Critical Housing Analysis
Volume 3 | Issue 1 | 2016 | 30-41
Available online at www.housing-critical.com
http://dx.doi.org/10.13060/10.13060/23362839.2016.3.1.264

The Apartment with the Best Floor Plan Layout: Architects versus Non-architects

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Abstract: *This study examined differences in the floor-plan preferences of architects and laypersons with no architectural education or experience (non-architects). Qualitative data on floor-plan preferences were collected using interviews and an online survey. The floor plans used in the online survey were differentiated primarily by spatial arrangements and included the original layout of a socialist prefab apartment and two contemporary redesigns of the space. The results showed significant differences in the floor-plan preferences of architects and non-architects. Topological properties of layout and a required level of privacy were identified as key factors influencing the between-group differences. Architects and non-architects disagreed in particular over how the public and private zones were defined and arranged in the apartment layouts. From the perspective of architectural practice, understanding non-architects' preferences can decrease the uncertainty in new product development for an unknown end user and increase residential satisfaction.*

Keywords: Apartment, Floor plan layout, Housing design, Preferences, Architects, Non-architects.

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Introduction

The qualities of apartments are very important factors that influence overall residential satisfaction and satisfaction with the residential area (Musil 1985, Dekker and Van Kempen 2009, Permentier, Bolt and Van Ham 2011). Floor plans are not only the basic spatial representation of apartment but also an important communication tool between the customer and the real estate agent, and between the architect and the client during the design process. Nevertheless many studies showed that architects evaluate architecture differently than non-architects and use diverse categorisation schemes for interpreting architecture (Hersberger 1973, Nasar 1989, Groat 1982, Devlin 1990, Gifford et al 2000, Gifford et al 2002, Llinares Montañana and Navarro 2011, Montañana Llinares and Navarro 2013). Even though the floor plan is a significant communication tool the above-mentioned studies scarcely use it as input data in a study. Yet an experiment conducted by Montañana, Llinares and Navarro (2013) showed that a 'good functional layout' is one of the most important factors influencing people´s willingness to buy a property for residential purposes.

The potential of including a spatial analysis of floor plans into the environmental psychology and spatial cognition approach has been discussed by Bafna (2003) and Zimring and Dalton (2003). Studies of floor-plan preferences have revealed the key spatial properties of apartments and proved that their evaluation may vary depending on the household structure and social characteristic of respondents (Ishikawa, Nakata and Asami 2011, Gao et al. 2013). An experiment by Ischikawa, Nakata and Asami (2011) showed the existence of systematic patterns in respondents' perceptions and conceptualisations of different floor plans. The most important floor-plan attributes were identified as the 'number of bedrooms', 'the overall shape of a plan' and 'the access to bedrooms'. The floor-plan preference survey conducted by Gao et al. (2013) was based on a comparison of medium-sized apartments designed in different qualitative standards. According to the results, the attributes of 'privacy', 'south-facing', 'storage', and 'number of rooms' were recognised as critical criteria of evaluation.

Unlike both above-mentioned quantitative surveys on floor-plan preferences (Ishikawa, Nakata and Asami 2011, Gao et al. 2013) this paper uses the qualitative approach and focuses only on attributes related to the spatial arrangement of a floor plan. The subjects of analysis were different floor-plan variants designed for the same apartment. The aim of the study was to analyse whether architects and non-architects (i.e. people without architectural education or practise) evaluate the spatial arrangement of floor plans differently and what specifically are the main differences.

Data and methods

Participants

The floor-plan preference survey was conducted on two separated groups of respondents: a group of 32 first-time homebuyers with no architectural education or experience and a group of 44 practising architects recruited through the Czech Chamber of Architects' address book. Both groups were similar with regard to age and gender. The age of non-architects ranged between 23 and 45 years with a mean age of 31.8 years. The group was made up of 38% men and 62% women. The architects ranged in age from 26 to 44 years (with a mean age of 32.7

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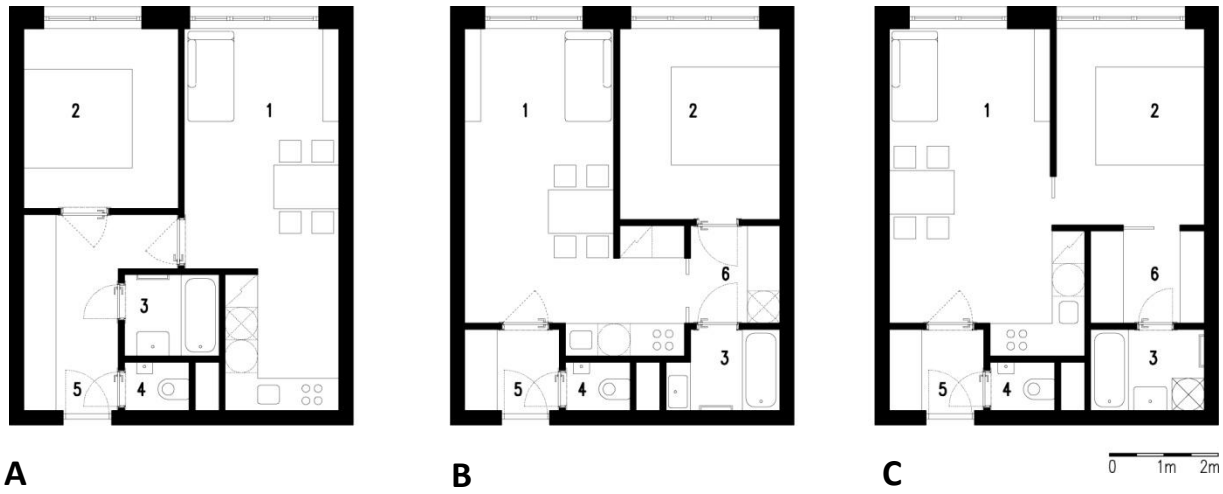
years), and the majority in this group were again women (60%). The qualitative data on floor-plan preferences were collected using interviews and an online survey. The respondents in both groups were asked to choose, in their opinion, the best floor-plan layout and clarify their choice. In addition, respondents compared the strengths and weaknesses of the different floor plan they were presented with.

Method

To analyse floor-plan preferences the *residential images method* was employed. The method was developed in the late 1970s as an alternative to purely verbal questionnaires based on the assumption that specific dwelling characteristics can be better described with the use of images instead of text (Singelemberg, Goetgeluk and Jansen 2011). The preference analysis focused only on one attribute of a dwelling – the floor plan. The floor plans selected for the study were differentiated primarily by their spatial arrangements. To reduce measurement errors, other significant floor-plan characteristics identified in similar studies (Ishikawa, Nakata and Asami 2011, Gao et al. 2013), such as the geographical orientation of the apartment, i.e. whether it faces north or south etc., the number of bedrooms, and the overall floor-plan shape, were deliberately eliminated.

Figure 1: Floor-plan variants



Source: authors.
Notes: 1 Living room with a kitchenette, 2 Bedroom, 3 Bathroom, 4 Toilet, 5 Entrance hall, 6 Utility room.

The floor plans analysed

The floor plans used in this study were an original layout of a socialist prefab apartment and two renovations of the apartment designed by contemporary architects. Prefab apartments built in the socialist period made up 48% of apartments located in multi-dwelling buildings in the Czech Republic (Czech Statistical Office 2011). The standardisation and prefabrication of socialist housing construction made it possible to produce a large number of housing units, but

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at the same time limited their variety. In the post-socialist period, many prefab apartments were privatised and were then individually renovated by homeowners.

All three floor plans analysed depict a one-bedroom apartment with the same gross floor area and furnishings (Figure 1). As Table 1 shows, the share of living and service areas is also almost identical in all three variants. The major differences between the floor plans are the type of spatial arrangements. Variant A represents the standardised layout of a socialist prefab apartment. In the socialist period both architects and users preferred what was known as a '*traditional*' layout (Musil and Polackova 1962, Musil 1985). The entrance hall in this type of layout was designed as the '*circulation backbone*' from which all the other rooms can be accessed (Batík 1983). The shape of the entrance hall and the position of the living room were strongly determined by a *prefab sanitary unit*[1] associated with a particular type of prefab structural framework. In both of the new designs, variants B and C, the prefab sanitary unit was replaced with new kitchen and bathroom designs. The living room was shifted into a central position and designed as a walk-through space. In variant B, the bedroom and the bathroom are accessible from the new utility room adjacent to the living room. The bedroom in variant C is directly connected to the living room and access to the bathroom is through the bedroom and the utility room.

Table 1: Floor area comparison

		A (1983)		B (2007)		C (2013)	
	Room	m^2	%	m^2	%	m^2	%
1	Living room with a kitchenette	18,0	45,4%	18,5	47,8%	18,2	47,0%
2	Bedroom	9,4	25,3%	10,4	26,9%	9,9	25,6%
3	Bathroom	2,7	7,0%	3,0	7,6%	3,2	8,3%
4	Toilet	1,2	3,0%	1,2	3,0%	1,2	3,0%
5	Entrance hall	7,5	19,4%	2,7	7,0%	2,7	7,0%
6	Utility room	-	-	3,0	7,8%	3,6	9,3%
	Living areas	27,4	70,7%	28,9	74,6%	28,1	72,6%
	Service areas	11,3	29,3%	9,9	25,4%	10,7	27,6%
	Total area	**38,8**		**38,8**		**38,8**	

Source: authors.

To describe the spatial differences between the three floor plan variants, *Space Syntax* methods and technics were used (Hillier Hanson 1984, Hanson 1998, Hillier 1999, Bafna 2003). The topological characteristics of the floor plans analysed were expressed by means of *justified graphs* and subsequently quantified by the *integration* values defined by Hillier and Hanson (1884). In *justified graphs*, every convex space is represented according to its relation to other spaces in the structure (Figure 2). The degree of topological centrality of the spaces is measured by values of *integration*. High *integration* values indicate that the particular space is well connected and easily accessible from all other spaces, and vice versa lower values of *integration* are assigned to more segregated spaces. As presented in Table 2, the most integrated space in the original floor plan is the inner part of the L-shape entrance hall. In the case of the new

[1] *Prefab sanitary units* were designed as a standardised bathroom, toilet, and kitchen set. Particular sets were associated with particular types of prefab structural framework and were mostly assembled off the construction site.

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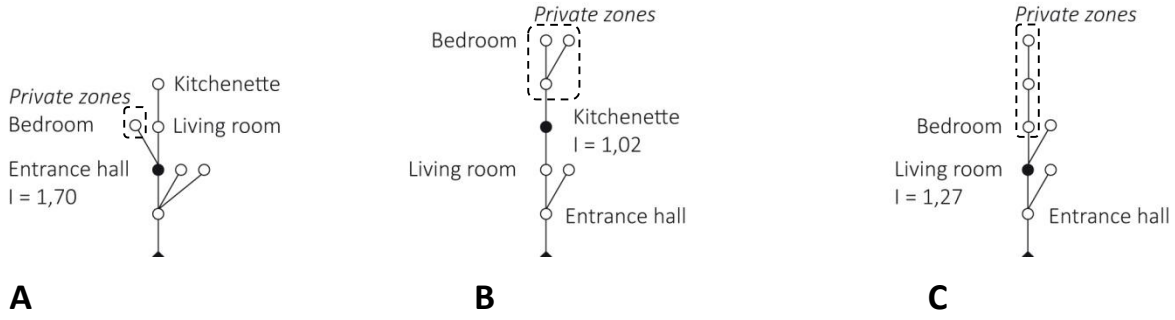
designs, variants B and C, the walk-through living areas have the highest *integration* values. Variant A has a shallow spatial structure with a dominant and highly integrated circulation space, whereas the spatial configurations of variants B and C are more hierarchised and characterised by a lower range of *integration* values.

Figure 2: Justified graphs



Source: authors.

Table 2: Integration values

		A (1983)	B (2007)	C (2013)
	Convex Space	Integration v	Integration	Integration
1a	Living room	0,85	0,85	**1,27**
1b	Kitchenette	0,46	**1,02**	0,57
2	Bedroom	0,64	0,46	1,02
3	Bathroom	0,57	0,46	0,39
4	Toilet	0,57	0,36	0,42
5a	Entrance hall - entrance	1,27	0,57	0,73
5b	Entrance hall - inner part	**1,70**	-	-
6	Utility room	-	0,85	0,64
	Mean Integration	**0,86**	**0,65**	**0,72**

Source: authors.

Results

Differences in preferences

A comparison of both groups in the study shows the preferences of architects and non-architects to be diametrically opposed. As Figure 3 shows, 64% of architects favoured variant C, while 75% of non-architects preferred variant A, preserving the original layout of the socialist prefab apartment. Variant C was the least popular option in the group of non-architects and was chosen only by 9% of the respondents who had no professional architectural education or experience. With regard to age and gender, no significant differences in floor plan preferences were observed in our sample.

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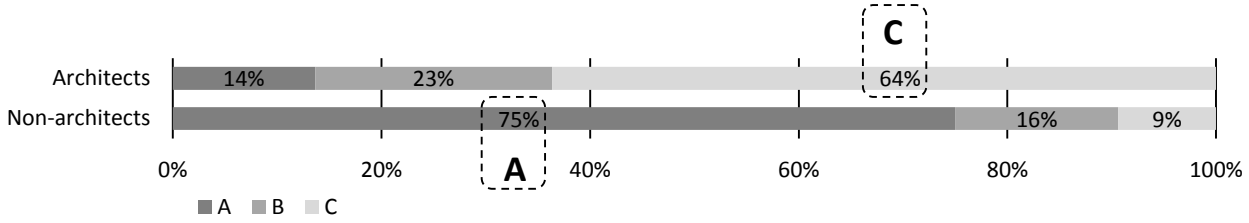
Figure 3: The best floor plan layout: a comparison of the preferences of architects and non-architects



Source: Floor Plan Preference Survey, 2012–2014: N = 76, Non-architects = 32, Architects = 44.
Q: Please select the apartment with the best floor plan layout and clarify your choice. What are the strengths and weaknesses of the floor plans presented?

Types of comments

Differences between the groups of architects and non-architects were observed not only in their preferences but also in the types of written and verbal comments they made. In accordance with Hershberger (1983) and Devlin (1990), the architects, owing to their educational background, tended to describe abstract design ideas or concepts of spatial arrangement. An example of an expert floor-plan evaluation is provided in the following statement:

> *'Despite the small size of the apartment, variant C creates the impression of having relatively the most space and at the same time the key spatial relations between the living and private areas function perfectly.'*
> (Architect 12)

On the other hand the non-architects responded in a more affective and prescriptive way. As in previous studies (Hershberger 1983, Devlin 1990), the non-architects more often used judgemental expressions of liking and disliking, as in the following non-expert evaluation:

> '*Definitely A, the living room and the kitchenette are separated from the bedroom. The bathroom is accessible to guests from the entrance hall. It is really silly to go to the bedroom and pass through the kitchen and to walk to the bathroom through the utility room, as it is in variants B and C. My guests don't have to see the content of my wardrobe.*'
> (Non-architect 03)

The range of categorisation schemes

The comparison presented in Table 3 shows that the architects used a broader range of categories to evaluate the floor plan than the non-architects did. Given their expertise, the architects were able to identify the original floor plan of a socialist prefab apartment and review

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the degree of *functional zoning.*[2] In contrast to the non-architects, the architects considered whether the particular spaces in the floor plan had been given the right size and proportions according to their functions. The expert evaluation was also more concerned with qualities of '*inner environment*' and '*furnishings*'. The non-architects paid attention almost entirely to the topological properties of apartments such as the access to the rooms or connections between them (Table 3, dashed frame). Compared to the frequent mentions of topological properties, other categories such as the *'inner environment'* or '*furnishings*' were mentioned significantly less often in the group of non-architects.

Table 3: Comparison of categories used by architects and non-architects

Categories	Architects	Non-architects
Type of Layout		
Socialist prefab apartment	●	
Spatial Topology		
Functional zoning (private-public / living-service / day-night)	●	
Access from/to	●	●
Walk-through spaces	●	●
Distances (near-distant / segregated-connected spaces)	●	●
Spatial Characteristics		
Proportions	●	
Size	●	
Inner Environment		
Natural light (dark-light spaces)	●	●
Natural ventilation	●	
Noise (noisy-quiet spaces)	●	●
Furnishings		
Kitchen arrangements (e.g. L-shape kitchen, 2 line kitchen)	●	●
Bathroom arrangements	●	
Door positions	●	
Washing machine placement	●	●
Utility room / Storage space	●	●
	15	**8**

Source: Floor Plan Preference Survey, 2012–2014: N = 76, Non-architects = 32, Architects = 44.

Topological preferences

The spatial topology of the apartments played a crucial role in the differentiation of architects and non-architects. Scheme 1 compares the main differences in the topological preferences of both groups and the influence they had on the decisions and the final choices of both groups. An important criterion for the architects was the '*effectiveness of the use of space*' which was

[2] In architectural design, the term 'functional zoning' refers to the effective grouping of spaces in the apartment layout according to their function or use.

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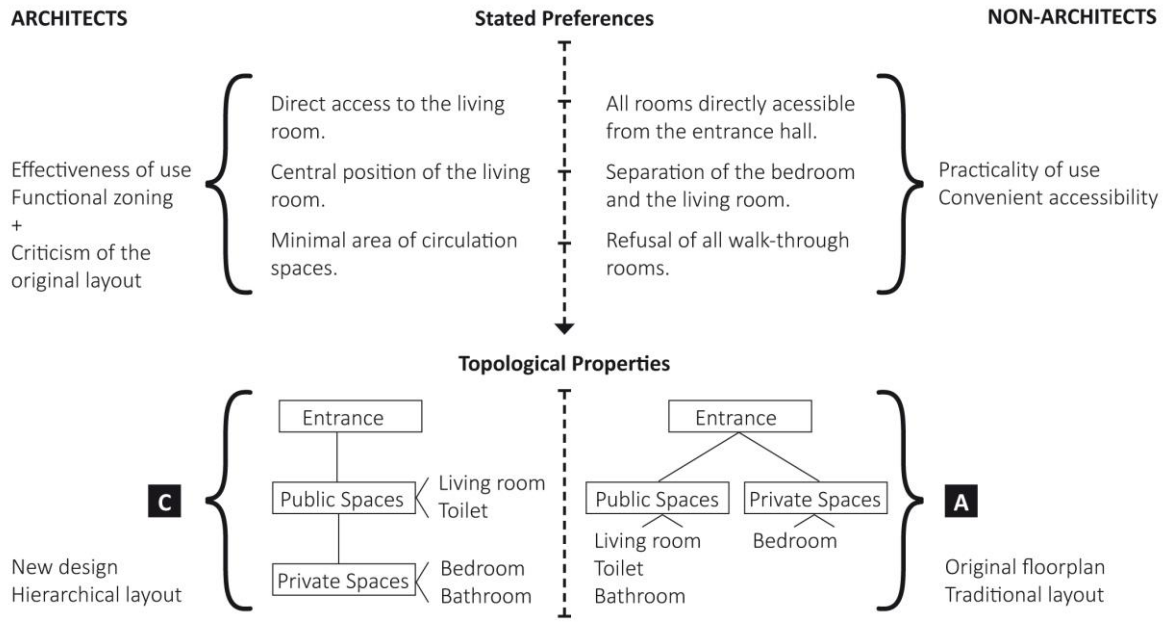
particularly associated with the reduction in the size of the circulation space and the inclusion of a direct connection between the entrance and the living room. Taking into account the apartment size category, the architects positively evaluated the *functional zoning* when living room was moved to a central position and the private zone was located far from the entrance. Most of the architects also favoured the bathroom being located in the private zone and its close connection to the bedroom and the utility room, as designed in variants B and C. The original floor plan of the socialist prefab apartment was on the other hand the subject of professional criticism and was described for instance as '*classic*', '*old school*' and '*outdated*'. The architects criticised in particular its '*disproportionally and unreasonably long L-shape*' corridor and the spatially separated living room.

Scheme 1: Topological preferences of architects and non-architects



Source: authors.

The non-architects highly appreciated especially the '*practical accessibility*' of the rooms, which was evaluated with regard to the level of privacy. From this point of view, the walk-through rooms were perceived as problematic and labelled as '*impractical*', '*unsuitable*', '*badly placed*', and '*with awkward access*'. The firm rejection of walk-through rooms significantly contributed to the strong preference for the original layout of the socialist prefab apartment. In the opinion of the non-architects, the direct access from the entrance hall to the bedroom was more convenient as it ensured a lower noise level in the bedroom. Guests and their potential use of the bathroom were the main reasons why non-architects refused both of the new redesigns. Access to the bathroom without guests having to pass through the private spaces of the bedroom or the utility room seemed to be a priority for the non-architects.

A comparison of topological preferences revealed that the architects preferred the hierarchical and more differentiated spatial structures, whereas the non-architects favoured the original layout with a shallow spatial configuration and the entrance hall in the dominant position. The topological centrality of the living areas that the architects appreciated was not commented on or positively evaluated by the non-architects. In contrast to the group of architects, the non-architects strongly criticised the newly designed variants because of the lower *integration* of

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the bathroom and its lack of connection between it and the entrance hall. Architects on the other hand appreciated the new location of the bathroom in the spatially separated private zone and its connection to the bedroom.

Conclusion and discussion

This study analysed the differences in the floor-plan preferences of architects and non-architects. The qualitative data were collected using interviews and an online survey in which the respondents were asked to choose the best floor-plan layout and clarify their choice. The floor plans used in the study included the original layout of a socialist prefab apartment and two renovations designed by contemporary architects. The layouts analysed primarily differed by their spatial arrangements. The influence of other characteristics of the floor plan including the apartment's (geographical) orientation, the number of bedrooms, and the shape of the floor plan were eliminated.

The results showed significant differences in the floor-plan preferences of architects and non-architects. Whereas the majority of architects preferred the redesigned layout, the non-architects favoured the original layout of the socialist prefab apartment. In the group of architects, the original floor plan was considered outmoded mainly owing to the form of circulation spaces. Even though the architectural and spatial qualities of socialist prefab housing were often the subject of professional criticism, our study revealed that non-architects positively evaluated the usability and practicality of the original floor-plan layout.

During the evaluation process, the non-architects paid attention almost entirely to the topological properties of the apartments such as access to the rooms or connections between them. The spatial topology of apartments played the crucial role in the differentiation of architects and non-architects. The key factor influencing the topological preferences of both groups was the required level of privacy. The conflict between the architects and the non-architects was related to the definition and arrangement of the public and private zones in the apartment layout. The architects positively evaluated putting the living room in a central position and spatially separating the private zone and giving access to it through the living areas. In contrast, the non-architects prioritised direct access to all private and public spaces from the entrance hall.

Architecture as a field and architectural discourse have been criticised for their excessive focus on design aesthetics and a lack of interest in user preferences (Hill 1998, Franklin 2001). Nevertheless we must distinguish between two aspects of architectural practice. Firstly, the design can be the outcome of close cooperation between the individual client and the architect. In such a situation the architect is well acquainted with the clients' ideas, requirements and suggestions and the resulting design is based on them. This was also the case of both of the new floor-plan variants used in our experiment.

The second aspect of architectural practice consists in the design for an unknown end-user typically in mass housing construction. Here, understanding the preferences of non-architects and more specific insight into laypersons' perceptions of spatial properties may make up for the absence of direct dialogue between an architect and an end user. A detailed knowledge of

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laypersons' preferred spatial configurations of apartments can decrease the developers' level of uncertainty in new product development and increase residential satisfaction.

Acknowledgements

This work was supported by the Czech Science Foundation [grant number 16-06335S].

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References

Bafna, S. 2003. Space Syntax: A Brief Introduction to Its Logic and Analytical Techniques. *Environment and Behavior* 35 (1): 17–29. DOI: 10.1177/0013916502238863

Batík, S. 1983. *Typologie obytných budov*. Brno: Vysoké učení technické Brno.

Czech Statistical Office *2011. Population and Housing Census 2011*. Český statistický úřad.

Dekker, K., R. Van Kempen 2009. 'Resident Satisfaction in Post-WWII Housing Estates'. Pp. 53-76 in R. Rowlands, S. Musterd, R. Van Kempen (eds). *Mass Housing in Europe: Multiple Faces of Development, Change and Response*. Palgrave Macmillan.

Devlin, K. 1990. An Examination of Architectural Interpretation: Architects versus Non-architects. *Journal of Architectural and Planning Research 7* (3)*:* 235–244.

Franklin, B. J. 2001. Discourses of Design: Perspectives on the Meaning of Housing Quality and 'Good' Housing Design. *Housing, Theory and Society* 18 (1-2): 79–92. DOI: 10.1080/140360901750424789.

Gao, X., Y. Asami, Y. Zhou, T. Ishikawa 2013. Preferences for Floor Plans of Medium-sized Apartments: A Survey Analysis in Beijing, China. *Housing Studies* 28 (3): 429–452. DOI: 10.1080/02673037.2013.759542.

Gifford, R., D. W. Hine, W. Muller-Clemm, K. T. Shaw 2002. Why Architects and Laypersons Judge Buildings Differently: Cognitive Properties and Physical Bases. *Journal of Architectural and Planning Research* 19 (2): 131–148.

Gifford, R., D. W. Hine, W. Muller-Clemm, D. Reynolds, K. Shaw 2000. Decoding Modern Architecture: a Lens Model Approach for Understanding the Aesthetic Differences of Architects and Laypersons. *Environment and Behavior* 32 (2): 163–187. DOI: 10.1177/00139160021972487.

Hanson, J. 1998. *Decoding Homes and Houses*. Cambridge: Cambridge University Press.

Hersberger, G. R. 1988. 'A Study of Meaning and Architecture' Pp. 175–194 in J. L. Nasar (ed) *Environmental Aesthetics Theory Research and Applications*. Cambridge: Cambridge University Press

Hill, J. 1998. *Occupying Architecture: Between the Architect and the User*. New York: Routledge.

Hillier, B., J. Hanson 1988. *The Social Logic of Space*. Cambridge: Cambridge University Press.

Hillier, B. 1999. *Space Is the Machine: A Configurational Theory of Architecture*. Cambridge: Cambridge University Press.

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Available online at www.housing-critical.com
http://dx.doi.org/10.13060/10.13060/23362839.2016.3.1.264

Ishikawa T., S. Nakata, Y. Asami 2011. Perception and Conceptualization of House Floor Plans: An Experimental Analysis. *Environment and Behavior* 43 (2): 233–251. DOI 10.1177/0013916509356874.

Llinares, C., A. Montañana, E. Navarro 2011. Differences in Architects and Nonarchitects' Perception of Urban Design: An Application of Kansei Engineering Techniques. *Urban Studies Research*. DOI:10.1155/2011/736307.

Montañana A., C. Llinares, E. Navarro 2013. Architects and Non-architects: Differences in Perception of Property Design. *Journal of Housing and the Built Environment* 28 (2): 273–291. DOI: 10.1007/s10901-012-9312-7.

Musil, J., H. Poláčková 1962. *První celostátní diskuse o bydlení*. Praha: Výzkumný ústav výstavby a architektury.

Musil J., L. Kotačka, I. Lérová, E. Librová, L. Macková, V. Procházka, Z. Ryšavý 1985. *Lidé a sídliště*. Praha: Svoboda.

Permentier, M., G. Bolt, M. Van Ham 2011. Determinants of Neighbourhood Satisfaction and Perception of Neighbourhood Reputation. *Urban Studies* 48 (5): 977–996. DOI: 10.1177/0042098010367860.

Singelemberg, J. P. J., R. W. Goetgeluk, S. J. T. Jansen 2011. 'The Residential Images Method'. Pp. 157 in S. J. T. Jansen, H. C.C.H. Coolen, R. W. Goetgeluk (eds). *The Measurement and Analysis of Housing Preference and Choice*. Dordrecht Heidelberg London New York: Springer.

Zimring, C., R. C. Dalton 2003. Linking Objective Measures of Space to Cognition and Action. *Environment and Behavior* 35 (1): 3–16. DOI: 10.1177/0013916502238862.