristics of the case study virtual environment were derived from the features of the historical building and its actual architectural program - these characteristics have not been modified for the sake of the experiment. When designing the moods based on material-related considerations, the designer team aimed to deliver designs that can be applied to a certain extent in reality. Experimenting with a realistic design, on one hand, meant a wide range of given environmental features that were creating experimental stimuli, posing a challenge in the controllability of environmental variables. On the other hand these conditions were beneficial to make the research ecologically valid and reflect on its results in the design process (ecological validity refers to the degree the results of a research will actually appear in real life conditions, cf. Dhami, Hertwig and Hoffrage, 2004).

The 6 sub-space are visually well distinguishable because of the vaults in-between them, though movement is not obstructed by any doors (Figure 1). The division of the environment into the sub-spaces in the experiment matches the division that the designers were working with in the actual project. The participants need to navigate visually through the virtual model of the building and choose a seat in different given experimental social scenarios. While the participants are asked to choose a seat, the research examines room preferences for the reasons above and the assumptions presented in section 1.4.

Due to technical limitations navigation happens on a fixed route by showing a slideshow. Because of the fixed route and the slideshow being replayed until the submission of the filled questionnaire, the participants can make their choices by get acquainted to all parts of the spatial system. The participants are receiving exclusively visual information.

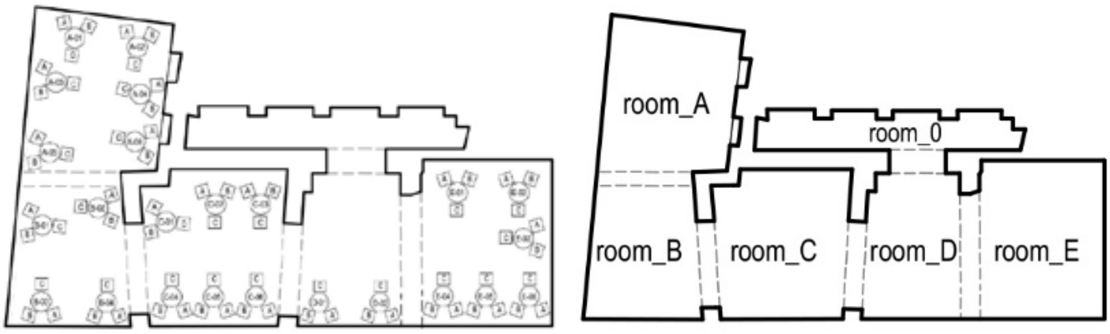


Figure 1 - Room labels and seating diagram

The various configurational features of the spatial system and the sub-spaces are likely to affect user choices as explored with the methodology of space syntax (Turner et al., 2001, Bafna, 2003, Peponis et al., 1997), as presented later in section 3.3.1. The configurational variables of the spatial system and the sub-spaces are fixed in all the cases (social situations and environment types). The virtual model is altered in the factors linked to the affective-aesthetic variables (are based on designer intuition, but only with changing well defined surface structuring variables).

An online questionnaire is used for collecting data. Different subjects are given different experimental task sequences (sequences of scenarios) in different environmental settings. The questionnaire contains demographic data (gender, age, occupation), furthermore familiarity with 3D virtual environments and the degree of immersion. Convenience sampling was applied.

3.2. DESCRIPTION OF THE EXPERIMENTAL SOCIAL SCENARIOS

The experimental social scenarios are representing the program of the building (research and creative institute functions). The participants need to imagine the way the lounge functions, which is based on the situations. Other potential clues such as unique function-related elements or other agents are not coming into play for methodological reasons. The same furniture is used in all of the rooms, so that only the syntactic relations between the rooms (geometry) and the changes in the material qualities are supposed to be influential. The designer team had to consider these limitations while creating the two different moods used in the study (see section 3.3.2.). Also, other agents are not modelled or included. User choice (sitting preference in the experiment) is representing the expectation of other people to come and move around based on the situations.

The situations (see in Appendix 7.3) are designed based on a degree of presumed openness of the user to have physical encounter that are either coincidental or initiated by the other users in a moment that is not entirely controlled by the subject. The situations had been formulated to be lifelike and aiming involvement of the participants for the sake of ecological validity. This implies elements in the text that contain information/variables potentially distorting the results. This possible inaccuracy is compensated by the multiplication of the situations (a set of situations are based on a higher and a set on a lower degree of presumed openness, and similar results are expected to each set of situations). The similarity between the situations is based on variables of time pressure and the degree of required focused work with control dimensions of solitary/group situation and if the subject is centered rather on working or consuming (Table 1). In situations S1 and S3 participants are expected to be open for encounter to a higher degree, while in situations S5 and S7 participants are expected to be less opened for encounter. Table 1 gives an overview of the logic of setting up the scenarios.

	Primary Dimension			Control Dimension
	Presumed degree of openness for coincident encounters	Time pressure	Focused work	Solitary / Group of 2 S/G
Scenario 1 (S1)	Higher	Lower	Lower	S
Scenario 3 (S3)	Higher	Lower	Lower	G
Scenario 5 (S5)	Lower	Higher	Higher	S
Scenario 7 (S7)	Lower	Higher	Higher	G

Table 1 - Scenario design[1]

According to the theoretical assumptions presented above, the program of the building is influencing spatial choices depending both on the configurational geometry-related and material related (surface structuring) environmental variables.

3.3. DESCRIPTION OF THE ENVIRONMENTS USED AS A CASE STUDY

3.3.1. GEOMETRY - SPATIAL CONFIGURATION

The probabilistic patterns of movements and other functional patterns are affected by the topological relationship between spatial components of a spatial system (Bafna, 2003). According to Hillier, configurational features are related to the degree of permeability, accessibility and visibility in space. Space syntax research has developed several analytical methods to describe spatial relationships, methods on which the present research is building upon. Notions and measures introduced to describe spaces within a system include the depth of a space in a spatial system and spatial integration (Hillier and Hanson, 1984, Hillier, 1996). Stamps (2005) is using the notion of permeability (the degree of possible movement through space) as a factor influential in movement patterns through space. Visibility qualities of subspaces of a spatial structure are unraveled by means of isovists, inter-visibility graphs, axial lines and other methods.

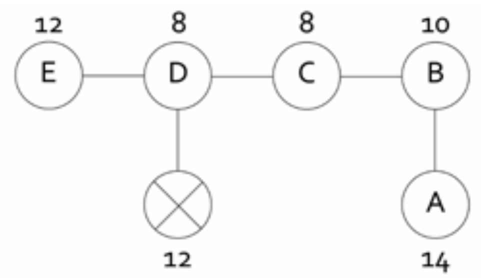
The sub-spaces of the spatial system (Figure 1.) in the experiment have markedly different spatial qualities: the depth of spaces relative to each other are different (Table 2., Graph 1.), room A and E are “dead-ends” with only one entrance (uni-permeable space), room D, C and B are passages with multiple access points (bi-permeable spaces). Room A and E are less

1 The scenarios not presented in the current paper (S2,S4,S6,S8) are centered on consuming instead of working, as a second control dimension;

integrated, while rooms D, C and B are more integrated. Selected configurational measures of the sub-spaces are shown in Table 2. The selection was based on their relevance in the context of the social situations presented to the participants, and on their suitability for the spatial typologies found in that specific spatial system.

	No. of access points	Total Depths	Permeability	Avg. visibility from tables	Visual Integration	Depth from entrance	Average degree of spatial integration
A	1	14	low	61	low	4	low
B	2	10	medium	102	high	3	medium
C	2	8	high	83	high	2	high
D	3	8	high	114	high	1	high
E	1	12	low	93	medium	2	medium

Table 2 - Configurational variables of the rooms



Graph 1 - J-Graph of the spatial system

3.3.2. MATERIAL QUALITIES - SURFACE STRUCTURING

The previous section explored those physical features of the environment which were given and fixed. This section presents how material quality variables are defined and the sort of challenges, questions relate to their definition.

While the long-term goal of the research is to define a systematic categorization of material-related variables which can be applied for a wider variety of situations (and to map their relationships with configurational variables), the moods defined in the experiment have been created without that sort of systematization. We call "mood" the sum of the material-related environmental elements that are controlled by the designer and that are relevant in the subjective process of the functional and mental representation of space of the user. Figure 2 and Figure 3 show the same space with different moods.

While researches that are categorizing and discussing variables related to material quality exist (cf. Sadalla and Sheets, 1993, cf. Stamps and Krishnan, 2006, cf. Nasar, 1994, cf. Soliman, 2013), these categorizations couldn't be applied for the case study and assumptions of the present research. A designer team composed of architects got the task to design moods (Mood_1 and Mood_2) that are (1) very different from each other, (2) generate strong moods that have positive affective effects on the users, (3) that are credible and (4) to design by changing material qualities variables that can be controlled in the experiment. Some methodological issues and observations related to the design process are described in detail in the Appendix (7.1). The geometry and position of the furniture was kept the same in all rooms in all environments, not to affect any configurational (geometry-related) features, so both moods (Mood_1 and Mood_2) had to be adjusted to that specific furniture.

Figure 2 - Mood_1 in room C and D and Mood_2 in the distance in room E

Figure 3 - Mood_2 in room C and D and Mood_1 in the distance in room E

3.4. QUESTIONNAIRE TYPES

Different cases (questionnaire types, see the online questionnaire links in the Appendix 7.2) are generated by changing the surface structuring qualities of the rooms and the order of the scenarios (Table 3). The configurational variables (Table 2) of the spatial system are the same in all of the cases. Two sets of designs (Mood_1 and Mood_2, see in Figure 2 and Figure 3.) are used to differentiate the cases in terms of material quality. In the homogeneous cases all rooms have the same surface properties. E1: all the rooms use the first set of design (Mood_1); E2: all the rooms use the second set of design (Mood_2). In the heterogeneous cases one room of the spatial system has different material qualities than all the others. E3: room E uses the first set of design (Mood_1), while all the other rooms the second (Mood_2); E4: room E uses the second set of design (Mood_2), all the other the first (Mood_1). The configurational/geometry-related aspects of space are fixed. (See Figure 4 about the overview of the combinations of the moods applied to the rooms.) The article presents results obtained for E1 and E4.

Questionnaire Type	Order of scenarios		Environment Types	Mood
A	From Higher degree of openness to coincidental encounter to a lower degree	S1-S3-S5-S7	E1	Homogenous M1
B		S5-S7-S1-S3	E4	Heterogenous M1-M2
C	From a lower degree of openness to coincidental encounter to a higher degree	S5-S7-S1-S3	E1	Homogenous M1
D		S5-S7-S1-S3	E4	Heterogenous M1-M2

Table 3 - Questionnaire types and orders of the scenarios

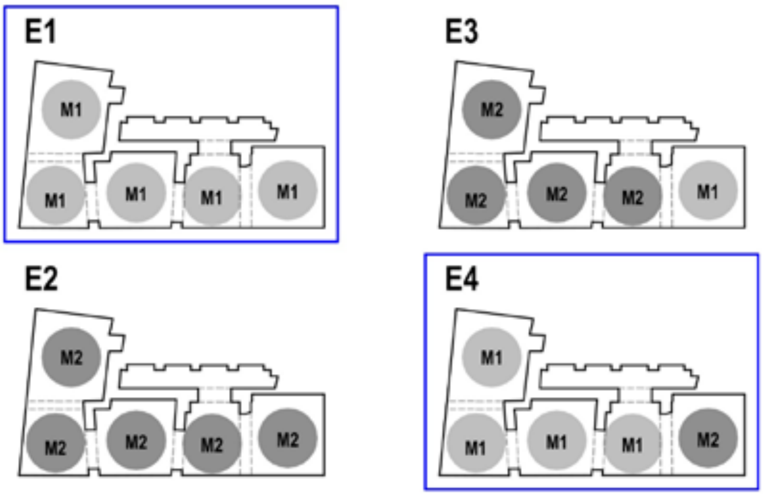


Figure 4 - Overview of design arrangements. Current study focuses on E1 and E4

4. RESULTS

107 respondents have completed the experiment[2]. The convenience sampling aimed to reach respondents who can easily relate to the given situations. The number of architects and non-professional respondents were balanced. The present study does not investigate the differences in results by user groups. The participants evaluated their immersion into the virtual environment on an average of 4,03 on a 1-5 Likert scale.

The research hypothesis (see section 2.) was the following: when sub-spaces in a spatial system are different in terms of their configurational measures and heterogenous in their surface structuring (material qualities), there will be cases when the latter variables are dominant in the subjective process of the functional and mental representation of space, which is influencing patterns in spatial choices. In these cases spatial choices are altering relative to those which would exist in the same setting of spatial configuration but with homogenous material qualities. We have used an office environment composed of 6 sub-spaces to test this, with generating different cases (questionnaire types) as described in section 3.4. In the heterogeneous cases room E has different material qualities than all the other rooms, therefore - as in the research hypothesis - we expect to get different patterns in spatial choices compared to the homogeneous cases. The rooms do not have precisely the same physical features (angles of the walls, number of seats. etc) - as they are based on the actual heritage building -, therefore the rooms are not comparable with each other in only homogenous or in only heterogenous cases, however, changes in seating pattern between the homogenous and heterogenous can be examined.

2 Females: 47, males: 60; age: 34 year ± 0,89 year, min. 23 year; max. 73 year; architects:43, other professions: 63

SCENARIO 1 (S1)

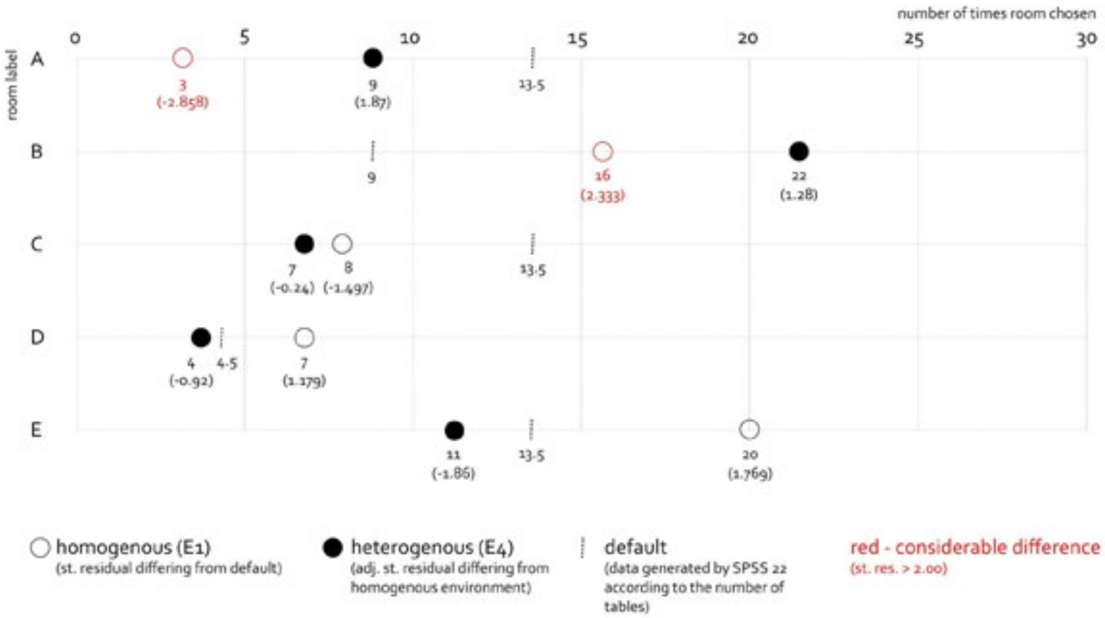


Chart 1 - Comparing seating patterns between"default" and homogeneous seating pattern and between the homogenous and heterogenous environments in Scenario 1

SCENARIO 3 (S3)

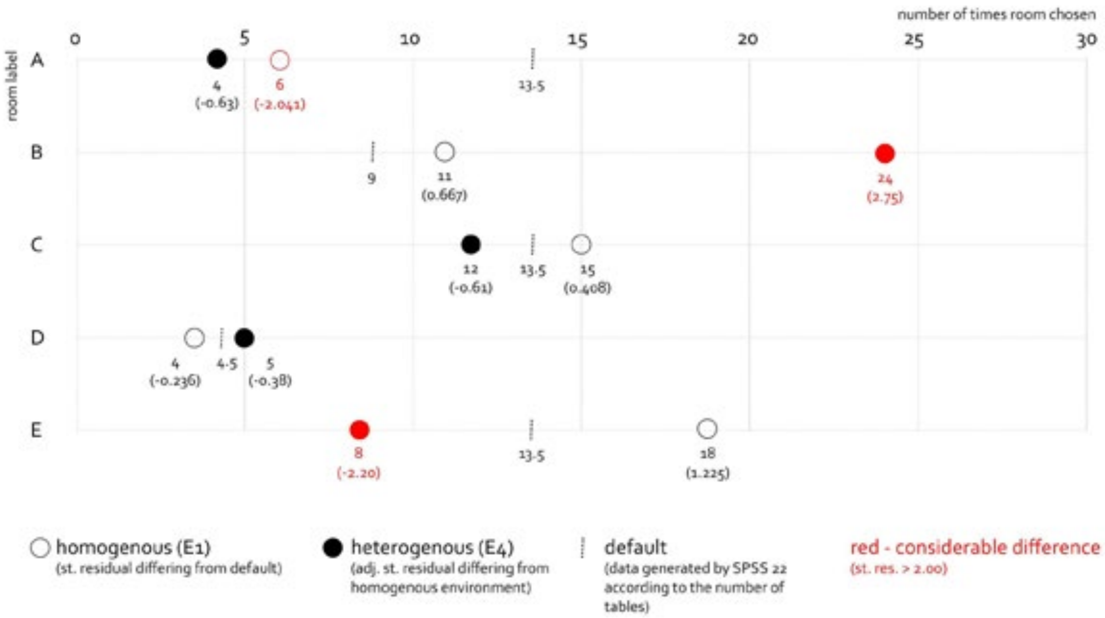


Chart 2 - Comparing seating patterns between"default" and homogeneous seating pattern and between the homogenous and heterogenous environments in Scenario 3

SCENARIO 5 (S5)

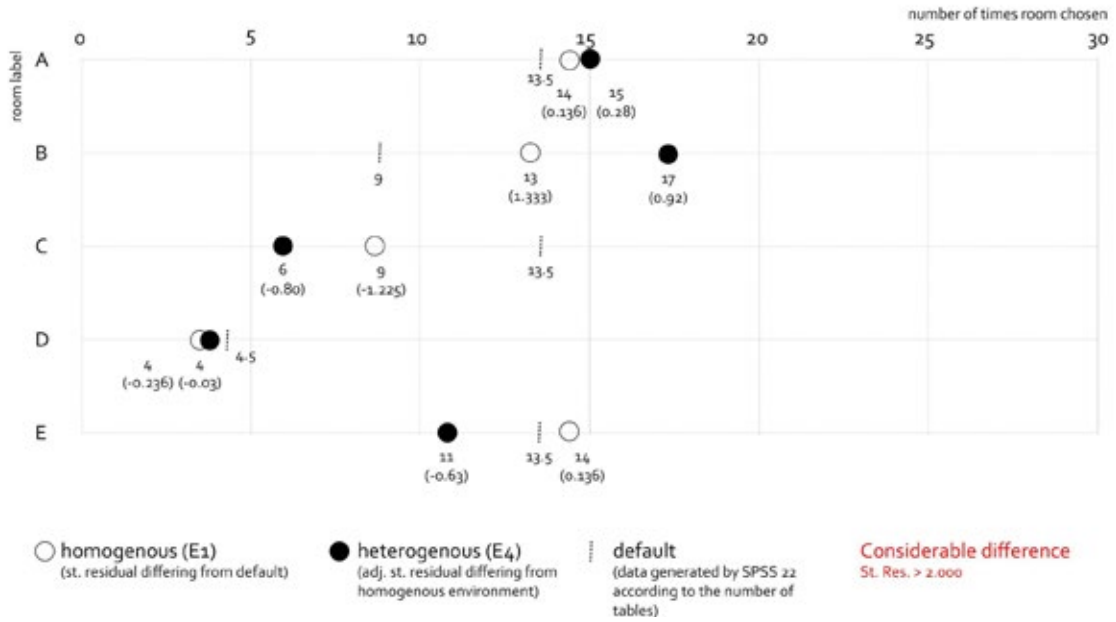


Chart 3 - Comparing seating patterns between"default" and homogeneous seating pattern and between the homogenous and heterogenous environments in Scenario 5

SCENARIO 7 (S7)

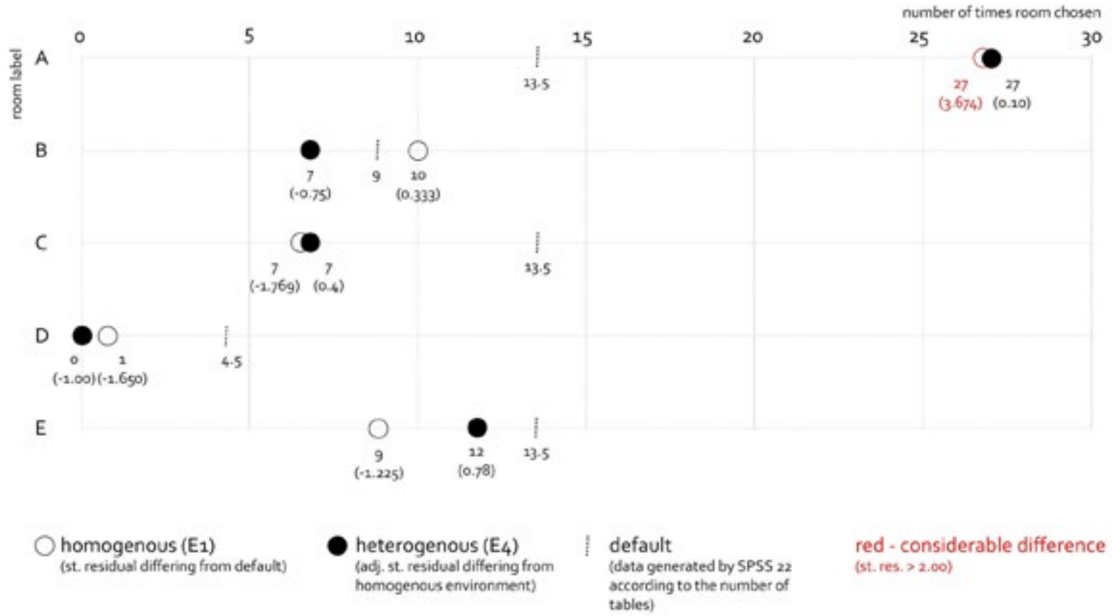


Chart 4 - Comparing seating patterns between"default" and homogeneous seating pattern and between the homogenous and heterogenous environments in Scenario 7

4.1. COMPARISON OF SUB-SPACES IN SEATING PATTERNS IN HOMOGENOUS ENVIRONMENTS

Looking at seating pattern in homogenous cases gives the opportunity reflect on the effects of certain configurational features and to compare the social situations with each other. In terms of configuration Room A is a dead-end, a deep space, it has low visual integration, it is located far from entrance - it has little permeability and low spatial integration; Room B is a passage, medium in terms of depth, it is relatively far from the entrance and has a high visual integration. Room C is a passage, shallow space, permeable, it has high overall visual integration but containing tables with low visibility, near to the entrance; Room D is a passage, a shallow space, the closest to the entrance of the lounge, it has a high integration visually as well; Room E is also a dead-end, it's a deep space, but located near to the entrance and it has higher visual integration than room A (see Table 2). In the homogeneous cases all room have the same material qualities, therefore only configuration is expected to influence spatial choices depending on the social situation.

While the rooms can't be directly compared to each other due to the different number of seats, the seating pattern in the different situations can be compared with a default seating pattern (Chart 1)[3]. The default seating pattern is a seating pattern that is assumed when all the rooms are similar in the selected configurational variables (e.g. the rooms are isolated from each other and as a result total depth is zero, the number of access points is zero, visual and spatial integration is low, etc.) and there is no social situation presented.

The results show significant differences in overall room choice patterns in the cases of S1 *(Chi^2=20,370; df=4; p=0,000**)* and S7 *(Chi^2=20,964; df=4; p=0,000**)*, in comparison with a default seating pattern, while in the case of S3 *(Chi^2=6,333; df=4; p=0,176)* and S5 *(Chi^2=3,370; df=4; p=0,498)* no significant differences were found. When looking at the individual rooms, further observations can be made (see Chart 1):

- In situations in which the participants are expected to be more open for coincident encounter (S1 and S3), lower preference is expected for "deep" spaces further away from the entrance and with low visibility (compared to the default seating pattern and compared to situations in which there is a presumably lower degree of openness for coincident encounter). The expectation above is confirmed in the case of room A (st. res.>1.95) . Also, Room B in S1 is more preferred than in the default setting. This might be explained by taking into account that spaces with a high level of movement can result in lower levels of unplanned interaction (Penn, Desyllas and Vaughan, 1999), which could result in the participants choosing room E or maybe B (medium spatial integration) over C or D (high spatial integration), as E or B is less of a space of movement, but it still has a high visual integration (Table 2).
- In situations in which participants are less opened for coincident encounter (S5 and S7), compared to S1 and S3, the participants are expected to choose rooms further away from the entrance, they are expected to have less preference for passages and shallow spaces and more preference for sitting in deep spaces. When comparing the number of users choosing a certain room, these presumptions are in general confirmed only in S7, in the case of room A (Chart 1).

4.2. COMPARISON OF HOMOGENEOUS AND HETEROGENEOUS ENVIRONMENTS

While in the previous section effects of one environment type has been investigated, this section compares two different environment types - one has the same material qualities (mood) in all of the rooms (homogeneous environment), in the other one Room E has markedly different material qualities than all the other rooms (heterogeneous environment). Changing material qualities in room E was expected to influence user choices compared to the homogeneous cases. First overall seating patterns in homogenous and heterogenous cases are compared, then the single rooms are compared in the different environments types.

3 The default pattern is generated with the distribution based only on the number of chairs in each room: A: 23.8% (24 seats), B:19% (16 seats), C:23.8% (24 seats), D 9.5% (8 seats), E: 23.8% (24 seats) based on the number of seats in each room.

When comparing overall seating patterns in the spatial system between the homogenous and heterogenous environments by situations, there is significant difference only in the case of S3 (Fisher's Exact Test=9,522; df=4; p=0,046*), where significant changes are caused by the higher seating preference for room B (p=0,006**) and lower seating preference for room E (p=0,028*) in heterogenous environment[4] (Chart 1). In cases S1 *(Fisher's Exact Test=7,316; df=4; p=0,116)*, S5 *(Fisher's Exact Test=1,599; df=4; p=0,824)*, S7 *(Fisher's Exact Test=1,931; df=4; p=0,807)* there is no significant difference between heterogenous and homogenous cases in terms of overall seating pattern.

In order to understand the role of single rooms, the comparison of every pair of rooms has been made. Initially the pairs including Room E were in focus, so the - potentially - direct effects of changing the mood in Room E could be investigated. Secondly all other relations have been looked into to see if changing the mood of E can generate differences in room preferences in the relation of other pairs as well (Table 4)[5].

	S1	S3	S5	S7	Cases with significant or tendency level difference
A-E	p= 0,023*	p= 0,440	p= 0,385	p=0,383	S1
B-E	p= 0,053	p= 0,004**	p= 0,253	p= 0,257	S1; S3
C-E	p= 0,340	p= 0,229	p= 0,534	p= 0,472	NO
D-E	p= 0,616	p= 0,177	p= 0,541	p= 0,455	NO
B-A	p= 0,238	p= 0,103	p= 0,452	p= 0,362	NO
B-C	p= 0,332	p= 0,049*	p= 0,231	p= 0,449	S3
B-D	p= 0,180	p= 0,359	p= 0,522	p= 0,611	NO
A-C	p= 0,137	p= 0,555	p= 0,338	p= 0,617	NO
A-D	p= 0,074	p=0,414	p=0,621	p=0,509	S1
C-D	p=0,452	p=0,423	p=0,490	p=0,533	NO
	3 cases	2 cases	NO cases	NO cases	

Table 4 - Deviation from homogeneous cases when materials in room E are altered, p<0.05 is statistically significant, p<0.1 shows difference at a tendency level;

4 Although, when using the strict adjusted Bonferroni corrected p values (in this case p<0,005), there were no significant differences between the homogeneous and heterogeneous environments in room choices in S3. Although the difference in the case of room B was very close to the strict level of significance (in this case the p value is 0,006).

5 The conservative two sided Fisher's Exact Test was run on the data because the low frequencies in certain categories.

5. INTERPRETATION OF THE RESULTS AND CONCLUSIONS

1. The rooms in the spatial system of the lounge are different in terms of their configurational features (based on the geometry-related indicators chosen). The differences in configuration affects patterns of space usage depending on the social situations, confirming the importance of configuration in choosing seating (corresponding to a certain degree of openness for coincident encounter) - but not in all the cases examined.
2. Changing material-related environmental variables (the way described in the methodology and results section of this article) affected patterns of room choices in certain cases, while in other relations no significant difference could be observed. The fact that there were cases with shifting spatial choices draws attention on the importance of rather aesthetic features linked to material quality (surface structuring). As a consequence, further investigation in material-related environmental variables is needed.
3. While the effect of changing the moods is apparent in certain cases, the reasons need further investigation. Two possible explanations are: (1) the certain material qualities used to create mood have such effects, (2) the proportion and disposition of the moods relative to each other is the reason for the differences in spatial choices when comparing heterogenous and homogenous environments. The next phase of the present research will test E2 and E3 environments with Mood _1 and Mood_2 swapped (Figure 4).
4. A long-term goal of the research is the conscious (non-intuitive) design of moods along the theme of openness for coincident encounter, based on further research into relevant material-related environmental variables (and a systematic categorization of those).
5. An important methodological aim was to carry out an experiment that is ecologically valid (see in 3.1.) and the results can be potentially used by designers as well. The participants found the experiment credible and real life-like based on the results of the control question regarding immersion, showing that the designer and researcher team succeeded in creating moods and situations that are immersive and the participants could relate to. Nevertheless, favouring an ecologically valid experiment (based on a real-life project in the design phase) over an experiment with all variables tightly controlled might explain certain controversies in the results.

ACKNOWLEDGEMENTS

This article would not have been possible without the valuable critiques and advices of John Peponis (School of Architecture, Georgia Institute of Technology). The authors would also like to thank the designer architects Anna Felcsúti, Lilla Turi, Attila Kurucz assisting in the creation of the case study environments and the management of Ginkgo Green Architects collaborating in the design-research project.

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APPENDIX

METHODOLOGICAL ISSUES RELATED TO THE DESIGN PROCESS

- The designers found hard to design environments that provide a strong spatial experience without being able to work with variables that are linked to the geometry of the sub-spaces and the furniture, as - according to the designers - the effects are dependent on a certain synchronization of materials and geometry. Defining what can be regarded as material quality was also allotted to the designers, as a more accurate definition has yet to be developed. An example for the occasionally inexact definitions and selection of design elements is the vertical bookshelf texture on the walls in Mood_1. In case the bookshelves have rather aesthetic and associative effects (such as association to calmness, wisdom, etc.) it can fit in the given methodological concept, but it can raise methodological concerns if the shelves also have strong functional connotations (Peponis et al., 2007).
- A design challenge was to set up a balance between the simplification of the physical features to control variables and real life complexity of the heritage building and program used as a case study. Researches on environmental preferences show that a certain degree of complexity is needed (depending on the context) for a higher degree of preference (Kaplan, 1987, Berlyne, 1974). A major design challenge to reach sufficient complexity despite the homogeneity/standardization needed between the sub-spaces and moods. The design team and the researchers based their decisions with a regard on these contradictions. The furniture had to be kept homogenous: the size and geometry of the tables, number and height of the lamps (etc) are the same in each rooms and both Moods. Above these features the colour and the material were the same in each mood in all sub-spaces.
- An appropriate design tool for creating a "strong mood" is the application of unique elements with strong affective effects (such as plants (Kaplan and Kaplan, 1989). Each room contains a unique element that is linked to either Mood_1, or Mood_2, so no single room is prioritized.

QUESTIONNAIRE LINKS

Questionnaire A

Questionnaire B

Questionnaire C

Questionnaire D

TEXT OF THE SCENARIOS USED IN THE QUESTIONNAIRE

S1 - SCENARIO 1

You have just finished your morning working session at your desk which is on the first floor, as you needed all your notes that you left on your table yesterday. Some change in the environment could be beneficial, so you decide to have a coffee in the researchers' living room and to dive into your new topic on what you will be working on the rest of the week.

S3 - SCENARIO 3

You were very happy to learn that a young colleague from the States is going to spend a semester in Budapest, and going to use the library of your organization. You have contacted him and invited for a meeting, to find a common research topic. You choose a table for both in the lounge, hoping that your colleague will get a good impression of your workplace.

S5 - SCENARIO 5

You have plenty of work to do, you have been sitting at your desk on the first floor for days buried in work. You really need to concentrate on your job, but you feel you need a different environment to go on, so you go down to the lounge to continue working there. You are ordering a coffee.

S7 - SCENARIO 7

You will have an important meeting to discuss a research with a fellow colleague of your age. The deadlines are very tight and you are stuck in solving a problem that needs urgent answer. Usually you work in the library but now you're sitting down in the lounge. You are ordering a coffee, papers are all around the table.