



Development of an Effective Indicators Model on the Genius loci by House Sorting in Pahlavi period

Farzaneh Bimakr¹, Reza Mirzaei^{2*}, Seyed Mehdi Madahi^{3*}, Ahmad Heidari²

1. PhD student, Department of Art and Architecture, Birjand Branch, Islamic Azad University, Birjand, Iran.
2. Assistant Professor, Department of Art and Architecture, Birjand Branch, Islamic Azad University, Birjand, Iran.
3. Assistant Professor, Faculty of Architecture, Khavaran Institute of Higher Education, Mashhad, Iran.

Submit Date: 16 June 2022, Accepted Date: 05 September 2022

ABSTRACT

Genius loci is a lost concept in the spatial quality of today's homes. The starting point of this transformation is the Pahlavi historical period with new developments in Iranian architecture when by imitating Western architecture, it led to the creation of a mask alien to Iranian culture on the spirit of home and city architecture. In order to solve this problem, identifying the types of houses in the Pahlavi period with the help of identifying their architectural context can be effective in developing indicators that improve the Genius loci in today's homes. In this article, which is part of a research by examining the species of Pahlavi house in Mashhad; the refinement of these indicators and the compilation of a model of them with the help of Delphi method and Shannon technique are considered. The main 2 question of this stage of the research is, firstly, how the interaction between typology and architectural developments can help improve the Genius loci today, and secondly, what are the effective indicators on improving the Genius loci in the field of contemporary housing and how can achieve them? In order to answer the questions, in the first stage of the research, based on the fundamental theory method, the proposed initial model was developed based on a review of sources and residents' opinions. Then, by collecting the theories of a circle of 12 experts from the field of housing during four stages of interviews and questionnaires, the validity of the model was performed and the data obtained from their agreement were collected and analyzed using the Shannon technique. Finally, the final model of the research was developed based on 12 main indicators and 45 sub-indices in 4 effective categories. The most effective indicators on sensory perception are in the perceptual-cognitive category with an impact weight of (0.0537). The most important influential dimension is the cognitive category, which has the greatest impact on improving the sense of place through the indicators of bodily perception, sense of belonging and emotional attachment.

Keywords: *Genius loci, types of houses, Mashhad, Delphi method, Pahlavi period.*

1. Introduction

Today, the vulnerability of many environmental and social systems to the stimuli of change in modernity has been the subject of considerable attention. Unfortunately, many cities and places today suffer from a typological crisis and loss of "Genius loci" [24]. This sense that is formed following human interaction with place; It transforms a space into a place with special sensory and behavioral characteristics for specific people [30]. According to Cross, objective and subjective factors arising from the environment can create a sense of different places [17]. This means that people can experience experiences beyond the physical characteristics of

place through other activity, perceptual and social characteristics through the five human senses and find a sense of belonging to the spirit of the place [28]. Around the concept of modern Iranian house, the need to increase the sense of attachment to the location has become more important [6] because this sense is an important category in improving the daily needs of human beings that must be answered in the context of life [7], but unfortunately, economic globalization, product standardization, and integration concepts in urban space planning have led to a weakening of the Genius loci and local identity [48]. In Iran, with the beginning of the

*Corresponding author: mirzaeireza@iaubir.ac.ir

Pahlavi regime, the entry of modernity in the field of architecture and urban planning penetrated more than before, the most important consequence of which was the transformation of house construction patterns and the emergence of new types of houses and led to a change in residents' Genius loci [3]. Since the concepts of typology and spatial evolution are two interrelated issues, the relationship between them is both objectively and subjectively debatable [23,22,50,42]. Through a comparative study between them and the concept of Genius loci, it is possible to explain the characteristics of form, time and scale [23] that help to improve the Genius loci in today's architecture [18].

This article seeks to re-read the components affecting the narration of the Genius loci in different types of housing in the Pahlavi period, so that through rereading the factors and refining the points in the effective scale of building houses, a conceptual framework can be achieved and the most important concern of urban planners and designers in creating the house responded with a positive sense of place. Now, in the present article, with the help of "Delphi technique" and "Shannon entropy", It should be noted that the obtained quality indicators, firstly, refer to the conceptual area of the place with human values in architecture and secondly, are effective in improving the quality of the desirability of the place in the residential area. In the following, the research background is introduced first. Then the concept of Genius loci and its relationship with the typology of housing in the Pahlavi period of Mashhad is mentioned and by examining the research method, how to use the Delphi technique in collecting the required data and how to use the Shannon technique in data analysis will be explained. Finally, the findings of the analysis of the priorities and weight of each of the indicators and the final model of the research are explained.

2. Research background

Discussion of the relationship between house typology and Genius loci due to the problem of reducing attachment to place is a topic that is less addressed in Iran and has been studied mainly as separate topics. In major recent research to investigate the impact of lifestyle change in the architecture of contemporary houses [1], understanding the relationship between man and home through lifestyle and its body [8], the impact Modernism on the architecture of apartment houses [2], the impact of semi-open outdoor spaces on the quality of residential environment and the sense of attachment to the place [10] and the impact of environmental-physical factors such as yard and

Green space has been analyzed on increasing the sense of belonging in several studies [5,4]. In a recent study, Mousavi (2021) compared the modern residential architecture of Turkey and Iran and believes that the architects of the Pahlavi period converted new (foreign) concepts into traditional (local) concepts or, conversely, traditional concepts into new concepts. They showed; in such a way that they changed or renewed these concepts and had a great impact on the residents' sense of desirability. Always trying to explore the architectural solutions of the past can be a window to help us understand the strengths and weaknesses of modern house architecture. As shown in Table 1, the findings of researchers from other countries show that the Genius loci is strongly influenced by changes in modernity in the historical context of neighborhoods, streets and buildings, and indicators affecting the environmental, functional and perceptual dimensions of residents increase the sense of spatial belonging. They return. Also, most studies have recommended effective strategies to improve social and perceptual relationships [67] that can have a positive effect on today's homes.

In this research, with the help of typology, the constructed environment is interpreted in relation to location (Mashhad city), time (Pahlavi period) and urban scale (building) in order to understand the relationship between Genius loci and species evolution.

3. Research Theoretical Framework

In the Genius loci sense, the term "sense" refers to a person's emotional understanding of the environment, and the term "place" combines the physical environment and human attitudes toward it [59]. It includes both mental and objective aspects and is closely related to the satisfaction of individuals according to the ability of space to meet human needs [3].

In some studies, the Genius loci between different geographical locations, nationalities, socio-economic and cultural backgrounds of people has been studied [26,27,35] whose main purpose is to identify effective factors. It is based on a Genius loci such as common race and ethnicity, age, gender, length of stays, etc. [12,37] and in some other studies show that not only the cultural, social and economic context affects the Genius loci [34,35] but also depends on the physical characteristics of the environment [59,62,66].

Accordingly, predictors affecting the Genius loci include social, human, physical, cultural, functional and climatic factors [21,61,65]. In major research, the Genius loci is recognized as a category that is affected by four dimensions of physical-physical,

individual-social, functional-activity and perceptual-cognitive as objective and subjective components [28]. On the other hand, typological discussion also studies the evolution of the built environment [15]. In architecture, the discussion of the concept of species is related to the classification of places, which in addition to function, also refers to the form and style of construction [40] Rapaport (1969a) claims that different types of buildings are created from different cultures, lifestyles, climates, materials and technologies in different places, and considers the physical form to be the product of socio-cultural factors. Kropf studies typology based on five different aspects of form, time (history), scale, culture, and nature [31]; In the meantime, the factor considers form and culture important. Species is the main idea that forms [58,43,16] and is subconsciously produced as

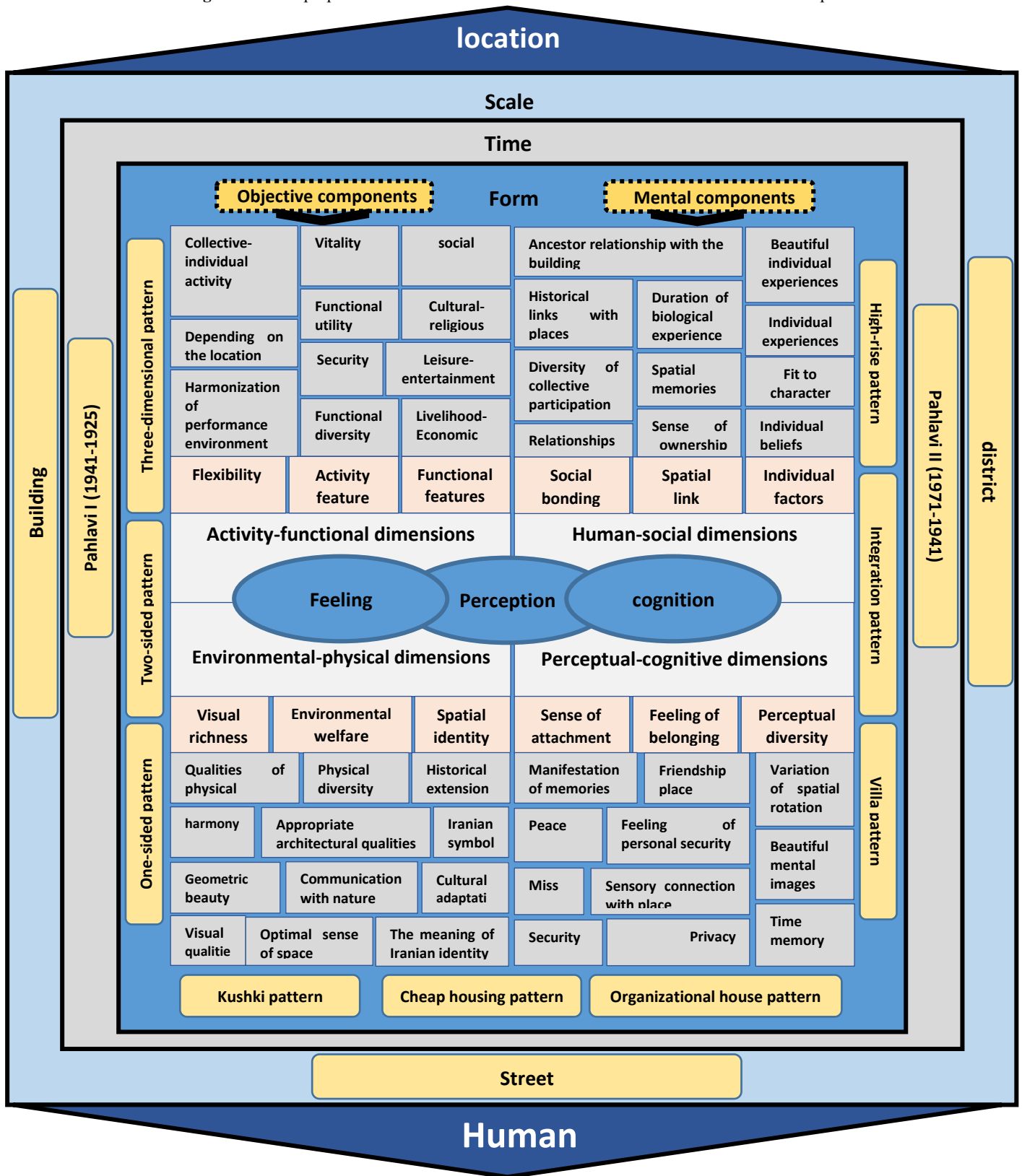
a result of cultural experience [14]. In fact, spatial species are cultural products that have historical roots in cultural development [32].

By observing historical forms, typology provides a framework for providing a better quality of life in accordance with tradition for future generations and is used as a useful design tool to produce form [64]. Meanwhile, some researchers believe that the relationship between typology and environmental developments can be generalized through form, time and scale [25,39] and thus can overlap with the concept of Genius loci. Although examples of successful historic homes to improve understanding of the Genius loci still exist, a significant number of newer species are now significant number of newer species are now built, severely lacking a Genius loci [38].

Table 1. Results of foreign research according to the concept of Genius loci and typology of the house

Examined indicators	Conclusions	researcher
Sense of belonging, privacy, connection with nature, beauty, spatial identity, social connection, intimacy, spatial dependence, social connection	<ul style="list-style-type: none"> • A study of seven types of traditional houses in the late nineteenth century in Turkey (Ankara) according to the different spatial sense of the inhabitants • Negative association between Genius loci with typomorphological changes over time • The great impact of physical changes on the street and neighborhood on the Genius loci of residents over time 	Gokce (2017)
Social ties, cultural identity, sense of belonging, privacy and concepts of privacy, spatial dependence	<ul style="list-style-type: none"> • A study of 6 types of traditional houses in three regions of China in comparison of individual behaviors • The effect of different spatial structure of houses on the behavior of residents according to culture and society • Attenuation the impact of spatial and collective relationships on more modern species compared to traditional species (reduced interest in space) 	Ding & Ma (2019)
Social participation, environmental qualities, attractive public realm, social and cultural ties	<ul style="list-style-type: none"> • Analysis of the spatial system of traditional Ahmadabad houses according to social reflection • The success of traditional homes in improving public relations over modern homes • The great influence of social factors in improving the sense of interest in place 	Lambe & Dongre (2016)
The importance of privacy, privacy, belonging, Nature Friendship	<ul style="list-style-type: none"> • Comparison of residents' behavioral patterns in the spatial configuration of modern and traditional houses in Hamadan • Increasing the positive feeling of the inhabitants in the social-physical system of the older species compared to the newer species of the house 	Alitajer & Molavi Nojoumi (2016)

Figure 1. Initial proposed research framework based on theoretical sources and residents' opinions



Lynch (1960: 119) shows that there is always a need for a "well-organized", "poetic" and "symbolic" environment, much of which helps to improve the

Genius loci through the physical environment. Moreover, as Montgomery (1998: 94) shows, Genius loci must be sustained in contemporary


environments that define quality of life only as luxury.









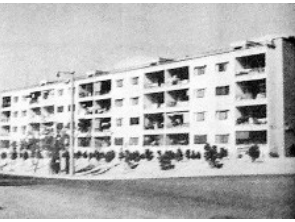

Accordingly, there is a need to study the effect of effective components on the Genius loci in the historical species of houses of the Pahlavi period through experimental research by combining qualitative and quantitative research methods. Table 2 shows nine types of housing of the Pahlavi period during documentary, library and field studies in Mashhad. Based on the data obtained from interviews with residents [3], using non-parametric tests "Chi-square" and "Kruskal-Wallis" it is shown that the three urban scales of the neighborhood, street and building in dimensions The above are effective on the Genius loci of the inhabitants and the changes in the form of buildings over time during the modernization of the Pahlavi period have a negative relationship with the Genius loci. Based on the results obtained from the first phase of the

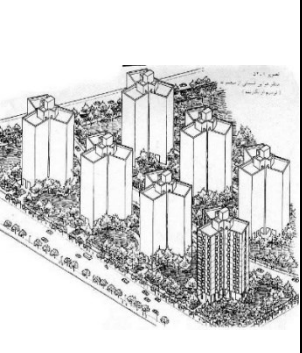

first author's doctoral research, which is shown in the article "Evaluation of indicators affecting the Genius loci in Pahlavi period housing species in Mashhad", the overlap of these two concepts can be examined according to Figure 1.

In fact, physical form (environment) and human behavior are always interdependent and the relationship between them is debatable objectively and mentally. The objective layers of any space, after passing through the filter of personal perception and motivation of meaning, are connected with the mental layers of the individual. In this article, using the results obtained from the opinions of residents, we will focus specifically on the construction scale of Mashhad houses using Delphi technique and Shannon entropy method in order to achieve the most effective indicators in improving the sense of location of today's houses.

Table 2. Introduction of Pahlavi house species in Mashhad

Type	building image	Type of spatial organization	Features of the building
Species 1 (3-way pattern)		<ul style="list-style-type: none"> Organizing element: middle yard 	Combining western and Persian decorations, opening the facade of the building facing the streets, brick and tile decorations, variety of activities, separation of winter and summer living spaces on both sides of the yard, separation of activities in the private and public sectors, yard, element of the house, The language of interior architecture corresponds to the Iranian identity
Species 2 (2-way pattern)		<ul style="list-style-type: none"> Organizing element: middle yard 	Reduction of interior and exterior decorations of the building compared to the past, historical display of western decorations on the facade by combining Iranian decorations, maintaining the yard in connection with nature and house arrangement, flexibility of spaces, reducing the variety of activities, using the yard for different activities, architectural language Interior spaces in accordance with Iranian identity
Species 3 (1-way pattern)		<ul style="list-style-type: none"> Organizing element: side yard 	Reducing the dimensions of the building compared to before, the physical design of the building in the facade of traditional and western composition, architectural language of the plan in accordance with the principles of Iranian architecture, connection with the courtyard environment, separation of winter and summer spaces in floors, separation of private and public In the classes, the diversity of building activities decreased compared to before

<p>Species 4 (Pavilion pattern)</p>		<ul style="list-style-type: none"> Organizing element: independent yard 	<p>Western decorations more than before, plywood inlaid, gabled roof, special visual richness, high connection with nature, differentiation of physical design, variety of home activities, use of yard for different activities, environmental utility, vitality, activity permeability</p>
<p>Species 5 (Cheap housing)</p>		<ul style="list-style-type: none"> Organizing element: one-way yard 	<p>Reducing the role and importance of the yard, the organizing element: communication spaces such as corridors, halls or private open space, simplicity and smaller building, turning the yard into a private open space, reducing decorations, mismatch between the building and Iranian culture, reducing social activities among women Neighborhood and use of alley spaces and public buildings for participation, high flexibility in the activity of small rooms, inadequate spatial circulation</p>
<p>Species 6 (Organizational model)</p>		<ul style="list-style-type: none"> Organizing element: hebronistic or common yard 	<p>Changing spatial relations compared to traditional houses, reducing the number of interior spaces, turning the private yard into a semi-private open space, using new decorations and materials of cement, glass and brick in the facade, reducing the variety of functional activities compared to other traditional types, creating New service spaces inside the house such as kitchen and bathroom, use of common public spaces outside the house</p>
<p>Species 7 (Villa model)</p>		<ul style="list-style-type: none"> Organizing element: one-way yard 	<p>Diversification of functional activities compared to traditional species due to the change of large household to nuclear, privacy by creating new spaces, reducing the importance of the role of the yard to communication and parking space, using the yard for some recreational and ritual functions, separation of activities Private and public in the interior due to the multiplicity of interiors, sensory richness with the help of the yard and vegetation, sense of environmental vitality, lack of security due to the location of the building</p>
<p>Species 8 (Integration pattern)</p>		<p>Organizing element: common green space</p> 	<p>Extensive change of spatial relations of the house, moving towards modern patterns, disappearance of Iranian conceptual elements, separation from history, changing the quality of materials and construction, turning the yard into a terrace or public green spaces, reducing the variety of functional activities according to the dimensions of the house, composition Kitchen and bathroom service spaces inside the building, holding some collective activities in a more limited way than before, performing social activities in the yard</p>

<p>Species 9 (High ranking pattern)</p>		<ul style="list-style-type: none"> Organizing element: common outdoor and public space 	<p>Composition of multi-apartment buildings on each floor, extensive change of spatial relations of the house, move towards modern patterns, separation from history, change of material quality, beautiful view from house to outside, display of new technology and spatial proportions, major combination of commercial and recreational activities, Social and cultural with the yard, removing the yard privately for each house, doing collective activities in the yard, a sense of vitality through the visual charm of the landscape</p>
--	---	---	---

4. Methodology

Delphi technique is one of the most widely used methods of qualitative research; It is a method used to gather opinions on specific issues and find collective agreement on disputed issues [56]. The Delphi method is used when it is necessary for a group of experts to discuss the consensus on a particular issue but it is not possible to bring them together in one [63,36]. This technique is suitable as a method for consensus building with the help of questionnaires and their multiple repetitions to collect data from a panel of experts (usually between 10 and 15 people) [19]. This method is done in three or four steps according to Figure 2 to form a consensus among group members (70 to 80% of the participating team) or a score of 4 or higher for answers based on a five-factor Likert scale [29]. This article is the result of the third stage of a research in the form of a doctoral dissertation that seeks to re-read the components affecting the narration of the Genius loci in different types of housing in the Pahlavi period. In the first stage of this research, after reviewing the relevant sources and during several interviews, the components affecting the Genius loci were extracted using the method of fundamental theory. Then, in the second

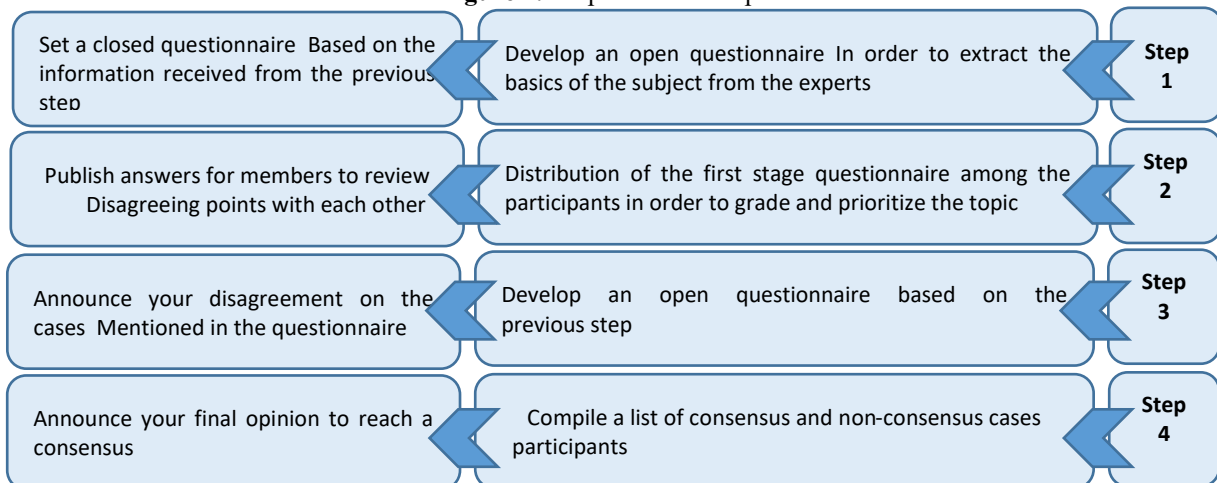
stage, with the help of decoding of lasting conceptual patterns from the Pahlavi period, these components were verified in Mashhad using the method of "qualitative content analysis" during interviews with residents and the proposed initial model was developed.

In this research, Shannon entropy technique is used to analyze the data obtained from the Delphi method, which is widely used in content analysis, and the development of a mathematical formula for use in data analysis is used. The entropy techniques have more validity and strength for analyzing and prioritizing indicators than the traditional method of frequency and mean [13].

5. Findings

The selection of a circle of experts is a very important part of the Delphi method which is done by the researcher based on their expertise and knowledge of the [36]. In this study, there are 12 members of the Delphi working group, of which the first 6 were selected from experts in the field of historical heritage of the cultural heritage and the Housing Foundation as non-probabilistic sampling and a combination of purposeful or judgmental methods; Then 6 other people were introduced and

Figure 2. Delphi method steps



selected by them in the form of snowballs. In the first stage of the Delphi method, first interviews and qualitative questionnaires were used. In this way, the findings of previous sources and research were shared with experts and they were asked to personally create a brainstorm and to freely express their strategies and opinions... Also identify and express the most important factors affecting the Genius loci from the perspective of themselves and

other experts. In these conversations, the degree of agreement of experts with the indigenous and historical view of the Genius loci of the house and its difference with the modern approach was considered by the researcher. At this stage, about 400 minutes of conversation were conducted with a 12-member circle, and a list of 20 measures affecting the Genius loci was extracted according to Table 3.

Table 3. Tips obtained from the first step of Delphi technique

Row	Description of the obligation	Number of Responses	Responses Mean value	Standard deviation of responses	Order of importance
1	Being nostalgic and reminiscent of historical memories	12	4.91	0.45	1
2	Perception of the subconscious environment through historical elements and signs	12	4.27	1.12	9
3	Proportional connection of the building with its neighborhood and texture	12	3.41	1.05	17
4	Originality of Iranian architecture according to the details and building materials	12	4.81	0.89	3
5	Communication tailored to your surroundings and nature	12	4.02	1.12	12
6	A good sense of humor in relation to the building and the qualities of different constructions	12	4.46	0.92	7
7	Spatial proportions, proportions and geometry in the body and decorations	12	3.96	1.15	13
8	Variety of activities and functional proportions in the building	12	3.75	0.99	15
9	Functional resolution in different spaces of the building	12	3.06	1.16	19
10	Suit the space for collective and private activities	12	3.88	1.11	14
11	Appropriate motor hierarchy with respect to activity permeability	12	2.97	1.51	20
12	Dependence on location in performing various activities	12	3.22	1.42	18
13	Meet the needs of the audience regardless of environmental constraints	12	4.08	0.68	11
14	Adapting individual needs and characteristics in relation to location	12	4.33	0.99	8
15	Orientation of human behavior based on physical concepts	12	3.51	1.29	16
16	Formation of various collective activities	12	4.61	0.95	5
17	Link to place according to duration of biological experience	12	4.16	0.78	10
18	Unconscious conflict of human senses with movement in space	12	4.55	0.91	6
19	A sense of intimacy and love for the building	12	4.76	0.68	4
20	Manifestation of memories and deep attachment to the place	12	4.85	0.55	2

Then, based on compliance with the criteria proposed by the residents, the circle of experts was again asked to provide their proposed components with a brief explanation that also includes the

criteria proposed by the former residents. Respondents introduced a total of 16 indicators, which by combining some indicators with each

other due to the similarity of meaning remained 14 indicators (Figure 3).

In the second stage questionnaire, a list of factors was presented that the participants in the first round had presented as a subset of factors affecting the Genius loci. In this section, the respondent had to rate his opinion based on the Likert scale about the impact of each of these factors on the Genius loci so that for each item, the average of their answers, their standard deviation, the order of importance of each factor and the average of members' responses Calculated the working group. The third stage questionnaire also consisted of two parts. In the first part of the questionnaire, a set of factors was presented that the participants in both the first and second rounds considered to be effective on the Genius loci and the average effect of these factors was high and very high (items with a weight of 3 and above). For each factor, the average responses of the working group members were entered

separately. In this section, the questionnaire with five-point answers of the Likert spectrum were again examined by a 12-member circle of experts to express their opinion on these issues again.

In the second part, they were asked to divide the measures into 4 dimensions affecting the Genius loci and to comment on the order of importance of each indicator by assigning the number 1 as the most important to the number 14 as the least important. Table 4 shows the final results. By referring to this table, we can end the repetition of rounds because the average opinion of the members of the working group is 4 and above, which indicates a lot of agreement between them, and because Kendall coordination coefficient for the answers of the fourth round is 0.851, Shows that between two consecutive rounds, there has been no significant growth and consensus has been reached among the members of the working group.

Figure 3. Refining and extracting the final codes of the experts in the first stage of Delphi

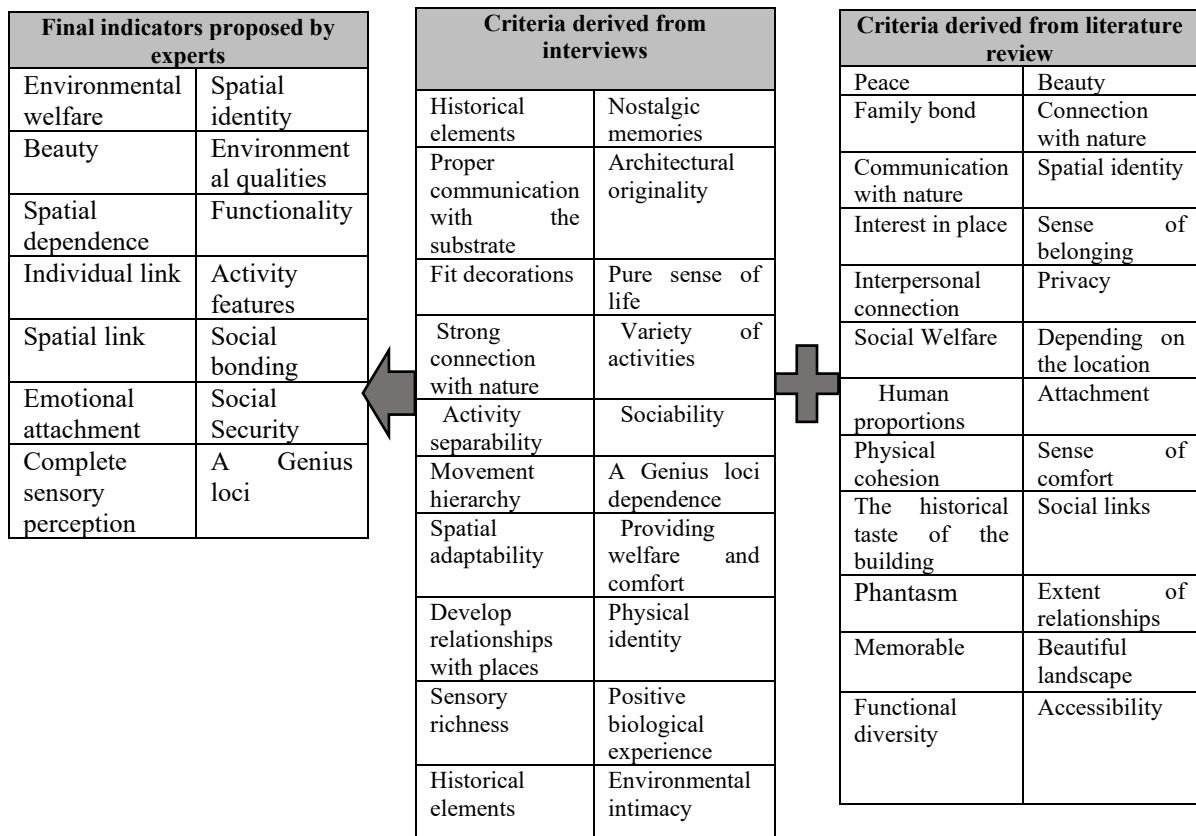


Table 4. Final findings of the Delphi technique

Thematic categorization in the influential dimension	Order of importance	Standard deviation of responses	Responses Mean value	Number of replies	Proposed main components by working group members	No.
Peripheral-physical	3	0.42	4.81	12	Spatial identity	1
Peripheral-physical	13	0.88	4.11	12	Environmental well-being	2
Peripheral-physical	7	0.65	4.44	12	Environmental qualities	3
Peripheral-physical	5	0.55	4.75	12	Beauty	4
Activity-functional	9	0.75	4.25	12	Functionality	5
Activity-functional	12	0.85	4.03	12	Spatial dependence	6
Activity-functional	10	0.77	4.20	12	Functional features	7
Human-social	11	0.8	4.14	12	Individual link	8
Human-social	4	0.49	4.77	12	Social bonding	9
Human-social	8	0.71	4.28	12	Spatial link	10
Human-social	14	0.88	4.15	12	Social Security	11
Perceptual-cognitive	1	0.22	4.94	12	Emotional attachment	12
Perceptual-cognitive	2	0.31	4.88	12	Genius loci	13
Perceptual-cognitive	6	0.6	4.69	12	Complete sensory perception	14

6. Discussion

After collecting data in the Delphi method, in order to find the degree of agreement of experts with each index, first the method of adding scores and their averages was used. After that, the data were analyzed again by Shannon entropy method, which is one of the most famous methods for calculating the weights of indices [45], which has a higher accuracy than the frequency of data [13]. In this method, the decision matrix is formed first. To form this matrix (Equation 1), it is enough to put a quantitative number of criteria in the following equation (columns are criteria and rows are options).

$$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & & \vdots \\ x_{m1} & x_{m2} & & x_{mn} \end{bmatrix} \quad \text{Equation 1: Decision matrix}$$

The data must then be normalized through Equation 2. In this formula, the P_{ij} score is the norm and the F_{ij} score is each respondent to the desired category. Then, the entropy of each index (E_j) is calculated based on Equation 3. In this equation, m is the number of respondents and n is the number of categories. K also holds the value of E_j between 0 and 1 as a constant value. Finally, the weight of each category or index W_j is obtained through Equation 4. As expected, the findings of Shannon's algorithm show a different ranking than the findings of frequency, which in this study is based on the

weight of variables based on Shannon's algorithm due to its greater accuracy (Table 5).

$$P_{ij} = \frac{F_{ij}}{\sum_{i=1}^m F_{ij}} \quad (i = 1,2, \dots, m; j = 1,2 \dots n) \quad \text{Equation 2}$$

$$E_j = -k \sum_{i=1}^m [P_{ij} \ln(P_{ij})] \quad j \in \dots, n \quad k = \frac{1}{\ln(m)} \quad \text{Equation 3}$$

$$W_{ij} = \frac{E_j}{\sum_{j=1}^n E_j} \quad \text{Equation 4}$$

Accordingly, the perceptual-cognitive category was recognized as very effective and the activity-functional category was the least effective in that period due to almost identical lifestyle conditions. The most effective indicator on the Genius loci is "total sensory perception" with a weight of 0.05419 and then the three indicators "emotional attachment", "sense of belonging" and "spatial identity" have the greatest impact on promoting a Genius loci. The "spatial dependence" index also has the least impact. In this section, according to the members of the working group and according to the rules governing the Delphi method, the two indicators of "environmental welfare and comfort" and "social security" were combined due to semantic similarity with the indicators of "environmental quality" and "social bond", respectively. Finally, as shown in Figure 4; Indices affecting the Genius loci are explained by 12 main indicators and 45 sub-indicators in four thematic categories. The weight of each group is determined by the members of the working group in terms of its impact on the Genius loci.

Table 5. Weight of final indices using Shannon entropy technique

Mean of category weight	Index weight (Shannon technique)	Indicator information load	Mean of category weight	Mean of category	Indicators	Category
0.04758	0.04839	1.471	4.28	4.51	Spatial identity	Peripheral-physical
	0.04509	1.447		4.11	Environmental well-being	
	0.04729	1.468		4.24	Environmental qualities	
	0.04795	1.471		4.25	Beauty	
0.04282	0.04597	1.451	4.16	4.25	Functionality	Activity-functional
	0.04194	1.401		4.03	Spatial dependence	
	0.04355	1.424		4.20	Functional features	
0.04561	0.04627	1.453	4.46	4.34	Individual link	Human-social
	0.04701	1.469		4.77	Social bonding	
	0.04621	1.458		4.48	Spatial link	
	0.04297	1.423		4.25	Social Security	
0.0537	0.05348	1.528	4.83	4.94	Emotional attachment	Perceptual-cognitive
	0.05339	1.521		4.88	Genius loci	
	0.05419	1.531		4.69	Complete sensory perception	

7. conclusion

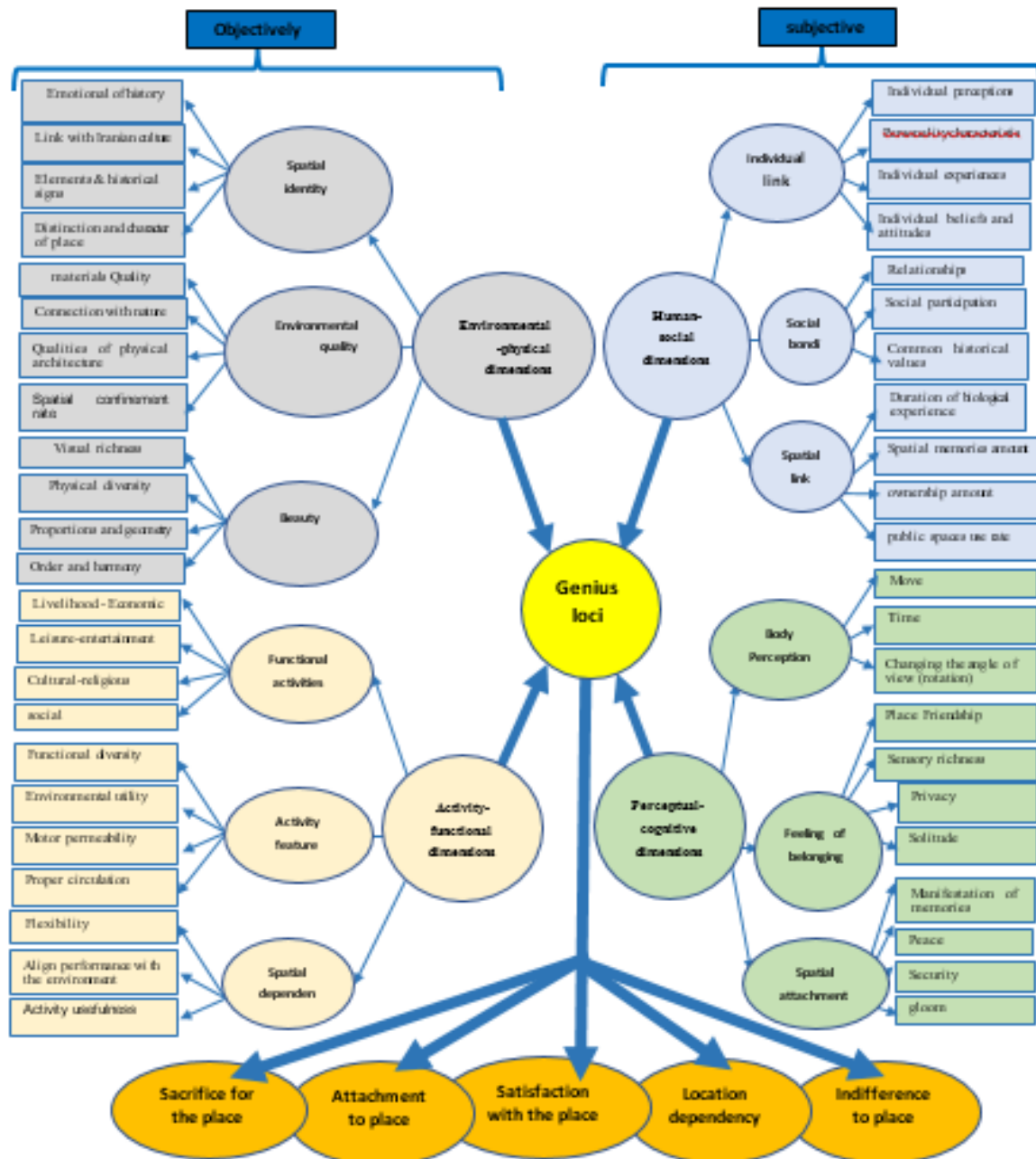
This article seeks to use the indicators affecting the promotion of the Genius loci in contemporary houses with the help of the typology of houses of the Pahlavi period. For this purpose, it is first necessary to understand the relationship between the Genius loci and the types of house. Since the fundamental changes in the architectural form of the house began during this period; the course of developments of 9 types of housing in Mashhad is introduced as a case study and based on the opinions of researchers, three factors of form, time and scale are criticized in them, which also overlap with the concept of Genius loci.

The evaluation of the sense of place of the old residents in these 9 patterns according to the morphological changes shows that the sense of place is affected by the range of simultaneous changes in the spatial structure of the street and the neighborhood in addition to the building. As in Gokce and Chen's research [24]; Also, urban transformations at the scale of the street and neighborhood strongly affect the sense of place of the residents of traditional houses in Turkey, and the main reason for this is the change of the urban fabric from traditional to modern. And as some researchers

such as Twedt & Rainey & Proffitt have proven in their research that the environment as an emotional phenomenon in human and cultural geography carries common feelings for its residents and can reflect It is the cultural and social concepts that the criterion of social interaction in connection with nature is highly effective on the satisfaction and sense of spatial desirability.

Preliminary results of this relationship are divided into four categories based on the review of resources and residents' opinions using the basic theory method from the perspective of residents and citizens, which are environmental-physical, activity-functional, perceptual-cognitive, human-social. It is shown that environmental-physical indices are very effective due to Fermi changes. But this research seeks to explain valid indicators from the point of view of experts using the Delphi method that can be extended to contemporary house patterns. For this purpose, a circle of 12 experts was selected and in four stages, interviews and questionnaires were conducted based on the opinions of residents.

The first stage of Delphi was conducted in the form of interviews with them; Then, from the text of the interviews, using the content analysis technique,



effective indicators on improving the Genius loci were extracted. These indicators were compared and matched with the model derived from reviewing finally divided into 14 codes in 4 categories: environmental-physical, perceptual-cognitive, human-social and activity-functional.

Then, the data obtained from the questionnaires were analyzed by two traditional methods (frequency and mean) and Shannon method and since Shannon technique has more validity and strength in similar cases to determine the weight of indicators, it was used as a basis for conclusion. The two indicators of "social security" and "comfort and spatial well-being" were removed due to semantic similarity with the indicators of "social connection"

resources and interviewing residents, and 20 initial codes were extracted. The obtained codes were prioritized and scored in several stages, which were and "environmental qualities", and finally 12 indicators were agreed upon by the Delphi circle.

Findings from the analysis using Shannon entropy technique show that the perceptual-cognitive category, which includes indicators of body perception, sense of belonging and emotional attachment, has the greatest impact on promoting Genius loci. After that, environmental-physical, human-social and activity-functional categories have a great impact, respectively. According to the lifestyle of that period in all the houses of that period, the indicators of the activity-functional category with an impact weight of 0.04382 had the

same effect in all species. Among the proposed indicators, the index of "total sensory perception" with a weight of 0.05419 has the most impact and the index of "spatial dependence" with a weight of 0.04194 have the least effect. Finally, the proposed model was developed and presented based on the weight importance of the indicators.

In future research, the model derived from this research can be verified in contemporary homes and more accurately measured and compared indicators and sub-indicators from the perspective of homeowners to be able to experimentally prove whether the continuity in the process of transforming the forms of historic houses can help to build and maintain a Genius loci; And what strategies can be effective in improving the human relationship with the place.

References

- [1] Ebrahimi, Gh., Sultanzadeh, H., Mirshahzadeh, Sh. (2017), "The effect of lifestyle modernity on the architecture of houses in the first Pahlavi period of Hamadan", *Urban Management*, (47): 505-522.
- [2] Islami, N., Sultanzadeh, H., Alborzi, F. (2021). "Explaining the Impact of Modernist Thoughts on the Modern International Architectural Process in Iran and Uzbekistan", *Safa*, 18 (94): 101-116.
- [3] Bimakr, F., Mirzaei, Reza., Madahi, M., Heidari, A. (2021). "Evaluation of effective factors on the Genius loci in Pahlavi period housing species (Case study: Mashhad)", *Environmental Studies Seven Fences*, (37): 5-20.
- [4] Heidari, A.A., (2018), "Investigation of residential utility criteria in three scales of apartment unit, residential building and neighborhood (case study: Mashhad city)", *Haft Hesar environmental studies*, (23): 19-30.
- [5] Keshavarzi, G., Jalalian, S. (2019), "Explaining the role of factors affecting territoriality in creating a Genius loci in residential complexes (Case study: Etemadiyah Hamedan residential complex)", *Haft Hesar Environmental Studies*, 27: 81-101.
- [6] Hashemizadeh Mutab, L. (2012), "Comparison of place attachment, social identity, social self-esteem among residents of houses with modern and traditional architecture in Kerman", Tehran: Payame Noor University, Faculty of Humanities, Master Thesis.
- [7] Rahimi, R. (2019), "Relationship between physical form and attachment to place in architecture (Case study: collective spaces of residential complexes in Tehran)", Tehran: Tarbiat Modares University, Faculty of Art and Architecture, Ph.D.
- [8] Alipour, R., Mahmoudi, S.A., Agha Latifi, A. (2020), "Investigating the relationship between effective factors of lifestyle and contemporary body in Mashhad", *Architectural Thought*. 4 (8), 69-84.
- [9] Mousavi, M.H. (2021), "Translation theory in the analysis of modern residential architecture in Turkey and Iran (1930s)", *Iranian architecture and urban planning*, 2 (12), 68-55.
- [10] Farnad F., Kamran Kasmaei H., Khakzand M., Memarian Gh. (2022). "Evaluation of the correlation between the orientation and sides in Qajar", *Creative city design*, Vol. 5, No. 2: 1-10.
- [11] Alitajer, S., Molavi Nojumi, Gh. (2016), "Privacy at home: Analysis of behavioral patterns in the spatial configuration of traditional and modern houses in the city of Hamedan based on the notion of space syntax", *Frontiers of Architectural Research*, (5), 341-352.
- [12] Anton, C.E., Lawrence, C. (2014), "Home is where the heart is: The effect of place of residence on place attachment and community participation", *Environmental Psychology*, (40), 451-461.
- [13] Azar, A. (2001), "Developing of Shannon Entropy Method in Content Analysis", *Al-Zahra University Journal of Humanities*, 11(37- 38), 1-18.
- [14] Caniggia, G., Maffei, G.L. (2001), "Architectural Composition and Building Typology: Interpreting Basic Building", Translated by Fraser, S.J. Firenze: Alinea Editrice.
- [15] Chen, F. (2009), "The role of typomorphology in sustaining the cultural identity of Chinese cities: the case study of Nanjing", China. PhD Thesis. Glasgow: University of Strathclyde.
- [16] Chen, F. & Thwaites, K. (2013), "Chinese Urban Design: The Typomorphological Approach". Surrey: Ashgate.
- [17] Cross, J. E. (2001), "What is Sense of Place", *Research on Place & Space Website*, 20 Feb. 2003; 12. Mar. 2003; <http://www.western.edu/headwtrs/Archives/headwaters12_papers/cross_paper.html>.
- [18] Deutsch, K. & Yoon, S. & Goulias, K.G. (2011), "Unpacking the Theory of Sense of Place. Is it Useful for Choice Modeling?" In: *International Choice Modeling Conference*. 4-6 July. Leeds.
- [19] Delbecq, A.L., Van de Ven, A.H. & Gustafson, D.H. (1975). "Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes". Scott Foresman and Company, Glenview. ISBN 0-673-07591-5. Out of Print: Only Available in Libraries.
- [20] Ding, J., Shanshan, M.a. (2019). "Comparative analysis of habitation behavioral patterns in spatial configuration of traditional houses in Anhui, Jiangsu, and Zhejiang provinces of China", *Frontiers of Architectural Research*, <https://doi.org/10.1016/j.foar.2019.06.002>.
- [21] Farshchi, S.K., Mabhoot, M., Rastegar, A.A. (2014). "How Citizens' Perception is Influenced by the Sense of Belonging and Identity to Urban Deteriorated Texture (Case Study: Sarshoor District in Mashad)", *The SIJ Transactions on Computer Science Engineering & Its Applications*, 2(5): 177-181.
- [22] Gehl, J. (2011). *Life Between Buildings: Using Public Space*. Translated by Koch, J. Washington: Island Press.
- [23] Gokce, D. (2017). "An Empirical Investigation of the Interplay between Typo-Morphological Transformation of Historic House Form and Sense of Place". M.Sc Thesis. the University of Liverpool. Faculty of Humanities and Social Sciences. School of Architecture. 355 pages.
- [24] Gokce, D., Chen, F. (2017). "Sense of Place in the Changing Process of House Form: Case Studies from Ankara, Turkey". *Environment and Planning B: Urban Analytics and City Science* 0(0), 1-25.
- [25] Gurer, T.K. (2012). "A Theory for Sustainability of Townscape: Typomorphology. In: *Regional Development*:

Concepts, Methodologies, Tools, and Applications: Concepts, Methodologies, Tools, and Applications”, Heshey, USA: Information Science Reference (IGI Global), 1418-1433.

- [26] Hay, R. (1998), “A rooted sense of place in cross-cultural perspective”, *Canadian Geographer* 42(3):245–266.
- [27] Hernandez, B. & Hidalgo, M. & Salazar-Laplace, M. & Hess, S. (2007). “Place attachment and place identity in natives and non-natives”, *Environmental Psychology*, 27(4), 310-319.
- [28] Hessari, E. & Peysokhan, M. & Havashemi, A. & Gheibi, D. & Ghafourian, M. & Bayat, F. (2018). “Analyzing the Dimensionality of Place Attachment and Its Relationship with Residential Satisfaction in New Cities: The Case of Sadra, Iran”, Springer Voluom.Published online. Social Indicators Research. <https://doi.org/10.1007/s11205-018-1949-5>.
- [29] Hsu, Ch.Ch. & Brian A. S. (2007), “The Delphi Technique: Making Sense of Consensus”, *Practical Assessment, Research & Evaluation Journal*, 21 (10), 1.
- [30] Jackson, J. B. (1994), “A Sense of Place, a Sense of Time”, New Haven: Yale University Press.
- [31] Kropf, K. (1993), “The Definition of Built Form in Urban Morphology”. PhD Thesis.
- [32] Kropf, K. (2009). “Aspects of urban form”, *Urban Morphology*, 13(2), 105-120. Birmingham: University of Birmingham.
- [33] Lambe, N. & Dongre A. (2016). “Analysing Social Relevance of Spatial Organisation: A Case Study of Traditional Pol Houses, Ahmedabad, India”, *Asian Social Science*, 12(9), 35- 43.
- [34] Lynch, K. (1960), “The Image of City”, Cambridge: The MIT Press.
- [35] Lewicka, M. (2010), “What makes neighbourhood different from home and city? Effects of place scale on place attachment”, *Journal of Environmental Psychology*, 30(1), 35-51.
- [36] Linstone, H. A. & Murray, T. (2002), “The Delphi Method, Techniques and Applications”, Melbourne: Addison Wesley Publishing Company.
- [37] Mazloomi, S.M. & Ariffin, S.I. & Shahminan, R.N.R. (2014), “A comparative analysis of perceptual and demographic predictors of sense of place dimension in the State Mosques of Malaysia”, *Asian Journal of Social Psychology*, 17, 128-140.
- [38] Montgomery, J. (1998), “Making a city: Urbanity, vitality and urban design”, *Urban Design*, (1), 93-115.
- [39] Moudon, A.V. (1994), “Getting to know the Built Landscape: Typomorphology”, In: Frank, K.A. & Schneekloth, L.H., eds. *Ordering Space: Types in Architecture and Design*. New York: Van Nostrand Reinhold.
- [40] Pevsner, N. (1976), “A History of Building Types”, London: Thames and Hudson.
- [41] Rapoport, A. (1969a), “House Form and Culture”, London: Prentice-HALL, INC.Englewood Cliffs, N.J.
- [42] Rapoport, A. (1977), “Human Aspects of Urban Form”, New York: Pergamon Press.
- [43] Rossi, A. (1984), “The Architecture of City”, Cambridge: The MIT Press.
- [44] Sarlak, M. (2012), “Identifying the Aspects of Ideal and Spiritual Based Organization in Iran Supreme Education (Islamic Approach)”, *Journal of the Islamic University*, 2(4), 355-376.
- [45] Shannon, C.E. (1948), “A Mathematical Theory of Communication”, *Bell System Technical Journal*, 27, 379–423, 623-656.
- [46] Schneekloth, L.H. & Frank, K.A. (1994), “Type: Prison or Promise? In: Frank, K.A. & Schneekloth, L.H., eds. *Ordering Space: Types in Architecture and Design*”. New York: Van Nostrand Reinhold, 15-38.
- [47] Shamai, S. & Arnon, S. & Schnell, I. (2012). “From home to community and settlement: Sense of place in different scales”. *Studies on Home and Community Science*, 6(3),153–163.
- [48] Shamsuddin, Sh. (2008). “making places: The role of attachment in creating the sense of place for traditional streets in Malaysia”, *Habitat International*, 32(3), 399-409, DOI: 10.1016/j.habitatint.2008.01.004.
- [49] Smith, K.M. (2011). “The Relationship between Residential Satisfaction, Sense of Community, Sense of Belonging and Sense of Place in a Western Australian Urban Planned Community”. PhD Thesis. Edith Cowan University.
- [50] Stedman, R. (2003a). “Is it Really just a Social Construction? The Contribution of the Physical Environment to Sense of Place”. *Society and Natural Resources*, 16, 671- 685.
- [51] Stone Fish, L. & Busby, D. (2005). “The Delphi Method”. In D. Sprenkle & F. Piercy (Eds.) *Research Methods in Family Therapy* (2nd Ed., 238–253). New York: Guilford Press.
- [52] Tice, J. (1993). *Theme and Variations: A Typological Approach to Housing Design, Teaching and Research*. *Architectural Education*, 46(3), 162-175.
- [53] Twedt, E. & Rainey, R.M. & Proffitt, D.R. (2019). *Beyond nature: The roles of visual appeal and individual differences in perceived restorative potential*. *Environmental Psychology*, (65), doi: <https://doi.org/10.1016/j.jenvp.2019.101322>.
- [54] Vanclay, F. (2008). *Place matters. Making sense of place: Exploring concepts and expressions of place through different sense and lenses*. Canberra: National Museum of Australia Press, 3-11.
- [55] Žlender, V. & Gemin, S. (2020). *Testing urban dwellers' sense of place towards leisure and recreational periurban green open spaces in two European cities*, *Cities*, 98, 1-13.
- [56] Sarlak, M. (2012). *Identifying the Aspects of Ideal and Spiritual Based Organization in Iran Supreme Education (Islamic Approach)*. *Journal of the Islamic University*, 2(4), 355-376.
- [57] Shannon, C.E. (1948). *A Mathematical Theory of Communication*. *Bell System Technical Journal*, 27, 379–423, 623-656.
- [58] Schneekloth, L.H. & Frank, K.A. (1994). *Type: Prison or Promise? In: Frank, K.A. & Schneekloth, L.H., eds. Ordering Space: Types in Architecture and Design*. New York: Van Nostrand Reinhold,15-38.
- [59] Shamai, S. & Arnon, S. & Schnell, I. (2012). *From home to community and settlement: Sense of place in different scales*. *Studies on Home and Community Science*, 6(3): 153–163.
- [60] Shamsuddin, Sh. (2008). *making places: The role of attachment in creating the sense of place for traditional streets in Malaysia*, *Habitat International*. 32(3):399-409, DOI: 10.1016/j.habitatint.2008.01.004.

- [61] Smith, K.M. (2011). The Relationship between Residential Satisfaction, Sense of Community, Sense of Belonging and Sense of Place in a Western Australian Urban Planned Community. PhD Thesis. Edith Cowan University.
- [62] Stedman, R. (2003a). Is it Really just a Social Construction? The Contribution of the Physical Environment to Sense of Place. *Society and Natural Resources*, 16, 671- 685.
- [63] Stone Fish, L. & Busby, D. (2005). The Delphi Method. In D. Sprenkle & F. Piercy (Eds.) *Research Methods in Family Therapy* (2nd Ed., pp.238–253). New York: Guilford Press.
- [64] Tice, J. (1993). Theme and Variations: A Typological Approach to Housing Design, Teaching and Research. *Architectural Education*, 46(3), 162-175.
- [65] Twedt, E. & Rainey, R.M. & Proffitt, D.R. (2019). Beyond nature: The roles of visual appeal and individual differences in perceived restorative potential. *Environmental Psychology*, (65), doi: <https://doi.org/10.1016/j.jenvp.2019.101322>.
- [66] Vanclay, F. (2008). *Place matters. Making sense of place: Exploring concepts and expressions of place through different sense and lenses*. Canberra: National Museum of Australia Press, 3-11.
- [67] Žlender, V. & Gemin, S. (2020). Testing urban dwellers' sense of place towards leisure and recreational periurban green open spaces in two European cities, *Cities*, 98: 1-13.