

IMPACT OF FAMILY LIVELIHOOD ON THE SPATIAL ORGANISATION OF INDIGENOUS HOUSING IN BOSHROUYE, IRAN

Yasaman Hashemi Ghochani* and Akram Hosseini*

Abstract

Indigenous housing has been created to cater to the cultural, social, and economic needs of society as well as its family livelihood. Boshrouye City, located in South Khorasan Province, Iran, has a special livelihood system with valuable examples of indigenous housing. The present study aims to investigate the effects of the family livelihood and its associated activities on the spatial organisation of housing. For this purpose, 20 samples of indigenous houses were selected non-randomly and investigated based on the space syntax theory. Plans of houses were analysed using UCL Depthmap software and then evaluated through Convex and Isovist map analyses. The research method employed was the interpretive method. The results of the study indicate that the model of family livelihood has a significant impact on the spatial organisation of housing in Boshrouye City. This model has employed physical means, including the creation of new spaces and changing the role and configuration of spaces to protect the privacy of occupants. This privacy is one of the cultural requirements of this region.

Keywords: Indigenous Housing, Livelihood, Spatial Configuration, Space Syntax, Boshrouye, Iran.

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Introduction

The elements of the culture of a society develop under the mutual influence of the physical environment and are thus revealed through the structural organisation of space (Rapaport, 1969). This results from the fact that human behaviours are shaped within space and displayed through space (Scott, 2005). Conversely, if the structural features of space are identified, more human behaviours can be revealed, lifestyles can be predicted, and more social phenomena can be discussed than spatial structures (Hall, 1966). Studies on domestic space, on the other hand, can be extended to diverse cultural studies through microscopic approaches (Byun & Choi, 2016). Since the type of livelihood is one of the aspects of culture, the influence of housing on the type of livelihood of its residents is also one of the aspects of the manifestation of culture in the living patterns of its residents. The type of livelihood and its resulting economy play a prominent role in the formation of some Indigenous Housing (Khakpour et al., 2015). Therefore, the spatial organisation of indigenous housing can be considered in terms of the way it responds to the occupational system and family livelihood patterns.

One of the jobs prospering in Boshrouye is weaving Barak fabrics. Since weaving Barak was carried out inside houses, it required special space and activities. These activities could have violated the resident's privacy. This research aims to investigate the measures taken to prevent privacy violations (either in terms of physical access or visual privacy) in houses of Boshrouye with regard to the proximity of the workspace and housing. The main question of this research is, considering the cultural background of the people of this region, how the livelihoods of the family and its related activities have contributed to the configuration of the spaces of indigenous houses of Boshrouye. So, the manner in which work and living spaces are located in the general configuration of houses is analysed and compared in each of the three types of indigenous housing, in terms of the factors that prohibit the violation of privacy. The main hypothesis of the present study is that the

livelihood pattern of the people of Boshrouye, especially the Barak weaving profession, has played a significant role in the formation of the spatial configuration of indigenous housing in this place. In other words, indigenous housing spaces are organised to take into account the cultural issues of the region, following the pattern of livelihoods and work-related activities.

In this study, the space syntax theory is applied. This theory proposed by Hillier and Hanson (1984) emphasises the impact of social and cultural structures on architectural configuration. Seeking to identify a significant relationship between human factors and the physical environment, this theory tries to discover the social logic that shapes the configuration of artefact spaces (Groat & Wang, 2013).

The method used in this research is interpretive and the software outputs will be interpreted to answer the research question. This method is based on the assumption that social realities are not isolated or objective but rather based on human experiences and social contexts.

Literature Review

A house serves as the fundamental constructed space for individuals. Beyond being a mere refuge offering safety and defence against harm, it serves as a canvas for personal expression. A house becomes the backdrop for shaping one's identity, a space where individuality evolves, human interactions take form, and pivotal life experiences unfold (Marcus, 1997). It also reflects the social and cultural values and ideas of the society and culture where it is built and the characteristics and meanings of the time (Lawrence, 1987; Rapaport, 2001).

The form of housing, its organisation, and spatial order are strongly influenced by the environment and culture where it belongs. The spatial configuration of a house and its interior design can support or disrupt the culture of the inhabitants (Rapaport, 1969; Norberg-Schultz, 1974).

Spatial analysis of indigenous houses is a subject that has a deep connection with cognition of the cultural characteristics of its residents (Rapaport, 2005). Housing is the manifestation of different biological, cultural, social, subsistence, and economic ways, and the set of these factors has caused the formation of differences in the way indigenous settlements (Rostami, et al., 2021). Architecture, as a social phenomenon, originates from culture and influences it; therefore, indigenous housing in each region is considered a reflection of the culture and art of that region and is proportional to the changes that take place in other areas of life and culture.

One of the issues associated with lifestyle is the occupational system and livelihood patterns and each ethnicity regulates its place of residence based on its characteristics (Papoli Yazdi & Vosoughi, 1996). People's livelihood is one of the objective aspects of the crystallisation of culture in the life of the residents of a region, which is related to the concept of lifestyle as one of the aspects that shape culture (Afshari et al., 2015). This concept means the tools, solutions, and methods that people use to meet the needs of their lives. Livelihood means the abilities, assets, and activities that are needed to live and be alive (Chambers, 2005). Livelihood also includes the mechanisms of access to resources during the life cycle (Helmor & Sing, 2001).

The Economic-Livelihood function includes all the workshop and supply spaces in the house, which are used for production and subsistence activities, and are considered one of the main functions of many native houses. For example, the effect of livelihood patterns of the residents of Bustano village of Bandar Abbas City in Iran on the formation of settlements and the spatial organisation of village houses has been done by using flexible spaces with the ability to perform functional diversity, increasing the ratio of space to mass in the configuration system of houses as well as the construction of warehouses and suitable spaces for the preparation, separation, and depot of manufactured products (Rostami et al., 2021). The organisation of houses in the desert areas of

Iran can also be mentioned. A group of these houses owned by merchants, in addition to the main courtyard, had a second courtyard larger and more luxurious than the main courtyard, but related to it, for the residents' business relations. Business clients had no direct or visual access to the family yard. The culture of the people of these regions can be traced in these spaces.

The economic factor generally discusses how wealth is generated and distributed, inventory turnover, the production-distribution-consumption process of products, and their relationship with the physical structure of settlement context and housing. For most people, a home is a place for the distribution of wealth, control over life circumstances, and access to social resources, an important factor in the processes of social identity formation, and the establishment and maintenance of social relationships (Dunn, 2000).

The pattern of activities is set in a particular way in the context of a set of home areas that are organised to achieve privacy. In this way, it is essential to recognise the space hierarchy as a type of grading that emerges during the transition from a public to a private space (Hanson, 2003). It helps to understand the mutual relationship of spaces that are affected by their cultural context. Greenbam and Greenbam (1981) describe two almost contradictory functions -- preventing unwanted social contacts and facilitating social interactions. The avoiding function includes measures to prevent theft or aggression, provide a sense of security (Brown & Altman, 1983; Newman, 1973), express ownership and legal residence (Sommer & Becker, 1969), and provide privacy, especially visually (Pastalan, 1970; Tames, 2004).

According to Norberg-Schultz (1984), like accommodation options, humans have private and public housing; the spatial units they choose are of extremely sophisticated complexity. So, three characteristics can be considered: the sense of spatial identity, the sense of monopoly, and the communication control in space and time. According to Chermayeff and Alexander (1963), the description of the privacy of a house depends on

the physical components providing segregation, isolation, access, and controlled movement between scopes. People usually tend to use various behavioural mechanisms, including verbal, non-verbal, or environmental behaviour, as well as cultural norms and actions (Altman, 1975).

The literature refers to the organisation of indigenous housing systems by cultural systems and livelihood systems. This research highlights the role of cultural requirements resulting from the type of livelihood in organising the indigenous housing system of Boshrouye.

Research Setting

Location and Historical Background: Boshrouye City is located in South Khorasan province, Iran. Due to its location near the desert, the city's climate is hot and dry (Figure 1). Before 1200 A.D., Boshrouye was unknown. It was mentioned in the history of *Hafiz Abro*, one of the historians of the Timurid period as one of the small villages in the *Raghe* area, but its urban texture was formed during the Safavid era in 1500 A.D. with four neighbourhoods¹ (Figures 2 & 3).

Figure 1

The location of Boshrouye in South Khorasan Province, Iran



Source: Authors

Figure 2

Historical Residential Texture of Boshrouye City



Source: Authors

Figure 3

Historical Neighbourhoods of Boshrouye City: 1-Mian-Deh, 2-Ghale no, 3- Sar_pol, 4-Paeen Mahalle



Source: Authors

The Livelihood of the People of Boshrouye

The livelihood of the people in Boshrouye city has mainly been based on agriculture, livestock, and crafts. Agriculture is based on underground water resources and fertile lands, and the major products are cotton, barley, wheat, saffron, pistachio, and pomegranates. The presence of a delta on the coastal area of the desert, a place where groundwater surfaces, has provided favourable vegetation for livestock breeding.

The most popular handicrafts and household industries of Boshrouye city are industries dealing with copper and other metals, woodworking, forging, mat weaving, grindstone, and sewing on fabrics, Barak weaving, carpet weaving, and Jajim (a kind of carpet) weaving. Barak weaving can be considered the main handicraft of this city. Barak is a soft and thick fabric that is woven from camel wool or goat fluff. This fabric is used to sew winter clothes. It is smooth, yet, has great strength. Weaving Barak requires some special equipment and workspace, including a hole named Barak hole, spinning, and Chele-Keshi, a kind of weaving

machine. There were places for Barak weaving in many houses in Boshrouye City and the production of Barak fabrics was surplus, largely to cater to the needs of the local residents. The presence of camel meadow in the region, which has been the source of appellation for this ancient region, has been an enormous source for these Barak fabrics - the source of dry farming or Bosh plant growing in this region. Weaving Barak has helped the people satisfy their basic needs and the city to move towards urbanisation².

The people of Boshrouye follow the Islam religion; they have strong privacy for their personal lives, both in terms of their Persian character and what was recommended in Islam. Since the family plays a very serious role in their belief system, it is also important to protect the privacy of the family from strangers. For example, by arranging the mass of their house around courtyards, the house separates from the outside environment so that only "Hashti" connects the inside with the outside. All housing components were also organised to protect the family's privacy.

Classification of Indigenous Houses in Boshrouye According to the Livelihood Model

Housing in this area is affected by the desert region of Iran and its excessive heat. Historical buildings in Boshrouye have an introverted architecture with central courtyards and dome roofs, whose dominant materials are clay and mud.

These houses generally include three types of spaces; open (yard, roof, and in some cases patio), semi-open (balcony and veranda), and enclosed (including *Panj_dar*³, *Shah_neshin*⁴, *Hoz_khane*⁵, cellar, service rooms, amongst others) spaces. Kavian and Gholami (2017) presented three types of houses, according to the pattern of livelihoods of the inhabitants.

The first type is small houses belonging to nuclear families with limited family and work

relationships. The livelihood of these families was limited to agriculture and animal husbandry, which in the cold seasons of the year began to weave Barak.

The second type is *Chahar_Soffe*⁶ houses whose inhabitant's livelihood was through weaving Barak. The third type is houses with large aristocratic courtyards belonging to extended families with a more extensive network of trading connections. Owners of these houses began trading Barak products produced by newly-set businesses.

Smaller houses often have a longer background than two other houses. But this type continued even after the appearance of the third type in the nineteenth century and belonged to families with lower social and economic status. Specifications of all three types are illustrated in Table 1.

Table 1

Specifications of Houses by Types

House type	Livelihood patterns	Work-related activities	Related spaces
Small houses	- Limited animal husbandry and agriculture - Limited <i>Barak</i> weaving in cold seasons	- Packing agricultural products at home for storing, flour making, and preparing straw for livestock - Spinning - <i>Chele-keshi</i> - Weaving of fabric	- Creating <i>Banje_Dou</i> at home to store wheat - Building straw room at home to store livestock forage - Using semi-open space of <i>Soffe</i> or courtyard in summer - <i>Barak</i> hole in the northern <i>Eyvān</i>
Medium-sized houses (Often <i>Chahar_Soffe</i>)	- Weaving <i>Barak</i> on a large scale	- Separating the fluff of the goats and camels - Spinning - <i>Chele-keshi</i> - Weaving fabric - Selling <i>Barak</i> to retailers and wholesalers	- <i>Barak</i> hole in the northern <i>Eyvān</i> - A room for weaving <i>Barak</i>
Large houses (Double <i>Eyvān</i>)	- Major farmers - Trading <i>Barak</i>	- Packing agricultural products at home for storing and flour-making - Doing business with retailers and wholesalers	- Creating <i>Banje_Dou</i> at home to store wheat - Building straw room at home to store livestock forage - Providing a place to trade <i>Barak</i> fabrics and meet businessmen

Source: Authors, Based on: (Kavian, Gholami, 2017, Madahi, Memarian, 2017, Madahi, et al. 2017, Madahi, Memarian, 2019)

Methodology

Data Collection and Case Studies

The social changes that took place in the contemporary era changed many issues compared to the traditional society. These changes include their lifestyle and the separation of work and home. Boshrouye also changed in this area over time. The livelihood changed and the work was transferred to some centres outside the homes. For this reason, contemporary homes are not included in this study. On the other hand, the houses before the Safavid period were destroyed and there is not enough documentation of them. So, the scope of this research is houses of the Safavid and Qajar periods that belong to the 17th to 19th centuries AD.

The data of this research includes historical information, maps, and images. Historical information was obtained through library studies. The required maps and information about the spaces of the houses were gathered via field method, including a survey of house plans and interviews conducted by the authors. First, the Cultural Heritage Department of Boshrouye provided the list, including houses registered in the national heritage record. Then out of these, maps

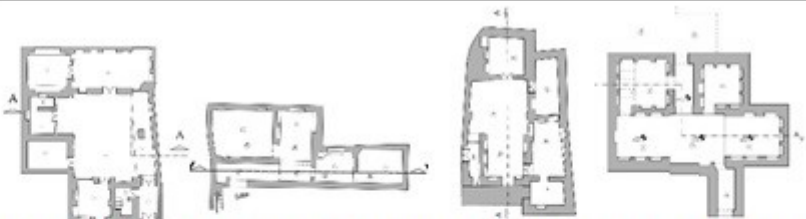
of 22 available houses were collected through a direct survey. Most of these houses are still inhabited (15 of 22). In this process, all rooms and spaces were thoroughly surveyed and photographed. However, three houses had inaccessible spaces, so their maps were drawn utilising questioning the owners.

To better understand the spatial relationships of the houses, interviews were conducted with some current residents and two experts from the Cultural Heritage Department. Approximately, 15 maps of the houses were also provided through the archive of the Cultural Heritage Department and documents in previous studies.

Twenty-three samples had information about the Barak hole and workspaces. Due to the extent and volume of the subjects, 20 samples were selected with the criteria included in Table 1. Of these, eight houses were small, six were medium-sized, and six were large (Table 2). All these samples were located in the primary core and historical district of Boshrouye.

Table 2

Selected Samples

First type (small houses) Average number of spaces: 11 Very small courtyards				
	Single Soffeh House	Khakshour's House	Jahani's House	Hossein Pour's House
				
	Attar's House	Nasiri's House	Kheyri's House	Khazaei's House

Contd...

Second type (Medium-sized houses) Average number of spaces: 21 Small and Medium-sized courtyards	 Forouzan Far's House Attaei's House Panahi's House Molla Abdolali's House Javdani's House Molla Mohammad Taghi's House
Third type (large houses) Average number of spaces: 35 Either one very large courtyard or a few yards	 Asadi's House Akbari's House Panahi's House Mostoufi's House Garden's Khan Asadi's House

Source: Authors

Data Analysis: Tools and Methods

The spatial organisation of the houses was analysed using the space syntax method and UCL Depthmap software. Map analysis was done through two techniques, including convex and Isovist maps. In the former, the spatial relationships of the house plans and index of connectivity, integration, and step depth were examined. Isovist maps of spaces intended for work-related activities, particularly those related to strangers, (such as fabric delivery, and sales, amongst others) were prepared.

As mentioned, to analyse the samples, indigenous housing was divided into three - small, medium-sized, and large houses. All three indices of connectivity, step depth (from the entrance of the house), and integration were examined for all spaces of plans using UCL Depthmap software. Then, these indices were compared in spaces such as entrance, courtyard, Eyvān (northern and others), and rooms. At first, the plans were analysed and compared in each group. Then, the average of these indices was compared among groups.

To investigate the admission limit of strangers and businessmen to the house and visual privacy of spaces, northern Eyvān, courtyards, entrance, and guest rooms, maps were analysed using Convex maps, and Isovist maps were prepared. The viewing angle for these maps was 120 degrees and the centre of space was considered as the location of the observer. Some houses of the third type- large houses- had two courtyards so they had their analyses separately. In this type of house, the entrance from the exterior rather than the interior courtyard was considered as the origin for step depth analysis. And since there was no Barak weaving in these houses, investigation of the Isovist map was unnecessary for the northern Eyvān.

Data Analysis

Analysis of Plans through the Convex Method:

In each of the following tables, the average of connectivity [Table 3], integration [Table 4], and step depth [Table 5] indices for all spaces are presented in the three types of houses. Since some spaces are important for their relation with livelihood patterns such as the entrance Eyvān, the northern Eyvān, and the guest room, they are presented separately from some spaces of the same kind. It should be noted that the connectivity and step depth indices always have an integer value, but here, because the average of 20 samples is presented, it can also be decimal. As an example, one of the plans analysed via the Convex method for each group in the Depthmap software is presented in Table 6.

Table 3

Average of Connectivity Index of Indigenous Housing Spaces of Boshrouye

Space/Type	Small Houses	Medium Houses	Large Houses
Entrance	1.25	1.2	1.6
Main Courtyard (Interior yard)	5	8.2	11
Secondary Courtyard (Exterior yard)	-	-	8
Eyvān of Entrance	3.25	3	4
North Eyvān	1.6	1.8	2.5
Other Eyvān	2	2	3.2
Rooms	1.3	1.7	1.4
Guest Room	1	1.3	1.3
Living Room (Wind tower Room or Hoz_khane)	1	2	3.5

Source: Authors

Table 4*Average of Integration Index of Indigenous Housing Spaces of Boshrouye*

Space/Type	Small Houses	Medium Houses	Large Houses
Entrance	0.6	0.6	0.8
Main Courtyard (Interior yard)	1.9	2.4	2.1
Secondary Courtyard (Exterior yard)	-	-	0.6
<i>Eyvān</i> of Entrance	1.2	1.3	0.9
North <i>Eyvān</i>	0.9	1.1	1.3
Other <i>Eyvān</i>	1	1.2	1.2
Rooms	0.7	0.9	0.8
Guest Room	0.6	0.8	0.8
Living Room (Wind tower Room or <i>Hoz_khane</i>)	0.6	0.8	0.9

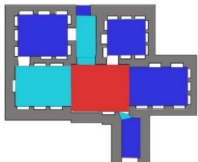
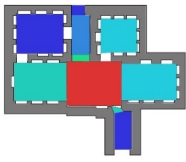
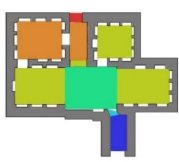
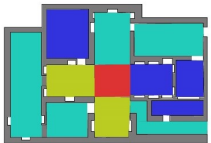
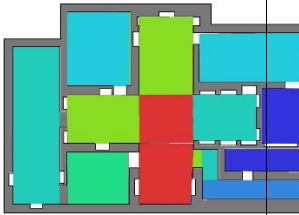
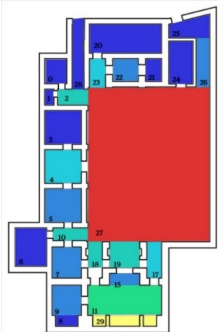
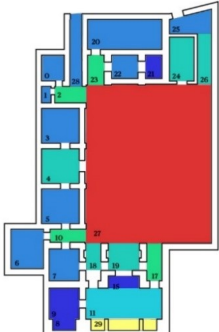
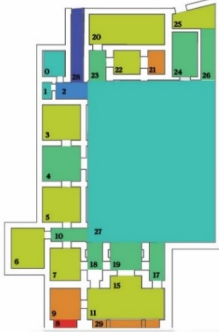
Source: Authors

Table 5*Average of Step Depth Index of indigenous Housing Spaces of Boshrouye*

Space/Type	Small Houses	Medium Houses	Large Houses
Entrance	0	0	0
Main Courtyard (Interior yard)	2.8	3.5	4.5
Secondary Courtyard (Exterior yard)	-	-	2
<i>Eyvān</i> of Entrance	2.7	3.5	4
North <i>Eyvān</i>	4.2	5	5.25
Other <i>Eyvān</i>	4	4.8	5.6
Rooms	4.6	5.6	6.5
Guest Room	2.7	3.3	2.5
Living Room (Wind tower Room or <i>Hoz_khane</i>)	5	6.5	6.6

Source: Authors

Table 6*Convex Plans Sample for Connectivity, Integration, and Step Depth Indices*

Sample plans	Connectivity	Interrelation	Step depth
Small type (Hossein Pour house)			
Medium-sized type (Javdani house)			
Large type (Akbari house)			

Source: Authors

To interpret the results, due to the difference in the area of the houses and the number of spaces in each type, a relative disparity of indices such as connectivity and step depth was expected. Therefore, the significant difference between these indices in some spaces or the absence of this difference was considered to interpret the data. First, for each space, the connectivity, integration, and step depth indices were investigated in each of the three types, and then, different spaces of all three types were compared.

The connectivity index in the entrance of all types has a similar value. In all houses, the entrance was directly related to only one or two other spaces (including the corridors and, in some cases, guest rooms). The main courtyard in all

houses has by far the highest connectivity index. Even in houses with two courtyards, the connectivity index in the main courtyard- interior- is higher than the secondary courtyard- exterior-.

In the majority of houses, there is an Eyvān, entrance Eyvān. The connectivity index on the entrance Eyvān is relatively close and high (3- 3.25 -4). This Eyvān is directly connected to the entrance corridor and the courtyard on both sides and in some cases, it is connected to one or two rooms. The northern Eyvān was of particular importance since this space had signs of Barak weaving tools in some samples. The northern Eyvān in large houses has a higher connectivity index (2.5) in comparison to medium-sized (1.8) and small houses (1.6).

The connectivity index of rooms is the same and lower than other spaces of all types. There are three small houses, five medium-sized houses, and one large house with a room (or rooms) connected to the entrance. This room has often been the residence of guests. In the guest room, the index of connectivity in all types is equal and at the lowest value. The living room or Hoz_khane has low, relatively higher, and relatively high connectivity in small, medium-sized, and large houses, respectively.

The integration index is the lowest and similar to the entrance of all houses. The highest index of integration among the spaces of the houses is seen in the interior courtyard. Unlike the interior courtyard, the exterior courtyard has the lowest integration. The entrance Eyvān has a relatively low integration index. But, surprisingly, among the three types of housing, the interrelation of the entrance Eyvān in large houses is lower than in medium-sized and small ones. In the living room and other rooms of all three types, like connectivity, the integration index is similar and low. The guest room also has the minimum integration index in all three types (in large houses after the secondary courtyard).

Because the entrance was considered as the origin space for step depth evaluation, the depth of this space is zero. The guest room and the secondary courtyard are the second deepest, followed by the entrance Eyvān. The step depth of this space is lower in smaller houses (2.7), mediocre in medium-sized houses (3.5) and higher in large houses (4). After that, the interior courtyard is located and the step depth of this space in all three types is high and slightly more in comparison to the entrance Eyvān. The step depth of the northern Eyvān and other Eyvān s have similar and relatively high values in all three types. After the Eyvān, the rooms have a great step depth (4.5 to 6.5) and are considered to be the most private spaces in the house. The maximum step depth is seen in Wind tower rooms and Hoz_khane which is the family's living room, especially in warm seasons.

Analysis of Plans through the Isovist Map Technique

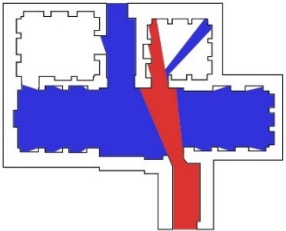
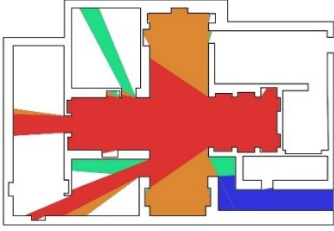
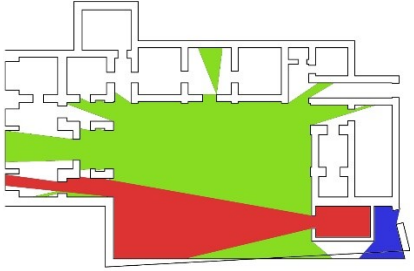
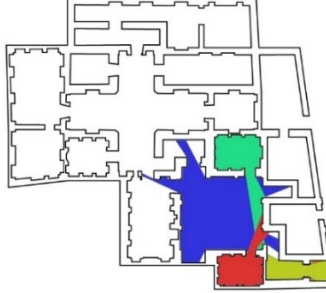
Samples of plans analysed through the Isovist map technique are presented for all types of houses in Table 7. Since the third type included two types of plans - one courtyard and two courtyards - analyses were done separately for each type. The location of the observer in plans was the centre of all spaces where business-related activities were carried out. In addition to the Isovist plans, the total number of spaces and the number and percentage of spaces having visual privacy are also provided for each house in Table 7.

In the Convex method, index analysis was performed regardless of the shape and geometry of the plan. But in the Isovist method analysis, the shape and dimensions of the spaces, the location of the entrance, etc., affect the evaluation of plans. The results indicate the amount of visual privacy in the spaces. On average, 1 space (16 per cent) of small houses, 3 spaces (25%) of medium-sized houses, 12 spaces (50 per cent) of large houses with one courtyard, and 21 spaces (70 per cent) of large houses with two courtyards are completely out of sight from the centre of the spaces where work-related activities were conducted. Spaces whose most parts are invisible make up 16 per cent, 25 per cent, 25 per cent, and 10 per cent of total space in small houses, medium-sized houses, large houses with one courtyard, and large houses with two courtyards, respectively. Most spaces that enjoy visual privacy include rooms and service spaces. Therefore, as the area of houses increases, the percentage of spaces with visual privacy increases.

Interpretation of Outputs

The entrance has low connectivity and the lowest integration among all spaces. The entrance location and its spaces follow the same pattern in all houses. Since the entrance is considered the border between the exterior public space and the interior space, its lack of integration with the other spaces of the house distinguishes it from other spaces. So, it marks the private area of the house.

Table 7*Isovist Plan Samples for Three Types of Houses*

The first type: Small houses Total number of spaces: 6 Number of spaces with visual privacy: 1 Percentage: 16 	The second type: Medium-sized houses Total number of spaces: 12 Number of spaces with visual privacy: 3 Percentage: 25 
The third type: Large houses with one courtyard Total number of spaces: 24 Number of spaces with visual privacy: 12 Percentage: 50 	The third type: Large houses with two courtyards Total number of spaces: 30 Number of spaces with visual privacy: 21 Percentage: 70 

Source: Authors

The main interior courtyard has the highest level of connectivity and integration among all the spaces. This space has a large step depth. To reach the interior courtyard from the entrance in large houses, one needs to pass 4 to 5 spaces; and in small and medium-sized 3 to 4 spaces. This provides an appropriate hierarchy for entering the private house. While entering from the exterior space to the house is completely controlled, entering from the courtyard to other spaces is unlimited. This potential of the courtyard is used to organise the entire space of the house. Even in houses having two courtyards, the majority of spaces of houses surround an interior courtyard. Therefore, in all types, the courtyard, regardless of livelihood, plays a key role in organising private spaces of houses.

The exterior courtyard seen only in some large houses has a high connectivity index- the highest after the main courtyard- and a low integration and step depth. It represents an active social space with a set of spaces around it, including warehouses, rooms, and corridors. This complex is located near the entrance and separated from other areas of the house. Because large houses have been places to trade Barak fabrics, this space has been a place for work activities with strangers, and customers. This can be confirmed by the guest room around this courtyard. The location of this courtyard with its surroundings near the entrance, the hierarchy of entering the private area, and the retreat and creation of a level difference with a stair at the entrance of the corridor provide accessibility from this courtyard to the interior courtyard (Figure

4), and the fractures of the corridor (Figure 5) are the methods to prevent the violation of the visual privacy and physical access.

The entrance Eyvān has a relatively high connectivity index and a low integration. Among the three types of housing, integration of entrance Eyvān in large houses is less than in medium-sized and small houses. This is because the entrance Eyvān located after a corridor is a joint between the

private sector, the place of living, and the semi-public sector, the workplace, in most of the samples. So, it is organised in a way that is more distinct than the two other types of houses to which strangers travel less.

Figure 4

Entrance of Corridor Providing Access from the Exterior Courtyard to the Interior at Panahi's House



Source: Authors

Figure 5

How to Access from the Exterior Courtyard to the Main Courtyard of Panahi's House



Source: Authors

According to the authors' observations, some samples had a place for *Barak* weaving in the northern *Eyvān* (Figures 6 & 7). Among the samples, there were five out of eight small houses, all medium-sized houses (six), and three out of the six large houses with a northern *Eyvān*. The connectivity index of this *Eyvān* in larger houses is more than the other two, while its area in large houses is significantly lower than in small and medium-sized houses. Therefore, the northern *Eyvān* either does not exist in large houses or is a small communication space rather than the main

space. But in some small houses and all medium-sized houses, this space is bigger and has changed its communicational role to the main spaces of the home for *Barak* weaning. The reason is that *Barak* weaving was done mainly in cold seasons when agriculture was out of the question while this place received the pleasant heat of sunlight. Also, this *Eyvān* in medium-sized and small houses are often in contact with a room. This room can be used to store *Barak* fabrics and even as *Barak* weaving workshops.

Figure 6

Signs of the Barak Hole on the Northern Eyvān of the House of Mollah Mohammad Taghi



Source: Authors

Figure 7

Signs of a Barak Weaving Machine on the Northern Eyvān of the House of Molla Mohammad Taghi



Source: Authors

In all houses, connectivity and integration indices of rooms are low and step depth is high. Creating an appropriate space hierarchy for entrance rooms that are the most private spaces in the house, and minimizing relationship and continuity with other spaces along with visual privacy, are the most important mechanisms employed to prevent the violation of family privacy.

The guest room has the lowest amount of integration and connectivity and low step depth. This reflects the importance of separating the work area from the house, yet, is consistent with the pattern of family livelihood. To the extent that in all the bigger houses where business communication is more extensive due to the *Barak* business, this room is required. The guest room is organised in all houses in such a way that it can be separated from other areas of the house. Therefore, strangers or guests stayed in the public sector and at the entrance in order not to disturb the privacy of the occupants.

The Wind tower room in large houses has more connectivity in comparison to small and medium-sized houses. The step depth of this space in all houses is the highest and its integration with other spaces is relatively low. In small and medium-sized houses with a nuclear family pattern and limited family relationships, this space has low connectivity, with a marginal difference from other rooms. But in large houses whose living patterns are extended families with more relationships, the Wind tower room, and *Hoz_khane* are more connected to other rooms and more distinct from them. The high level of connectivity of this space in large houses shows that this area has been the centre of the house's activities. This is due to the superiority of the collective to individual lifestyle in the cultural model of this region. The position of this space at the maximum step depth is to protect family privacy.

In large houses, visual privacy receives more attention. This is because in larger houses, due to wider business and social relationships, the privacy of the family is more prone to violation. Therefore, the shape and arrangement of the spaces are

organised in such a way as to prevent the arrival of strangers to the inhabitants' living places. Since the livelihood of the family in small and medium-sized houses was based on *Barak* weaving, workspaces (such as the Northern *Eyvān*) were used by family members, rather than strangers. Therefore, it was unnecessary to provide visual privacy.

Discussion

Geographical conditions in Boshrouye with a certain climate have supported a certain type of livelihood and economic system. Systems and methods of production, while linearly forming the cultural systems of the people, along with cultural systems such as beliefs and values of the people have also affected the housing structure of Boshrouye as the mentioned livelihood activities needed their own spaces and those spaces, influenced by cultural variables, caused a special spatial organisation. Therefore, the quadruple climates, livelihood, culture, and housing structure of Boshrouye can be narrated as follows:

The livelihood of the inhabitants of Boshrouye, when it was a small village, was limited to agriculture and animal husbandry. Each occupant probably had a small land adjacent to the village that produced as much produce as their household needed. These houses were formed as a central courtyard based on the pattern of indigenous housing in the hot and dry climate of Iran. They were not very large, and the financial capacity of the occupants did not make it possible. The small household from the nuclear system did not need larger spaces, and the compactness of the unit and yard provided shading in the long summers of this climate; in addition to all this, simple rural life did not need variety in spaces. The limited number of livestock meant that these houses did not have stables, and the livestock was kept either in the yard or on the roof of the house. This first caused the yard to be empty of green space, contrary to the housing pattern of desert areas, and the second gave rise to the existence of stairs outside the house to move livestock to the roof. These two

were the first effects that livelihood had on the spatial organisation of these houses.

Farmers also created storage space for wheat, flour, and other produce in the colder southern corner of the house. In the winter, with the completion of agricultural work, occupants began weaving *Barak* to help support household expenses. The north *Eyvān*, which was previously the main living space in winter, was dedicated to *Barak* Hole as it provides favourable heat by absorbing sunlight in winter. Gradually, due to the profitability and feasibility it had found, weaving *Barak* became one of the main and profitable livelihoods of these families. More affluent people were able to build the medium-sized homes of the next period. In these houses, the space of the north *Eyvān* was made wider from the beginning to carry out wider weaving. With the difference, this time weaving was also done in summer. In summer, relying on the nature of sunlight at high and direct heights, a good shade was created on the high and large north *Eyvān* by projected roof and walls, while the height and angle of the sun prevented *Eyvān* from getting warm in summer. Therefore, the weaving space was warm in winter and had a suitable temperature in summer.

Naturally, in the summer, the south *Eyvān*, with its pleasant cool set-up, was used as the main living space for the family. The *Barak* produced at this stage were bought by small traders and taken to the city. Over time, the merchants created the third type of housing. The new *Chahar-Soffe* houses had a large area, because of the financial means of the owners and their extended multi-family structure since the occupants, who had a lot of free time now, needed a variety of spaces. Of course, bigger and more beautiful houses, by creating a feeling of distinction and superiority, could also have a positive effect on attracting customers.

There was no production activity in these houses and only the exchange of goods was done by their trader owners, so these houses have no *Barak* hole. These houses either have a very large

yard or more than one smaller yard for business and the main yard for family use. In these houses, there is a guest room for commercial exchanges. The fact that there were only two small markets in Boshrouye, despite the boom in *Barak* weaving, indicates the serious role of these houses in trading.

As discussed in the previous section, home spaces are organised in such a way that doing work at home does not endanger the privacy of the family. For example, the entrance space, regardless of the socio-economic status of the occupants, has low connectivity and integration in all three groups of houses. The guest room, storeroom, or exterior courtyard has low connectivity and integration with other spaces in the house. The main courtyard has high depth and integration, the *Eyvān* of the entrance has low integration, and the rooms have high depth and low connectivity and integration with other spaces. In general, it can be said that the spatial configuration of Boshrouye housing, which was affected by the living system of the occupants, was adapted to the cultural system of the occupants in the following ways:

1. Creation of new spaces based on the pattern of work-related activities and livelihood such as the formation of a separate courtyard in large houses with a set of surrounding spaces, including a guest room, warehouse, and a second entrance operating independently from the other house spaces.
2. Changing the roles of spaces such as changing the connectivity role of the northern *Eyvān* into the main space for *Barak* weaving.
3. The impact on the spatial organisation such as increasing the hierarchy of entry into the house from the second entrance in larger houses to control entry into privacy, and changing the layout of spaces in large houses gave appropriate visual privacy to more houses.

Conclusion

The present study aims to investigate the effect of family livelihood and its related activities on the organisation of indigenous house spaces in Boshrouye. In the Convex analysis of the plans, the issues related to privacy in terms of physical access, including sociality of spaces and being private or public, connectivity index, separation or continuity, integration and hierarchy, and step depth, were examined. Isovist analysis, however, investigated visual privacy. Finally, the impact of family livelihood with emphasis on *Barak* weaving on the spatial configuration of indigenous housing was shown by examining and comparing each of the spaces in all three types of housing in Boshrouye. These effects include the creation of new spaces based on the pattern of work-related activities and livelihood, changing the roles of spaces, and the impact on spatial organisation.

Although the livelihood patterns have been effective in the spatial organisation of indigenous housing in Boshrouye, their effects have been within the cultural context of the region. In some spaces, especially the main spaces of the house, such as the rooms, the main interior- courtyard, the entrance, etc., the spatial organisation and indices, regardless of the type of livelihood in the family in all samples, have been either constant or influenced by cultural issues, rather than by livelihood pattern. Spaces for work-related activities were organised in such a way as to prevent the

violation of family privacy in terms of physical aspects and visual access. The model of family livelihood has been one of the factors forming the spatial organisation of indigenous housing in Boshrouye. Yet, it has meant to guarantee a more culturally essential issue of this region, privacy.

This research can be used to acquaint researchers with the methods that indigenous architecture has used to adapt the built environment, especially housing, with environmental, economic, and cultural structures.

After the global experience with COVID-19, the boundary between work and home has rapidly shifted and become ambiguous. Despite the challenges posed by the pandemic, many employees now prefer working from home. The accessibility and increased speed of the internet and technology have further diminished obstacles in this direction. Embracing more remote work necessitates a permanent transformation of residential environments, requiring the design of spaces within residential units to enhance versatility and promote efficiency. In contemporary architecture, the findings of this research can guide residential project designers and developers on how residential settings can serve as work environments and even accommodate business guests without compromising their role as living spaces and without jeopardising the comfort and tranquillity of other family members.

Author's Contribution:

Yasaman Hashemi Ghochani: Tool Design, Data collection, Data analysis, Conceptualisation, Preparation of the draft manuscript.

Akram Hosseini: Methodology, Interpretation of the results, Writing Original draft, Writing reviews, Approved the final version.

End Notes:

1. Archives of Cultural Heritage Department of Boshrouye.
2. Based on the website of the Cultural Heritage Department of South Khorasan.
3. A big room with five doors on the veranda.
4. The main chamber of the house.
5. A room having a small and shallow pool connected to the Wind tower room.
6. One of the patterns of traditional Iranian homes in the warm and dry areas.

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