Sense of place in the process of changing the configuration and activity of rural housing types
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ABSTRACT
The present study aims to investigate the effect of configuration changes and activities of rural housing types on the sense of place of residents. For this purpose, 382 houses from two types of rural housing in Guilan, Iran are randomly selected. The analysis of houses is done through space syntax and analysis of activities is done through structured interviews, chi-square test, and balloon and cluster analyses. Also, ten indicators are used to evaluate the sense of place in R software. The results show that the typological changes of rural housing have changed the configuration and the place of activities, affecting the sense of place of residents. It is observed that the sense of place in indigenous housing is more than engineered housing. Therefore, it is necessary to design a rural housing configuration with appropriate spatial quality for residents’ activities in order to strengthen their sense of place.

1. Introduction
Rural housing types’ change and orientation towards urban types affect the sense of place of residents (Caniggia and Maffei 1979; Chen and Thwaites 2013; Chigbu 2013; Wang et al. 2020). Sense of place establishes a kind of relationship between people and the place where they live and reflects the feeling of people’s dependence on the place of living. Paying attention to it can play a significant role in improving the quality of the environment and satisfaction (Relph 1976; Shamai and Ilatov 2005; Ardon 2006; Falahat 2006; Larson, D., and H. 2013). Adherence to urban patterns in new rural constructions has caused the sense of place of residents in indigenous architecture to be less considered (Krier 1979; Zetter & Boano, 2010; Shams Al-dini and Shakur Ali 2011; Azadeh Lak 2014; Gheibi and H. 2016). Continuation of this process, in a situation where about 2,100,000 housing units in the villages in the last 14 years have been renovated and rebuilt only by the Housing Foundation (Islamic Revolution Housing Foundation, 2018), can cause dissatisfaction and create the context for an anonymous place in the villages, accelerating escape and migration to cities (Chigbu 2013; Vasefian, Hosseini & Gheibi, 2016; Zarei, Hashemi & Golabi, 2019). It is such that from the first census of Iran in 1956 to the last census of 2016, the rural population has decreased from 68% to 26% and the most important reason for population decline has been the migration of people from rural to urban areas. The lack of emotional connection of residents with rural housing and environment along with other factors, such as economic and livelihood, have had a significant impact on rural migration (Pretty et al. 2003; Rostamalizadeh and Ardahae 2017). Therefore, decision-makers, planners, and designers of rural housing must recognize the impact of housing type on the sense of place to maintain and strengthen it. Sense of place has been welcomed by researchers in various scientific fields, such as psychology, sociology, architecture, and geography (e.g. Tuan 1977; Relph, 1976; Norberg-Schulz, 1979).

Some of these researchers have introduced their constituent dimensions and components and have enumerated one to four components. For example, Tuan (1977) emphasizes the role of the physical environment as a carrier of emotions from a geographical perspective. In this regard, the sense of place is created based on the action-reaction relationship between the physical environment and human perception (e.g., Steele 1981; Hummon 1992; Williams et al. 2010). In the perspective of environmental psychology, which is the approach of this research, theorists, in addition to the role of the physical environment, emphasize the dimension of residents’ activities in the sense of place (Canter, 1977; Punter 1991; Montgomery 1998; Smaldone, Harris, and Sanyal 2005; Falahat 2006; Chigbu 2013; Ghoomei et al. 2015).

Following these theories, a lot of research has been done to improve the sense of place. Some studies have examined the effect of physical factors and consider it to have different dimensions. One of these dimensions that has been emphasized a lot is spatial configuration (e.g. George & Campbell, 2000; Saraf & Ahlen, 2010; Gokce and Chen 2017). This dimension is also
important in typological analyses and activities and can be used to identify changes in the built environment over time in social and cultural phenomena (Hillier, Hanson, and Garham 1987; Ahrentzen, Levine, and Michelson 1989; Monteiro 1997; Dalton and Bafna 2003; Wicker 2012; Chen and Thwaites 2013). Another group of studies has examined the effect of activities on the sense of place. They acknowledge that the relationship of residents with places is created by this factor and the how of people’s activities affect the how of the environment and therefore the sense of place of people (Ujang and Dola 2007; Al-Obeydi & Hasan Ali, 2017).

Research has been conducted at various spatial scales, such as house, street, neighborhood, village, city or district. For example, Ghoomi et al. (2015) compared the components of sense of place on the scale of traditional and modern residential neighborhoods. The results of this study showed that in traditional neighborhoods, social activities and in modern neighborhoods, physical and visual environment has a greater impact on people’s sense of place. Musaab and Turki (2017) have dealt with the effect of socio-cultural activities on the sense of place on the street scale of Mosul, Iraq. The results of their research showed that the weakness of the sense of place in Neinawa Street is due to the weakness in social and cultural activities and to provide a sense of place in the center of Mosul, they consider it necessary to restore these activities. Gokce and Chen (2017) report the effect of typomorphological changes of residential environments on residents’ sense of place in three scales (neighborhood, street and house) in Ankara, Turkey. As a result of this study, the sense of place decreases over time through typo-morphological changes in the residential environment, especially when leaps and bounds occur. Their research showed that the sense of place is different in three scales so that residents have achieved a better sense of place in the building scale. In this study, changes in house scale through spatial configuration and function of spaces have been investigated using space syntax theory. Wang et al. (2020) examined the scale of rural areas in China. Based on the results of the study, the general sense of place of rural residents has shown significant growth in the period of urbanization and it was found that the more urbanization is seen in the city, the lower the sense of place is.

Although these studies have investigated the effect of typological changes and consequently spatial configuration on the sense of place, the simultaneous effect of configuration change and activities has not been investigated. This is while some studies (Eid 2004; Rapoport 2005; Wicker 2012) emphasize the adherence of configuration to activities and believe that by changing the spatial configuration of housing, its activity and place for residents will also change. On the other hand, in these studies, activity has been studied only with user variables, behavioral patterns, social and cultural roles and social interactions. However, according to the theories of cultural anthropologists such as Rapoport (2005), any activity can be analyzed based on its manifested dimension and how it is done, related activities, and the place of activity (Rapoport 2005; Scott 2005; Wicker 2012). In this regard, no research was found that examined activities based on this theory in rural housing types. Therefore, due to the importance of housing scale in assessing the sense of place of residents and typological changes in housing with this high volume of rural construction in Iran and the impact of these changes on housing configuration and thus changing activities as one of the dimensions of sense of place, it is essential to investigate the effect of these changes on the sense of place.

2. Purpose of the present study

Therefore, the purpose of this study is to investigate the effect of configuration and activity changes in rural housing types on the sense of place of residents. To achieve this goal, it is necessary to determine the configuration and activity-place changes of any housing type and the impact of these changes on the sense of place. This research was carried out with a case study in the rural part of Guilan as an example of the rich and long-term rural architectural culture of Iran which has undergone many changes in the typological structure of its various housing types over time. Guilan rural housing can be divided into two types of indigenous housing, which is housing without an engineering plan already built by the natives themselves, and engineered housing, which includes new constructions and is often designed in engineering offices.

3. Method

The present study is applied in terms of its objective and it is quantitative and qualitative (mixed) in nature, which has a three-pronged approach in combining spatial configuration analysis, activities and sense of place evaluation. Configuration and sense of place analyses are of quantitative research type and activities are in the category of qualitative research, the relationship between which is examined by a logical explanation by correspondence analysis in R software. The main strategy for sampling in this study was purposeful random selection of housing types and rural generation groups (old generation in indigenous housing and new generation in engineered housing) according to the purpose-based method and considerations related to the study method. The sample size is 382 types of housing according to Morgan table. From the selected samples according to the variables of space syntax, configuration information was collected by accurately interpreting the plans and activities of
residents through structured interviews (Coolen 2008) with family mothers. Gokce and Chen (2017) ten-point questionnaire was also used to measure the sense of place to provide a complete picture of residents’ spatial feelings about the housing in which they live. This methodology not only determines the impact of activity changes in housing types on sense of place, but also shows what characteristics of the activities and housing configuration of rural residents have changed.

4. Sample

4.1. Scope of study and sampling method

Guilan province is the twelfth most populous province located in the north of Iran, and its cultural-architectural basin is classified into nine sub-areas without considering the national and political divisions (Statistical Center of Iran 2016). The division of these basins is based on environmental factors (topography, climate . . .), type of agricultural activity, culture, religion (dialect, language) and type of indigenous rural architecture. These nine basins are two basins of the east and west branches, each of which has four sub-branches: coastal, plain, foothill and mountainous. The study area is Ashkor, one of the southeastern mountainous areas and the residence of part of the rural population, which includes 3 rural districts with more than 160 villages in three parts. The three areas are Lower Ashkor with the centrality of Ziaz with 52 villages and 5012 people, Upper Ashkor with Arkam centrality with 55 villages and 2864 people, and Central Ashkor with the centrality of Shoeil with 56 villages and 3657 people (Statistical Center of Iran 2016). The reasons for choosing these rural areas of Guilan are many changes in the typological structure of rural environment and housing, increased migration and population decline, as well as lack of research on rural architecture and lifestyle of the inhabitants of this area (Figure 1).

Sampling in this study was done from two types of housing (indigenous and engineered) to achieve more organized results and make a comparison between the views of people with different schemas, which includes two sampling to perform the questionnaire and draw plan. Based on purposive random clustering, 128 samples were selected in each Ashkor section. Due to the decrease in samples, the sampling volume was increased to 150 questionnaires and a total of 450 questionnaires were distributed. First, 10 villages were randomly selected from each section, then 15 questionnaires were randomly distributed in each village. Considering that in the study area, the number of indigenous housing was more than engineered housing and it was approximately 62% to 38%, it has been observed in sampling. Finally, 382 questionnaires containing complete and valid answers were returned to the researcher, of which 238 were from indigenous housing and 144 were from engineered housing. Then, to select the samples for drawing the plan, an overview of the selected villages (10 selected villages in each Ashkor section) was first performed. Two villages from each section and 10 indigenous and engineered houses were randomly selected from each village. Therefore, due to the similarity of the pattern of any housing in the sample villages and the variables of space syntax, a total of 60 indigenous and engineered housing were selected from the three sections for configuration analysis. Figure (2) shows examples of plan drawing, hierarchical graphs, and convex space of indigenous and engineered housing.

![Figure 1. Research scope.](image-url)
5. Instrument

**Justification graph** (Brown and B. 2001) and **UCL depthmap software** (Turner and Pinelo, 2010): were used for spatial configuration structure analysis. The basis for the formation of justification graph is derived from graph theory. Using this tool, the structure of each environment is plotted in the form of a graph in which each circle symbolizes a space and each line represents the relationship of its different spaces. In this tool, the structure and place of the various components of the plan are translated simply and legibly (Brown and B. 2001). Another tool used is UCL depthmap software, which is one of the most well-known tools used to analyze the structure of spatial configuration. Accordingly, the configuration structure analysis was performed using the concepts mentioned below. Connection is defined as the number of points that a point communicates directly with other points and is defined as Equation (1), where K is the number of points that are directly connected to the point under consideration. Depth is based on the number of steps that have to be taken to move from one point to another. It should be noted that the depth and integrity indices are inversely related to each other (Haq 1999), dij is equal to the number of distances calculated as Equation (2), n in this equation is the number of all graph nodes (Yazdanfar, Mousavi, and Zargar Daghigh 2008). The unity index has a direct and linear relationship with the connection index, i.e. the more connections space has and the more nodes it connects, the more unity it has (Heydari et al., 2017). Unity can be measured by relative asymmetry (RA) or real relative asymmetry (RRA). Here, Dn is the value of D, which provides the standard value for the measurement of unity, obtained from Equations (4) and (3).

\[ c_i = k \]  \hspace{1cm} (1)

\[ MD_i = \frac{\sum_{j=1}^{i-1} k_j}{n-1} \]  \hspace{1cm} (2)

\[ \frac{2(MD_i - 1)}{n - 2}, \quad RRA_i = \frac{RA_i}{D_n} = RA_i \]  \hspace{1cm} (3)

\[ D_n = 2 \left\{ n \log_2 (n + 2) (n - 1) + 1 \right\} \left\{ (n - 1) (n - 2) \right\} \]  \hspace{1cm} (4)

(Coolen 2008): was adopted to examine activities in rural housing types. It is a tool for studying the

**Figure 2.** Morphological pattern of housing types.
relationship between housing characteristics and residents’ activities (Coolen 2008). In this study, data were analyzed based on the environment in which family members perform their activities. Using this tool, mothers of both types of housing were interviewed. First, the names of the spaces were asked to identify the distribution of activities by the residents in each space by specifying the name of each space on the pre-drawn map. According to this process, the activities and characteristics of each space to perform these activities in it were obtained. The interviews were analyzed using the content analysis method and the results are presented in the goal-content table. Transcripts of interviews transcribed from recorded audio files were coded. To ensure the validity of the coding process, the content of each of the 10 interviews was independently coded by 4 other experts and the goal-content table was set. In the end, in a meeting with all these coding experts, the coding was compared and the differences were discussed to reach unity. The 32-item questionnaire was designed based on the coding table and was finalized after face review and pilot implementation. Figure 3 (shows the characteristics related to the activity and configuration analysis in different types of housing.

Measuring the sense of place: Ten-indicator (place attachment, place identity, place dependence, nature bonding, social bonding, aesthetics, privacy, sense of belonging, familiarity, and social interaction) questionnaire of Gokce and Chen (2017) was used. The index of aesthetics has 4 questions, nature bonding 6 questions, familiarity 2 questions, sense of belonging 4 questions, place identity 4 questions, place attachment 5 questions, place dependence 5 questions, social bonding 4 questions, social interactions 5 questions, and privacy has 9 questions that are all (48 questions) are scored on a 7-point Likert scale. To evaluate the validity of this questionnaire, Cronbach’s alpha coefficient was used. The value of these coefficients for each index according to Figure (4) is 0.60, 0.76, 0.80, 0.67, 0.86, 0.84, 0.84, 0.79, 0.70, and 0.60 for aesthetics, nature bonding, familiarity, sense of belonging, place identity, place attachment, place dependence, social bonding, social interactions, and privacy, respectively. Cronbach’s alpha coefficient of the whole test was equal to $\alpha = 0.81$. The questionnaire was organized in 3 parts. The first part included questions about the demographic characteristics of residents to control family life expectancy, education, employment, economic disputes, and length of residence.

![Figure 3](image-url)  
**Figure 3.** Characteristics related to activity and configuration analysis in housing types (reference: Authors).

![Figure 4](image-url)  
**Figure 4.** Sense of place evaluation model consisting of 10 indicators (Gokce and Chen 2017).
The second part was organized in the form of two tables. In the first table, the names of the spaces they have in their home should be written, and in the second table, there was a list of activities that asked the names of the space in which this activity often takes place. The third part of the questionnaire was the questions related to measuring the sense of place.

6. Results

Before analyzing the data, it is necessary to first describe the data. Because mothers had more control over the distribution of activities within their homes, respondents were mothers in both housing types. Their age range is from 20 to over 80 years. Older mothers were between 40 and 80 years old, most of whom were between 50 and 70 years old. In the new generation group, most people were between 20 and 40 years old. The level of education of the respondents also showed that in the old generation group, most of the participants (86.1%) were illiterate and 13% of them had under-diploma education and in the new generation group, most of the people (66.2%) had under-diploma education and 22.8% of them had a diploma. In terms of type of occupation, about 92% of the mother participants have been engaged in agriculture in the old generation group, but 36% of the mothers of the new generation were engaged in agriculture and 60% of them were housewives. Most respondents were homeowners in both house types and a small number of people were non-owners. Regarding the period of residence, it was found that 98.7% of the participants of the older generation have lived for 30 years or more. But in the new generation, most people (39.3%) lived between 10 and 20 years, and after that, 5 to 10 years had more frequency.

7. Describing and analyzing the pattern of activities

Chi-square test, balloon analysis and K-mean clustering were used to compare the activity and its occurrence in housing types. The results of Chi-square test showed that there is a significant difference between the two types of housing in all activities and their place of performance, and the results obtained are confirmed at the level of 0.001. Activities’ analysis showed differences in the frequency of collective family, social, individual and service activities in residential spaces (Figures 5 and 6). In indigenous housing, most activities take place in the “Nishteh Bukhnoneh” space (the main space of indigenous houses), which is a collective family space. While in engineered housing, most of the activities of family members are done in the individual space, i.e. “bedroom”. As can be seen in Figure 5, the abundance of indigenous housing activity space is in the “Nishteh Bukhnoneh”, “hall”, “around the house”, “yard”, “teiar”, “kitchen”, “ceiling”, “warehouse”, “WC” and “Bathroom”, “stable”, each of which is a base for specific activities. In this type of housing, the space of “Nishteh Bukhnoneh”, having the most activity, has a prominent role among other spaces. Figure 6 shows the frequency of activities in engineered housing spaces, which are “bedroom”, “hall”, “kitchen”, “yard”, “warehouse”, “hall”, “WC” and “Bathroom”, “ceiling”, respectively. Due to the fact that most of the activities of the residents of this type of housing are distributed in the “bedroom” space, this space has a prominent role compared to other spaces in engineered housing.

8. Cluster analysis of activity and place activity in housing types

K-mean clustering is one of the algorithms that is performed based on the number of clusters (groups). In the cluster analysis, the value of each cluster was determined by the color spectrum, in which the color red means more focus of residents on the activity and the place where it is done, and as the color spectrum fades, their value decreases. By observing the analysis of clusters, each cluster of activity can be defined and given a title. The selection of titles with process/performance aspects is shown based on Figures 7 and 8.

In addition, field studies related to the pattern of activities provide theoretical support for definition. In order to check and guarantee the validity of the selected titles, the factors were sent to 3 experts and their comments and tips were mentioned and the necessary corrections were made. The proposed items and titles of the activity model are classified into collective family, social, individual and service activities based on cluster analysis. Figure 7 shows the thermal map diagram along with clustering activity and place-activity of indigenous housing. The results of cluster analysis revealed that this type of housing has 5 clusters of activities, which are important to the residents in order.

Cluster 1 includes collective family and individual activities of parents (tea, lunch and dinner, watching TV, sitting together, eating breakfast early, parents sleeping, parents’ private activities, reception of female guests at weddings, anniversaries and vows, putting parents’ personal belongings, praying). Cluster 2 includes social and personal activities (personal activity of children, studying, sleeping of children, putting personal belongings of children, sleeping of guests, reception of guests, reception of private party of children, reception of strangers, reception of male guests at weddings, anniversaries and vows). Cluster 3 includes service activities (ironing, sewing, warehousing, Livestock care, performing Wudu, cooking), cluster 4 includes collective family, social and service activities (making walnut and Echium products, women’s
collective cooking, outdoor and semi-open family gathering and welcoming guests), and cluster 5 includes service activities (warehousing of Echium). The information in Figure 7 indicates that there are two clusters of activity place in the indigenous housing. Due to the fact that the focus of residents in this type of housing is more on collective family activities, one of the places to perform this group of activities is “Nishteh Bukhoneh,” which is recognized as a place-activity category because of its importance to residents. The second category of place-activity, in terms of less focus of residents on the cluster of social, personal and service activities, includes all places such as “hall”, “around the house”, “kitchen”, “telaar”, “yard”, “warehouse”, “stable”, “WC” and “Bathroom”. According to the results of indigenous housing cluster
analysis, any category of activities can be placed in the spaces that are formed. Based on this, collective family activity is in “Nishteh Bukhneh”, “hall” and “yard”, social activity is in “hall”, “telaar” and “yard”, individual activity is in “hall” and “around the house”, and service activity is in “kitchen”, “yard”, “telaar”, “warehouse”, “stable”, “ceiling” and “WC” and “Bathroom” (Figure 7).

Since there is individual activity of parents and one of the social activities in the space of “Nishteh Bukhneh”, but this space is a collective arena, it is in the place-activity category of collective family activities. On the other hand, it was found that cluster 1 is more important for the residents, but in the same category, the value of collective family activities (tea, lunch and dinner, watching TV, sitting together with the family, having an early breakfast) is more than the individual activity of the parents. Therefore, collective family activities in indigenous housing were
recognized as the most important category of activities compared to other activities (Figures 5 and 7). Figure 8 shows the thermal map diagram along with the clustering of activity and place-activity of engineered housing. The results of the analysis indicated that in this type of housing, there are four clusters of activities, which are in order of importance.

Cluster 1 includes individual activities (sleeping of children, putting personal belongings of parents, studying, private activities of parents, praying, sleeping of parents, putting children’s personal belongings, doing some things like ironing and sewing, doing personal activities of children, and reception of children’s private guests). Cluster 2 includes collective family and social activities (watching TV, sitting with family, reception of guests, reception of unfamiliar guests, sleeping of guests, reception of male guests at weddings, anniversaries and vows, and reception of female guests at weddings, anniversaries and vows). Cluster 3 includes collective family activities (cooking, early breakfast, tea, lunch and dinner) and cluster 4 includes collective family, social and service activities (outdoor and semi-open family gathering, welcoming guests, women’s collective cooking, making products, performing Wudu).

Based on the information obtained from Figure 8, it was found that engineered housing includes two
categories of place-activity. In this type of housing, the residents focus more on individual activities, based on which, the place of this cluster of activities is “bedroom”. Considering that more activities take place in it, it is recognized as a category of place of activity. Collective family, social, service activities and their place of performance, including “hall”, “kitchen”, “yard”, “telaar”, “warehouse”, “ceiling”, “WC” and “Bathroom”, are considered as the second category of place of activity in engineered housing due to less focus of residents on them. Based on the results of cluster analysis of this type of housing, it was found that collective family activities take place in the spaces of “hall”, “kitchen” and “yard”, social activity takes place in “hall” and “yard”, individual activity in “bedroom”, and service activities in “yard”, “warehouse”, “ceiling” and “WC” (Figure 8).

According to the researcher’s observations, the plan of the engineered housing (Figure 2) showed that the “telaar” space in most of the examples of this type of housing is located next to the “bedroom” space. Therefore, collective family, social and service activities in this space have been greatly reduced and this space has been removed from the place of these activities. Also, the performance of these activities by indigenous housing residents is more in the “yard” space in comparison to those who live in engineered housing (Figures 5 and 6). On the other hand, some places of service activities such as “ceiling” and “stable” have been removed from the configuration of such housing due to the reduction of agricultural and livestock activities among the residents of engineered housing. These activities have not been eliminated, but people use these spaces that exist in indigenous housing.

9. Spatial configuration analysis

To achieve the main research objective, it is necessary to investigate the effect of changing the spatial configuration of housing on the place of activities in housing types with spatial syntax analysis. Since the social interpretation of the RRA refers to the importance of space according to the type of space use (Hillier, Hanson, and Garham 1987; Zako 2006), this index shows that according to the value of unity in both types of housing, the place of collective family activities of the residents is the most integrated place of activity among other spaces (Table 1). As shown in Table 1, the place of collective family (Nishteh Bukhoneh, telaar and yard), social (hall, telaar and yard), and individual activities (hall and around the house) in indigenous housing is the place of more integrated activities compared to the place of collective family (hall, kitchen and yard), social (hall and yard), and individual activities (bedroom) in engineered housing with the lowest standard score of unity. These characteristics can be socially explained in housing types. The place of collective family, social and individual activities of indigenous housing in comparison with engineered housing has the highest unity and level of contact between residents with each other and with guests. This allows for group activities, such as family interactions, catering and other group activities, as well as social activities, such as reception of guests and better connection with residents.

Based on the calculations performed in Table 1, it was found that the place of individual activities in indigenous housing is more related to the place of collective family and social activities. However, in engineered housing, the place of individual activities is more separable, indicating the lack of permission for the presence of others and a high degree of control due to the nature of the activities allocated to these spaces in the engineered housing. It was also found that the place of joint service activities (yard, warehouse, WC, and bathroom) in the indigenous housing is “yard”, “warehouse” and “WC” that are more integrated and less separable than engineered housing. While the integration of “bath” of engineered housing is greater than indigenous housing. It should be noted that there is no “parking” space in the indigenous housing, and “stable” and “ceiling” space in the engineered housing. As mentioned, the load depth index has a social meaning. As the depth increases, the space becomes more private and the degree of impermeability to space and its relationship to the surrounding environment decreases.

The degree of privacy of the place of activities can be deduced from the depth of the spaces, which is presented in Table 1. According to the results, the place of collective family, social and individual activities in indigenous housing has less depth than engineered housing. These findings indicate that in indigenous housing, the degree of privacy of this category of activities is far less than engineered housing. Indigenous housing with this feature has shown better performance in facilitating relationships and more contact of family members with guests and their surroundings compared to engineered housing. It was also found that the place of joint service activities (warehouse, yard, bathroom, toilet), which was

| Table 1. Mean Connected (RRA), depth (MD), and number of spaces (N) of housing types including alley. |
| --- |
| Indigenous housing | Engineered housing |
| Space | RRA | MD | N | Space | RRA | MD | N |
| Alley | 1.33 | 3.76 | 30 | Alley | 1.8 | 4.15 | 30 |
| Yard | 1.19 | 3.53 | 30 | Yard | 1.62 | 4.10 | 30 |
| Warehouse | 1.63 | 4.24 | 24 | Warehouse | 1.94 | 4.18 | 13 |
| WC | 1.70 | 4.33 | 25 | WC | 1.86 | 4.37 | 28 |
| Bathroom | 1.94 | 5.07 | 20 | Bathroom | 1.89 | 4.52 | 26 |
| Hall | 1.46 | 3.93 | 27 | Hall | 1.50 | 3.98 | 28 |
| Kitchen | 1.61 | 4.52 | 21 | Kitchen | 1.51 | 3.9 | 27 |
| Nishteh | 1.44 | 3.97 | 26 | Bedroom | 1.63 | 4.13 | 26 |
| Bukhoneh | (1) | (2) | (3) | RRA | (1) | (2) | (3) |
| Around the house | 1.49 | 4.1 | 14 | Bedroom | 1.65 | 4.14 | 19 |
| telaar | 1.21 | 1.05 | 42 | telaar | 1.69 | 4.44 | 26 |
| Stable | 1.84 | 4.64 | 31 | Parking | 2.19 | 4.55 | 16 |
Table 2. Results of independent t-test of sense of place indices in housing types.

| Variable                | T    | Df  | P  | M.D  | S.E  | Lower limit | Upper limit |
|-------------------------|------|-----|----|------|------|-------------|-------------|
| Aesthetics              | 13.66| 261.69 | 0.001 | 4.05 | 0.30 | 3.47        | 4.64        |
| Sense of belonging      | -4.23| 352.51 | 0.001 | -0.65 | 0.15 | -0.95       | -0.35       |
| Privacy                 | 2.17 | 380   | 0.03 | 1.02 | 0.47 | 0.10        | 1.94        |
| Place attachment        | 11.17| 188.74 | 0.001 | 3.71 | 0.33 | 3.06        | 4.37        |
| Familiarity             | 14.68| 380   | 0.001 | 2.36 | 0.16 | 2.05        | 2.68        |
| Place identity          | 13.49| 235.55 | 0.001 | 3.00 | 0.22 | 2.56        | 3.44        |
| Place dependence        | 9.01 | 245.18 | 0.001 | 2.39 | 0.27 | 1.87        | 2.91        |
| Nature bonding          | 14.69| 228.20 | 0.001 | 6.30 | 0.43 | 5.46        | 7.15        |
| Social bonding          | 14.01| 380   | 0.001 | 4.08 | 0.29 | 3.51        | 4.66        |
| Social interactions     | 8.26 | 234.72 | 0.001 | 1.63 | 0.20 | 1.24        | 2.02        |

warehouse and bathroom in the engineered housing, and yard and toilet in the indigenous housing, has less depth (Table 1).

10. Sense of place in housing types

In order to investigate the effect of configuration change and place of activities on the sense of place of residents of housing types, the information obtained from the questionnaire in relation to the ten indicators presented in the research method section was evaluated using independent t-test and one-sample t-test. The results are presented in Tables 2, 3, and 4. Statistical analysis shows that there is a significant difference between the two types of housing in all indicators of sense of place. According to Table 2, the results are confirmed at the level of 0.03, 0.001. Based on the information in Table 3, the scores of ten indicators showed that the mean of aesthetics, nature bonding, familiarity, place identity, place attachment, place dependence, social bonding, social interactions, and privacy in indigenous housing is higher than engineered housing.

Only the mean of the index of sense of belonging is greater in engineered housing. Comparison of the scores of the indices shows that the indices of social bonding, place attachment, aesthetics, and nature bonding in housing types are more different than other indices of sense of place (Table 3). Also, the sense of place in two types of housing was analyzed using a one-sample t-test with a comparison of the mean of people with a value of 3.5 for each component, the results of which are reported in Table 4. According to the results, it can be said that there is a significant difference between all components of the sense of place and the mean of the whole population. The average population of housing types is higher than the average of the society.

11. Discussion and conclusion

This study investigated the state of sense of place in the process of changing the configuration and place of activity of rural housing types. In this research, activities and their place and spatial configuration were first identified. Findings indicated differences in activities, their place and configuration in types of housing. The results showed that in indigenous housing, collective family activities and in engineered housing, individual activities are more important for residents. It was found that most of the activities of residents are distributed in the collective family space in indigenous housing and in the individual space in engineered housing. Also, the combination of individual and social activities of the residents in the indigenous housing showed the desire of these people to social life. However, in engineered housing, the individual activities of the residents are separated from other activities.

This indicated that the social life in this type of housing is diminishing. Findings showed that the

Table 3. Mean value of sense of place indices in housing types.

| Variable                | M    | SD  | N   | M    | SD  | N   | M    | SD  | N   |
|-------------------------|------|-----|-----|------|-----|-----|------|-----|-----|
| Aesthetics              | 20.56| 2.50| 238 | 16.51| 2.98| 144 | 19.03| 3.33| 382 |
| Sense of belonging      | 15.37| 1.65| 238 | 16.02| 1.31| 144 | 15.62| 1.56| 382 |
| Privacy                 | 38.00| 4.68| 238 | 36.98| 4.05| 144 | 37.62| 4.47| 382 |
| Place attachment        | 28.09| 1.89| 238 | 24.38| 3.70| 144 | 26.69| 3.26| 382 |
| Familiarity             | 10.47| 1.43| 238 | 8.31 | 1.68| 144 | 9.58 | 1.91| 382 |
| Place identity          | 18.69| 1.69| 238 | 15.69| 2.32| 144 | 17.56| 2.43| 382 |
| Place dependence        | 25.52| 2.11| 238 | 23.13| 2.73| 144 | 24.62| 2.63| 382 |
| Nature bonding          | 30.61| 3.16| 238 | 24.31| 4.52| 144 | 28.24| 4.82| 382 |
| Social bonding          | 20.74| 2.66| 238 | 16.65| 2.91| 144 | 19.20| 3.39| 382 |
| Social interactions     | 17.45| 1.49| 238 | 15.81| 2.07| 144 | 16.83| 1.91| 382 |

Table 4. Results of single-sample t-test in housing types.

| Variable                | Independent housing |        | Engineered housing |        |
|-------------------------|---------------------|--------|--------------------|--------|
| Aesthetics              | 45.88               | 0.001  | 1.68               | 1.60   | 1.75   | 0.001  | 0.63  | 0.50  | 0.75  |
| Sense of belonging      | 14.62               | 0.001  | 0.37               | 0.32   | 0.42   | 0.001  | 0.53  | 0.48  | 0.58  |
| Privacy                 | 22.27               | 0.001  | 0.74               | 0.67   | 0.81   | 0.001  | 0.63  | 0.55  | 0.70  |
| Place attachment        | 88.03               | 0.001  | 2.12               | 2.08   | 2.17   | 0.001  | 1.38  | 1.25  | 1.50  |
| Familiarity             | 37.62               | 0.001  | 1.74               | 1.65   | 1.83   | 0.001  | 0.57  | 0.43  | 0.70  |
| Place identity          | 42.73               | 0.001  | 1.17               | 1.12   | 1.23   | 0.001  | 0.43  | 0.34  | 0.53  |
| Place dependence        | 61.93               | 0.001  | 1.62               | 1.56   | 1.67   | 0.001  | 1.15  | 1.06  | 1.23  |
| Nature bonding          | 47.62               | 0.001  | 1.61               | 1.54   | 1.68   | 0.001  | 0.56  | 0.44  | 0.68  |
| Social bonding          | 39.05               | 0.001  | 1.68               | 1.60   | 1.77   | 0.001  | 0.66  | 0.54  | 0.78  |
| Social interactions     | 35.65               | 0.001  | 0.86               | 0.81   | 0.91   | 0.001  | 0.46  | 0.38  | 0.54  |
place of occurrence of collective family, social and individual activities of indigenous housing is more integrated and of less spatial depth than the place of these activities in engineered housing. Engineered housing has more integration and less spatial depth in only a few places of service activities in comparison to indigenous housing. Another finding of this study is the difference in the sense of place in the types of housing. The mean value of indices of aesthetics, privacy, place attachment, familiarity, place identity, place dependence, nature bonding, social bonding, and social interactions in indigenous housing is more than engineered housing. A significant finding in the studied dimensions of sense of place is the high degree of sense of belonging in engineered housing compared to indigenous housing.

According to the research of Pir Babaei and Sajjadzadeh (2016), it seems that this phenomenon is due to the fact that the sense of belonging is affected by the mental experience of individuals, such as tradition, history, beliefs and the organization of rural context. In fact, it can be concluded that the high level of sense of belonging of the residents of engineered housing is due to the effect of these factors in the village scale that changes in the configuration and place of activities could not have a negative impact on the sense of belonging of residents. In order to investigate the main research objective, i.e. comparing the configuration, activity and sense of place in the types of housing, it can be found that indigenous housing residents have achieved a better sense of place compared to people living in engineered housing.

These differences can be related to Conter’s theory of change in residents’ behavioral places (the place of activities) so that the checklist of activities is the same in both types of housing. However, there is a better quality of space for activities to take place in indigenous housing than in engineered housing. This has strengthened and expanded the relationship and interaction of residents with each other, guests and the environment. Hence, this activity-place structure has had a positive effect on sense of place factors. But in engineered housing, these qualities have changed, reducing their relationship with each other and the housing and the surrounding environment, and as a result, their sense of place has not been strengthened. In fact, it can be said that the change in the configuration of engineered housing and its impact on the place of activities has led to a weakening of the sense of place of the residents of this type of housing.

These findings are consistent with Musaab and Turki (2017) who considered the weakness of the sense of place as a result of the weakness of activities. According to existing theories, activities and social structures are related to the housing spatial configuration system (e.g. Scott 2005; Rapoport 2005; Dursun 2007; Jeong and Ban 2011; Wicker 2012). It is such that the change of configuration system has changed the relationship between these two structures, and the change in this relationship affects the relationship of family members with the environment and ultimately the sense of place of residents. This has led to some dissatisfaction with engineered housing among residents. Therefore, in order to improve the sense of place, the configuration of rural housing should be designed in such a way that the place of activities has a suitable spatial quality to meet the spiritual and social needs, and satisfaction and sense of place of residents. Future research is suggested to extract features other than the configuration features of the place of activities to further explain the impact of housing types’ changes on residents’ sense of place so that this sense can be enhanced in rural housing.

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No potential conflict of interest was reported by the author(s).

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