

Investigating Variables of Sense of Place for the Infill Development of Historical Textures; Case Study: Semnan's Historical Texture

Sajad Moazen^{a*}

^a Assistant Professor of Restoration, Faculty of Architecture and environmental design, University of Science and Technology, Tehran, Iran (Corresponding Author).

Received 19 January 2024; Revised 09 December 2024; Accepted 21 December 2024; Available Online 03 March 2025

ABSTRACT

Today, infill development is facing the challenge of balancing the preservation and development of historical textures, as failure to pay attention to this balance could reduce the vitality of historical textures and disrupt their visual quality. Infill development is primarily characterized by preserving and improving a sense of place, which plays a defining role in resident satisfaction and historical texture sustainability. The goal of this study was to investigate and analyze the variables influencing a sense of place to help provide infill development and present a model to increase place satisfaction within historical textures. To this end, this study selected the historical texture of Semnan City as a case study, and the literature review led to the identification of 27 variables related to a sense of place within three physical-structural, semantic-perceptual, and functional-activity dimensions. Data were collected using a questionnaire with the participation of 21 experts. Meanwhile, the MICMAC method was used to analyze the relationships between the variables. This method allows for identifying the key variables and classifying them within five excluded, input, resultant, intermediate (goal and risk), and regulatory categories. Findings showed that the variables of value and culture (a score of 537), spirituality (a score of 498), stability (a score of 467), and readability (a score of 444) falling under the semantic-perceptual dimension and proportions (a score of 428) falling under the physical dimension held the strongest influence. In contrast, the variables of being memorable (a score of 568), security (a score of 522), perception and orientation (a score of 514), vitality (a score of 491), and satisfaction (a score of 483) were most influenced. The results can also help urban planners and designers to develop and design infill development policies and projects, establishing a balance between the preservation of historical textures and how it may be improved to enhance their vitality.

Keywords: Infill Architecture, Sense of Place, Micmac Method, Semnan City's Historical Texture.

* E_mail: sajadmoazen@iust.ac.ir

1. STATEMENT OF THE PROBLEM

Historical textures are going through some transformations caused by historical developments and events (Gaber and Akçay 2020). Contemporary transformations may include construction of new buildings within historical textures, i.e., infill architecture. While infill architecture allows for reviving and strengthening historical textures, construction of new buildings and indiscriminate development in historical textures could unavoidably affect the quality of the appearance of older regions (Alitany 2019). As development of historical regions appears to be a critical subject due to their historical, cultural, and economic values (Feisal 2020), it would be imperative to utilize infill development policies and develop a systematic framework based on preserving the existing assets of historical textures.

Infill development refers to the construction of new buildings in empty spaces or the replacement of old and dilapidated buildings with new ones in urban areas. This approach is administered in regions where urban infrastructure already exists and thus contributes to the revival and rejuvenation of society and preservation of land (Feisal 2020). In historical textures, infill architecture creates a reasonable and spiritual bond between the past, the present, and the future, thereby playing a significant role in reviving the regional texture and improving the quality of urban life (Gaber and Akçay 2020).

In this connection, the unique sense of place in historical textures and its role in defining the character of each texture could be one of the main indicators of historical textures to be focused attention. Compared to physical features, the intangible features of [infill development] could increase its risk of being ignored or discarded. Accordingly, it is important to pay attention to components of a sense of place in developing infill architecture due to its growing role in defining the nature of historical textures. It is understood that a sense of place arises from place dependence and place identity (Zhang and Li 2021). Building upon the literature where a sense of place has been regarded as synonymous with the spirit of place (Relph 2007; Alexander 2012), the present study also defined a sense of place as denoting the spirit of place.

In this connection, researchers of different disciplines are increasingly focusing on components of "place" in urban life and social integrity (Li et al. 2020; Raymond et al. 2017; Ujang and Zakariya 2015; Fleury-Bahi et al. 2008). The literature has shown a close link between a sense of place, place satisfaction, place identity, and place attachment (Li et al. 2020; Zhang and Li 2021; Jorgensen and Stedman 2001; Zhang and Li 2021). Research has mainly concerned with the connection between a sense of place and tourism, identification, attachment, and a sense of belonging in historical textures (Zhang and Li 2021;

Arefi 1999; Rezaei et al. 2018; Li et al. 2020; Zhang and Li 2021).

However, the literature has not yet examined the variables of a sense of place and their connection with the infill development of historical textures. This warrants a comprehensive study to deal with this subject. This research gap, especially the identification and prioritization of the variables of a sense of place and the explanation of their interrelationships, would require a comprehensive study in this domain.

To this end, this study aimed to analyze the variables of a sense of place for the infill development of historical textures and present a model to promote place satisfaction. Nasar Neighborhood in the city of Semnan was selected as the case study due to its historical background and major mansions such as the Friday (Congregation) Mosque and the Old Bazaar. The key role of these buildings in urban spaces has strengthened the quality of a sense of place over time. On the other hand, the presence of vacant pieces of land has made this neighborhood an appropriate region for the administration of infill development policies. To this end, the Nasar neighborhood was selected to help implement the analyses and make research results applicable.

As explained above, the main goal of this study was to provide a model of place satisfaction through the variables of a sense of place for the infill development of historical textures; meanwhile, the secondary goal of the study was to measure the variables of a sense of place in Semnan's Nasar Neighborhood for infill development. The study goals help answer the following questions:

- What are the variables creating a sense of place for place satisfaction in historical neighborhoods?
- What is the role and nature of the variables creating a sense of place for place satisfaction in the historical Nasar neighborhood?
- To what extent do the variables of sense of place and place satisfaction influence and are influenced in the Nasar neighborhood?

1.1. Significance of Focusing on Infill Development Policies in Historical Textures

To preserve his identity, man has striven to take measures to keep the city, especially historical textures, alive; one of these measures is infill development. Infill architecture is a product of endogenous urban development, helping to solve developmental problems, especially urban sprawling issues (Esmaeilzadeh et al. 2020).

The literature has shown that successful infill development connects new structures to the city background, with the implementation of infill development policies in historical textures not only maintaining the structural and formative integrity of new construction volumes added to historical textures (visual adaptability) but also preserving background

and contextual harmony (Navickienė 2012). In other words, the integrity of new volumes with historical textures is not only formed by visual connection (e.g., physical and aesthetic features, such as volumes, scales, forms, colors, materials, and proportions) but also by some specific place features (e.g., local characteristics, meanings, traditions, textures place character, and identity) (NSW Heritage Office 2005; Navickienė 2012; Alitany 2019). Hence, the quality of integrity depends on the knowledge of place and its ability to reflect that knowledge (Navickienė 2012). The above-stated features can be included in the Montgomery¹ Three-Dimension Classification (e.g., perceptual, form (physical), and functional). Hence, in infill development, perceptual dimensions (e.g., place character, identity, culture, and tradition), as well as place semantics, must be considered in addition to the physical dimension (e.g., volumes, scales, forms, materials, and proportions).

1.2. Sense of Place Definitions

A sense of place has been one of the key concepts affecting the man-environment relationship. A sense of place is also considered one of the basic criteria for evaluating high-quality environments. This concept broadly describes the relationship between man and place, including place attachment and place meaning. A sense of place involves several complex yet contradicting structures and definitions (Hidalgo and Hernández 2001; Jorgensen and Stedman 2001; Pretty et al. 2003; Esmailzadeh and Ebrahimi 2020; McCunn and Gifford 2014; Lengen and Kistemann 2012; Shamai 1991). The multi-dimensionality of a sense of place can be represented by some theoretical descriptions posited by various scholars in different domains (Jorgensen and Stedman 2006; Raymond et al. 2017; Lengen and Kistemann 2012), as the literature has introduced terms similar to a “sense of place”, such as community attachment (Kasarda and Janowitz 1974), a sense of community (Mannarini et al. 2004), place identity (Proshansky 1978), place dependence (Williams and Vaske 2003), place meaning (Kyle et al. 2004), urban quality (Montgomery 1998), and the spirit of place (Relph 2007; Alexander 2012).

In the 1960s, Lynch was one of the first who applied the term “sense of place” in urban planning where he used the term to refer to the symbolic and memorable dimensions of the urban environment (Kudryavtsev et al. 2012). In the 1970s, Tuan maintained that personal experiences and the physical environment could be used to create a sense of place (Kudryavtsev et al. 2012). He also maintained that a sense of place could be defined as place meaning and place attachment to an environment sensed by people (Masterson et al. 2017). In 1991, Shamai categorized three main levels of belonging, attachment, and commitment to place in connection with the formation of the various levels of a sense of place, classifying this sense into seven levels: indifference to place, knowledge of one’s

exposure to the place, attachment, being assimilated with place goals, presence in the place, and finally sacrifice for place (Shamai 1991).

Hamon (1992) defines a sense of place as the people’s subjective understanding and conscious feeling about the environment, arguing that it involves an interpretive perspective and a sentimental response to the environment. To the contrary, Greider and Garkevich (1994) maintained that a sense of place is a product of social structure and some shared behavioral and cultural processes not just simple perceptual processes based on physical characteristics (Kudryavtsev et al. 2012). Arefi (1999) described a sense of place to be people’s attachment to places. Jorgensen and Stedman (2001) defined a sense of place to be a wide-ranging attitudinal structure featuring three dimensions: sense of belonging, place attachment, and place identity. Cross (2001) considers a sense of place as involving two main dimensions: relationship with the place (how people establish relations with spaces) and attachment to the community (intensity and type of social bonds in the place).

Salvesen (2002) defined a sense of place to be the result of the interaction between place, perspective, and individual participation. Stedman (2003) classified it into three physical, behavioral, and social-psychological dimensions. Meanwhile, Entrikin and Teple (2006) stressed the role of social relations and networks in forming and regenerating a sense of place (Frantzeskaki et al. 2018). Relph (2007) believed that a sense of place and the spirit of place were interconnected, maintaining that accumulated physical changes and subjective associations could, over time, shape the spirit of place. Alexander (2012) also considered the pattern of events as effective in the formation of the spirit of place, in addition to the physical environment. These definitions suggest that a sense of place involves various physical, cultural, social, and psychological dimensions.

2. THEORETICAL FOUNDATIONS OF THE STUDY

The definitions provided by theorists suggest that a sense of place is influenced by various factors. Steele (1981) emphasized such physical factors as sizes, enclosure, scales, proportions, colors, and sounds. Champman (2008) and Shultz believed that visual and spatial qualities such as rhythm, texture, light, and materials were effective in a sense of place. Salvesen (2002) considered a sense of place to be a subjective phenomenon associated with memories, history sounds, and collective activities (Rezaei et al. 2018). Sirkas and Nairn (1965) emphasized the stability and reliability of the place (Carmona and Tiesdell 2007) and symbolic perceptions, respectively. Cross (2001) maintained that a sense of place was a combination of the relationship with

place and presence in the community, classifying it into five levels: coherent, incoherent, assimilation, relative placelessness, and absolute placelessness rootedness. Salvesen maintained that a sense of place was highly subjective and depended on such factors as memories, shared history, traditions, perspectives, smells, sounds, collective activities, natural sceneries, buildings, etc. (Salvesen 2002).

To Relph, activities, man-place interactions, and man-man interactions could affect the creation of a sense of place. In other words, he believes three physical structures, activities, and meaning elements are effective in creating a sense of place (Relph 1976). Montgomery considers a sense of place to be equivalent to urban quality, arguing that architectural form, scales, signs, landscape, spaces for interaction, outdoors, and green spaces were involved in creating

a sense of place (Montgomery 1998). In his studies, he classified the factors contributing to a sense of place into three dimensions: activities, forms, and mental images.

According to the theoretical foundations, the study variables were divided into three main dimensions: physical-structural, semantic-perceptual, and functional-activity dimensions (Montgomery 1998). The classification was made to provide a comprehensive and structured framework to help analyze various dimensions of a sense of place and its relationship with infill development in historical textures (Table 1). Each of the dimensions specifically influences the various dimensions of the environment and how man interacts with it, thus helping to improve the quality of urban spaces and reviving its historical identity.

Table 1. Theoretical Foundations of the Study

Dimensions	Variables	Symbol	Resources
Physical-Structural	Degree of Enclosure	V1	
	Conflict	V2	
	Proportions	V3	
	Human Scale	V4	
	Texture	V5	(Qodsi and Soheili 2016; Ujang 2012;
	Color	V6	Brehm et al. 2013; Salvesen 2002;
	Visual Diversity	V7	Steele 1981; Li et al. 2020)
	Perspective	V8	
	Integrity	V9	
	View	V10	
	Natural Landscapes	V11	
Semantic-Perceptual	Value and Culture	V12	
	Spirituality	V13	
	Satisfaction	V14	
	Perception and Orientation	V15	(Carmona and Tiesdell 2007; Qodsi and
	Reliability	V16	Soheili 2016; Herliana et al. 2019; Nairn
	Stability	V17	1965; Ujang 2012; Salvesen 2002; Hay
	Mental Image (Being Memorable)	V18	1998; Ujang and Zakariya 2015; Lengen
	Security	V19	and Kistemann 2012)
	Duration of Residence	V20	
	Readability	V21	
Functional-Activity	Diversity of Activities	V22	
	Social Interactions	V23	(Relph 1976; Salvesen 2002; Relph
	Accessibility	V24	1976; Qodsi and Soheili 2016; Herliana
	Events	V25	et al. 2019; Nairn 1965; Ujang 2012;
	Vitality	V26	Ujang and Zakariya 2015; Alexander
	Diversity of Uses	V27	2012; Lengen and Kistemann 2012)

3. AREA UNDER STUDY

The area under study was the historical texture of Semnan City. Semnan is located east of the Iranian capital of Tehran and its historical texture is situated in the center of the city (Fig. 1). There lie major buildings in this area such as the Old Bazaar, the Bathroom, and the Friday Mosque. Most of the buildings were destroyed due to new construction development and the dilapidation of residential houses, which resulted in some empty land. This has reduced the

residents' sense of belonging to their own residences and led locals to migrate to newly constructed areas. Figure 2 (a) demonstrates Semnan City's historical textures, dating back to 1957. As shown, this area features an integrated yet coherent texture. Figure 2 (b) represents the city's historical texture in 2021. Currently, this area has lost its coherence and integrity due to the presence of vacant land and the destruction and dilapidation of buildings (Fig. 3).

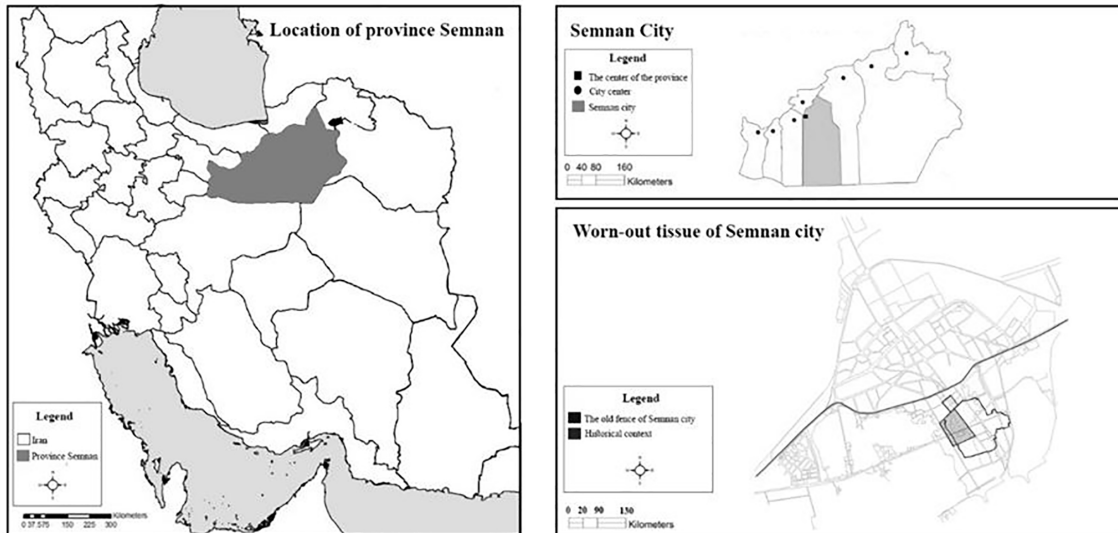


Fig. 1. Location of Semnan City and Its Historical Texture

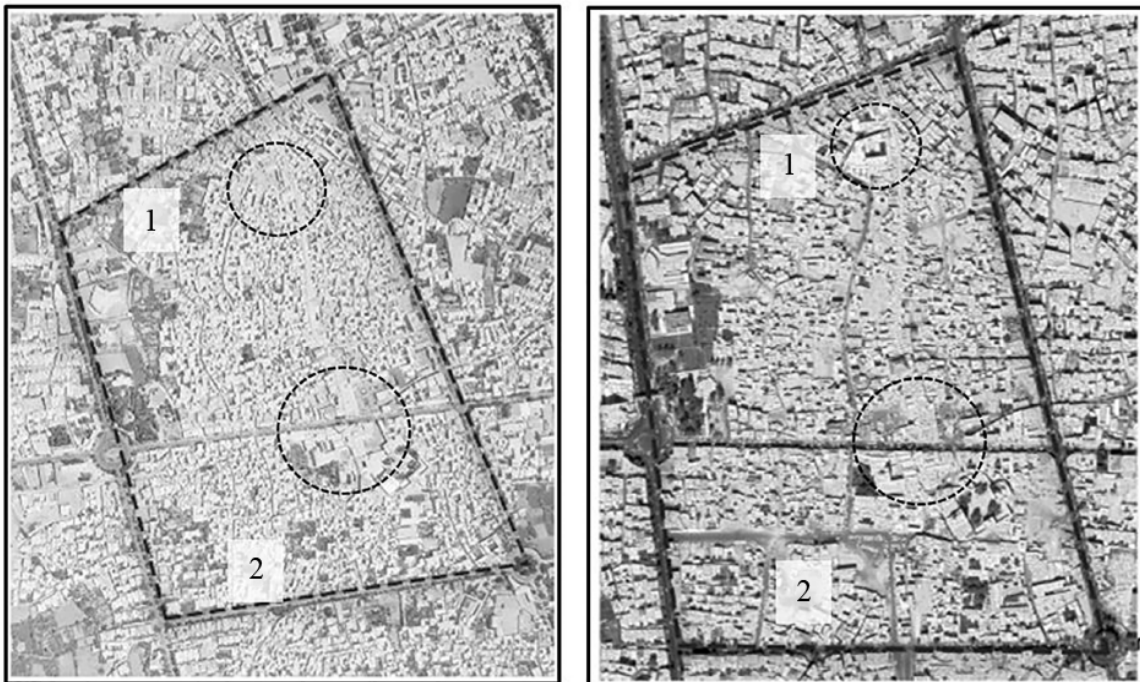


Fig. 2. a) The Historical Texture of the Nasar Neighborhood in 1957; b) The Historical Texture of the Nasar Neighborhood in 2021

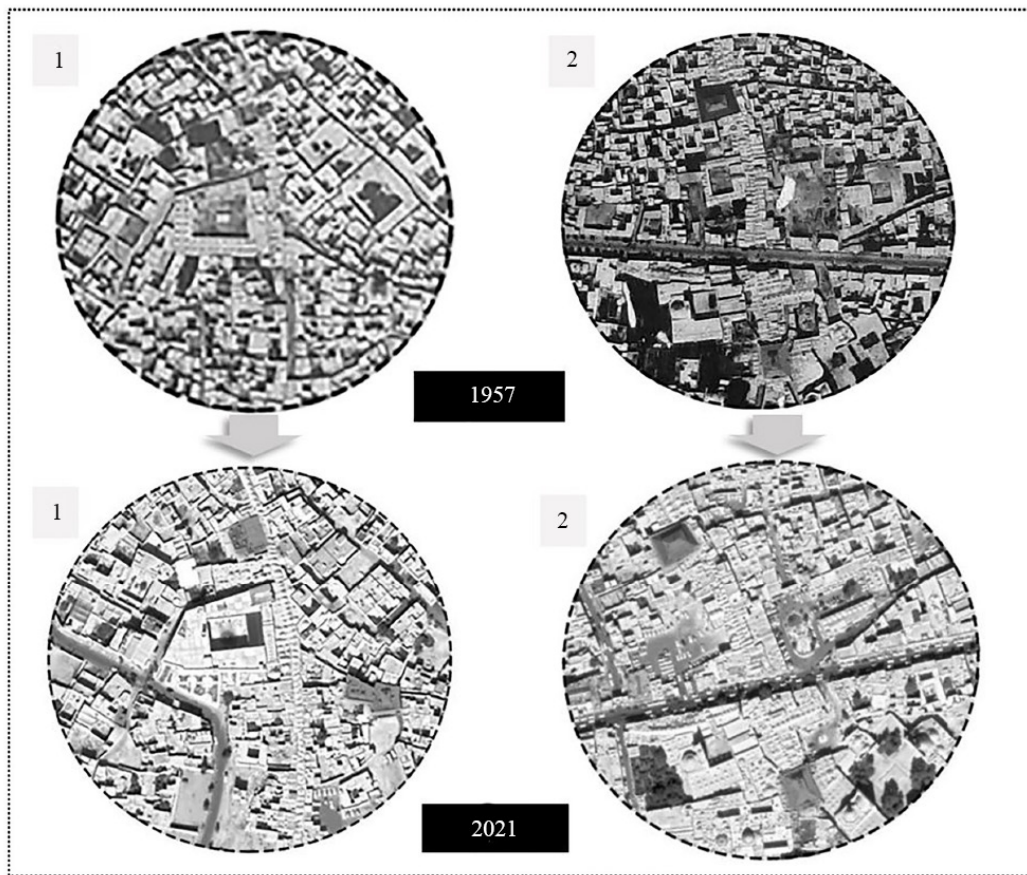


Fig. 3. Comparing Areas of the Historical Texture of the Nasar Neighborhood

4. STUDY METHODOLOGY

This study employed interpretive-structure modeling (ISM) to analyze the interrelationships of the variables. This methodology not only makes it possible to rank the criteria but also measures the extent to which the variables influence and are influenced. The ISM is also capable of turning complex structures into a visual model (Al-Zarooni and Bashir 2020). In this connection, the MICMAC method was used as a structural analysis tool. This method uses matrix multiplication to classify the study variables based on their driving forces and dependencies, distinguishing the independent and dependent variables (Agrawal 2019; Dewangan et al. 2015; Barati et al. 2019).

The study procedure is as follows:

- Identifying the primary factors: Extracting the variables through library and documentary studies
- Analyzing the relationships between the variables: Forming the $n \times n$ matrix and measuring the variables' degree of influence based on the views of 15 experts

using the purposive sampling method. The influence values are ranked 0 to 3.

- Extracting key factors: The scattering of the variables in the coordinate axis based on the extent to which they influence and are influenced, which would thus help determine their characteristics.

5. DISCUSSION AND CONCLUSION

According to the literature, 27 variables were identified to measure a sense of place in three physical-structural, semantic-perceptual, and functional-activity dimensions, which were analyzed using the MICMAC software (Table 1). The results indicated a four-time repetition rate and a degree of filling of 86.55%, suggesting the selected factors were highly influencing each other. According to the statistical variables, the study's matrix enjoyed an optimality of 100% with a four time rotation, indicating the higher validity of the questionnaire and its responses (Table 2).

Table 2. Primary Analysis of Matrix Data of Cross-Influences (by the MICMAC Software)

Indicator	Zero-Time Rate	One-Time Rate	Two-Time Rate	Three-Time Rate	Total	Degree of Filling
Value	98	193	183	255	631	86.55%

5.1. Variable Scattering Explained

The scattering of the variables on the scattering plot indicates the stability or instability of the system. In the course of analyzing cross-influences using the MICMAC software, two systems are defined: stable and unstable. In stable systems, the variables' scattering takes an L-shaped form and consists of three input, independent, and resultant variable categories with certain positions in the model. In contrast, unstable systems are more complex, and

the variables are scattered along a diagonal axis from the southwest to the northeast. This usually shows a combination of influences and dependencies, making it difficult to identify the key variables. This system distinguishes the input, intermediate, regulatory, resultant, and excluded variables. The scattering of the variables in the study (Fig.) corresponds to the unstable system's model, with the exact position of the variables being presented in Table 3.

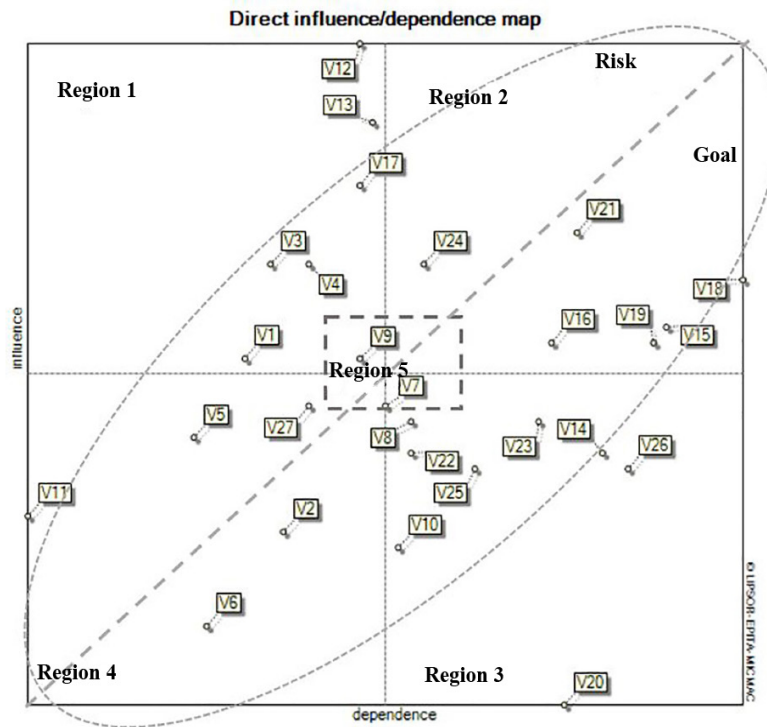


Fig. 4. Map of Variables Scatterings

Table 3. Explaining Variables' Scattering

Region	Type of Variable	Description	Variables	Dimensions
Region 1	Input Variables	Input variables serve as inputs to the system. They are not generally controlled by the system because they are out of access by the system. The extent to which they will influence is greater than the extent to which they are influenced.	Proportions (V3) Human scale (V4) Value and culture (V12) Spirituality V13) Stability (V17) Degree of enclosure (V1)	Physical-structural Semantic-perceptual

Region	Type of Variable	Description	Variables	Dimensions
Region 2	Intermediate Variables	Risk variables: These variables are characterized by a greater capacity to turn into the key players of the system because their unstable nature makes them potentially turn into the system's point of inaction.	Accessibility (V24)	Functional-activity
		These variables simultaneously serve as highly influential and highly dependent. These variables feature instability because any action or change to them will entail an action or change to other variables.	Goal variables: These variables are identified as the outcome of the system's evolution. These variables, if manipulated, could help the system evolve in the direction intended. These variables tend to represent the possible goals in the system rather than representing a pre-determined outcome.	Perception and orientation (V15) Reliability (V16) Mental image (being memorable) (V18) Security (V19) Readability (V21)
Region 3	Resultant Variables	These variables represent lower influence and higher dependency while being highly sensitive to the evolution of intermediate and input variables. These variables are also considered as the outputs of the system.	Residence duration (V20) Events (V25) Type of activities (V22) Satisfaction (V14) Vitality (V26) Social interactions (V23) View (V10) Perspective (V8)	Semantic-perceptual Physical-structural
Region 4	Excluded Variables	These variables are not influenced by other variables of the system while not influencing them either. They are less associated with the system because they neither cause the main variable to stop nor allow for the evolution and perfection of a variable.	Texture (V50) Land use diversity (V27) Natural landscapes (V11) Color (V6) Conflict (V2)	Physical-structural (Functional-activity)
Region 5	Regulatory Variables	These variables are regulatory in nature and sometimes serve as a secondary leverage. These variables can be promoted by officials' policies into determinant variables or goal and risk variables.	Integrity (V9) Visual diversity (V7)	Physical-structural

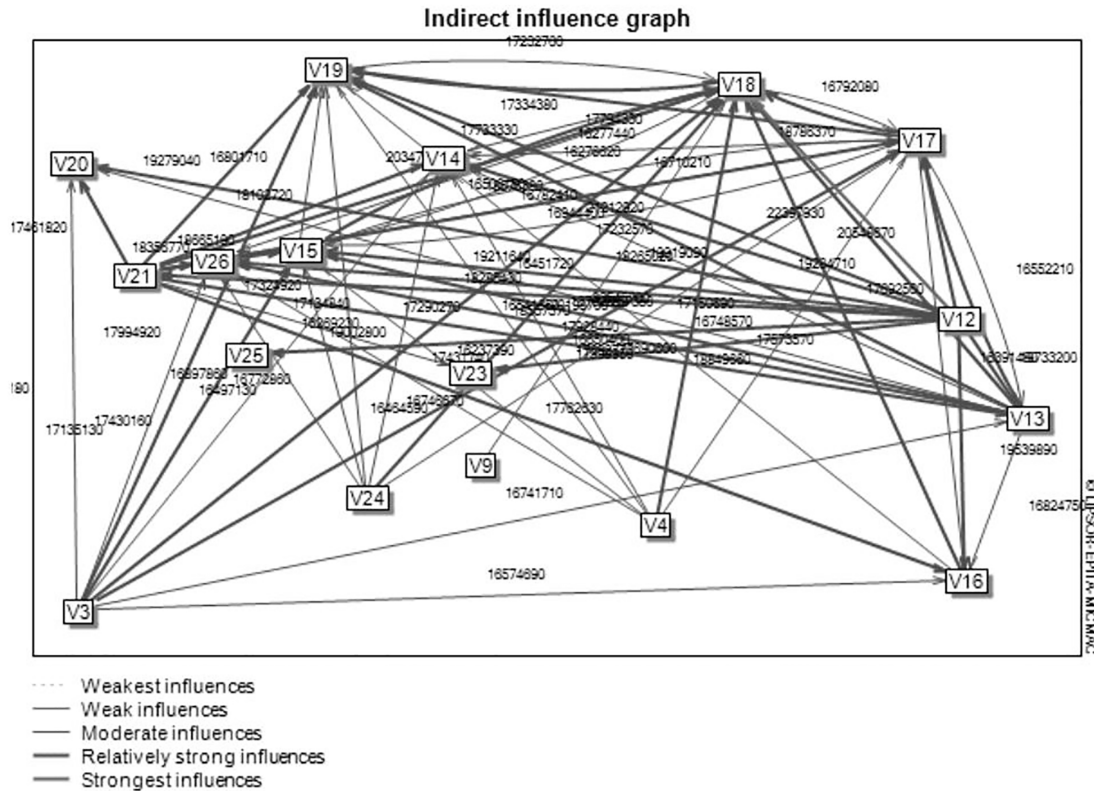
5.2. Analyzing the Direct and Indirect Influences between Variables

Figures 5 and 6 and Table 5 give the extent to which variables directly and indirectly influence each other. These figures show how each variable influences or is influenced by other variables. The relationship between the variables is specified on five levels of influence based on the thickness of the lines, as drawn on the graphs: the weakest influence, weak influence, moderate, relatively strong influence, and the strongest influence. The direction of the arrows indicates the path of influence, with the tip of the arrow on a variable indicate how it is influenced by the other variable; also, the beginning of the arrow indicates the input variable. As noted in Figure 5 and Table 5, the variable mental image (being memorable) (V18) (560) was found to be most indirectly influenced by other variables (proportions, value and culture, degree of enclosure, integrity, human scales, perception

and orientation, stability, and readability). Figure 5 also shows the extent to which variables indirectly influence and are influenced. For instance, the variable of value and culture represented the strongest indirect influence on the variable of mental image (being memorable) (V18). The variables of human scales, proportions, perception and orientation, stability, and readability represented strong indirect influences on the variable of mental image (being memorable) (V18). Also, the variables of security (530) and perception and orientation (515) were most indirectly influenced, respectively, following the variable of mental image. The variable of changing value and culture (V12) (530) represented the strongest indirect influence on the variables of reliability, events, vitality, readability, security, perception and orientation, mental image, residence duration, and satisfaction. Then, the variables of spirituality (V13) (496) and stability (V17) (465) were found to be most

indirectly influenced by other variables, respectively. According to Table 5, the variables with indirect influences and the lowest scores included, at the level of influence, the duration of residence (224), color

(253), and natural landscapes (291), while including, at the level of being influenced, natural landscapes (104), color (218), and texture (220).



**Fig. 5. Indirect Relationships between the Variables (from the Weakest Influence to the Strongest Influence):
Outputs of the MICMAC Software**

As noted in Figure 6 and Table 5, it is possible for a variable to be associated with a few variables but its intensity of influence may be so strong that it would make it more important than other variables. The variables of value and culture (V12), spirituality (V13), and stability (V17) represented the highest direct influence on other variables. This finding was in line with those of other studies (Carmona and Tiesdell 2007, 102; Naim 1965; Ujang and Zakariya 2015; Ujang 2012; Hay 1998). The variables of mental image (being memorable) (V18) (568), perception and orientation (V15) (522), and security (V19) (514)

were most directly influenced by other variables. This finding was in line with those of three studies (Qodsi and Soheili 2016; Naim 1965; Salvesen 2002). As given in Table 6, the variables with direct influences and the lowest scores included, at the influencing level, the duration of residence (210), color (249), and view (288), while including, at the influenced level, natural landscapes (132), texture (233), and color (241). This finding was not in line with those of some other studies (Hay 1998; Salvesen 2002; Chapman 2008; Steele 1981; Montgomery 1998).

Direct influence graph

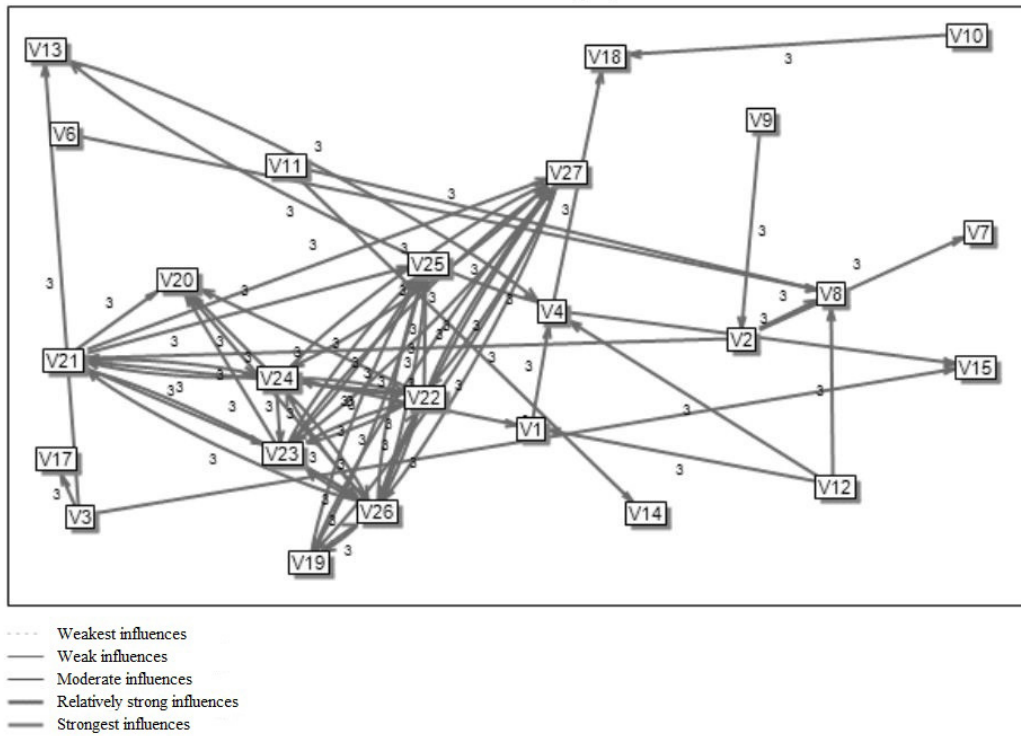


Fig. 6. Direct Relationships between the Variables (from the Weakest Influence to the Strongest Influence); Outputs of the MICMAC Software

Table 5. Direct and Indirect Influences and Dependencies

Rank	Variable	Direct Influence	Variable	Direct Dependencies	Variable	Indirect Influence	Variable	Indirect Dependencies
1	V12	537	V18	568	V12	530	V18	560
2	V13	498	V15	522	V13	496	V19	530
3	V17	467	V19	514	V17	465	V15	515
4	V21	444	V26	491	V21	438	V26	506
5	V3	428	V14	483	V24	423	V14	498
6	V4	428	V21	467	V18	421	V16	481
7	V18	420	V20	459	V4	420	V20	481
8	V24	420	V16	444	V3	419	V23	474
9	V15	397	V23	444	V15	399	V21	464
10	V16	389	V25	405	V19	391	V25	442
11	V19	389	V22	366	V16	388	V22	398
12	V1	381	V24	366	V1	379	V24	395
13	V9	381	V8	358	V9	378	V13	356
14	V7	358	V10	358	V23	363	V12	356
15	V27	358	V7	350	V27	356	V17	347
16	V23	350	V13	342	V7	353	V27	333
17	V5	342	V9	335	V22	342	V7	326
18	V14	335	V12	335	V5	341	V10	320
19	V22	335	V17	335	V25	338	V8	319

Rank	Variable	Direct Influence	Variable	Direct Dependencies	Variable	Indirect Influence	Variable	Indirect Dependencies
20	V8	327	V4	303	V26	337	V9	297
21	V25	327	V27	303	V14	335	V4	274
22	V26	327	V2	288	V8	322	V3	265
23	V11	303	V3	280	V2	294	V2	256
24	V2	296	V1	265	V10	293	V1	251
25	V10	288	V6	241	V11	291	V5	220
26	V6	249	V5	233	V6	253	V6	218
27	V20	210	V11	132	V20	224	V11	104

6. CONCLUSION

Today, in considering the dilapidation and destruction of historical textures due to unsystematic construction, as well as inappropriate urban development, infill development designs could help preserve the historical value of buildings and facilitate their revival and revitalization. In the meantime, a sense of place is one of the main key factors in this process. This study aimed to present a model of place satisfaction through a sense of place variables in the course of the infill development of historical textures. The questions answered by the study are as follows:

- What are the variables creating a sense of place for place satisfaction in historical neighborhoods?
- What is the role and nature of the variables creating a sense of place for place satisfaction in the historical Nasar neighborhood?
- To what extent do the variables of sense of place and place satisfaction influence and are influenced in the Nasar neighborhood?

To answer the first question, findings showed that the factors creating a sense of place for place satisfaction in historical neighborhoods are divided into three dimensions:

1) physical-structural dimension: Degree of enclosure, conflict, proportion, human scale, texture, color, visual diversity, perspective, integrity, view, and natural landscapes; 2) semantic-perceptual: Value and culture, spirituality, satisfaction, perception and orientation, reliability, stability, mental image (being memorable), security, residence duration, and readability, and 3) functional-activity: diversity of activities, social interactions, accessibility, events, vitality, and land use diversity.

To answer the second question, the findings showed that the variables of proportions, human scales, value and culture, spirituality, stability, and the degree of enclosure were identified as the input variables, suggesting that they played a key role in forming and strengthening a sense of place in the infill development of historical textures. For example, proportions and human scales were effective in strengthening readability and spatial integrity as they helped create visual and functional contacts between

buildings and the surrounding environment.

The variables of accessibility, perception and orientation, reliability, mental image, security, and readability were identified as intermediate variables, suggesting that they could, on the one hand, influence other variables, and, on the other hand, be influenced by other variables. Intermediate characteristics indicate the intermediary role of these variables in the interaction network of components of a sense of place in the historical neighborhood of Nasar. Due to their intermediacy, these variables form points of balance in a sense of place system. If properly controlled, these variables would help improve the environmental quality and increase user satisfaction in the neighborhood. On the other hand, failure to focus on them would engender a lack of integrity and reduce spatial desirability.

The variables of residence duration, events, type of activities, satisfaction, vitality, view, and perspective were identified as resultant variables. This suggested that they could be directly and indirectly influenced by other input or intermediate variables, as they could not significantly influence other variables themselves and were primarily the outcome of the influencing processes of other variables. To this end, these variables served as the final indicators of the successful and ineffective functions of other factors. Meantime, improving and controlling input and intermediate components could increase these variables, whereas the weak management of key components could reduce the variables and consequently, lower a sense of place and overall user satisfaction.

The variables of texture, land use diversity, natural landscapes, color, and conflict were identified as independent variables, suggesting that they did not represent significant direct or indirect influences on other system variables, and were not influenced by other variables, either. Put simply, these variables played a secondary role in the system as their changes could not significantly influence the overall infill development process or the sense of place.

In the end, the variables of integrity and visual diversity were identified as regulatory variables, suggesting these variables were serving to moderate

Moazen, S.

the system. These variables could maintain the balance and coordination among different sections of the system and play a key role in regulating the changes.

To answer the third question, findings showed that the variables of value and culture, spirituality, stability, and readability falling under the semantic and perceptual dimension, and proportions falling under the physical-structural dimension held the highest influence. In contrast, the variables of mental image, security, perception and orientation vitality, and satisfaction were most influenced.

Hence, this study aimed to investigate the role of a sense of place in the infill development of the historical texture of Semnan's Nasar Neighborhood

by promoting the knowledge of urban design and developing these textures. An understanding of the relationship between the variables influencing a sense of place will help gain a deeper insight into how these factors influence the quality of a sense of place and place satisfaction. Findings could help urban planners and directors to revive and revitalize historical textures. Also, research of this kind is suggested to be expanded across various historical textures to help generalize the findings. In sum, considering the influence of social and environmental factors such as climatic changes, urban migration and economic developments could result in a more comprehensive understanding of the role of a sense of place in infill development.

ACKNOWLEDGMENTS

This article wasn't supported by any financial or spiritual sponsors.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

MORAL APPROVAL

The authors commit to observe all the ethical principles of the publication of the scientific work based on the ethical principles of COPE. In case of any violation of the ethical principles, even after the publication of the article, they give the journal the right to delete the article and follow up on the matter.

PARTICIPATION PERCENTAGE

The authors state that they have directly participated in the stages of conducting research and writing the article.

ENDNOTE

1. Charles Montgomery (1968), the Canadian author, news photographer, and an urban planning theorist

REFERENCES

- Agrawal, Nishant Mukesh. 2019. Modeling Deming's quality principles to improve performance using interpretive structural modeling and MICMAC analysis. *International Journal of Quality & Reliability Management*.
- Alexander, Christopher. 2012. *The timeless way of building (Vol. 3)*. New York: Oxford University Press.
- Alitany, Ayman Khalil. 2019. Identifying Architectural Attributes and Aesthetics for Assessment of New Infill Design in Urban Historic Context: The Case of Historic Jeddah. In *Congreso Internacional Ciudad y Territorio Virtual (CTV)*. <https://doi.org/10.5821/ctv.8502>
- Al-Zarooni, Hassan, and Bashir Hamdi A. 2020. An integrated ISM fuzzy MICMAC approach for modeling and analyzing electrical power system network interdependencies. *International Journal of System Assurance Engineering and Management* 11(6): 1204-1226.
- Arefi, Mahyar. 1999. Non-place and placelessness as narratives of loss: Rethinking the notion of place. *Journal of urban design* 4(2): 179-193. <https://doi.org/10.1080/13574809908724445>
- Barati, Aliakbar, Hossein Azadi, Milad Dehghani Pour, Philippe Lebailly, and Mostafa Qafari. 2019. Determining key agricultural strategic factors using AHP-MICMAC. *Sustainability* 11(14): 3947. <https://doi.org/10.3390/su11143947>
- Brehm, Joan M., Briam W. Eisenhauer, and Richard C. Stedman. 2013. Environmental concern: examining the role of place meaning and place attachment. *Society & Natural Resources* 26(5): 522-538. <https://doi.org/10.1080/08941920.2012.715726>
- Carmona, Matthew, and Steve Tiesdell. (Eds.). 2007. *Urban design reader*. Routledge.
- Chapman, David. 2005. Environment and Space. In *The Creation of Places and Places in the Man-Made Environment*.
- Cross, Jennifer E. 2001. What is sense of place? Doctoral dissertation, Colorado State University. Libraries.
- Dewangan, Devendra Kumar, Rajat Agrawal, and Vinay Sharma. 2015. Enablers for competitiveness of Indian manufacturing sector: an ISM-fuzzy MICMAC analysis. *Procedia-Social and Behavioral Sciences* 189: 416-432. <https://doi.org/10.1016/j.sbspro.2015.03.200>
- Feisal, Zeinab. 2020. ENHANCING SUSTAINABILITY OF HISTORIC CONTEXTS THROUGH INFILL LANDSCAPE PROJECTS Infill development as a catalyst for Rehabilitation. *Journal of Urban Research* 36(1): 45-60. <https://doi.org/10.21608/jur.2020.90100>
- Fleury-Bahi, Ghazlane, Marie-Line Félonneau, and Dorothée Marchand. 2008. Processes of place identification and residential satisfaction. *Environment and Behavior* 40(5): 669-682. <https://doi.org/10.1177/0013916507307461>
- Gaber, Mostafa Ahmad, and Ayten Akçay. Ö. 2020. Qualitative and Quantitative Evaluation Techniques of New Infill Designs in Historic Context. *Amazonia Investiga* 9(35): 20-33. <https://doi.org/10.34069/AI/2020.35.11.2>
- Hay, Robert. 1998. Sense of place in developmental context. *Journal of environmental psychology* 18(1): 5-29. <https://doi.org/10.1006/jevvp.1997.0060>
- Herliana, Emmelle Tricia, Himasari Hanan, and Hanson E. Kusuma. 2019, February. Significant Factors of Sense of Place That Makes Jeron Beteng Yogyakarta Sustainable as a Historical Place. In *18th International Conference on Sustainable Environment and Architecture (SENVAR 2018)*, 147-152. Atlantis Press. <https://doi.org/10.2991/senvar-18.2019.21>
- Hussein, Fatmaelzahraa, John Stephens, and Reena Tiwari. 2020. Memory for social sustainability: Recalling cultural memories in Zanqit Alsitat historical street market, Alexandria, Egypt. *Sustainability* 12(19): 8141. <https://doi.org/10.3390/su12198141>
- Jorgensen, Bradley S., and Richard C. Stedman. 2001. Sense of place as an attitude: Lakeshore owners attitudes toward their properties. *Journal of environmental psychology* 21(3): 233-248. <https://doi.org/10.1006/jevvp.2001.0226>
- Kasarda, John, and Morris Janowitz. 1974, "Community attachment in mass society". *American Sociological Review* 39: 328-339. <https://doi.org/10.2307/2094293>
- Kyle, Gerard, Andrew J. Mowen, and Michael Tarrant. 2004, "Linking place preferences with place meaning: an examination of relationship between place motivation and place attachment". *Journal of Environmental Psychology* 24: 439-454. <https://doi.org/10.1016/j.jenvp.2004.11.001>
- Lengen, Charis, and Thomas Kistemann. 2012. Sense of place and place identity: Review of neuroscientific evidence. *Health & place* 18(5): 1162-1171. <https://doi.org/10.1016/j.healthplace.2012.01.012>
- Li, Xin, Tao Jia, Anne Lusk, and Peter Larkham. 2020. Rethinking place-making: aligning placeness factors with perceived urban design qualities (PUDQs) to improve the built environment in historical districts. *URBAN DESIGN International* 25(4): 338-356.
- Mannarini, Terri, Stefano Tartaglia, Angela Fedi, and Katuscia Greganti. 2004, "Image of neighbourhood, self-image and sense of community". *Journal of Environmental Psychology* 26: 202-214. <https://doi.org/10.1016/j.jenvp.2006.07.008>
- Masullo, Massimiliano, Francesca Caștanò, Roxana Adina Toma, and Luigi Maffei. 2020. Historical cloisters and courtyards as quiet areas. *Sustainability* 12(7): 2887. <https://doi.org/10.3390/su12072887>
- McCunn, Lindsay J., and Robert Gifford. 2014. Interrelations between sense of place, organizational commitment, and green neighborhoods. *Cities* 41: 20-29. <https://doi.org/10.1016/j.cities.2014.04.008>

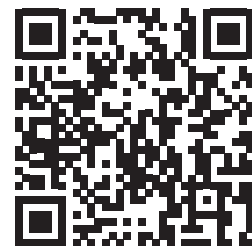
- Montgomery, John. 1998. Making a city: Urbanity, vitality and urban design. *Journal of urban design* 3(1): 93-116. <https://doi.org/10.1080/13574809808724418>
- Nairn, Ian. 1995. *The American Landscape*. New York: Random House.
- Navickienė, Egle. 2012. Infill architecture: chasing changes of attitudes in conservation of urban heritage. In *HERITAGE 2012-proceedings of the 3rd international conference on Heritage and Sustainable Development*, Vol. 2, 1325-1334.
- Önaç, Ayşe Kalaycı, and Gökçe Gönüllü Sütçüoğlu. 2021. Effect of urban change on place attachment: evidence from two locations from a city in Turkey with similar historical landscape values. *Arabian Journal of Geosciences* 14(11): 1-17.
- Proshansky, Harold M. 1978, "The city and self-identity". *Environment & Behavior* 10: 147-170. <https://doi.org/10.1177/001391657810200>
- Qodsi, Seyedeh Sarah, and Jamaluddin Soheili. 2016. Study of The Impact of Form Enclosure in Residential Complexes On the Sense of Place Attachment of Residents. *Specialty Journal of Architecture and Construction* 2(2): 43-52.
- Raymond, Christopher M., Marketta Kyttä, and Richard Stedman. 2017. Sense of place, fast and slow: the potential contributions of affordance theory to sense of place. *Frontiers in psychology* 8: 1674. <https://doi.org/10.3389/fpsyg.2017.01674>
- Rezaei, Hossein, Ghazal Keramati, Mozayan Dehbashi Sharif, and Mohamadreza Nasir Salami. 2018. A Schematic explanatory pattern for the psychological process of achieving environmental meaning and actualizing sense of place focusing on the intervening role of the perception. *The Monthly Scientific Journal of Bagh-E Nazar* 15(65): 49-66. [10.22034/bagh.2018.74083](https://doi.org/10.22034/bagh.2018.74083)
- Relph, Edward. 1976. *Place and Placelessness*. London: Pion.
- Relph, Edward. 2007. Spirit of place and sense of place in virtual realities. *Techne: Research in philosophy and technology* 10(3): 17-25.
- Salvesen, David. 2002. The Making of Place; Research on Place & Space. Website, 20 Feb. 2003, Mar, Available at <http://www.matr.net/print-4108.html>
- Seyyedpour Esmailzadeh, Mitra, Ahad Nejad Ebrahimi, and Vahid Vaziri. 2022. Prioritizing infill structure indicators in a historical context: In terms of economic sustainability-the vicinity zone of Tabriz historic bazaar. *Smart and Sustainable Built Environment* 11(3): 500-515.
- Shamai, Shmuel. 1991. Sense of place: An empirical measurement. *Geoforum* 22(3): 347-358.
- Smaldone, David, Charles Harris, and Nick Sanyal. 2008. The role of time in developing place meanings. *J. Leisure Research* 40: 479-504. <https://doi.org/10.1080/00222216.2008.11950149>
- Steele, Fritz. 1981. *The Sense of Place*. Boston: CBI Publishing Company.
- Ujang, Norsidah. 2012. Place attachment and continuity of urban place identity. *Procedia-Social and Behavioral Sciences* 49: 156-167. <https://doi.org/10.1016/j.sbspro.2012.07.014>
- Ujang, Norsidah, and Khaliliah Zakariya. 2015. Place Attachment and the Value of Place in the Life of the Users. *Procedia-Social and Behavioral Sciences* 168: 373-380. <https://doi.org/10.1016/j.sbspro.2014.10.243>
- Williams, Daniel R., and Jerry J. Vaske. 2003. "The measurement of place attachment: validity and generalizability of a psychometric approach". *Forest Science* 49(6): 830-840. <https://doi.org/10.1093/forestscience/49.6.830>
- Zhang, Jing, and Qiang Li. 2021. Research on the Complex Mechanism of Placeness, Sense of Place, and Satisfaction of Historical and Cultural Blocks in Beijing's Old City Based on Structural Equation Model. *Complexity*. <https://doi.org/10.1155/2021/6673158>

HOW TO CITE THIS ARTICLE

Moazen, Sajad. 2025. Investigating Variables of Sense of Place for the Infill Development of Historical Textures; Case Study: Semnan's Historical Texture. *Armanshahr Architecture & Urban Development Journal* 17(49): 19-32.

DOI: 10.22034/AAUD.2024.431159.2847

URL: https://www.armanshahrjournal.com/article_212547.html



COPYRIGHTS

Copyright for this article is retained by the author(s), with publication rights granted to the Armanshahr Architecture & Urban Development Journal. This is an open- access article distributed under the terms and conditions of the Creative Commons Attribution License.

<http://creativecommons.org/licenses/by/4.0/>

