

A Comparative Study of Historical and Contemporary Houses in Kermanshah to Recognize Micro-Space Empowerment Methods*

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ABSTRACT

To enhance the performance of space, as the essence of architecture, it is required to strengthen and optimally use micro-spaces. The methods applied to this end are referred to as "micro-space empowerment methods". These methods have been applied at specific times and in given places to organize space by each society to interact with the territory, history, environmental capabilities, as well as lifestyle. The present study aims to investigate the empowerment methods of micro-spaces in the home to identify effective solutions to improve the quality of contemporary housing. So, the research questions are as follows: What are the micro-space empowerment methods? How are the micro-spaces in historical and contemporary houses empowered? How can micro-space empowerment methods be applied in today's housing? The present study is qualitative research carried out using data analysis. In the present study, first, the concepts related to micro-space empowerment are redefined and micro-space empowerment methods are described. Next, three houses belonging to three Qajar, Pahlavi, and contemporary eras are selected from the three old, middle, and new textures of Kermanshah City as a source, and their micro-spaces are studied and compared by library studies, field studies, and observations. The results indicate that traditional architecture and modern architecture are different in the design of architectural elements. In traditional houses, there is a convergent spatial organization through which various aspects such as responding to lifestyle, diverse lighting and landscape, interaction with nature, and comfort, are organized and integrated, while in contemporary houses, they are provided in a divergent design. Convergent design methods require the use of micro-space empowerment methods.

Keywords: Space Empowerment, Space Definition, Space Composition, Space Adaptation.

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1. INTRODUCTION

Architecture is the art of organizing space. In traditional houses, space is organized and arranged for all daily activities to achieve a special goal that is the meaning of life (Noghrehkar, 2011, p. 174). Space empowerment methods include space definition, space composition, space display, and space adaptation. In traditional houses, using these methods, space becomes free, and three different spaces (open, closed, and covered) are defined through three space-forming elements (ceiling, floor, and wall) and combined with other adjacent space through other elements (such as doors and windows), leading to light and landscape expansion. Also, due to the presence of natural elements in traditional houses, they don't need modern mechanical systems. Applying space empowerment methods in the spatial organization of traditional houses relates the formation of each component of space to the formation of the components of other spaces. Thus, various open, closed, and covered spaces are formed, defined, combined, and strengthen each other's ability to expand the space, while various types of micro-spaces belonging to the covered, open and closed spaces are organized in relation to each other (Haeri Mazandarani, 2008, p. 136). Today, dissatisfaction with the quality of architecture has become a major issue for everyone and such dissatisfaction is more acute, especially about houses as safe shelters for residents (Asefi & Imani, 2012, p. 64). The present study aims to: 1. Study micro-

space empowerment methods; 2. Investigate the micro-space empowerment methods applied in traditional and contemporary houses; and 3. Provide solutions for reusing these methods. What makes the present study necessary is the importance of housing and its desirable quality as well as the needs and status of the current society.

2. METHOD

The present study is descriptive-analytical research in which research samples were examined according to the main factors. The theoretical framework was developed using the library study and reviewing books and articles on the micro-space empowerment methods (space definition, space composition, space differentiation, space construction, and space adaptation), and their role in the quality of the residential environment. Research samples included two traditional houses (belonging to Qajar, late Qajar, and Pahlavi periods) and one contemporary house which were selected from the old, middle, and new textures of Kermanshah City, respectively. Examining the samples reveals the changes in the micro-spatial organization methods applied in residential buildings. To this end, objective and field observations as well as building plans, were applied to analyze the samples. Since there is no difference between the houses of each period in the micro-space empowerment method, one sample was selected from each period to avoid duplication (Fig. 1).

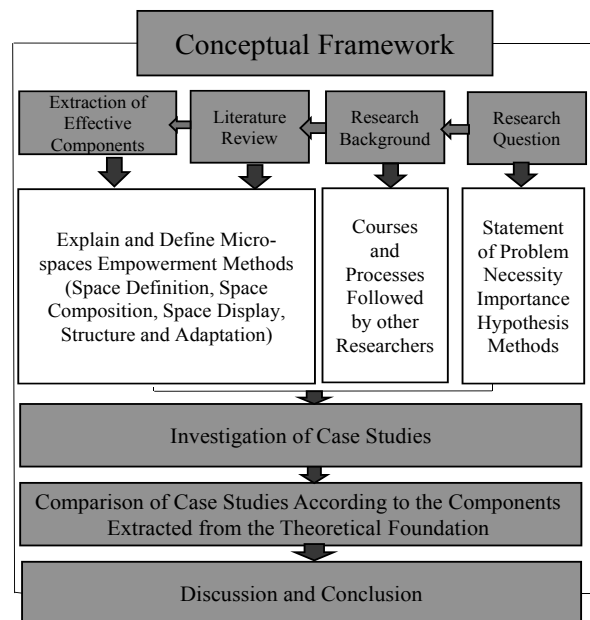


Fig. 1. Part Research Process

3. RESEARCH BACKGROUND

In Iran, new forms of houses have emerged since the 1940s, which have been constructed with different architectural principles from those applied in traditional houses. Such a change is mainly related to

the role of space in houses. In traditional houses, the components were combined to form the spaces within a given spatial organization, while being independent and having a clear definition, and the micro-spaces were combined to form the totality of the spatial organization. Thus, the combination of components,

in addition to the components themselves, was applied, allowing the application of the entire spatial organization. In contemporary houses, although the ceiling, floor, and wall form the boundaries of spaces, the micro-spaces provide no opportunity to fully benefit the spatial organization (Haeri Mazandarani, 2008, p. 114). Research background can be presented in two areas:

1. Space empowerment: In this area, one can refer to Haeri Mazandarani's (2009) book "Home, Culture, Nature" in which the investigation of traditional houses in the cities of Kashan, Hamedan, and Shiraz has indicated that factors such as spatial perception, light and landscape expansion, privacy, spatial diversity, etc. are effective factors in space empowerment. Also in 2013, a study has discussed the role of windows, sash, and openings in the empowerment of spaces in Iranian houses. In the article entitled "Architecture as Empowerment: The Participatory Approach in South Africa", the role of social participation in empowering space in South Africa has been discussed.

2. Factors related to the micro-space empowerment: In this area, in 2012, the article entitled "Evaluation of Traditional Iranian House and Match It with Modern Housing" has investigated factors such as geometry, zoning, diversity and simplicity, spatial hierarchy, introversion, and privacy in traditional and contemporary houses in Yazd. In 2016, in the article entitled "Different Ways of Space Based on the Architectural Models of Traditional Houses", spatial organization and factors such as diversity, hierarchy, flexibility, introversion, and legibility in houses in Qazvin have been investigated. Also in 2017, the article entitled "Evolution of Residential Building in Iran based on Organization of Space" has compared the courtyard, open space, and rooms of traditional and modern houses discussed the role of introversion, privacy, flexibility, spatial organization, spatial connection, and domain of personal spaces in the quality of space in different historical periods in Iran, and investigated micro-spaces such as entrance, room, yard, and kitchen in today's houses. In another article entitled "Explaining the Role of Diversity in Creating Life in Iranian House Based on Christopher Alexander's Opinion and Focusing on Boundary Spaces", it has been attempted to investigate the diversity of size, distance, and characteristics of various spaces including open, closed, and covered spaces, in Iranian houses and to address factors such as the hierarchy of areas, proportions, and geometry in traditional houses. In 2007, a study entitled "Architectural Expression: Corporeal Manifestation of the Essence of Architecture" has examined the presence of convergence and co-expression in traditional houses and divergence in modern architecture.

The review of these references shows that open, closed, covered spaces (space definition), privacy, pause space, light and landscape expansion (space composition) and spatial diversity, color, light, decorations (space

display), and the adaptation of the building to climate and structure (structure and space adaptation) have been present in the structure of traditional houses and empowered the spaces in them.

4. MICRO-SPACE EMPOWERMENT METHODS

Space empowerment methods include space definition, space composition, space display, and space adaptation which are less considered in contemporary houses, making their residents less benefit from values such as spatial diversity, uses of color and light, privacy, flexibility of space, thermal comfort, non-use of mechanical devices, etc.

4.1. Space Definition Methods

Space has defining and limiting elements which can be measured and recombined (Memarian, 2010, p. 243). Other factors influencing an individual's perception of space are including color and light, sound and how it is diffused, his movement/ pause in space, and his orientation in space. Space definition methods refer to the roles of architectural elements in introducing space (Haeri Mazandarani, 2008, p. 98). The building body is a set of open, closed, and covered spaces. The spatial organization represents the simultaneous presence of open, covered, and closed space and their combinations in the same place in the form of powerful spatial patterns. The definition and legibility of spaces in a house represent its quality and provide a clear mental image to the observer. The spaces in a house are not only visible but also represent all the human senses and help the individual to find himself in the space and have a sense of safety in that space.

4.2. Space Composition Methods

The ability to adjust tranquility in the context of a built environment depends on flexibility as one of the qualities of space (Shakoori and Khamoushi, 2016, 1). Although an architectural space is a well-defined space, there may be a need for the space to be designed in a way to be made changeable (Groter, 2014, p. 204). Some environments provide space for many activities without being changed and reorganized. Some environments can be easily changed to provide space for different activities (Lang, 2009, p. 134). Therefore, space composition methods refer to how spaces are put together. In the spatial organization, no space in the house is finished and blocked and any space, while independent, can be composed with its surrounding space (Abdollahzadeh & Arzhmand, 2012, p. 8). This is realized if in-between spaces are created. The in-between space separates two spaces, and in cases where it is necessary to combine these two spaces, the in-between space acts as an expanding space between the two spaces and empowers them (Haeri Mazandarani, 2008, p. 102).

4.3. Space Display Methods

In contemporary architecture, each building is divided into two parts: patterns and elements of architecture. The elements of architecture clearly refer to columns,

windows, doors, walls, floors, ceilings, and so on. The elements of architecture are part of spatial patterns that play a role in shaping, and theming the space (Haeri Mazandarani, 2008, p. 197). The elements play different roles in space empowerment (Table 1).

Table 1: The Role of the Elements of Architecture in Empowering Space

Space-Defining Elements	Wall Floor Ceiling	Defined Space
Space-Composing Elements, Light Expansion, Landscape Expansion, Spatial Expansion	Door Window, Skylight Columns	Expanded Space
Space-Differentiating Elements	Light, Brightness and Darkness Colors, Materials, and Motifs Shortness and Tallness Fullness and Emptiness of Space	Differentiated Space
Space-Enlivening Elements	Direction of Air Flow Presence of Light, Spectrum of Shade and Light Use of Landscape	Enriched Space

(Haeri Mazandarani, 2008, p. 111)

4.3.1.1. Wall

In Iranian architecture, the wall plays an essential role not only as a separate space for shelter and security but also in determining the levels of spaces, arranging and displaying, as well as composing spaces. In Iranian architecture, a wall is equivalent to passing and joining, not obstruction and separation. The niches and shelves within the walls of the rooms change their smooth form and architecture participates in the spatial arrangement in this way. The connection, continuity, and sequence of spaces play a role in the spatial expansion, landscape expansion, and light expansion by placing doorways, doors, windows, or smaller frames within walls (Ibid, p. 198).

4.3.1.2. Floor

The floor design, in any part of the space, whether open, covered, or closed, strengthens the definition, composition, and distinction of the space. The floor design is related to various conditions of pause and movement, stop and transitions, public and private realms, feelings of continuity and connection. Spatial diversity is obtained through the elevation difference between floors and spatial distinction is obtained

through the display and combination of texture, color, and material properties of the floor (Ibid, p. 112).

4.3.1.3. Ceiling

The ceilings play different roles depending on its dimensions and location in relation to public and private realms (Ardalan & Bakhtiar, 2012, p. 69). In addition to being used in closed and covered spaces to empower the space and increase space diversity, in the architecture of traditional houses, different degrees of roof coverage on open spaces also allow experiencing various lighting, atmospheres, and shades in open space (Haeri Mazandarani, 2008, p. 111).

4.3.1.4. Window

One can see cultural and environmental features in the structure of the windows of traditional buildings. Sash windows are one of the prominent examples of Iranian windows (Valiani and Hosseini, 2014, p. 7) (Fig. 1). By placing sash windows in one or two fronts of the interior, they are used as a ventilator, a factor creating draught or allowing the passage of a gentle breeze. The structure of sash windows as well as their location in traditional houses make the space flexible (Akhavizadegan, 2013, p. 4).

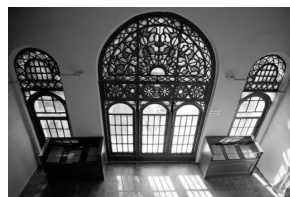


Fig. 2. Sash Window, Biglarbeigi House

(Archive of Kermanshah's Cultural Heritage, Handicrafts and Tourism Organization, 2018)

4.3.1.5. Light and Color

The color and amount and direction of light are among the factors influencing the quality of space. Light and color are the aesthetic elements of Islamic architecture. Light is one of the distinctive aspects of Iranian architecture and an element of divine wisdom (Arjmandi, Sha'abani, & Mazaheri, 2011, p. 8). Light and shade create an active texture on the building, walls, and floor. The texture not only has unique beauty but also revitalizes and enriches the space. The color is created from the multiplicity of light and has the nature of unity. Eaton believes that the eye seeks a combination of colors that are complementary and balancing (Toghroljerdi, Asefi, & Mohajeri, 2017, p.

17).

4.4. Space Adaptation Methods

Home is a space in which people can be safe, and feel peace and comfort. Safety, comfort, and peace have the same value within the spatial organization. The architecture of traditional houses is an interdisciplinary science that meets the necessities of stability and comfort. So, new solutions, initiatives, and methods of providing stability and comfort must satisfy architectural standards. Even if they play a role in heating, cooling, and earthquake resistance, they are not allowed to have a separate and non-integrated presence in the spatial organization (Haeri Mazandarani, 2008, p. 114) (Table 2).

Table 2: Space Adaptation Method in Traditional Houses

Space Adaptation Methods
To make the most of the natural capabilities of the soil and to use the soil depth to deal with severe cold;
To take architectural measures to establish the building within the ground and use cooling and heating inside the ground, use obtained materials, and increase the space volume in relation to its area;
To use space integration methods to provide space coverage (provision of tall and expanded ceilings) and space comfort;
The main bearing structure of the building must be design in such a way that separating elements can be moved.

(Pakzad, 2004; Haeri Mazandarani, 2008)

5. CASE STUDY: HOUSES OF VARIOUS PERIODS (QAJAR, PAHLAVI, AND CONTEMPORARY) IN KERMANSHAH CITY

In the area of space empowerment, issues such as the definition of open spaces (including courtyard, estrade, Tarmeh, and loggia), closed spaces (including room, Shahneshin room, Panjdari and Sedari room), and covered spaces (including porch, stoop, and terrace) are of particular importance. Also, space composition and light and landscape expansions

help the spatial organization and thereby enhancing space empowerment. Moreover, in all fields, including light, color, structure, and adaptation, space diversification methods are considered in the area of space empowerment and have been applied in traditional houses by observing climatic, construction, and adaptation principles, using the basement and climatic elements and coordinating all these elements in the building. In the following, the abovementioned concepts and methods are compared in traditional and contemporary houses. Also, the theoretical framework of the present study is as follows (Fig. 3).

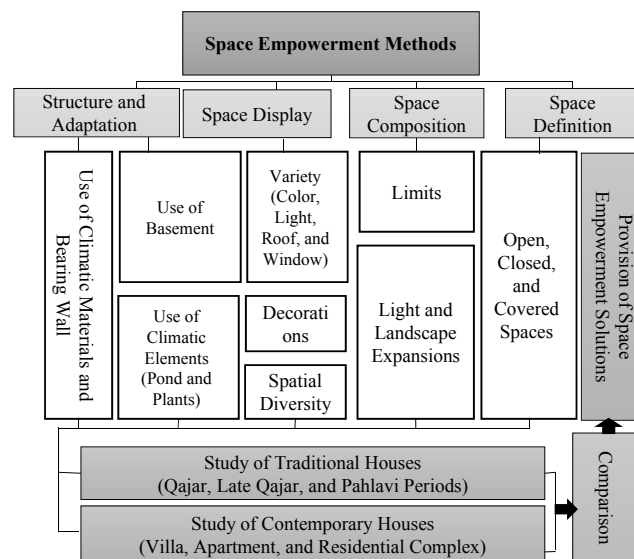








Fig. 3. Theoretical Framework

The traditional houses in Kermanshah City have an architecture compatible with environmental and climatic conditions, and this architecture is valuable physically and sustainably on both micro and macro scales because of the applied attitudes to man, and environment, and also the observation of architectural




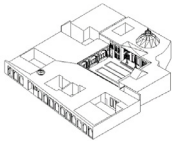








arrangements in it. In the present study, the micro-space empowerment methods which were applied in houses belonging to Qajar (Biglarbeigi House), late Qajar (Suri House), Pahlavi (Khadivi House) periods and also, contemporary houses in Kermanshah City are studied (Table 3).

Table 3: Characteristics of Selected Houses Studied

Characteristics	Traditional Houses (Qajar and Pahlavi Periods)			Contemporary Houses		
	Biglarbeigi House (Qajar Period)	Suri House (Late Qajar Period)	Khadivi House (Pahlavi Period)	Villa	Apartment	Residential Complex
Plan						
Architecture	Introverted, Broken Skyline (Gable Roof, Dome), Andaruni-Biruni (2 Floors)	Central Estrade, Smooth Skyline, No Andaruni-Biruni (2 Floors)	Extroverted, Broken Skyline, No Andaruni-Biruni (2 Floors)	Extroverted, Smooth Skyline (Flat), No Andaruni-Biruni (1 Floor)	Extroverted, Smooth Skyline (Flat), No Andaruni-Biruni (2 Floors and Pilot)	Extroverted, Smooth Skyline (Flat), No Andaruni-Biruni (6 Floors and Pilot)

1. (Entrance, Entrance Door, Vestibule); 2. Courtyard; 3. Living Space (Room, Sedari, Panjdari, etc.); 4. Service Space (Kitchen, Service, Bathroom, Storage, etc.); 5. Porch; 6. Connecting Space (Stairs, Corridors, etc.) and 7. Skylight / Terrace

Table 4: Figures of the Studied Qajar and Pahlavi Houses

House	Figures of Traditional Houses			
Biglarbeigi House				
Suri House				
Khadivi House				
Contemporary Houses				

(Archive of Kermanshah's Cultural Heritage, Handicrafts and Tourism Organization, 2018)

5.1. Space Definition in the Studied Houses



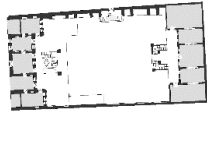

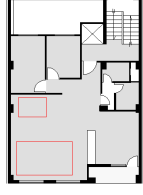
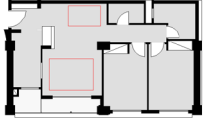
The spatial structure of Qajar houses in Kermanshah

City has all three types of open, covered and closed spaces. The open space is seen in the form of a yard and an estrade, and the covered space in the form of a

porch and a stoop, and the closed space in the form of a Shahneshin room, a Panjdari room, a Sedari room, and Pasotagh (backroom). From the late Qajar and Pahlavi periods, house plans have experienced major changes and followed Western forms. Some residential spaces have been removed and some elements have been added. Nested andaruni-biruni courtyards have gradually lost their function. At the same time, few elements of Iranian architecture, such as porches, have been used but in new forms (Boroumand Sorkhabi, 2009, p. 289). In this period, one can see space definition through the open space in the form of a yard, the covered space in the form of a porch, and the closed space in the form of Sedari and Panjdari rooms. But it is noteworthy that the quality of the covered spaces such as porches has not been the same as that in the Qajar period. This trend of change has intensified in the contemporary houses,

including villas, apartments, and residential complexes, in Kermanshah City. In contemporary houses, the variety and quality of open space such as courtyards, covered spaces such as porches, and closed spaces such as rooms have decreased and the presence of covered space in the spatial organization of houses has reached its minimum. In some cases, the presence of a porch facing the courtyard creates a usable and connecting space between the two open and closed spaces, and on the upper floors, terraces and covered balconies create covered spaces. As the presence of open and covered spaces has decreased, the ability of the micro-spaces of the rooms to define, compose, and differentiate space has decreased. In addition, the micro-spaces have preserved only the name "room" due to the absence of privacy, articulation, composition, and landscape (Table 5).

Table 5: Comparison of Qajar, Pahlavi, and Contemporary Houses in Kermanshah City in Space Definition

Space Definition	Traditional Houses (Qajar and Pahlavi Periods)		
	Biglarbeigi House	Suri House	Khadivi House
Open, Closed, and Covered Spaces			
	Contemporary Houses		
	Villa	Apartment	Residential Complex
			

☐ Open space (in traditional houses: courtyard, estrade, Tarmeh, and loggia, and in contemporary houses: courtyard)
☒ Closed space (in traditional houses: Shahneshin, Panjdari, Sedari, backroom, and in contemporary houses: room, entrance, drawing room, toilets)
☒ Covered space (in traditional houses: porch and stoop, and in contemporary houses: porch and terrace)
☒ Evaluation the power of defining space







In the case of space definition in contemporary houses in Kermanshah City, the presence of open space is reduced due to car traffic, and the covered space is limited to only a balcony or terrace with small dimensions. Regarding closed space, a number of small and large closed spaces are put together.



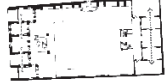


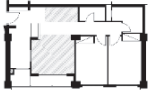










5.2. Space Composition in the Studied Houses

Table 6 compares Qajar, Pahlavi, and contemporary

houses in Kermanshah City in space composition and expansion.

Table 6: Comparison of Qajar, Pahlavi, and Contemporary Houses in Kermanshah City in Space Definition

Feature	Traditional Houses (Qajar and Pahlavi Periods)			Contemporary Houses		
	Biglarbeigi House	Suri House	Khadivi House	Villa	Apartment	Residential Complex
Pause Space, Long Stay + Privacy						

Feature	Traditional Houses (Qajar and Pahlavi Periods)			Contemporary Houses		
	Biglarbeigi House	Suri House	Khadivi House	Villa	Apartment	Residential Complex
Space Composition						
Spatial Expansion + Landscape Expansion						
Pause Space (Long Stay)  Privacy  Space Composition  Spatial and Landscape Expansions 						

In the spatial organization of contemporary houses in Kermanshah City, the flexibility and composition of space have become more limited. Privacy and closed spaces are mixed and are no longer separate space components that can be combined while being independent. Landscape and light expansions are also not provided in the more public sections.

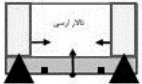
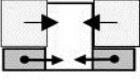
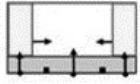



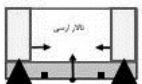
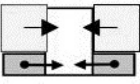
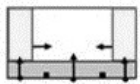
5.3. Space Display in the Studied Houses

In Biglarbeigi House (belonging to Qajar period), spaces are not the same in the elements of architecture such as color, materials, height change, fullness and emptiness, decorations, and each space has its own diversity so that one doesn't feel uniformity and fatigued. In Suri House (belonging to the late Qajar period) and Khadivi House (belonging to the Pahlavi period), the elements

of architecture have less contributed to the creation of spatial diversity, and despite brick decorations, some uniformity is observed in them. In the contemporary houses in Kermanshah, unlike the Qajar and Pahlavi houses, the spaces are very similar and lack the elements of architecture. This diminishes the vitality in the space and one sees no high-quality and rich space (Table 8). Table 7 compares selected houses in space display.

Table 7: Comparison of Qajar, Pahlavi, and Contemporary Houses in Kermanshah City in Space Display

Feature	Traditional Houses (Qajar and Pahlavi Periods)			Contemporary Houses		
	Biglarbeigi House	Suri House	Khadivi House	Villa	Apartment	Residential Complex
Decorations	Moagheli tiles, Stucco, Muqarnas, Brickwork, Mirrorwork	Lattice brick, Pishbor [having a trapezoid mold] brick, Molded brick in the margin, ordinary brick in the main body	Engraved bricks along with lattice bricks, Pishbor brick, Karbandi, Dentil such as stucco and tilework	Stucco on the ceiling, Artificial lighting in the form ceiling decorations	Stucco on the ceiling, Artificial lighting in the form ceiling decorations	Stucco on the ceiling, Artificial lighting in the form ceiling decorations
Roof	Gable, domed and flat	Flat	Gable		Flat	
Window	Window, sash window (southern part), Lattice window in basement and rozan (aperture)	Window, sash window (north-east part), Lattice window in basement and rozan (aperture)	Window, Lattice window in basement and rozan (aperture)	Windows in various disharmonious colors, Dimensions, and Materials	Window in a form of a frame for hanging the curtain and sometimes air ventilation	
Color	various color spectra in sash windows, Tilework and mirrorwork	limited color spectra in sash windows, Tilework	Limited to several colors	Lack of various colors		

Feature	Traditional Houses (Qajar and Pahlavi Periods)			Contemporary Houses		
	Biglarbeigi House	Suri House	Khadivi House	Villa	Apartment	Residential Complex
Natural light	All spaces enjoy daylight due to space composition			Lack of proper space composition makes some spaces not access daylight.	The daylight is not required in the spatial organization of contemporary houses.	
Spatial diversity				Limited presence of various rooms	Elimination of various types of rooms	Elimination of various types of rooms
	Room (Sedari, Panjdari, Gonbadkhaneh)	Just Sedari	Just Sedari	Limited presence of various rooms	Elimination of various types of rooms	Elimination of various types of rooms
	(West part)	(northeast part)	(north part of the second floor-east part)			
Porch				Removal of the porch	Removal of the porch	Removal of the porch
	Octagonal vestibule	Rectangular vestibule	Square vestibule			
Vestibule				Removal of the vestibule	Removal of the vestibule	Removal of the vestibule
	Octagonal vestibule	Rectangular vestibule	Square vestibule			
Corridor				Limited presence of the corridor	Removal of the corridor	Removal of the corridor
	The corridor is perpendicular to the main axis of the building	The corridor is aligned with the main axis of the building	The corridor is aligned with the main axis of the building			

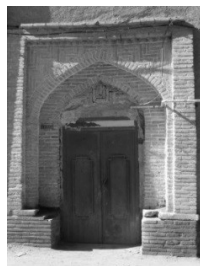
















Fig. 4. Entrance and Entrance Decorations, Left To Right: Suri House, Biglarbeigi House, Suri House (Wrought Iron Decorations), and Khadivi House
(Archive of Kermanshah's Cultural Heritage, Handicrafts and Tourism Organization, 2018)



Fig. 5. Porch, Left to Right: Biglarbeigi House, Suri House, and Khadivi House
(Archive of Kermanshah's Cultural Heritage, Handicrafts and Tourism Organization, 2018)

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Table 8: Various Windows and Decorations in the Studied Houses

House	Variety of Decorations in Traditional and Contemporary Houses in Kermanshah City		
Biglarbeigi House			
			
	Variety of windows and brick decorations (corridor and central courtyard), wooden decorations (columns and ceilings of the west porch), stone decorations (central courtyard), mirrorwork (ceiling and margins of the windows of Hussainiya)		
Suri House			
	Variety of windows and brick decorations (on different sides of the courtyard)		
Khadivi House			
	Variety of windows and brick decorations (in different views of the central courtyard)		
			
	Stucco, wooden decorations and lighting (on the ceiling, furniture, and walls)		

(Archive of Kermanshah's Cultural Heritage, Handicrafts and Tourism Organization, 2018)

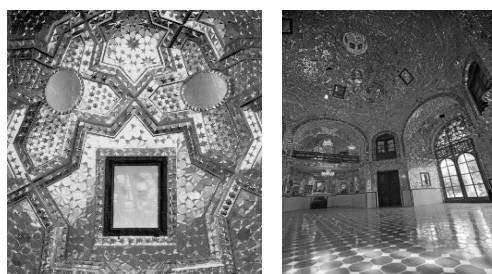






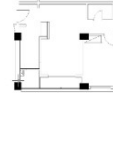
Fig. 6. Mirrorwork Decorations, Biglarbeigi House

(Archive of Kermanshah's Cultural Heritage, Handicrafts and Tourism Organization, 2018)

5.4. Structure and Adaptation in the Studied Houses

Table 9 compares selected houses in type of structure and space adaptation..

Table 9: Comparison of Qajar, Pahlavi, and Contemporary Houses in Kermanshah City in Structure and Space Adaptation

Feature	Traditional Houses (Qajar and Pahlavi Periods)			Contemporary Houses		
	Biglarbeigi House	Suri House	Khadivi House	Villa	Apartment	Residential complex
Structure	 Bearing wall, decorative column with wooden and Byzantine capitals with plant motif	 Bearing wall, no column	 Bearing wall, decorative column (Corinthian order)	Steel structure, structural column	 Steel structure, structural column	 Steel structure, structural column
Ceiling Structure	Wood beam ceiling and garret woodwork	Wooden ceiling, use of iron beam in some parts	Wooden beam ceiling, wooden dropped ceiling	one-way ribbed slab	one-way ribbed slab	one-way ribbed slab
Basement (Provision of Comfort)	The basement has been used to save energy by being integrated into the environment and nature. Soil plays a key role in providing various desirable temperatures and proximity to underground water. The volume of the basement is directly related to the lot area, slope, and residents' needs.			The basement was designed based on the family's needs.	The basement isn't usually considered in the plan due to difficult excavation conditions and proximity to unstable structures.	
Presence of pond (provision of thermal comfort)	There is a rectangular pond with proper dimensions proportional to the area of the courtyard, which is located in the center of the courtyard. Through the gradual evaporation of water in the pond, the space inside the courtyard and the house is provided by proper moisture.	There is a square pond located in the lower part of the courtyard.	There is an oval pond in the middle of the courtyard, which is fed by groundwater.	There is sometimes a rectangular pond in the courtyard.	The pond was removed since there is a lack of access to groundwater and also a lack of space due to car traffic.	
Presence of plants (provision of thermal comfort)	There are plants around the pond and in a symmetrical and chaharbagh (quadrilateral garden layout) form.	There is a limited presence of little gardens beside the walls.	There are little gardens in an asymmetrical form around and adjacent to the walls and around the pond.	There are little gardens in non-traffic spaces.	Usually, 30% of the courtyard area is allocated to green space.	Considering the dimensions of the land, unusable spaces are allocated to green space.






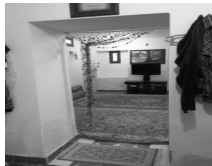
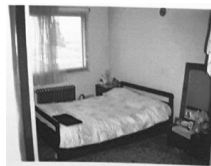









In traditional houses, the spatial organization provides comfort by allowing the movement of airflow inside the micro-spaces, creating shadows, placing the pond for surface evaporation, observing the saving criteria, and considering the presence of basements and gardens. In contemporary houses, such a convergence of the structure and the spatial organization has disappeared and comfort in micro-spaces is provided by industrial appliances (radiators, air conditioners, fan coils, etc.) which are attached to the building as additional components.

6. DATA ANALYSIS

In this section, selected traditional and contemporary

houses are compared in spatial structure and the applied micro-space empowerment methods.

Table 10: The Change of Spatial Structure Based on the Characteristics Empowering Micro-Spaces

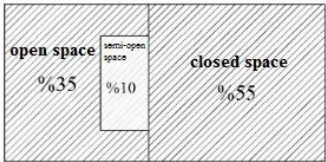
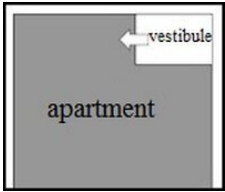
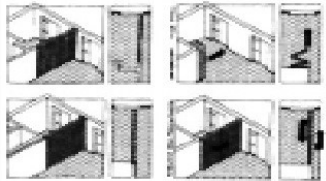

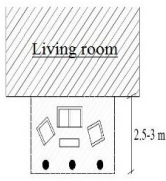
Structure	Appearance and Changes of the Structure Based on the Micro-Space Empowerment Methods in Traditional Houses	Appearance and Changes of the Structure Based on the Micro-Space Empowerment Methods in Contemporary Houses
Space Definition	In traditional houses, the open space around the closed space and the closed spaces around the open space are continuously moving, combined and defining each other.	In contemporary houses, the variety of open and covered spaces has been reduced to the point that their existence has also been questioned and only a number of closed spaces with different dimensions have been put together. The closed space is adjacent to an undefined open space called the courtyard and passageway, and the presence of the covered space has been minimized.
	 	 
Space Composition	Each room with two or more fronts with a view has a living space and the space-covering elements both have the responsibility of defining the space and empowering it to combine it with other spaces to create and encourage collective activities and make it possible to experience a variety of individual and social presence.	Rooms have one function and are a place for the accumulation of objects. So, they cannot be combined with other spaces and provide a variety of experiences. The rooms, with no in-between space, articulation and the possibilities of composition and perspective, have only taken the name "room".
	 	 
Space Display	A variety of methods have been used, including elevation differences, variety of materials, colors, patterns, lights, and landscapes.	In contemporary houses, spatial diversity is very limited due to the leveling of walls, floors, ceilings, unification of levels, and removal of the landscape from the spatial organization. The diversification and diverse, distinctive and eye-catching display of spaces are assigned to objects, and the distinction of space is assigned to covering objects.
	 	 
Structure and Space Adaptation	Comfort-providing elements such as basement, pond, and garden have been integrated into the spatial organization and taken architectural forms. Architecture is responsible for providing cooling and heating in traditional houses. Also, structures are not allowed to have a separate and non-integrated presence in the spatial organization.	Providing comfort is not the responsibility of the spatial organization in contemporary houses. In the new spatial structure, the presence of natural elements has also been overshadowed, and using a mechanical system for providing light and ventilation has replaced the central courtyard.
	 	 

7. CONCLUSION

The results of the present study indicate that space empowerment methods (space definition, space composition, space display, space adaptation) rely on the use of elements of architecture (ceiling, floor, and wall). These elements gain meaning with the presence of other elements such as doors and windows, various types of skylights, apertures and columns, motifs, and textures of materials. One of the major differences between ancient architecture and modern architecture is how the elements of architecture are applied to meet individuals' material and psychological needs. In traditional houses, the elements of architecture in the form of space definition, space composition, and space adaptation have resulted in convergence and co-expression in architecture. While in today's architecture, the applied elements and principles not only reduce the desirability of architecture but also cause divergence,

inconsistency, and mono-expression in architecture. In traditional architecture, convergence has led to the unity of architectural principles and also the principle of multiplicity in unity, while the reduced presence of space empowerment methods in contemporary houses has led to divergent design methods, leading to the loss of residents' privacy and comfort. In the contemporary method, the structure doesn't act in accordance with the spatial organization and is added as a separate layer to it. In contemporary houses, there is no spatial response for being integrated with nature and its changes, and in a divergent course, technology, without being integrated into the spatial organization of the house, has been replaced by the spatial response. Heating and cooling facilities are also integrated into elements and components without playing a role in space empowerment. Table 11 presents solutions for empowering micro-spaces in contemporary houses.

Table 11: Solutions for Using micro-space Empowerment Methods

Structure	Solutions for Using Micro-Space Empowerment Methods in Contemporary Houses
Space Definition	<p>- In the floor area ratio criterion, semi-open space is defined in addition to open and closed spaces (recommended average floor area ratio is 55% for closed space, 35% for open space, and 10% for semi-open space) (Fig. 7)</p>  <p>Fig. 7</p>
Space Composition	<p>- To put together and combine two or more spaces in the house to create spatial, light, and landscape expansion (Fig. 8)</p> <p>- To completely separate spaces with in-between spaces such as vestibules, corridors and courtyard between the inner and the outer</p> <p>- To increase flexibility to use habitable spaces by using separators creating the most sound, light, and visual limits for the surrounding spaces, in addition to facilitating the movement (Fig. 9).</p>  <p>Fig. 8</p>  <p>Fig. 9</p>
Space Display	<p>- To emphasize the use of four colors of blue, green, and yellow, like the colors used in traditional houses.</p> <p>- To apply the artistic display of light in bedrooms and drawing rooms through lattice windows (Fig. 10).</p> <p>- To create various experiences of light using natural and artificial lighting and using different types of skylights.</p> <p>- To distinguish closed spaces from each other using semi-bright and bright spaces.</p>
Space Adaptation	<p>- To pay more attention to the location of the yard or allocating part of the house to creepers</p> <p>- To apply nature in the contemporary house with its independent connection in the private space of the house by covering open spaces to create a sense of being surrounded, to take full advantage of natural gifts such as sunlight, sky, wind, rain, and also to pay attention to the presence of water and plants in the house.</p> <p>- To consider an appropriate width for the porch, to make it possible to connect it to the drawing room or living room, to plant a variety of plants in it, and to create a fountain or to plant trees around it in the center of the open space of the house (depth of 2.5-3 meters and area of 10-15 m2) (Fig. 11).</p> <p>- To design the roof as an open space</p>  <p>Fig. 10</p>  <p>Fig. 11</p>

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