

Assessment and Comparative Study of Concepts Affecting the Formation of Physical Variety in Qajar and Pahlavi Houses in Dezful*

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Received 01 August 2020; Revised 09 September 2020; Accepted 20 September 2020; Available Online 20 March 2022

ABSTRACT

Spatial organization and physical diversity are considered two characterization factors in different architectural styles. Measuring changes in them can be considered a means for understanding and explaining the concepts affecting the formation of the architectural body. Therefore, the difference between traditional and modern architecture can be found by measuring these two components. It is of great importance to investigate this issue in cities including historic context. In the present study, Dezful, as one of the Iranian cities including both historic and contemporary fabrics, is selected as the research field to answer the following questions: What factors are effective in the formation of physical diversity? The process of formation of the architectural body of Qajar and Pahlavi houses in Dezful shows a change in what criteria of diversity? The present study aims to identify the factors affecting the diversity of residential houses by comparing Pahlavi and Qajar houses. In the present study, Qajar and Pahlavi houses are compared in terms of the criteria of diversity using case studies and the survey method. Also, to collect the required data, a model is developed based on the research background using the VIKOR method. The sample population included all registered Qajar and Pahlavi houses that are weighted using the Shannon entropy method. The results indicate that the concept of body in Qajar houses includes proportions, yard area/building area ratio, spatial transparency, type of space, functional relationships between spaces, and flexibility while changes in the architectural body of Pahlavi houses include changes in the dimensions of the courtyard, proportions, hierarchy of access, reduction of privacy, space use, geometric form, and flexibility. Comparison of Qajar and Pahlavi houses shows that the concept of physical diversity has been expressed differently in these two periods and in Pahlavi houses, a decrease in some criteria of diversity is observed.

Keywords: Physical Diversity, Architectural Space, Houses in Dezful, Geometry, VIKOR Method.

* This article is derived from the first author's master thesis entitled "Parametric design in residential building to redefine variety (Case Study: traditional Dezful house)" defended under the guidance of the second and third authors at Jundishapur University of Technology, Dezful, in 2019.

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1. INTRODUCTION

In any culture, architecture is a tool for expressing ideas and aesthetics. Hence, the building body can refer to an event or cultural tendency (Rezaeinia, 2017, p. 126); Shahcheraghi and Bandarabad, 2016, p. 279). In the modern era, where it has been attempted to culturally unify societies to achieve sociological standards, in architecture, diversity has been disregarded, and bodies with the same architectural features have emerged, indicating a rejection of different, independent tones. Thus, the reduced diversity has indicated the neglect of the tastes and interests of the groups constituting the larger community. The boredom of contemporary architecture is mainly due to the inattention of diversity in building organization and building body. The diversity of the experience of space implies environmental characteristics that are influenced by form, function, human activities and needs, and physical diversity (Kopaie et al., 2016, p. 42). With this context, in a specific geography, it is possible to study the diversity in both old and contemporary fabrics. To this end, in the present study, the Qajar and Pahlavi fabrics are selected as case studies to compare traditional and contemporary architecture in diversity. The historic fabric of Dezful is one of the most important fabrics in Iran, where people live. Also, the Pahlavi fabric of Dezful is located near its historic fabric (including Bazaar, Qa'ale, etc. neighborhoods), it includes Miandareh, Shahrokn al-Din neighborhoods, etc. The present study aims to identify the factors affecting the diversity of residential houses by comparing Pahlavi and Qajar houses. To this end, it was attempted to comprehensively describe the components of diversity in the houses in Dezful by investigating the theoretical foundations and using various data collection methods. The research hypothesis also states that each culture has a specific diversity factor that can be seen in its architecture.

2. THEORETICAL FRAMEWORK

Architectural spaces in historic houses have been formed based on environmental, cultural, climatic conditions, and construction period (Mahdavi Nejad et al., 2016, p. 72). In other words, architectural space has been formed in the context of time and therefore its types have been created in a given geography (Haerimzandarani, 2010, p. 116). The created types of space and architectural organs in the historical houses in Dezful have been influenced by changes in the variables constituting diversity (Hayati and Safarpour Behbahani, 2016, p. 73). However, the concept of diversity has been studied in numerous research. Najafgholipour Kalantari et al. (2016), in their study entitled "check in architectural geometry and proportions of the golden Iran (Case Study: Tabriz Traditional Houses)" have analyzed and studied how geometric patterns emerge and stated that geometry has been the

main tool for creating diversity in Iranian architecture, and has formed its architecture with its special proportions. Habibi et al. (1992), in their book entitled "The housing pattern in the cities of Khuzestan", regarding the spatial geometry in houses in Dezful, have stated that in the houses in the historic fabric, no regular geometry is observed and the spaces have been formed around a square or rectangular courtyard. Therefore, the shape of the fabric has been an important factor in creating diversity. Daeipour (2013), in a book entitled "Passage and house in the historic fabric of Dezful", has stated that one of the important factors in the architecture of the houses in Dezful is diversity and various factors play an effective role in its formation. About architecture in Dezful, there are other studies focused on geometric diversity and space syntax. According to them, diversity is an objective and tangible component (Naghizadeh, 2016). Saremi and Radmard (1997), in their book entitled "Sustainable Values in Iranian Architecture", have believed that although symmetry is present as an effective component in the organization of houses in Dezful, it has been represented differently compared to other points in Iran. Buildings can be compared in diversity in both aesthetic points of view and construction. In the other approach, diversity refers to the assessment of spatial dimensions in a given geography and with a common thought. In this approach, the difference in the tone of expression of concepts is mainly studied. Also, diversity in functions can be studied (Gholipour and Partovi, 2014) and it can be examined in architectural spaces using analytical methods. These studies also show that in the architecture of historic houses in Dezful, despite being located around a square or rectangular courtyard, one can see spatial diversity in terms of organization. For this reason, it is found that most studies have analyzed and examined limited criteria.

2.1. Architectural Body

Architecture as the organization of bodies based on physical characteristics can be distinguished from other visual arts (Carmona and partner, 2003, p. 99). The most important features of the architectural body include size and dimensions, geometric form, degree of transparency, scale, proportions, relationships and syntax, texture and decoration, diversity (Mirgholami and Ayashm, 2016). The study of spatial structures in architecture is a part of systematic studies (Pasian Khomri et al., 2017, p. 191). For this reason, the comparison of space-making factors is the most appropriate approach from which the background of space recognition can be extracted (Amraee, 2014, p. 29). Therefore, the comparative study of architectural space in different periods can be an approach to explain the research subject (Ghasemi Sichani & Memarian, 2010, p. 99); (Ebrahimi et al., 2017, p. 30); (Ramezan jamaat and Neyestani, 2011, pp. 65-66). The flexibility of spaces, spatial hierarchy and

the existence of various types of space, introversion, the emphasis of the visual axis, and the placement of interconnected spaces besides each other indicate the specific Qajar architecture style (Zarei et al., 2018, pp. 239-240). The presence of the porch in front of the rooms and its location out of the symmetrical axis of the building have formed diversity in the architecture of the houses in this period (Saremi & Radmard, 1997).

In Figure 1 introduces and shows the locations of the elements of Qajar houses in Dezful, including the portal, the vestibule, the corridor, the courtyard, the porch, the passageway, the stairs, the cookhouse, the Pishbam, the roof, restroom, shabestan, shovadan, ghomesh, and rooms.

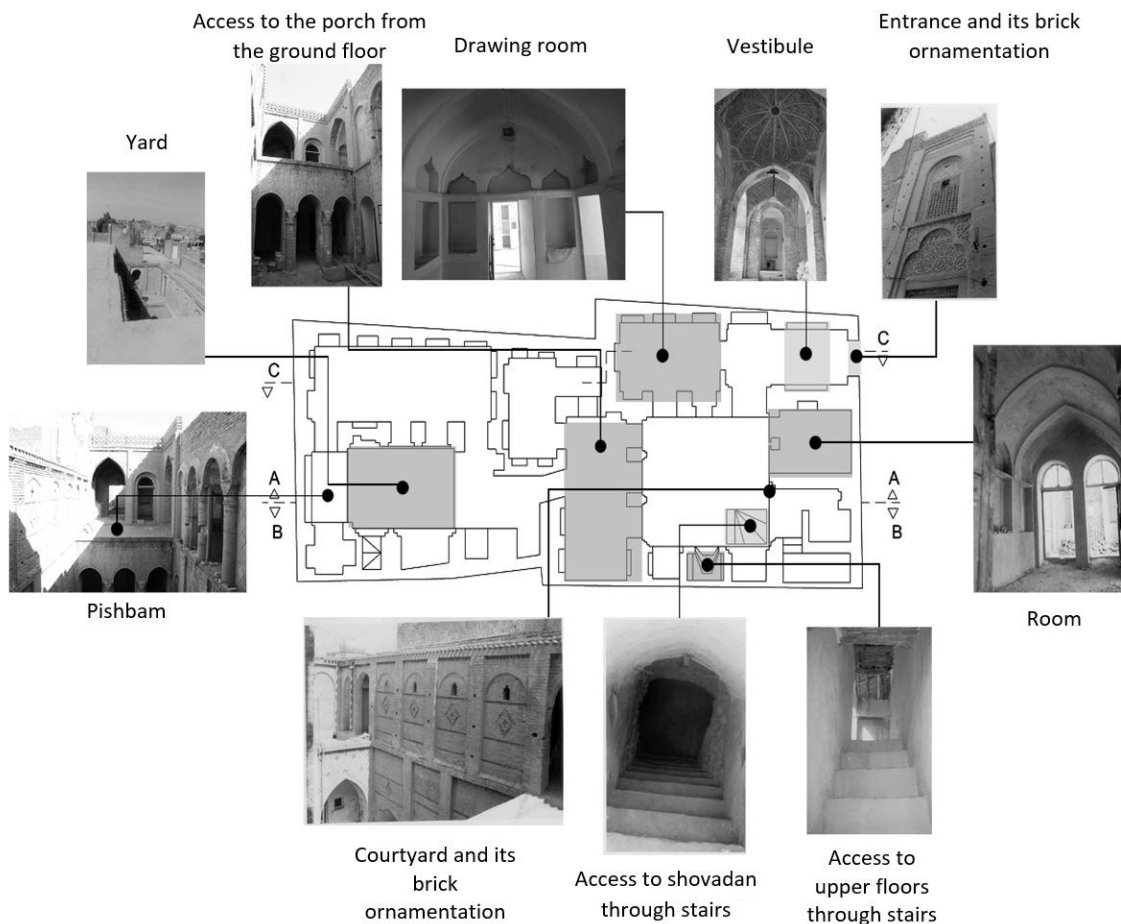


Fig. 1. Various Spaces in Soozangar House

During the Pahlavi period, service space has become important and spaces such as a kitchen has been moved from the corner of the courtyard or the lower half-floor to the interior. Moreover, other spaces were placed next to each other in a closed form (Kami Shirazi et al., 2018, p. 33). This has reduced transparency in these houses. Introversion has also diminished in this period. On the other hand, comfort has been created using technology and spatial diversity, that has been created to provide climatic comfort, has been reduced (Beheshti, 2016). Lack of use of entrance space and establishing a directly connection between the passage and the courtyard are one of the changes made in architecture in the Pahlavi compared to the previous period (Jalili & Akbari, 2015, p. 6).

3. METHOD

The present research was carried out using a survey method and case studies. Data were collected using library and field studies, and then, analyzed using logical inference. There are also several diversity assessment methods such as interweaving, grain, Shannon entropy, etc., among which Shannon entropy provides weighting qualitatively (Javadi et al., 2013, p. 26). On the other hand, according to the factors affecting the formation of the architectural body, some criteria were considered to measure physical diversity (Fig. 4). They were evaluated using the VIKOR method. The research field included the historic and contemporary residential architecture in Dezful. Samples included 60 Qajar houses in Qa'ale, Masjid,

Miandareh, Shahrokn al-Din, Siahpooshan, Pirnazar, Bazar, Pooladian, Lourián, and Moqaddasian neighborhoods, and 12 Pahlavi houses in Masjid, Siahpooshan, Qa'ale, Miandareh, Kalantarian (Sahrabdar Maghribi), Kharratan, Sakian, and Imam-Shomali (Koocheh Estakhr) neighborhoods. The plan maps of houses were prepared by field surveys. The research model is based on field studies and other models presented by other researchers. In this step, first, the sample population was weighted using the Shannon entropy method and then, the criteria were ranked based on the assessment quality using the VIKOR method. Also, the distribution of body assessment criteria was investigated, and the degree of diversity in each period was determined. The criteria were extracted by reviewing the field studies and the models presented by other researchers (Shahcheraghi & Bandarabad, 2016); (Mirgholami & Ayashm, 2016); (Falahat, 2006); (Montazerolhodjah, 2016). The research model included criteria including proportions, yard area/building area ratio, spatial transparency, types of open space, functional relationships between spaces, and spatial flexibility. In the next step, the initial values of the criteria were determined (in percentage and integer), and then they were multiplied by their evaluation coefficients to form a matrix. Next, to compare the data, it is required to make them scaleless. In other words, the numerical data are made scaleless to be summed. Then, the most appropriate and inappropriate samples were determined with given values, as shown in Figure 2. In this stage, the similarity values in the sample population indicated that there were significant similar samples in the research field. In the next step, the samples were weighted using the Shannon entropy method, as presented in Figure 3.

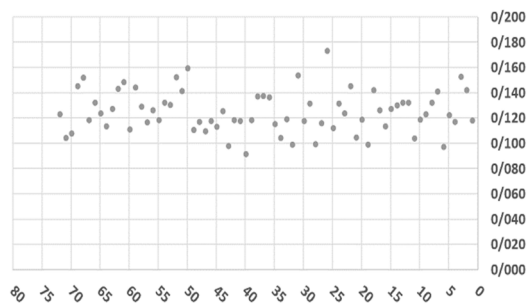


Fig. 2. The Most and Least Similarity in the Sample Population

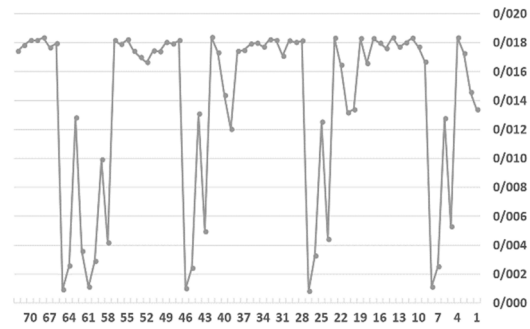


Fig. 3. Weighting the Sample Population in Entropy Method

The Shannon entropy method includes three steps of normalization of the data frequency matrix, calculation of the information load of the categories, and determination of the importance factors of the samples. As shown in Figure 3, there were significant samples with ideal weights. On the other hand, there were few inappropriate samples, that were eventually removed from the sample population.

$$W_j = \frac{E_j}{\sum_{j=1}^n E_j}$$

W_j: weight of each component;

E_j: amount of uncertainty).

Next, the similarity (S) and regret (R) of the desired criteria are determined. Similarity expresses the relative gap between the desired option and the ideal positive option (individual regret/gaps) and regret expresses the maximum gap between the desired option and the ideal option (maximum individual gap). The similarity and regret of the criteria studied are listed in Table 1.

$$S_j = \sum_{i=1}^n w_i \cdot \frac{f_i^* - f_{ij}}{f_i^* - f_i^-} R_j = \max[w_i \cdot \frac{f_i^* - f_{ij}}{f_i^* - f_i^-}]$$

Where,

S_j: relative gap between option i and the ideal option;

R_j: maximum gap between option i and the ideal option;

W_i: weight of each component;

f_i⁻: negative component;

f_i⁺: positive component.

Table 1. Similarity and Regret in VIKOR Analysis

No.	Similarity (S)	Regret (R)	No.	Similarity (S)	Regret (R)	No.	Similarity (S)	Regret (R)
1	0.636	0.018	9	0.979	0.018	17	0.398	0.012
2	0.763	0.018	10	0.909	0.018	18	0.360	0.011
3	0.580	0.017	11	0.760	0.017	19	0.626	0.015
4	0.624	0.018	12	0.567	0.015	20	0.462	0.014
5	0.932	0.018	13	0.057	0.010	21	0.420	0.017
6	0.881	0.018	14	0.645	0.017	22	0.506	0.018
7	0.966	0.018	15	0.338	0.013			
8	0.992	0.018	16	0.405	0.014			

In the following formula, Q_i is the VIKOR factor and expresses the value of option i . The VIKOR factor of each criterion is presented in Table 2. (S^- : maximum value of S_i); (R^- : maximum value of R_i); (Q_i : value of each criterion)

$$Q_i = v \left[\frac{S_i - S^-}{S^- - S^*} \right] + (1 - v) \left[\frac{R_i - R^-}{R^- - R^*} \right] \quad S^- = \max S_i, \\ S^* = \min S_i \quad R^- = \max R_i, R^* = \min R_i$$

Where,

S^- : maximum value of S_i ;

R^- : maximum value of R_i ;

Q_i : VIKOR value of each criterion.

The criteria were ranked based on their Q values in ascending order. The lowest Q value belongs to category 1 (most appropriate degree) and the highest value belongs to the last category (most inappropriate degree). Finally, according to the spectrum provided in the software, based on the Q values and the Likert scale, the criteria were placed in the desired categories. The categories are as follows: Category A (very good, Q value: 1 to 4), Category B (good, Q value: 5 to 9), Category C (fair, Q value: 10 to 13), Category D (poor, Q value: 14 to 18), and Category E (very poor, Q value: 19 to 22).

Table 2. The Q Value of each Criterion

Criterion	Q value	Criterion	Q value	Criterion	Q value
1:1 ratio	1.131	Yard area/building area ration	1.472	Specific space	0.522
1:1.25 ratio	1.251	Building ratio	1.365	General space	0.421
1:1.5 ratio	0.978	Open space	1.150	Service space	0.955
1:2 ratio	1.120	Semi-open space	0.845	Multi functionality	0.723
1:2.5 ratio	1.432	Closed space	0.056	Spatial adaptability	0.823
1:3 ratio	1.381	Public apace	1.047	Spatial variability	0.990
1:4 ratio	1.467	Semi-public space	0.543		
1:5 ratio	1.494	Private space	0.672		

3.1. Data Analysis Model

The criteria presented in this section are determined based on data tests and research background and considered research variables. The criteria in this model (Fig. 4) are classified in two dimensions of geometry, and relationships and space syntax, each of which has micro-criteria. The micro-criteria of the "geometry"

dimension include geometric patterns, proportions, yard area/building area ratio, and spatial transparency, and the micro-criteria of the "relationships and space syntax" dimension include spatial flexibility, type of space, and functional relationships. These criteria are used as a tool for analyzing the sample population according to the definitions given in Figure 4.

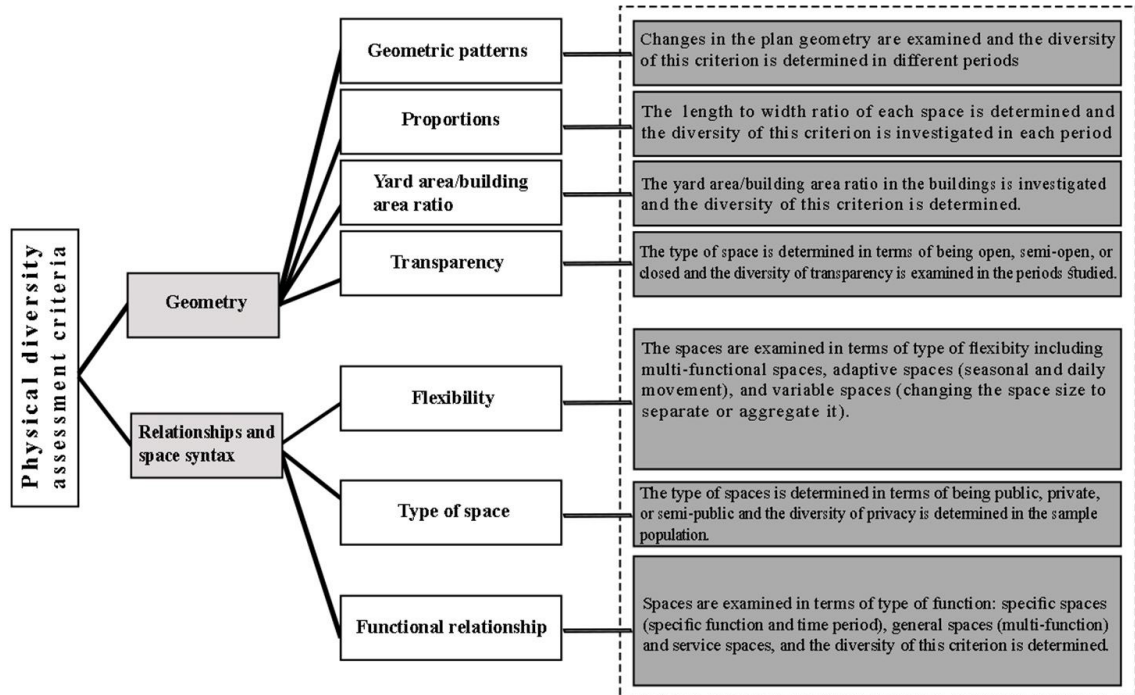


Fig. 4. Criteria for Assessing Physical Diversity in Houses in Dezful

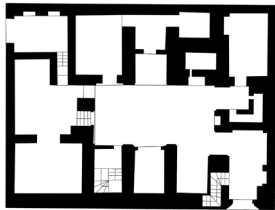
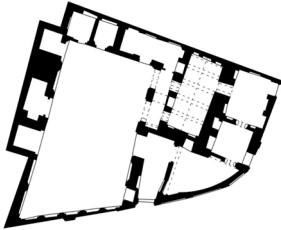
4. COMPARISON AND ANALYSIS OF RESEARCH FINDINGS

4.1. Geometric Patterns

In houses, geometric patterns are defined based on the shape of the urban fabric or the building geometry dominant in each period. In the historic fabric of Dezful (Qajar), two types of building geometry have emerged since the roads were organic. The spaces

around the yard are square or rectangular, and the spaces adjacent to the outer wall follow the geometry of the urban fabric. On the other hand, in the Pahlavi houses, one can see that in geometry, the spaces are influenced by the checkered texture of the city. Comparing Qajar and Pahlavi houses in Table 3 indicates that there is a significant difference between them in geometric diversity. This difference can also be seen in smaller elements such as porches, corridors, etc.

Table 3. Comparison of Qajar and Pahlavi Houses in Geometry


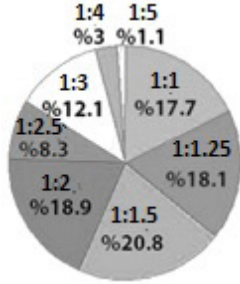
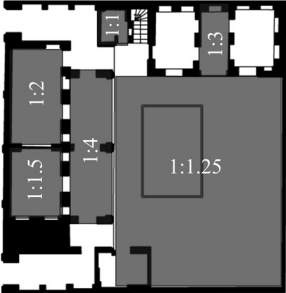
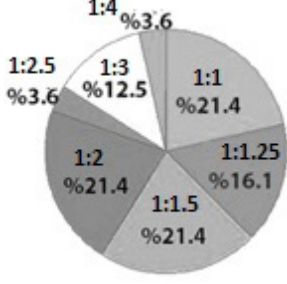
Geometric Pattern in Pahlavi Houses	Geometric Pattern in Qajar Houses
 <p>The Plan of Dianati House as an Example of the Houses in the Pahlavi Fabric</p> <p>Joker, Pakarzadeh, Khalaj House, Asha'ari, Taghibaba, etc.</p>	 <p>The Plan of Chinisaz House as an Example of the Houses in the Qajar Fabric</p> <p>Chinisaz, Adasi, Tahmasbi, Ashiri, etc.</p>

3.2. Proportions

According to Table 4, various proportions are seen in the plans of houses. In the proportions, the first value denotes the smaller side of a rectangle and the second value denotes its larger side. The proportions are defined in various ranges and the major proportions are 1:1, 1:1.25, 1:1.5, and 1:2 ratios. Accordingly, in Pahlavi and Qajar houses, one can find the changes in

proportions. In Pahlavi houses, one can see the increased application of the 1:1 ratio and the decreased use of the 1:1.25 ratio. The use of the 1:1.5 ratio is seen in both periods, but the use of the 1:2 ratio has been increased in Pahlavi houses. Comparing Qajar and Pahlavi houses showed that in Pahlavi houses, the proportions are less distributed than in Qajar houses.

Table 4. Comparison of Qajar and Pahlavi Houses in Proportions


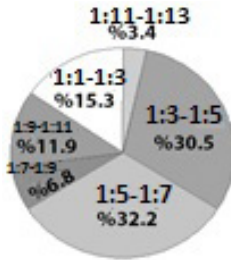

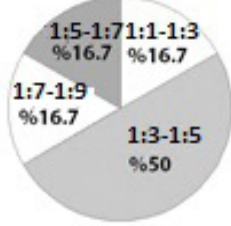
Housing Pattern	House	Diversity of the Component
 <p>Qajar</p> <p>The Plan of Dianati House as an Example of the Houses in the Qajar Fabric</p>	Dianati	 <p>The Highest Frequency is Related to the 1:1.5 Ratio</p>
	Aramesh	
	Chinisaz	
	Golchin	
	Shahrokni	
	Tahmasbi	
	Ashiri, etc.	
 <p>Pahlavi</p> <p>The Plan of Mirshekar House as an Example of the Houses in the Pahlavi Fabric</p>	Mirshekar	 <p>The Highest Frequencies are Related to the 1:1, 1:1.5, and 1:2 Ratios</p>
	Jokar	
	Pakarzadeh	
	Khalaj	
	House	
	Azarbad	
	Asha'ari	
	Taghi Baba, etc.	

3.3. The Yard Area/Building Area Ratio

The location of the courtyard is the main factor determining the syntax of the main and secondary spaces in Qajar houses while in Pahlavi houses, due to the reduced role of the courtyard in spatial organization, the elements have been determined based on the needs and desires of the owner. The area and location of the yard play a role in the formation of the house geometry, spatial transparency, etc. Table 5 compare Qajar and Pahlavi houses in the yard area/building area ratio. In this ratio, the first value refers to the courtyard

area and the second value denotes the building area. The empty space (yard)/ full space (building) ratios are defined in various ranges. In Qajar houses, the following ranges have the highest frequencies: 1:3 to 1:5 and 1:5 to 1:7 while in Pahlavi houses, the range of 1:3 to 1:5 has the highest frequency. The comparison of Qajar and Pahlavi houses shows that in Pahlavi houses, the yard area/building area ratio is larger, but less distribution of location types is observed in them. Therefore, the degree of diversity of yard area/building area ratio is higher in Qajar houses than in Pahlavi houses.

Table 5. Comparison of Qajar and Pahlavi Houses in Yard Area/Building Area Ratio

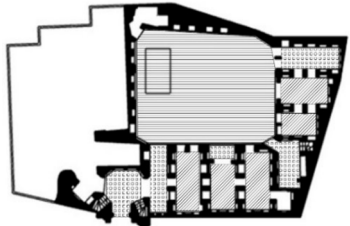

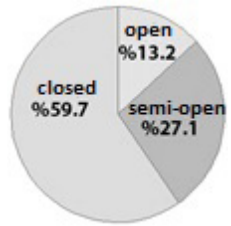
Housing Pattern	House	Diversity of the Component
 <p>The Plan of Kouhi Nejad House as an Example of the Houses in the Qajar Fabric</p>	Kouhi Nejad Nilsaz Shahrokni Da'aei Ghalambar Mostofi, etc.	 <p>The Highest Frequency is Related to the Range from 1:5 to 1:7</p>
 <p>The Plan of Asha'ari House as an Example of the Houses in the Pahlavi Fabric</p>	Asha'ari Taghi Baba Khalaj Azarabad Pakarzadeh 2, etc.	 <p>The Highest Frequency is Related to the Range from 1:3 to 1:5</p>

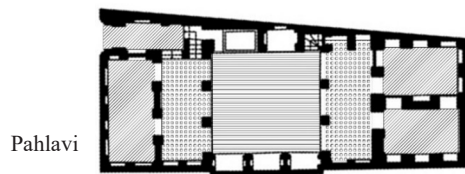
3.3. Spatial Transparency

The line of sight, openness, the relationship between inside and outside influence spatial transparency (Saadat et al., 2017, p. 82), and its degree in houses has increased with the reduction of walls (D. K. Ching, 2013, pp. 171-173); Pasian Khomri et al., 2017, pp. 93-94). Transparency can be defined by the degree of closure and openness of the walls. Various types of spatial transparency in the houses in Dezful provide open, semi-open, and closed spaces. For example, one can

refer to courtyard and Pishbam as open spaces, porch, entrance, corridor, passageway, and kitchen as semi-open spaces, and rooms, warehouses, restrooms, and closets as closed spaces. Table 6 compares Qajar and Pahlavi houses in spatial transparency. The results show that in Pahlavi houses, the semi-open space has reduced and it has been replaced by the closed space, indicating the tendency to reduce spatial transparency in the Pahlavi period. It also implies the reduced diversity of space form and architecture.

Table 6. Comparison of Qajar and Pahlavi Houses in Spatial Transparency

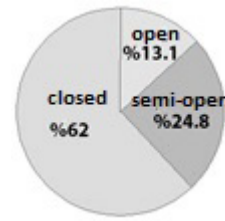
Housing Pattern	Legend	House	Frequencies of Open, Semi-Open, and Closed Spaces
 <p>The Plan of Jafar Khan House as an Example of the Houses in the Qajar Fabric</p>		Jafar Khan Masoumi Shahrokni Seyyed Sadr Touni, etc.	 <p>The Highest Frequency is Related to Closed Spaces</p>



Pahlavi

The Plan of Asha'ari House as an
Example of the Houses in the Pahlavi
Fabric

Asha'ari
Khalaj
Golchin
Mirshekar
Pakarzadeh
2, etc.



The Highest Frequency is Related to Closed
Spaces

3.4. Spatial Flexibility

The spatial flexibility is measured depending on the proportions and use of the space. In architecture, flexibility refers to the ability of the space to change and its adaptability. Therefore, creating a multifunctional space provides the ground for flexibility. To assess spatial flexibility, it is required to investigate the concepts of adaptability (seasonal and daily movement

according to environmental and climatic conditions) and variability (the presence of multifunctional spaces tailored to the needs of residents). Table 7 shows that Qajar houses have more multifunctional spaces than Pahlavi houses, while Pahlavi houses show a higher level of variability. On the other hand, the comparison of Qajar and Pahlavi houses shows a change of 21.5% in variability.

Table 7. Comparison of Qajar and Pahlavi Houses in Spatial Flexibility

Housing Pattern	House	Diversity of the Component
 Qajar	Moazzi	 variability % 19.3 multifunctionality % 39.3 adaptability % 41.4
	Shahrokni	
	Yek Khalilo	
	AshrafKouchak	
	Khalaj Ghassab	
	Chinisaz, etc.	
 Pahlavi	Golab Khayyam	 variability % 40.8 adaptability % 30.6 multifunctionality % 28.5
	Taghi Baba	
	Azarabad	
	Mirshekar	
	Khalaj	
	Gousfandi, etc.	

The Plan of Ghalambar House 2 as an Example of
the Houses in the Qajar Fabric

The Highest Frequency is Related to
Adaptable Spaces.



The Plan of Golab Khayyam House as an
Example of the Houses in the Pahlavi Fabric

The Highest Frequency is Related to
Variable Spaces.

3.5. Types of Space

There are three types of space in houses in terms of privacy including public space, semi-public space, and private space (Labibzadeh et al., 2016, p. 28); (Heidari et al., 2018, p. 56). Table 8 shows the comparison of Qajar and Pahlavi houses in these spaces. Public space refers to places where there is the lowest level of privacy and guests have access to it. These spaces include entrance, vestibule, hall-room (reception

of guests), and restroom. Semi-public space is a place where first-degree guests can be present. This space acts as an interface between public and private spaces and includes courtyards, corridors, porches, kitchens, restrooms. Private space is also a place where there is the highest level of privacy. This space also includes private rooms and closets. Analysis of this criterion shows a slight difference between Qajar and Pahlavi houses in the shares of public, semi-public, and private spaces.

Table 8. Comparison of Qajar and Pahlavi Houses in the Types of Space

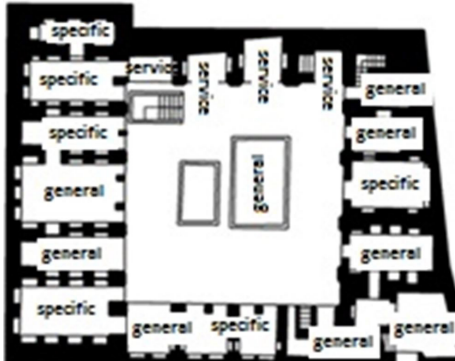
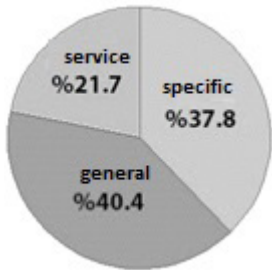
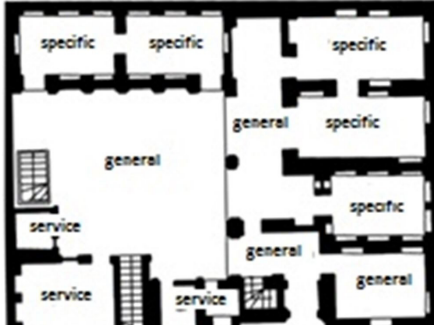
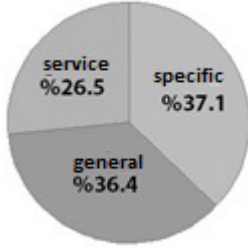
Housing Pattern	House	Legend	Diversity of the Component
<p>The plan of Moazzi House as an Example of the Houses in the Qajar Fabric</p>	Moazzi		<p>The Highest Frequencies are Related to Private and Semi-Public Spaces.</p>
	Nilsaz		
	Yek Khalilo		
	Ashraf		
	Tolouei far		
	Soozangar	s-p: semi-public	
	Da'aei Kouchak, etc.	P: public	
		Pr: private	
<p>The Plan of Sheikh Dezfuli House as an Example of the Houses in the Pahlavi Fabric</p>	Sheikhi Dezfuli		<p>The Highest Frequency is Related to Semi-Public Spaces.</p>
	Taghi Baba		
	Khalaj		
	Golab Khayyam		
	Azar abad, etc.		

3.5. Functional Relationships

The relationships between spaces in houses based on their functions include specific, general, and service spaces (Haber et al., 1988). Special spaces are places for specific activities at a given time. These spaces include the bedroom, the study room, and the kitchen. General spaces are places for the whole family. They have several functions and people spend most of their time there. This type of space includes living rooms and division.

Service spaces are places used in the short term and with special facilities. These spaces include restrooms and warehouses. Table 9 shows that this criterion has been slightly changed in Pahlavi and Qajar houses. The similar direction of changes in the relationships between spaces based on their functions indicates the accuracy of the comparison.

Table 9. Comparison of Qajar and Pahlavi Houses in the Relationships between Spaces based on Their Functions

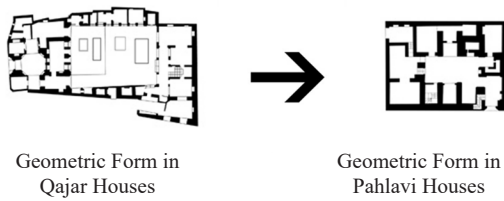
	Housing Pattern	House	Diversity of the Component
Qajar		Moazzi Yek Khalilo Ashraf Kouchak Nilsaz Khalaj Ghassab Touni, etc.	 The Highest Frequency is Related to General Spaces.
Pahlavi		Golab Khayyam Taghi Baba Azarabad Khalaj Gousfandi, etc.	 The Highest Frequency is t to Specific Spaces.

4. DISCUSSION

In previous sections, changes in the criteria of diversity, including proportions, yard area/ building area ratio, spatial transparency, flexibility, type of space, and type of space function have been studied. First, it is required to examine the weight percentages of the criteria to make it possible to compare the houses related to the two historical periods studied. In the spatial transparency criterion, the order of spaces includes open space, semi-open space, and closed spaces. The order of spaces in terms of their functions includes general space, specific space, and service space, and the order of spaces in terms of the effect of space type includes semi-public space, private space, and public space. In the proportions of spaces, the proportions are ordered as follows 1:1.5, 1:2, 1:1, 1:1.25, 1:3, 1:2.5, 1:4, and 1:5. On the other hand, the yard area/ building area ratio criterion includes the priorities of the building ratio and the numerical yard area/building area ratio, respectively. In the flexibility criterion, the order of priority includes space multifunctionality, adaptability, and variability. According to the classification presented in Table 2, in the houses in Dezful, the criteria of physical diversity can be ranked in

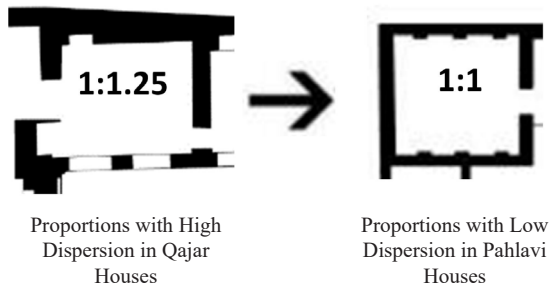
terms of their weight percentages as follows: type of transparency, type of function, type of space, flexibility, proportions, and yard area/building area ratio, respectively. The geometry of the Pahlavi houses indicates that these houses followed certain forms, while Qajar houses are more diverse in geometry. This is evident not only in the plan (Fig. 5) but also in micro-spaces such as the vestibule. The geometry of the Pahlavi houses has two external and internal sides that limit the house in a certain rectangle while in Qajar houses, spaces have been formed around a rectangular or square yard, and therefore, despite the irregular geometry of the fabric, the interior spaces have been formed with a given geometry. In Qajar houses, the vestibule has been constructed in a polygonal form while in the next period, it has been formed as a corridor. Moreover, in Pahlavi houses, it has been seen in a rectangular form and acts as a corridor. This has affected the flexibility of the vestibule and made it lose its function as a pause space and become a space for passing (Fig. 6).

Fig. 5. Changes in the Geometric Form of Pahlavi and Qajar Houses



Proportions have been studied as another criterion in Pahlavi and Qajar houses. This criterion shows that in Pahlavi houses, the proportions have been used with integer ratio and the distribution of numbers has been reduced (Fig. 7). For this reason, Pahlavi houses

Fig. 7. Changes in Proportions in Pahlavi and Qajar Houses



The criterion of spatial transparency has been used to measure the degree of closure or openness of houses and the results show changes in in-between spaces such as porches in Pahlavi houses. Also, according to the compared figure (Fig. 9), these changes have led to a change in the hierarchy of access to spaces and a change in the relationships between them and their syntax. With the removal of the porch in Figure 9, another criterion of flexibility, i.e. the "adaptability of space", has changed and led to the reduced diversity in Pahlavi houses. The porch is a place to sit for the residents, in addition to being a space connecting

Fig. 9. Changes in Spatial Transparency in Pahlavi and Qajar Houses

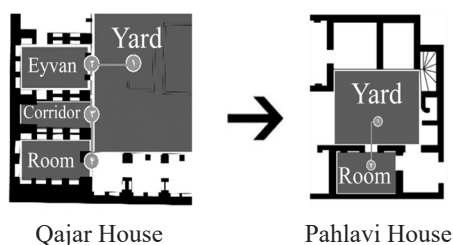


Fig. 6. Changes in the Vestibule Form in Pahlavi and Qajar Houses

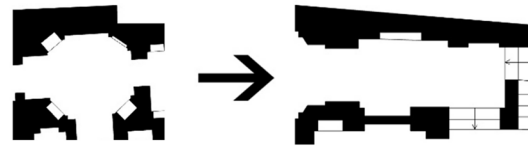
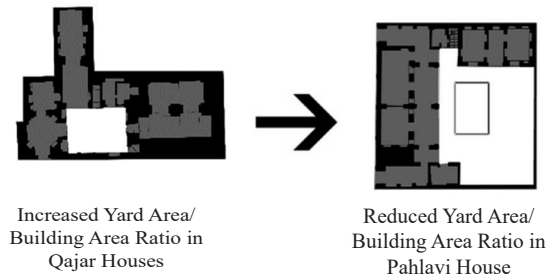
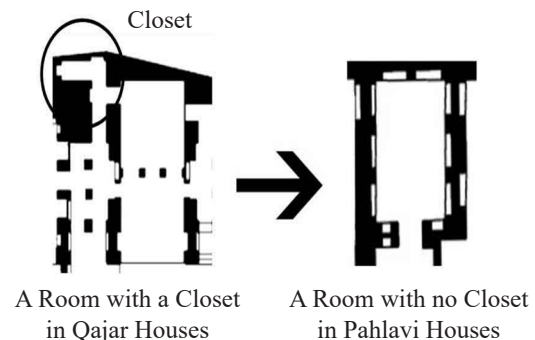


Fig. 8. Changes in the Yard Area/Building Area Ratio in Pahlavi and Qajar Houses



other spaces. Investigating the houses in the flexibility criterion shows that Qajar and Pahlavi houses have experienced changes in this criterion. In Qajar houses, the rooms had closets, and have been used as spaces with several different functions. These spaces have sometimes been used as a space for sleeping and sometimes as a living room. On the other hand, in Pahlavi houses, the rooms have one function due to the removal of the closet (Fig. 10). Also, with the decrease in space function, the amount of diversity in Pahlavi houses has decreased in this criterion.

Fig. 10. Changes in the Function of the Rooms in Pahlavi and Qajar Houses



The criterion of relationships between spaces was investigated by examining the organs of the house and spatial organization. The results (Fig. 11) show changes in the type of relationships between spaces.

For example, in Qajar houses, there is a corridor with a rotating end after the vestibule while in Pahlavi houses, it is linear and directly connects the spaces.

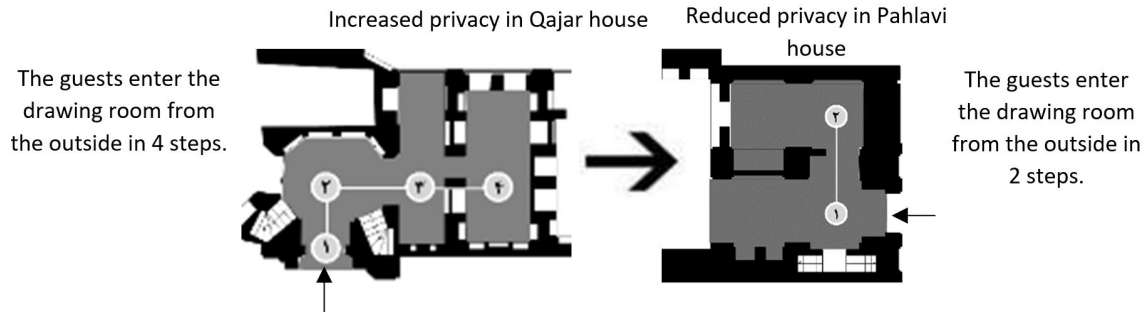


Fig. 11. Changes in Privacy in Pahlavi and Qajar Houses

The functional relationships between spaces are considered according to their functions. The results (Fig. 12) also show some changes in Pahlavi and Qajar houses in Dezful. These changes indicate the separation

of service and general functions. Moreover, they have caused changes in the micro-spaces and the relationships between spaces.

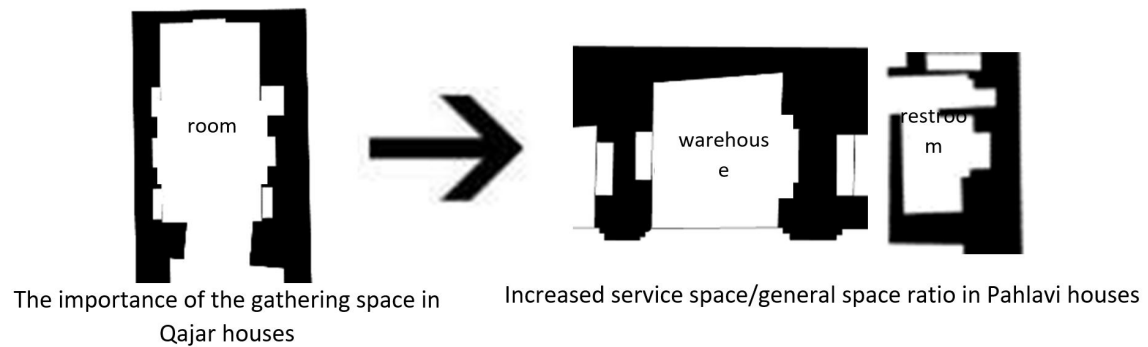


Fig. 12. Changes in the Space Function in Pahlavi and Qajar Houses

5. CONCLUSION

In the present study, it was attempted to study the concept of diversity in architecture by investigating it in two Qajar and Pahlavi fabrics. Therefore, after describing the criteria of diversity, the Qajar and Pahlavi houses were examined as case studied and compared, as presented in Tables 3 to 9. The obtained data were analyzed based on the developed model (Fig. 4) and the changes made in houses were examined to find the extent to which effective criteria were used in the diversity of Qajar and Pahlavi houses. In Qajar houses, one can see significant diversity in access hierarchy including individuals' access to spaces in the house (from open space to closed space) and their access from public space to private space, spatial flexibility, and quality of space (due to geometry and open plan). Comparison of these criteria in the Pahlavi period shows changes in the numerical distribution of the proportions, the diversity of spatial transparency (due

to the removal of the porch), access hierarchy, the degree of privacy, some sub-criteria of flexibility, and the micro and macro dimension of the house geometry. In Pahlavi houses, issues such as the diversity of geometric patterns, the multi-functionality of space, the degree of spatial adaptability, the diversity of proportions, and the diversity of the yard area/building area ratio have decreased while their variability has increased compared to Qajar houses.

Comparative and analytical study of the criteria of diversity in Qajar and Pahlavi houses shows that these houses are different in physical diversity and in Pahlavi houses, the spatial organization and the quality of space were less diverse than Qajar houses. In general, it can be concluded that diversity in spatial organization and the relationships between spaces has been more considered in the Qajar period.

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HOW TO CITE THIS ARTICLE

Sarrafzadeh, A., Dideban, M., & Vasigh, B. (2022). Assessment and Comparative Study of Concepts Affecting the Formation of Physical Variety in Qajar and Pahlavi Houses in Dezful. *Armanshahr Architecture & Urban Development Journal*. 14(37), 95-109.

DOI: 10.22034/AAUD.2020.229305.2191

URL: http://www.armanshahrjournal.com/article_147101.html



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