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Original Research Article

Investigating the Spatial Structure of Tehran's Late Qajar and Early Pahlavi Houses Using the Criteria of the Iranian House Model with a Focus on the Hierarchy of Access*

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Abstract

Problem statement: The role and position of the house in Iranian architecture have been of paramount importance since ancient times, and various patterns influenced by factors such as climate, religion, and culture can be observed in the design of each of them. The principle of privacy, which is one of the valuable principles in Iranian architecture, has also been used in the structure of historical houses. In Iranian houses, this principle is derived from religious, cultural, social beliefs, and other factors in the integration of architectural structure.

Objective: This study aims to evaluate the hierarchy of access with an emphasis on privacy and attention to patterns and spaces in the architecture of historical houses in Iran within the framework of the integration of architectural structure and lifestyle, and its impact on the examined samples. According to the research hypothesis, it seems that by using spatial arrangement based on the principles of privacy preservation in houses in Tehran during the late Qajar and early Pahlavi periods, it is possible to achieve functional patterns emphasizing private space and changes in human needs over time.

Method: This research involves examining the privacy hierarchy in the entrances of 8 historical houses in the late Qajar and early Pahlavi periods in Tehran, as well as quantitative analysis and evaluation of spaces. To investigate the principles of indigenous architecture and compare the existing regulations, the mentioned data were collected through field research and analyzed using Spss 22 and Depth Map software. By employing logical reasoning, the correlation between the research criteria in these houses was examined.

Results: The results of this study indicate that attention to the hierarchy of access, entrance, and spatial relationships based on responding to the human needs of the two periods under study are among the most important elements in the design of houses of the mentioned era, leading to the definition of patterns for these houses. which led to the definition of patterns.

Keywords: *Traditional houses, Privacy, Entrance, Spatial arrangement, Human needs.*

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Introduction

The need for shelter and housing has always been a fundamental and essential requirement for humanity. This need, in every society, takes on different and specific forms depending on the needs, time, place,

facilities, and economic, social, and cultural constraints. Among the numerous influential factors on the form of a house, some are considered more important and impactful on a higher level. Climate and culture are among these factors.

The home represents human identity and needs within the framework of a place for human life. A space with the status of individual and cultural relations can be represented within a place called home. The traditional architecture of Iranian houses can be considered rich in identity and culture, and one of the most important principles of the response of this place is the arrangement of spaces based on the principles of privacy and the need for psychological safety that can be seen in traditional case examples.

Rapoport's theory focuses on the relationship between lifestyle patterns and the form of a house. He emphasizes how basic daily needs such as eating, sleeping, and sitting, as well as factors such as family structure, the role of women, and the concept of privacy, influence the selection of location, materials used, shape of the house, and its. He concludes his argument by stating that although contemporary social factors influencing common housing traditions are gradually diminishing in significance, it cannot be said that physical factors determine the shape of the house. This is because social-cultural factors have replaced old factors (Rapoport, 2019, 80-78).

Another example of hierarchy preservation in traditional Iranian houses against strangers and guests is the internal concealment of houses. In a way that families were never exposed to the sight of unfamiliar guests, and private spaces of the house such as the kitchen, bathrooms, and restrooms, which were usually used more by women, were designed in a manner that they were not visible to the public. The importance of this

issue is such that Alexander pointed out the concept of personal space, stating that meetings with strangers and friends would be desirable only if personal boundaries were respected. He believes that the interior and exterior spaces of a building should be designed in such a way that they start with one entrance, reach the most public part, then reach the private boundaries, and finally reach the most private areas (Alexander,2010).Starting with an entrance, it reached the most public part, and then the privacy and finally reached the most private areas. In Fig. 1, this subject is elaborated upon.

In traditional Iranian architecture, spaces such as the vestibule, vestibules, courtyards, and halls create a series of intermediate spaces that transition the individual from the urban space to the personal space. The elimination of hierarchical entrances, such as a vestibule, can lead to a change in the Iranian mindset and have very detrimental effects by lacking an equivalent substitute, resulting not only in the loss of privacy but also in the incorrect definition of primary spaces. Looking at old houses with a series of intermediate spaces, we encounter not only spaces for dwelling but also spaces that lead to a lack of coherence among the areas. The examination of traditional houses where the principle of privacy has been well respected can serve as a key for architects in employing and recognizing this principle in contemporary housing architecture.

In traditional Iranian architecture, each space possesses its own unique identity. From the moment of entering a space, different sections are arranged in harmony to create a suitable spatial hierarchy, shaping the body of the ensemble. This has been accomplished in our traditional architecture in the following manner:

- Clear demarcation of spaces with defined and visible boundaries between them
- Utilization of intermediate spaces and distancing

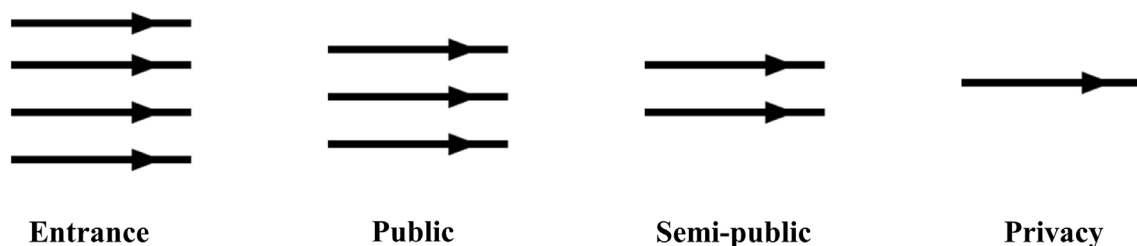


Fig. 1. Entry Hierarchy from Alexander's Perspective (Top) and Its Consistency with Islamic Recommendations Regarding. Source: Archives of the Architecture Faculty, Iran University of Science and Technology, 2013.

between primary spaces, known as “Meyandar”, to create a hierarchy

- Avoidance of homogenizing spaces or blurring boundaries
- Having quantitative and qualitative characteristics for each space to distinguish and differentiate them from other spaces (Noghrekar, 2008)

Although the subject of housing, privacy, and spatial hierarchy is not unfamiliar to architects and has been addressed in various research in recent years, the issue of privacy in housing has not been adequately addressed. However, studies indicate that empirical and theoretical research on the effects of entrances, privacy, and spatial hierarchy in housing on the lifestyle of residents has not been specifically focused on in Iran. This article focuses on one of the most valuable aspects of Iranian residential architecture, namely traditional houses in the capital city during the Tehran transition period. Therefore, this paper attempts to identify the most important paradigms of these houses and their influential factors on the residents' lifestyle in traditional housing. Therefore, this article tries to identify the most important paradigms of hierarchy and privacy and its influence on the lifestyle of residents in traditional housing. It takes steps to evaluate this perspective through a case study of late Qajar and early Pahlavi traditional houses in Tehran, which is considered a fundamental aspect of the research innovation. Therefore, the results of this article can serve as a guiding principle for architects in employing and recognizing this principle in contemporary housing architecture. In this study, particular attention has been paid to examining the impact of the principle of spatial hierarchy in creating privacy and intimacy in late Qajar and early Pahlavi traditional houses.

Research Questions

- How have changes in human needs over time affected the spatial organization of traditional houses in terms of privacy?

Research Process

The selection of the sample community for the eight selected houses has been based on various

characteristics, including the geographical location of these buildings in the historical area of Tehran, cultural and historical features of the city of Tehran, the number of courtyards in each house, the arrangement of entrance spaces, and the diversity of spatial forms found in entrances and courtyards. These samples have been selected in a way that, according to historical documents and oral testimonies related to them, the least interference and occupation have been done in the structural form of entrance spaces and the spatial relationship between the entrance and the building. Specifically, the number of entrances to the building, the micro-spaces present in the entrances, the relationship of the entrance with the courtyard, and the direction and method of access to the desired entrance were initially the focus of the authors. After reaching the desired sample community, the plans for these houses were redrawn. To achieve spatial analysis and privacy analysis of entrance spaces, the Depth Map software was used. In this way, graphical analyses of each house were drawn in the Depth Map software along with the relevant tables. In fact, the theory of spatial configuration primarily seeks to find a way to social relationships in space. For example, constraints and degrees of privacy, as well as the general state of spaces, are analyzed. The configuration relationship of all spaces in the spatial syntax technique is analyzed, and the spatial features are presented with mathematical and graphical factors (parameters). Additionally, Spss 22 SPSS 22 was used for analyzing building data (Mirmiran et al., 2021, 43). Furthermore, library resources, books, and reputable articles on the topic of privacy and its observance in Iranian architecture have been collected and addressed. Additionally, the observational method was used by physically being present in the entrance spaces of these houses and taking visual observations of these spaces to complement the collected studies. In this regard, by employing a descriptive-analytical and correlational method, which includes two parts: theoretical foundations and fieldwork, the analysis and examination of entrance spaces and privacy in traditional houses in Tehran are conducted. In the

qualitative section, data extraction was performed using historical-analytical and descriptive-analytical methods, while logical reasoning was employed for data analysis (Modirrousta et al., 2022, 39). The items under investigation in this article are illustrated in Fig. 2.

Literature Review

Residential buildings in Iran possess distinctive physical characteristics that can make them more indicative compared to houses in other countries. The available spaces for accessing the main space, referred to as hierarchy, are one of these superior factors.

In traditional architecture, privacy is achieved through the creation of new spaces and designings of the houses are based on establishing sanctity for the residents. Additionally, in the past, features such as external and internal segregation and deviation of vision at the entrance were important for creating the concept of veiling and privacy (Naseri et al., 2016, 78). Based on

this, an examination of the structural concepts present in Iranian houses is presented.

• Characteristics of Iranian houses

Historical houses in ancient cities of Iran reflect the lifestyle and mindset of people at different times, and their architecture is derived from the attitude, culture, and lifestyle of Iranians (Zarei et al., 2017, 1). Traditional Iranian houses are associated with concepts such as security, enclosure, intimacy, belonging, and emotional attachment. In a way that one can perceive and interpret the presence of humans, social relationships, rituals, culture, and customs. It is possible to contemplate its corridors, basements, alcoves, and courtyards without being bewildered by them, analyze them, extract their points, and recognize them (Ghorbani Sisakht & Yazdanpour, 2012). The traditional Iranian house is a combination of various open and closed spaces designed in a way that blends nature and living space together. Introversion plays a role in shaping traditional Iranian dwellings. That’s why the central

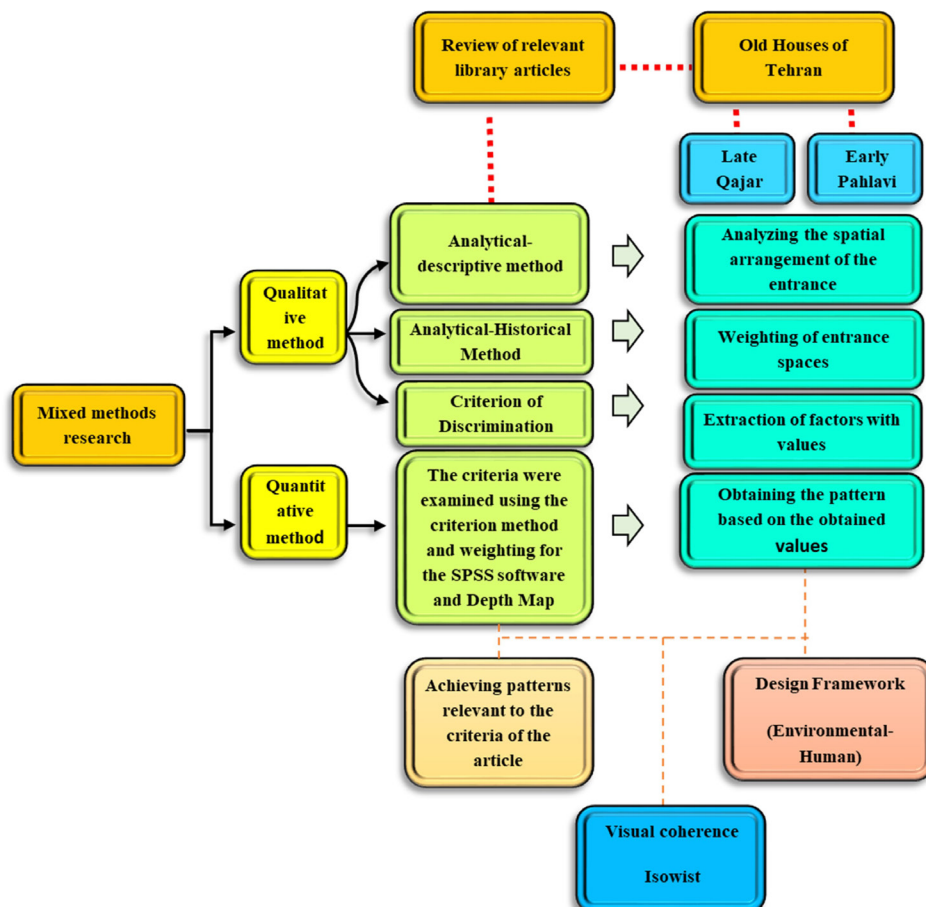


Fig. 2. Research Model. Source: Authors

courtyard is essential for typifying traditional houses in Iran. It can be argued that privacy is one of the main considerations in the design taxonomy of houses. In fact, through detailed analysis of spatial organizations in such houses, it can be said that the design is based on privacy, and this feature is the main point of plans and sections (Ghanadi Maragheh & Akiner, 2019, 3).

A prominent and distinctive feature in Iranian house architecture is attention to meticulous details which are discernible in the facade, corners, doors, and windows, as well as alcoves, convey the Iranian architectural details are repeatable and convey rhythm, order, and symmetry. Iranian houses, in general, besides their physical and visual significance, have more pronounced mental meanings and greater dimensions. For Iranians, human proportions in elements, visual connection between interior and exterior spaces, natural light for the vitality of interior spaces, verandas, roofs, ponds, gardens, courtyards, and communal living have been important aspects of their lifestyle. These elements have played a significant role in shaping the qualitative aesthetic values and many daily behaviors and functions in these spaces (Darvish et al., 2022, 95).

• **Hierarchy in architecture**

refers to the arrangement of spaces into a structured system based on their function and content characteristics. It involves categorizing and organizing spaces to demonstrate how these parts relate to each other and the overall system. This hierarchical organization helps in establishing relationships among different parts of a complex, indicating how they interact with each other and with the entire system (Soltanzadeh, 2005, 106).

The sequence, hierarchy, and private spaces are important elements in the narrative of architecture. Various aspects of hierarchy include form hierarchy, spatial-functional hierarchy, visual hierarchy, and other aspects that are clearly identifiable in traditional houses. The functionality of spaces, as well as the extent and diversity of spaces, are among the various factors in Iranian architecture, along with the presence of movement within them (Arbab et al., 2022, 5).

The basis of hierarchical structure in architecture can be observed in three physical aspects related to architectural

elements, spatial aspects related to architectural spatial components, and structural aspects related to these components (Tabassi & Fazelnasab, 2012, 85).

• **Space arrangement and privacy**

In terms of space arrangement, it needs to conform to the institutionalized cultural traditions of the society, which means that every culture has adopted a different way of treating space, this perspective is in agreement with Altman's view. According to him, behavioral systems include verbal and non-verbal behaviors and are influenced by social and cultural factors. In fact, in all cultures, specific behavioral systems regulate and moderate social interactions and accessibilities through which. Therefore, the cultural pattern, which includes the concept of privacy, is an important factor that affects the "level of social acceptability of space consumption and the extent and manner of its adjacency" (Ghafourian et al., 2017, 28).

The concept and arrangement of privacy in Islamic gender jurisprudence are associated with the term "mahram." A mahram is a member of the family who is allowed to enter the house and is trusted. Traditional Iranian families, due to the importance they attach to privacy, consider their social interactions and relationships with others. Skilled Iranian architects have traditionally designed the courtyard at the center of the building (as the hub of communication between other spaces) and surrounded other spaces in the courtyard. To achieve this, a hierarchical spatial arrangement is created, starting from public spaces and continuing through semi-public and semi-private spaces, culminating in private spaces. (Babaei et al., 2012, 2577; Habib et al., 2013, 12). On the other hand, privacy is a social-cultural demand, a social virtue, and a manifestation of cultural values. In addition to this, the way individuals interact determines the relationships between groups. Altman (1975) stated that privacy encompasses the creation, preservation, and alteration of personal boundaries to achieve control over interpersonal communications. On the one hand, privacy (intimacy) is considered a social-spatial feature that is necessary for the design and planning of residential units. Generally, privacy refers to the separation between private and public areas to protect the well-being of

residents (Obediat et al., 2022, 3). Altman defines privacy as the process of controlling the boundary between individuals, regulating the relationship between openness-closure, and also the relationship between accessibility-inaccessibility, where the multiplicity of access affects privacy (Altman, 1975). In addition, privacy encompasses the separation between private and public spaces to ensure security for all family members (Alitajer & Nojoumi, 2016, 342).

• **The evolution of human needs over time**

In this study, attention has been paid to the spatial and behavioral analysis of these structures (Li & Huang, 2020, 51). Moreover, the results have been presented in both qualitative and quantitative descriptions:

Qualitative descriptions have been categorized based on qualitative research criteria into three groups:

1. Human Needs
2. Privacy in Homes

Stage One: Human needs evolve over time.

In this regard, human needs have evolved over time, such that in traditional houses (built in the late Qajar and early Pahlavi periods), field studies show that there were spaces such as front porches, vestibules, alcoves, corridors, alcoves, and verandas for entering the house and reaching its main space. In addition, there was a

spatial classification including private, semi-private, semi-public, and public spaces. This is in contrast to modern houses where these spaces are not observed.

Therefore, human needs have evolved based on economic factors and population density, requiring a reevaluation of the internal spaces of houses. Because in every period and place, architectural design principles need to be considered in line with human needs. Thus, it can be said that human needs based on architectural standard change over time according to Fig. 3.

Furthermore, according to Fig. 4, which actually examines human needs based on spatial design. it is possible to review and redesign the principles of Iranian architectural design used in traditional houses to meet the primary needs of residents in today’s homes while considering the Iranian identity.

Research Background

The home has been portrayed as the symbol of dwelling and the most private architectural space throughout different periods. Various societies and cultures have different perspectives on housing (Mirmiran et al., 2021, 43).

Numerous articles have been conducted on the concept of housing and traditional housing in various cities in recent years, and many of these researchers have focused

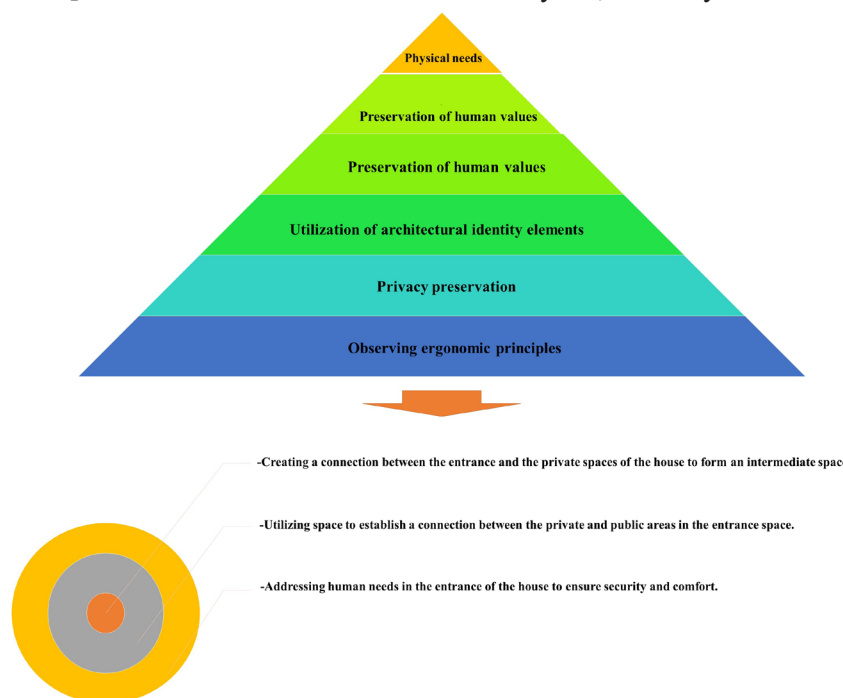


Fig. 3. Examination of Human Needs Based on Architectural Criteria. Source: The Authors

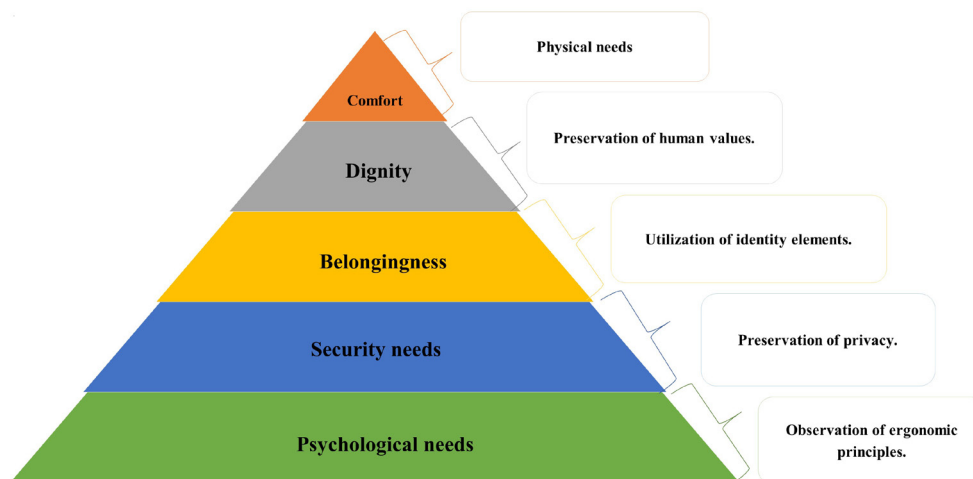


Fig. 4. Investigation of Human Needs Based on Architectural and Spatial Design. Source: Authors.

on the cultural-social aspects of the home and related themes such as territory, intimacy, security, and privacy. The following is an examination of some of these studies focusing on spatial arrangement, as outlined in Table 1. Based on Table 2, Research conducted on cultural and social topics related to the subject. In Table 3, Review of articles conducted in Latin on the research topic. Results of the reviewed studies indicate the significant role of visual elements in perceiving the environment and the diverse spaces based on the domain of each space. Attention to privacy and the classification of relationships based on the function of building spaces in the mentioned studies are priorities in building design in Iran and even Muslim countries like Jordan and Indonesia. The observance of these important points is evident in the design of traditional houses in Tehran. Given that the conducted studies are primarily in cities with significant differences in social customs, processes, and climatic conditions, paying attention to human needs and the relationship between space and privacy, as well as the mode of communication in these houses, can lead to more accurate and comprehensive results regarding understanding the architectural spatial structure of residential buildings.

Research Findings

The present study focuses on analyzing the entry spaces in traditional houses to identify common principles or specific features applied in their design. The reason for selecting houses built during the Qajar and Pahlavi

periods is that many old houses in Tehran date back to this era. To analyze the spatial structure and arrangement of these houses, all aspects were analyzed quantitatively and qualitatively. Spatial syntax that provides a tool for understanding the spatial configuration of a building for social interactions among its inhabitants is a theory adapted from mathematical processes (Khozaei Razavi et al., 2022, 6). It is essential to note that studying other factors such as environmental complexity or spatial arrangement contributes to the readability of an environment. (Li & Huang, 2020, 51). Techniques such as Justification Pattern Graph (JPG) analysis, View Graph Analysis (VGA), and Agent-Based Simulation (ABS) have been utilized to examine the social, cognitive, and behavioral characteristics of spaces. From these studies, multiple spatial-normative criteria and indicators have been proposed and used to measure and understand spatial-social features (Lee et al., 2023, 1). Additionally, using Depth Map software, the visual integration of all points is analyzed, indicating the depth of each area relative to others. Among the physical environmental elements that can affect the analysis of each area are nodes, edges, and landmarks. In this analysis, points that are best connected to other spaces appear in red, indicating that these spaces have less depth. Conversely, points with less connection to other areas in the space are highlighted in cool colors (green to dark blue), suggesting they have less depth. Based on the visual integration analysis, it can be generally stated that courtyards of houses and the spaces directly connected

Table 1. Existing research on spatial arrangement related to the topic of the article. Source: Authors.

Subject Abstract	Author/Year	Objectives	Questions	Research Methodology	Variables	The result of the research
The value of spatial arrangement on visual perceptual experiences of the environment (Case study: Qajar-era houses in Rasht city)	Esfandiari & Koolivand (2020)	Dealing with measuring the components of spatial structures affecting the experience gained from space according to the background of space	Evaluating visual qualities through field survey	Performing correlation tests between Isovist indices and visual-spatial experience indices.	-The correlation between Isovist indices (independent variables) -The correlation between visual quality indices	The results indicate that the arrangement and layout of internal elements significantly influence the perceived visual experience of the environment by users.
Reflection of Social Structure in Spatial Arrangement with Emphasis on Space Configuration: A Case Study of Traditional and Contemporary Dwellings in the Historical-Cultural Fabric of Tabriz	Fathbaqali et al. (2021)	Extraction and introduction of criteria of spatial syntax, change in spatial planning and structure.	- Spatial arrangement of houses in Tabriz from the perspective of spatial linguistics is how? - How is the role of social structures on the spatial arrangement of housing by utilizing the theory of spatial linguistics?	- Exploratory, analytical - Field study - Library research - Observation, interpretation - Computer simulation	- Social structure variables - Spatial arrangement	The structure and spatial system of traditional houses shape various aspects of desirable housing and regulate them through semi-permanent and non-permanent elements in contemporary times.
Cultural Analysis of Space in In Kurdish Residential Architecture; Case Study: Traditional Houses in Mukrian (The City of Sardasht)	Rashidzadeh & Habibi (2020)	Investigation and Explanation of the Nature of Residential Architecture in Mokryan with Emphasis on the Characteristics and Features of Architectural Space and Its Organization and Arrangement, from a Cultural Perspective	- Spatial arrangement of traditional houses in Mokryan from the perspective of spatial syntax criteria is as follows? - Spatial patterns and organization of space in the residential architecture of the Kurdish community in this area are influenced by their dominant worldview and culture, shaping how the space is structured and organized?	- Combining qualitative-qualitative methods. - Data collection through fieldwork.	-The overall Kurdish culture influences architecture such as lifestyle spaces -family structure, gender roles, privacy, and the dynamics of social relationships.	- Traditional houses have courtyards, and due to the main entrance's location on the courtyard, the depth of spaces calculated from the entrance point has a generally large depth. - Spaces have shallow depths and are physically accessible, leading to complexities in privacy issues in these houses. - The courtyard has the most connectivity and the least control compared to other spaces.

Table 2. Previous Research on Cultural and Social Topics Related to the Subject of the Article. Source: Authors.

Subject Abstract	Author/Year	Objectives	Questions	Research Methodology	Variables	The result of the research
The Role of Visual Connectivity in Shaping the Concept of Domain in Historic Houses of the Qajar Period in Rasht	Mesbah et al. (2023)	Enhanced Understanding of the Concept of Territory through Analysis of Visual Connectivity Indicators at the Scale of Internal Relationships within Houses	- Visual connectivity in different spaces of historical houses in Rasht exhibits what differences compared to each other? - In historical houses of Rasht, where is the readability and visual connectivity more prominent among spaces?	- Comparative descriptive-analytical study with logical reasoning - Comparative analysis - Library research and empirical observations	- Spatial pattern - Visibility level - Visual exposure distances - Legibility of spatial pathways	- Increased adjacency to walls and decreased spatial complexity due to the convexity of space, along with visual and physical accessibility, lead to greater connectivity of a space with other spaces, resulting in less seclusion. This phenomenon also holds true in reverse.
Analyzing the Changes in the Structure of Residential Types in the Historical Context of Borujerd City From Qajar to Pahlavi period	Afshari & Chegeni (2022)	“Understanding and Categorizing the Architectural and Spatial Structures of Traditional Houses in Borujerd, and Identifying the Spatial Organization Features of Historical Houses in This City”	- Investigation of the Architectural and Spatial Features of Qajar and Pahlavi Houses in Borujerd - Changes in the Architectural Structure of Traditional Houses in Borujerd Over Time	- Analytical-Descriptive Approach - Software Analysis - Library Studies - Field Approach	Layout Variables: - Connectivity - Spatial Depth - Isovist - Visual Access	-The results indicate that Qajar-era houses, compared to Pahlavi-era houses, exhibit greater unity, better spatial functionality, more suitable hierarchical organization, and consequently, greater permeability.

Table 3. Review of Relevant Latin Research Backgrounds on the Research Topic. Source: Authors.

Subject Abstract	Author/Year	Objectives	Questions	Research Methodology	Variables	The result of the research
Privacy as a motivating factor for spatial layout transformation in the Jordanian public housing	Obeidat et al. (2022)	Achieving goals such as expanding and altering residential spaces and preserving privacy within them.	- Can residential units meet the basic requirements of privacy? - How do changes in residential units affect behavioral patterns over time?	- Field methods such as observation and interviewing residents - Data analysis using the spatial arrangement method - Qualitative approach	Cultural and social needs with functional aspects	The impact of modernism on the evolving needs and priorities, alongside the necessity of preserving privacy in traditional residential units in Jordan, aligns with international standards and styles.
An Architectural Review of Privacy Value in Traditional Indonesian Housings: Framework of Locality-Based on Islamic Architecture Design	Hasan et al. (2021)	Presenting and introducing traditional houses in Indonesia in accordance with Islamic values.	- How to create distinct spaces in local houses in Indonesia.	- Utilization of library resources, books, and scientific journals.	Cultural and religious structures.	Preserving the values of privacy and ethics in traditional houses, including: regulating heights for building spaces, internal zoning of rooms, as well as dividing houses and using separate entrances to preserve the privacy of families and maintain their privacy during the presence of guests and hospitality conditions within the family.
Traditional Architecture Of Kalang, Limasap (ETHNOGRAPHIC APPROACH)	Hasrorahmanto et al. (2020)	Presentation and representation of traditional activities and functions among different ethnic groups in various residential areas according to ancestral customs and traditions.	- How tradition is reflected in local houses in this region.	- Field visits and observation - Analysis and findings between traditional activities and space.	Cultural factors	This research contributes to the preservation of ethnic groups in traditional settlements in Javanese houses in Indonesia. The differences and similarities of traditional houses based on the existence of two different traditions are as follows: 1. Spatial functionality: The use of space varies according to different traditions, as each tradition involves different activities with distinct spatial functions. 2. The use of materials and building structures is similar.

to them are the most visible areas. In these areas, individuals have longer horizontal lines of sight, thus creating better connections with other areas. This area has been highlighted in the analysis with red, orange, and yellow colors. This indicator varies across different houses. Additionally, the distribution of warm and cool colors in the graph of each house indicates the level of privacy and delineation of that space from other areas. For example, in the house of Reza Khan, the entrance is depicted in dark blue color, the surrounding rooms are in light blue, and the central courtyard is represented in warm colors. This clearly indicates the accessibility of each space and the hierarchy of entry. In general, areas that are more visible and have better connections with other areas are depicted in warm colors, while areas that are less visible and have weaker connections with other areas are depicted in cooler colors. Moreover, according to [Table 4](#) which compares the visual integration index and visual integration index

and isovist analysis of Qajar houses, the highest level of visual integration is observed in the house of the Friday prayer leader, where a large courtyard is located on one side. Therefore, the courtyard spaces are seen to a great extent from all parts of the house and are easily accessible. However, the residential spaces such as rooms and corridors indicate a hierarchical sequence of entry. The role of corridors as spaces that create boundaries and reduce visibility and accessibility is noticeable in all houses. This analysis also indicates that despite the central courtyard of these houses being fully visible, the privacy of surrounding spaces is significant, and access and visibility to them are limited. The isovisibility analysis indicates which areas are within sight of the vicinity of the entrance of the houses, namely the point where the isovisibility analysis was conducted. For example, the layout of the courtyard in the Matin house allows most parts of the courtyard to be directly visible. However, the complexity and

Table 4. Comparison of Visual Integration Index and Isovisability Analysis for Late Qajar Houses. Source: Authors.

	Visual coherence analysis	Visual coherence analysis
Anis House		
Emam Jomeh House		
Jalal House		
Lashkar Nevis House		
Malek House		

compact form of the plan in the Malek house result in not all parts being directly visible from the vicinity of the entrance. Therefore, the compactness of the plan and the form of the enclosed spaces significantly affect the isovisability analysis. The best method for examining and evaluating the quality of concave and convex spaces is using isovisability analysis. In this article, 120-degree isovisability analyses have been conducted for various spaces within the houses. Table 5 presents the visual

integration index and isovisability analysis for Pahlavi I period houses, while Table 6 shows visual integration index and descriptive statistics (mean and standard deviation) and the ratio of entrance space to the vestibule in the buildings belonging to the Qajar and Pahlavi I periods. Moreover, in this table, the standard deviation is considered as the main criterion.

According to the results of the above tables, the mean ratio of entry space to courtyard space and the standard

Table 5. Comparison of Visual Integration Index and Isovisibility Analysis for Early Pahlavi Houses. Source: Authors.

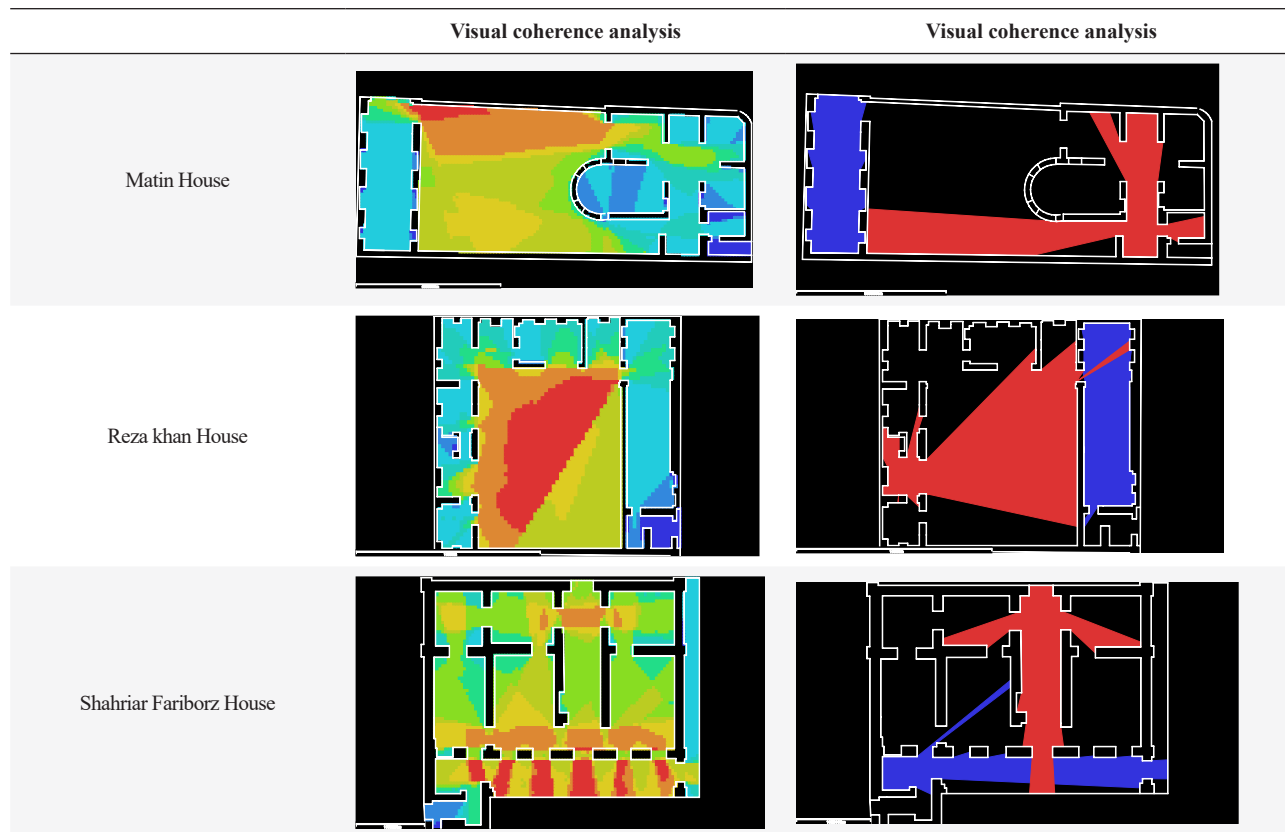


Table 6. Visual integrity index & Descriptive Statistics (Mean and Standard Deviation) and the Ratio of Entry Space to Courtyard Space. Source: Authors.

	The visual integration index				The entrance space to octagonal space ratio				Historical period					
	Minimum	Maximum	Mean	Standard deviation	Std. Error Mean	Std. Deviation	Mean	N						
Anis House	3.55	24.76	14.02	2.84	0.67414	1.78361	3.507	7	Qajar					
Emam Jome House	3.27	67.40	32.05	15.27										
Jalal House	3.44	17.24	9.69	2.59										
Lashkar Nevis House	4.88	33.43	17.75	7.14										
Malek House	1.76	10.04	6.60	1.43										
Matin House	3.67	24.62	14.27	5.20						0.31269	0.76594	2.5667	6	Pahlavi
Reza Khan House	2.87	25.49	15.95	6.51										
Shahriar House	3.12	14.04	9.83	2.04										

deviation in the Qajar period are higher than those in the Pahlavi I period. Therefore, it can be concluded that among the research samples, the buildings of the Pahlavi I period are more homogeneous and similar in terms of the ratio of entry space to courtyard space. Furthermore, the presence of a significant difference between the means of the two periods in the index of the ratio of entry space to courtyard space (or lobby) of the houses under study was examined. Table 7 shows the results of the independent sample T-test to investigate the hypothesis of equality of the ratio of entry space to courtyard space in the Qajar and Pahlavi I periods.

According to the results of the first column of the table above (Levene’s Test for Equality of Variances), the F statistic value is 4.096, and the significance level (sig) is 0.068. Therefore, the assumption of equality of variances for the two samples based on Levene’s test holds (sig > 0.05). However, according to the results of the second column of the table above (T-test for Equality of Means), the T statistic value is 0.742, and the significance level (sig) is 0.474. Therefore, there is no significant difference between the mean ratios of entry space to the octagon in the houses of the Qajar and Pahlavi periods (sig > 0.05). A correlation matrix was created for

the dimensions of the research factors under investigation, which can be observed in Table 8 which examines the characteristics of the analysis of weighting factors based on the model(CCBQ). Based on this, the numerical relationship between the scores before and after the test, from the relationship between the principles of form and structure of the houses, by obtaining the number 1 in all cases, indicates the establishment of a numerical relationship between the research variables.

For data analysis using logistic regression, relationships between variables were analyzed using Spss version 22 software. A confidence level of 0.05 was considered for the calculations. In this section of the study, a logistic regression model was employed to examine the relationships between demographic variables.

In Qajar-era houses due to the observance of traditional patterns and hierarchies, direct access to the interior spaces of the house is not available. The presence of hierarchies in the entrance space is highly considered in these buildings due to privacy and visual perception. The hierarchy of entrances in these houses is arranged in such a way that initially, there is an entrance hall (hashti), followed by a corridor (dalan). The presence of the entrance hall, which can itself be proportionate, obstructs the visual sight and observation of individuals inside the house, thus preserving privacy. However, the change in direction of spaces and the presence of elongated spaces such as “dalan” also emphasize this matter. Considering that in these houses, the number of entrances is usually more due to the different types of visitors entering

the house through a single entrance. In some houses, entrances are placed in a more favorable position based on the social or economic status of the homeowner, such as the “Malek” house, where the main entrance is located in the market area due to the comings and goings of people to this house. In Pahlavi-era buildings, due to the change in architectural style from introverted to extroverted and the presence of new Western-style buildings, and taking inspiration from some internal and external spaces of the building, including the hierarchy of entrance spaces, or changing their shape, and facilitating access to the internal spaces of the building has been provided. The removal of spaces such as “pish-taq” (verandah) and “pir-neshin” (anteroom), large octagons and corridors, and the creation of wide stairs and numerous entrances were created to beautify and boas more. vestibules for embellishment and greater ostentation should be noted. It is important to mention that all the data obtained are aimed at achieving the main goal of the research, which is to examine the privacy and intimacy in the entrance spaces of each house. Considering the placement of the main spaces on the ground floor and analyzing the spatial structure of this floor, the following results are generalized to most historical houses of the Qajar and Pahlavi periods in Tehran. According to the findings of this study, in Table 9 the analysis of the entrance hierarchical spatial structure and its changes in terms of physical aspects in Qajar and Pahlavi-era houses have played a significant role in human interactions.

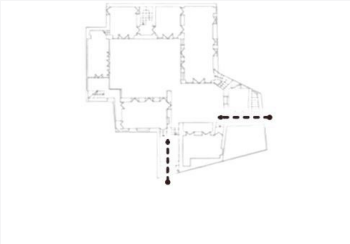
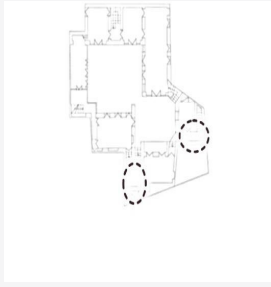

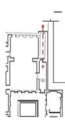
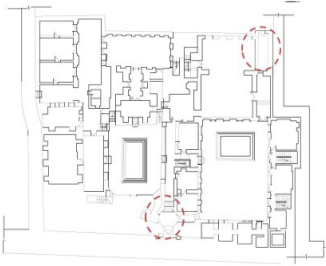
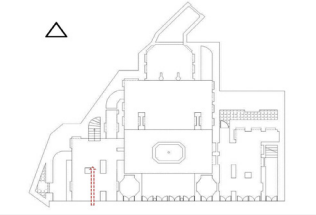
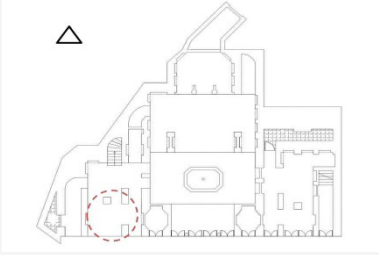
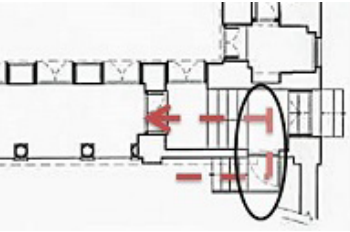
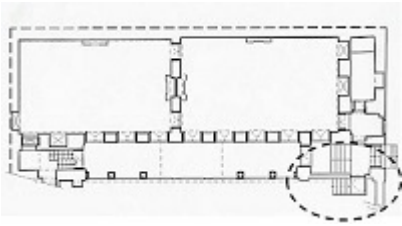
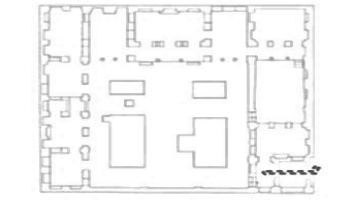
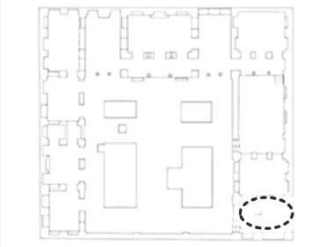
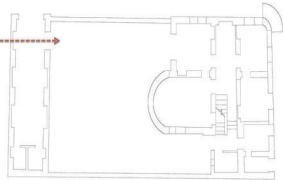
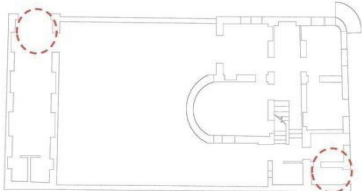
Table 7. Results of independent sample T-test for investigating the hypothesis of equality of the ratio of entry space to courtyard space in two periods. Source: Authors.

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
The ratio of the entry space to the octagon	Equal variances assumed	4.096	0.068	0.742	11	0.474	0.58405	0.78717	-1.14850	2.31659
	Equal variances not assumed			0.786	8.393	0.454	0.58405	0.74313	-1.11574	2.28383

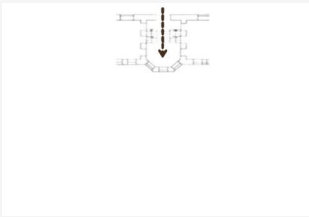
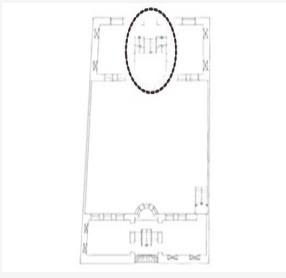
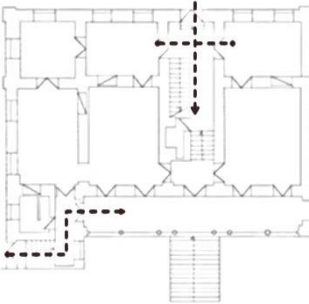
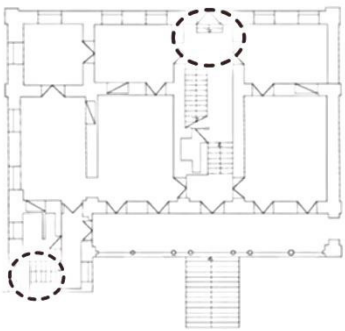
Table 8. Examination of Factor Analysis Characteristics Weighted According to the CCBQ Model (Note: All data are calculated out of 100, and 100% has been selected for the weighted indices). Source: Authors.

Indices	Privacy	Spatial elements	Spatial organization	Identity and culture	Human needs
	X2	DF	P	GFL	AGFI
The five main factors of the research	589.508	5.698	0.001	0.87	0.901

Table 9. Analysis of the hierarchical arrangement and visibility of the entrance space on the ground floor of Qajar and Pahlavi I houses. Source: Authors.

Building Name	Hierarchy of Entry	Entry Pathway into the Building	The positioning of the entrance in the ground floor plan
Jala House	<ul style="list-style-type: none"> - Vestibule - Gateway - Porch 		
Maliek House	<ol style="list-style-type: none"> 1. Entry1: <ul style="list-style-type: none"> - Anteroom - Foyer - Doorway - Vestibule - Rotunda - Courtyard 2. Entry2: <ul style="list-style-type: none"> - Doorway - Porch - Staircase - main space 	  entry1 entry2	
Emam jome House	<ul style="list-style-type: none"> - Doorway - Vestibule (or hall) - Change of direction - Main space 		
Anis House	<ul style="list-style-type: none"> - Stairs - Change of direction - Entrance - Vestibule (or hallway) - Stairs - Main space 		
Reza khan House	<ul style="list-style-type: none"> - Anteroom - Entrance - Hallway - Corridor 		
Matin House	<ul style="list-style-type: none"> - Entrance - Staircase - Level difference - Corridor - Rooms 		

Rest of table 5.

Building Name	Hierarchy of Entry	Entry Pathway into the Building	The positioning of the entrance in the ground floor plan
Lashkar Nevis House	<ul style="list-style-type: none"> - Entrance - Hallway - Rooms - Staircase floors 		
Shahriar House	<ul style="list-style-type: none"> - Entrance - Hallway - Rooms - Staircase to the floors 		

Conclusion

Given the placement of main spaces on the ground floor and the examination of this level, the following results can be generalized from the study of historical houses from the Qajar and Pahlavi periods in Tehran to the majority of houses from the mentioned periods. In the present research, to achieve a quantitative expression of patterns based on human needs and privacy preservation in historical houses, the analytical tool Depth Map was used in the first stage, and in the second stage, Spss 22 and correlation between research components were utilized. The tools were evaluated and analyzed using numerical outputs from both software packages and by plotting graphs. Additionally, it was demonstrated that by analyzing correlation indices and rating criteria, a new approach could be introduced. Both software packages were utilized to measure human needs and privacy preservation in the current research. The findings obtained from the studies related to the research topic examined the measurable physical components through the Depth Map software either in overall building analysis or individually. The aim is to utilize these results in the field of architectural design. This research seeks to investigate influential components in the entrance space of buildings and establish hierarchy and privacy. The results of the first stage indicate that traditional structures

provide better solutions in terms of entrance hierarchy and privacy, and the spaces surrounding the entrance, especially the courtyard, play a communicative role in the entry system. This study, which is the result of spatial arrangement and organization in the entrance hierarchy in these two periods, demonstrates that the entrance and its spatial relationships are the most important physical factors in Qajar and Pahlavi houses, which have actually been analyzed to achieve privacy, a fundamental aspect of these houses; and in the second stage, the results show that there is a relationship between barrier spaces at the entrance and spatial hierarchy in the entrance and privacy preservation, which can serve as a source for designers and homeowners.

This research provides a reasoned response based on quantitative outputs for analyzing and evaluating the privacy and intimacy in the entrance spaces of traditional houses. Considering that the entrance of each house plays a significant role in controlling direct visual access to other parts of the house, it can be said that the entrance regulates the permeability to other parts of the house. The analysis of the impact of changing human needs in the late Qajar and early Pahlavi periods on the architectural space of houses has been examined in [Table 10](#), which shows the results of the analysis.

Therefore, in response to the main question of the

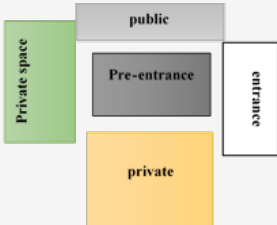
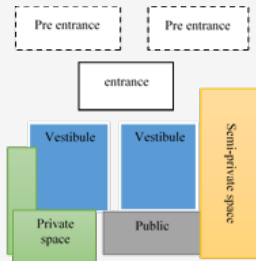
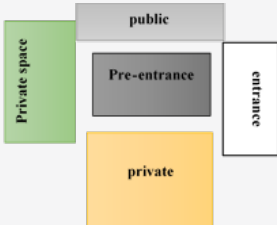
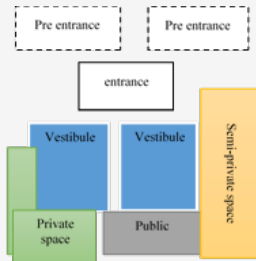
research, it can be said that ultimately, considering the mentioned factors, besides making changes in spaces, the removal and replacement of some important elements in the floor plans of Pahlavi-era houses have disrupted the hierarchy of entryways. These spaces, more commonly seen in Qajar-era floor plans, include the entrance, vestibule, exterior courtyard, cellar, and interior courtyard. Furthermore, Qajar-era houses are mostly constructed based on traditional hierarchical structures. The spatial depth of houses in this era is greater based on the indigenous culture of that period. Signs of modern architecture in Qajar-era houses are less evident. The imitation of Western architectural styles is more apparent in the floor plans of the Pahlavi era. The result of removing main spaces from the structure of floor plans has reduced privacy in Pahlavi-era floor plans. This trend continues in modern housing, affecting the appropriate access to the main spaces of the house and privacy.

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Table 10. Analysis Results. Source: Authors.

Row	Period	House Names	Model of late Qajar and early Pahlavi houses with Depth Map software	Model of late Qajar and early Pahlavi houses with SPSS software	Explanation of Patterns
1	late Qajar	Anis			Quantitative analyses indicate that in each of the 8 sample houses from the two periods under study, hierarchy, and entryways can serve as specific and practical templates for preserving the privacy of the house occupants.
2		Lashkar nevis			
3		Malek			
4		Emam Jome			
5	Early Pahlavi	Jalal			
6		Matin			
7		Reza khan			
8		Shahiar			

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