

The Social Impact of the Architectural Components of Safavid Bridges in Isfahan (Case Study: Khaju and Allahverdi Khan Bridges)

^{1*}Ghazaleh Hanaei, ²Darab Diba, ³Hamed Abedini, ⁴Masoumeh Yavari

^{1*}Ph.D., Department of Architecture, central Tehran Branch, Islamic Azad University, Tehran, Iran.

²Professor, Department of Architecture, Fine Arts Faculty, University of Tehran, Tehran, Iran.

³Ph.D. Candidate, Department of Architecture, Faculty of Art and Architecture, Khatam University, Tehran, Iran.

⁴Ph.D., Department of Architecture and Urban Planning, Qazvin Branch, Islamic Azad University, Qazvin, Iran.

Received 13.08.2020; Accepted 05.10.2020

ABSTRACT: The target bridges in this study were constructed during the Safavid era in Isfahan city and are considered as one of the most important components of the urban structure; during history. They have shown various functions in addition to their role as a connecting route, which has varied from individual scale to collective spaces over time. This research study is trying to find out the architectural components affecting the public presence in these urban buildings, specifically in two bridges called, Allahverdi Khan (Si-o-se-pol) and Khajoo bridge in the contemporary era, to see if they would correspond to the needs of today's urban residents.

To get this aim, the qualitative research approach was adopted based on an interview framework. To answer the questions was arranged based on three functional, physical, and structural aspects of these bridges, and a significant result was achieved by applying qualitative content analysis. The architectural components influencing the public presence were included eight general components and sub-components. These items were either in line with or opposite to each other, including the social functions and the contemporary space of bridges, the bridges' cultural and physical structure, the shaping context of the bridges and the memorability of them, the environmental psychology and the related aesthetics aspects. According to the content analysis outcomes, a functional review of the space of these bridges in the future can lead to the qualitative improvement of architecture and space of them.

Keywords: Safavid Era, Isfahan Urban Development, Social Impact, Khaju Bridge, Allahverdi Khan Bridge.

INTRODUCTION

Human being has always sought to make better use of nature and the environment around him/her. The vicinity of cities and villages with natural barriers and obstacles such as valleys and rivers has made humans seek a solution for the easier way of transportation and passage. The art of bridge-building goes back to the prehistoric era. The first bridges were made by laying the rocks or trees at the estuary when there was no other way to gain experience and build a bridge except dropping a floating wood in the water. Therefore, they could cross the water by dropping a large piece of wood on the river (Nazemi et al., 2016). Throughout history, bridges have been considered as particular achievements because of their

significant role in the improvement of human life. The Safavid era should be believed as a prosperous time of bridge design and construction, especially for those of inner-city bridges. The Khaju and Allahverdi Khan Bridges are the samples of these types of bridges that always have taken people's attention because of their special roles in making the structure and urban society of Isfahan. Creating recreational spaces along with providing the crossing places and other functions are the unique features of these bridges, which have led to the creation of collective spaces that are corresponding to the needs of their urban society.

The formation of urban space and human society within the context of these bridges has led to the creation of a superior

*Corresponding Author Email: hanaeighazale@gmail.com

example of an urban bridge that is arising from the special look of Iranian people to these kinds of urban bridges in the past. Despite the entry of water technologies from Rome to Iran, this way of looking to bridges has led to the creation of special spaces within the context of these urban structures. The creation of collective space in an urban bridge structure originates from this approach. Khaju and Allahverdi Khan Bridges are representing such a look. Therefore, identifying the target elements, the forming context of these bridges, and their interaction with audiences, are important factors in recognizing the collective spaces available in different cities of Iran.

This study, by recognizing the context and factors creating urban bridges in Isfahan city (in particular, Khaju and Allahverdi Khan Bridges), which is looking for the origin of creating collective space in these bridges context. By defining the contribution of these two bridges in the urban and social condition of Isfahan and knowing their role in creating urban space, which is the reason for their public acceptability. Today, the lack of urban spaces in architecture and urbanization of Iran are significant issues that many researchers seek to provide a suitable strategy to tackle it. Finding out the root cause of the constant presence of people in these urban spaces and understanding the way of their communication with the public community could be a suitable way of creating new urban patterns to be accepted by inhabitants. Therefore, during this research process, the components with the greatest impact on public presence in these urban locations have been achieved by using the interview framework and adopting the qualitative content analysis. At the final step, the following question will be addressed, could these components, either based on their current characteristics or by reviewing their architectural components correspond to the public needs of individuals?

This research study is trying to target the following answers:

What are the architectural components affecting the public presence in Khaju and Allahverdi Khan Bridges built in the Safavid era, in our contemporary time?

Are these bridges able to respond to the needs of modern society as collective spaces in contemporary time?

The research aim is to:

Identifying the architectural components (the effective elements of functional, structural and physical components) with the greatest impact on the public presence in the bridges of the Safavid era in Isfahan.

Investigating the architectural components of these bridges in creating the collective spaces or today's social context.

The Literature Review

The History of Bridge in Iran

Due to the special role of bridges in establishing communication inside and outside the cities, they are considered as the most important structural and architectural elements in the cities. Throughout history, the policymakers and designers have continuously paid special attention to the

design and construction of these urban structures. From the historical evolution and engineering perspective, bridges can be divided into three groups of structural patterns. One of them is called the suspension bridges that the passage part is suspended from a cable that was normally made up of materials known as Rasan [kind of papyrus], which were connecting two river banks. This type of bridge is known as the oldest type of bridge in the world. Another type is 'Beam Bridge' in which the bearing part is supported by piers or beams at the ends, located on the ground with a long constructional history. The third type known as 'Arch Bridges' architecturally is placed at a higher degree of construction compared to the beam ones. The construction of this type of bridge has been initiated from the areas located in Mesopotamia (Mianroodan) and Iran (Farshad, 2017, 245 & 246).

Because of the existence of different permanent and seasonal rivers in Iran, the first sample of bridges was constructed in the west and northwest. One of the most important differences between the primary bridges in Iran and other areas is related to the geographical conditions and the need of this area for land water storage, which has resulted in the construction of combined bridges serving the function of bridge and dam together (Farshidnik & Afhami, 2010). In the past, bridges were used in Iran with a variety of functions like the Dam-Bridges which are constructed for water storage and irrigation of agricultural lands similar to what is available in 'Band-e-Amir' in 'Marvdasht'. Then, this is used for water distribution, known as 'Shadirwan' similar to 'Band-e Kaisar' in Shushtar. Finally, for transferring water from a riverbank to another known 'Aab Bareh' such as Joui/Choobi Bridge of Isfahan, for power supply and transmission energy for turning large wheels of watermills and oil mills like 'Band-e-Amir' bridge and for other recreational activities similar to Khaju and Allahverdi Khan Bridges in Isfahan (Nazemi et al., 2016).

Despite acquiring the knowledge of constructing water structures from ancient Romans, that was arising from their geographical conditions and comprehensive experiences in making the world's system, the Iranian people have overtaken it in transforming the concept of the bridge from being merely a transport space to a location providing additional activities.

According to what is mentioned by Borrmann about the capital's bridges and the major European cities, there is no place for recreation, and the architects never thought to construct a palace or restaurant in these locations. The first example of using the bridge as a place other than a mere passage route in European architecture dates back to the year 1565, concurrent with the reign of Shah Tahmasp [in Iran], in which a porch was built on 'Ponte Vecchio' bridge where it turned into a recreational space and a place for the business activity of jewelry merchants from the year 1593 by evacuation of butcher shops that were used to located on the bridge deck (Farshidnik & Afhami, 2010).

Along with the commercial prosperity and the expansion of transportation during the Safavid era, the construction of

road facilities and bridges significantly improved. Looking at some routes in the Safavid era that were connecting Isfahan to various states show that at no point in history, from the Islamic era to the Safavid reign, the construction of road and its related buildings (caravanserai and bridge) have never been so expanded (Mokhlesi, 2000, 66). During this time, urban bridges significantly have been improving in addition to the construction of additional suburban bridges. On Zayandeh-Rud River, significant bridges were constructed, due to the urban expansion of Isfahan towards the south of the old city and the requirement to establish new urban communication rout. The construction of urban bridges in Isfahan during the Safavid is of great milestones in the history of bridge construction in Iran. The other function of Khaju and Allahverdi Khan Bridges in providing recreational urban spaces in addition to its function as an urban passage is of significant points in constructing them. The formation of Safavid bridges in the social context of Isfahan city during the Safavid era caused them to represent other functionality than mere a passage rout; and then providing urban recreational spaces become of their priority. One of the most important reasons for considering recreational spaces in these urban structures is being resulted from the construction of these bridges on the Zayandeh-Rud river that has always had an important role in creating public social life in Isfahan city. As an urban habit, it has always been common for people in Isfahan to walk along the Chahār-bāgh street and the Zayandeh-Rud river. The sides of the Zayandeh-Rud River were used to cover with forests and gardens before the existing parks, and recreational spaces being constructed over there and were considered as the main recreational space by people for walking and outgoing, which urban tradition continues (Ansari, 2000, 419). In addition to such activities that were common in the past and still ongoing, the other functionality has also been added to Khaju and Allahverdi Khan Bridges, according to the needs of today's urban community that make them kind of bridges with multi-functional properties. Besides the representation of the Khaju and Allahverdi Khan Bridges and due to their influence on different cultural and social dimensions, it is required to review their architectural aspects from three different points as function, structure, and body to clarify their urban use, physical features, and the basic reasons for public attendance in these collective spaces. This triple classifying is adopted based on the most accepted way of building evaluation. Therefore, reviewing the function has been done separately, while the structure and body have been evaluated through a comparative model.

MATERIALS AND METHODS

In this study, the qualitative research method has been adopted, and the data were analyzed by using qualitative content analysis. This method simply extracts the concepts needed for the research from the text under study; the concepts they will be organized in the form of regular issues. The reason for using

this method is that it can extract and analyze the concepts at its highest rate from the public viewpoints. This method is based on this assumption that the content analysis method can discover meanings, priorities, attitudes, methods of understanding, and organization of the world by analyzing linguistic messages. The purpose of this method is to compress and extensively describe a phenomenon, and the achievement of this analysis includes a series of concepts or descriptive classes of a phenomenon. Usually, the purpose of these concepts or classes is to construct a model, a conceptual system, a conceptual map, or even classes (Elo & Kyngas, 2008). This method is one of those research methods that are widely used today in social sciences and beyond it (Wilkinson & Birmingham, 2003). The data of this research has been obtained through oral interviews. The interview questions were extracted from the criteria arising from the general classification of architecture (function, structure, and body) that qualitatively determine their impact on the research results. This questionnaire form was verbally based and could be controlled by the researcher from one interview to another. To acquire this, Khaju and Allahverdi Khan Bridges were selected as case studies. Finally, 12 clear questions were adopted for the interview. The questions comprised both those types that sought to target the cases and the others that were looking for the ideas of interviewees about the present functions of these two bridges. As a result, the outcomes can clarify the possible considerations that need to be taken in the future. The interview was performed in form of eight (8) concentrated groups of four (4) to seven (7) respondents. At the beginning of setting interview, the item was clarified for interviewees and the written and oral consents were taken from them to be able to participate in the research. The condition for participating in the interview was the lack of architectural education (the university education in the architectural field could largely affect the research process). Thus, the credibility of the interview is equivalent to the 'content validity' that was promoted. The questions were simply presented; however, the case and analytical responses partly affected the next questions. The interview continued until the responses were repeated and saturated. Therefore, the number of interviewees were depended on the saturation time of responses. The duration of each interview lasted between an hour to an hour and twenty minutes. The interview was recorded and then the interview transcription accurately and completely documented. The original codes were then extracted from the text, and the acquired data were classified accordingly. The data were analyzed using the content analysis method with a deductive approach.

The 'unit of analysis' includes the total interviews. The text of the interviews was reviewed several times after transcription, and the units of meaning were selected out of them in the form of paragraphs, statements, and the primary codes were then extracted from them, which are given in the appendix section. Finally, the main classes (categories) were extracted from them.

Table1: The Biometrics and Educational Characteristics of Interviewee

Characteristics	No./Year/Field
Number of contributors	Persons 44
Gender	Male and 21 Female 23
Average of age	years old 35
Educational Background	Persons: under Diploma, 13 Persons: Diploma, 12 Persons: Bachelor, 9 9 Persons: Master of Science/Art and 3 Persons: PhD
Academic Degree	Non-Architectural Field

The interviewees were selected from different age groups and different academic backgrounds (Table 1).

Evaluating the ‘Function’ of Target Bridges; The Case Studies

Allahverdi Khan Bridge

The construction of Allahverdi Khan Bridge begins to start in 1011 AH following the order of Shah Abbas for building the bridge; His commander, Allahverdi Khan, then was responsible for accomplishing it. This bridge was constructed in line with the urban expansion plan of Isfahan toward the south parts of the city, were established a link between the upper and lower parts of Chahār bāgh. This bridge is also known as 1. ‘Si-o-se-pol’ that means thirty-three bridges (due to having 33 spans), 2. Jolfa bridge (as it connects the center of Isfahan with the Armenians region of Jolfa), and 3. Charbagh bridge (because it is located along the Chahār bāgh); it is about 300-meter-long and 14 meters wide.

The bridge structure has been formed on two floors (Fig.1). The lower one was constructed for water flow and the upper floor, which is enclosed by two rows of walls on each side of it was allocated for people and caravans as a passage to cross over the river. The enclosing structure of the second floor has been designed to protect passing pedestrians from steep local winds and to keep cattle calm while crossing the bridge and not

to scare by seeing the water flow. There are openings allocated on the walls of the 2nd floor to see the river and enjoy its natural scenery. Moreover, in each side of the bridge, there is a long indoor corridor designed at human scale between the two side walls; the people who cross this corridor can experience a better view of the river (Ghobadian, 2013, 368-370). Considering a landscape view and providing the conditions to enjoy the combination of bridge and river are of significant points in the design and construction of this urban bridge.

Pietro Dela Valle, an Italian traveler has described this bridge as a wonderful architecture and compared it with its counterpart bridges in Rome. He has pointed out that the long and wide of this bridge are several times larger than Rome’s bridges, and its architecture has been constructed in a bizarre structure (Hajianpour & Javadi, 2016). The Allahverdi Khan Bridge represents a structure with multiple functions. In addition to the connecting spaces allocating a special place for the King is of considerable points in this bridge. This space had been designed for the King to watch special ceremonies like water spring. The other similar spaces are those where are located between stone columns at the basement of the building and creating two Saqqa-khaneh (water fountains shrines) at the beginning and the end of the interior of the eastern wall (Moravej Torbaty & Pour Naderi, 2014), which are representing the multi-functionality of this bridge.



Fig.1: Allahverdi khan bridge

The Khaju Bridge

The Khaju Bridge has always been at the center of concentration, due to its unique architectural features. The special attention of travelers and the travel writers to this bridge indicate its importance and impressive beauty. The famous French tourist, 'Jean-Baptiste Tavernier, in Safavid era, says about Khaju Bridge which is one of those two bridges located downstream of Jolfa Bridge belongs to the time of Shah Abbas II. This bridge has a similarity with the Jolfa Bridge in architectural style, yet it has a higher beauty compared to the other one because of having a large six-cornered space in the middle of the bridge where the river has a function as a dock. The Shah Abbas II constructed this bridge for two reasons: one, to show the river view and its landscape, and another, to provide a crossing passage for the Christian's neighborhood that was located in the vicinity of this place as an alternative passage route for Charbagh street since the new route (the bridge) was closer to Isfahan city (Tavernier, 1984, 398).

Khaju Bridge was built in 1060 AH located on the old route of Isfahan to Shiraz, in the past. It was used to connect the city and 'Atigh square' to 'Takht-e-Foulad' and the southern villages. In the past, this bridge was also known as (Hassanabad) and (Baba Roknedin) bridge. Today's building of Khaju Bridge, which is well-known because of its proximity to the Khaju neighborhood (Honarfar, 1971, 582) is 132-meter-long and 12 meters wide and has two floors similar to 'Si-o-se-pol' (Fig. 2). In other words, it can be considered as a more evolved shape of Allahverdi Khan Bridge with various functions. This bridge is considered as a unique structure in Iran from different aspects.

In addition to being a transit route and a passageway like other bridges, the foundations of Khaju Bridge same as Allahverdi Khan Bridge, are located on a platform higher than the river surface to let water collect behind it. By occasionally placing the large wooden boards between the bridges and its foundation, the bridge structure was transformed into a small dam and caused the water spring ceremony to be held by the collected water behind it. The King and his courtiers were watching the

ceremonies from their special chambers in the middle of the bridge, which were larger and wider compared to the other chambers. This bridge was also considered as one of the urban gateways, where caravans were examined in this place and the urban tolls were received. As the final function, Khaju Bridge was built as a military base to protect the city; and also due to its lateral walls, it was a suitable place to shoot at invaders (Ghobadian, 2013, 374-375). Along with these functions and due to its special design, Khaju Bridge is an ideal environment for the formation of an urban space besides representing a recreational function.

The presence of the following architectural features all indicates the recreational function of this building. The way of passing through the lower surface, the position of platforms between the lower level arches, the formation of side porches on the upper surface, the way of providing settlement, the method of creating landscaping with water, making the platforms over the eastern stairs and finally the presence of Kooshk.

Due to the presence of its lower surface, Khaju Bridge can provide too many of these recreational functions together (Moravej Torbaty & Pour Naderi, 2014). Providing the possibility of people's presence near to the water stream and allowing them to have a sensory contact with the water flow gives the bridge a different quality compared to other urban bridges that have been constructed only for crossing over the water. The people's presence near to water flow has been possible by establishing the bridge columns on the lower floor to let them get access to each other and cross the bridge through the first floor, next to the water. The cool weather, the smooth breeze blowing over the river, the sound of water flowing under the Khaju Bridge, and the area around the river has turned it into a great urban recreational space. Moreover, the water flowing over the eastern stairs make a pleasant natural sound for the people who are passing by these areas; finally, people are possible to go down the stairs and sit by the river, touch the water surface and make a closer physical connection with the water stream and Nature. The river's landscape appearing



Fig. 2: A side view of the Khaju Bridge; Isfahan City

from the upper corridors represents a pleasing scenery of both the river and its surrounding frame by frame, similar to what the Si-o-se-pol bridge brings for its passengers (Ghobadian, 2013, 372-374). In this space, the interaction of people with Nature represents a kind of architecture in which, besides there is a focus on view and landscaping, providing a different sense of experience from surroundings environment has been considered as well.

The Physical body and Structure

The physical body and structure of these two bridges are very similar to each other; since the time of construction of these two buildings is nearly close to each other, around 50 years, it seems that Khaju Bridge has been built to complete the Allahverdi Khan Bridge in some way. There are body similarities between these two buildings as follows: The geometric and regular form, the space allocated to pedestrian, the emphasizing on the initiating and ending points, the buildings with two-floors, the importance of the building's center, the existence of porous facing (due to the existence of the side porches), using tile decorations, and finally the stone foundation and a brick structure has been placed on the basement of both buildings. The only obvious difference between these two buildings is the breaking point of the skyline in Khaju Bridge that is absent in the other one. In terms of structure, both are grouped as the pile foundation bridges, both have a triangular water channel in the same direction as the water flow, and the presence of buttress, the Piers (Pilasters), Putting pressure on the lower arch from the walls of the upper passage are of other similarities, while their difference is in the 'subgrade surface' that is wider in Khaju Bridge" (Moravej Torbaty & Pour Naderi, 2014). The building of Khaju and Allahverdi Khan Bridges is made up of the stone bases and a brick structure, which has given them rather a similar appearance in the urban landscape of Isfahan.

Dr. Honarfar has described the apparent difference between Khaju Bridge and other bridges of Zāyandé-Rūd in his book entitled "A Treasure of The Historical Monuments of Isfahan, (Ganjine-e Asar-e Tarikhi-e Esfahan): the advantage of Khaju Bridge to other bridges of Zāyandé-Rūd is that the bridge beside presenting the architectural differences, also has many tiling decorations as below: the spandrels of springs at lower floor and the upper rooms, and the two King's pavilions (known as Biglarbeigi earrings in the middle of the bridge which was the King's resort) located on its both sides have been decorated with the colorful tiling and the earrings of Biglarbeigi and the interior space of the rooms at both sides have been painted (Honarfar, 1971, 582-583). Such descriptions about Khaju Bridge indicate more attention to it compared to Allahverdi Khan Bridge from aesthetic aspects, which is due to its dominant decorations and the forming variations along the passage route.

The Role of Khaju and Allahverdi Khan Bridges in the City Landscape

Khaju and Allahverdi Khan Bridges are considered as the urban elements in the landscape of Isfahan city, due to the presenting various functions and characteristics, that were introduced earlier, and also because of their essential role in the urban structure. Considering the physical elements of the city landscape which was explained by Kevin Lynch (Lynch, 1960, 46), these two bridges in addition to functioning as a path (a factor that determines the actual and potential movement) as the connecting element between two major urban points, also play the role of landmark (a major element in recognition of the city landscape). On the other hand, regarding their ability in creating a recreational space and human communities, these bridges are considered as a node (the sensitive points in the city that an observer can enter into them and are considered as the focal points that create the origin and destination of their movement), which also allows the porch space to be created.

RESULTS AND DISCUSSION

The conducted interviews in this article have been considered as the unit of meaning. The categories have been classified according to the extracted codes from the unit of meaning that was provided randomly in the form of sentences and the respondents' conversations. The sentences have been selected considering that their central core to be able to express a concept with the ability to turn into code. The final conclusion was obtained according to the qualitative analysis by researchers. The 183 compact units of meaning were extracted that, considering their high volume, were not included within the article text due to lack of space here. According to these units, the 106 codes were defined that their categorization and the definitions of the components have been addressed in Tables 2-9. In these categorizations, the main codes are those components which are affecting the social presence; In other words, they are the outcomes of the meanings were extracted from the text of the interviews (The Interview Transcription) formed according to the questions were targeting the structure, function and the physical body of the target buildings. Therefore, the defined architectural components explain the influential factors from different points of view.

The role of the architectural unit as a 'key performance indicator' is much more significant when it comes to the urban structure, as it can be a suitable context for different urban functions from a wide range of communities. In the case of the historical bridges, their functions have come into consideration beyond the urban scale and have also acquired the tourism dimension. According to this research study, the functional role of these bridges indicates that, on the one hand, these buildings affect social behavior and, on the other hand, play a major role as an urban landmark. The most important function of these bridges is their role in providing an urban passage. Given that

Table 2: The Interrelationships between different social functions and the bridge space in response to the urban needs

Category	Code	Subcategory
The Interactive connection between different social functions and the bridge space to respond the urban needs	The importance and position of the bridge as an urban passage	The role of passage and creating urban communication
	The Communicative role of the bridge as a connecting highway	
	The public attention to the value of a pedestrian-based space	The importance of attention to pedestrian-based space in the urban architectural units
	The importance of pedestrian-based space in the historical buildings available in contemporary time	
	The impact of the pedestrian's presence on receiving the environmental attractiveness	
	Creating a walking option at different levels and making different urban functions [for a public space]	
	Making a lively environment by the creation of vibrant activities	Attention to functional dimensions of architecture in an urban environment
	Attention to human scales in performance	
	Considering the multidimensional performance suitable to the public's different needs	
	The need for making social activity in the historical context of the city	
	The recreational space and tourist attraction of bridges	The impact of creating social Activity
	The lack of space with proper social function in contemporary times	
	Social, protest, and ritual activities	
	The bridge function as a city plaza and creating a social atmosphere with a ritualistic approach	
	The need for recreational spaces	
	The collective social and artistic activities	
	Creating a suitable space for collective artistic activities	
	Using the bridges structural features for creating an artistic urban space	
	(The impact of architectural elements on the creation of artistic activities (music	Interaction between social activities and the creation of an artistic activity
	The impact of artistic activities on the creation of social activities	Interaction between social activities and the creation of the commercial activity
	The importance of creating commercial activities concerning space	
	The importance of considering the background and old traditions in reviving social activities	
	Creating social activities about the historical background of the bridge	
Attention to historical functions		
Attention to urban furniture in creating social activity	Interaction between the surrounding furniture and social activities	
The architectural unit as an urban landmark	Function as a landmark	
	Bridges performance as the city view	
The need for urban privacy and calmness	Creating a calm urban space	
	The need for urban privacy and calmness	

the main reason for constructing these bridges was to provide an urban transit, they are still considered as an urban connector between two parts of the city from the citizen's point of view.

Along with the bridges' role as the urban passage, for various reasons, the presence of pedestrians' movement in an urban architectural unit has a significant influence on its public acceptance, which have been mostly chosen by people compared to other new bridges that are not considered as the pedestrian-

based bridges; so, it can result in changing the direction and general social behavior of the urban residents. Additionally, the pedestrian-based design increases the opportunity for creating a private and calm space in these buildings; it is because this function provides more possibilities for understanding the environment, contemplating the building, or enjoying its natural space (river). Moreover, due to their historical value and visual attraction, an urban user will tend to walk across

the bridge slowly. In Khaju Bridge, by having two different levels for passing the pedestrians, attracts more public attention because of providing multiple choices. We can see that in spite of the existence of more new bridges in Isfahan, which similarly play as the urban connectors, the citizens still prefer the ancient bridges to cross over. In addition to this, bypassing time, the historical dimension has also been added to these buildings; so, various functions have been created in them. The social functions of these buildings by providing places for collective events are of those functions that have been created over time, among them, the protest, ritual, recreational, and tourism activities can be mentioned here. The artistic activities, which usually arise from the community context, are among the current functions of these buildings. The most popular one includes music and dramatic activities that are suitable to be presented in this platform, due to the presence of local and foreign tourists over there. The other activities of these bridges are commercial one which is required to be considered due to the contemporary needs of society. This consideration addressing both the commercial function and the architectural dimension of them. Most of the people are willing to see the commercial activities in the historical context of these bridges. Another important function of them is their role in creating a city sign or landmark. It can be said that this role is one of the most influential components that affect the other functions so that the operation of these bridges as a landmark can attract the tourists, and consequently, create additional social activities. The people's social behavior in the context of these historical bridges, providing a calm public space is also discussed here. According to Irwin Altman, the four concepts of 'Crowding, Territory, Personal space, and Privacy are considered as the foundation of social behavior (Altman, 1975, 1). The need for urban privacy and a calm environment within these buildings

are among those functions that lead to public attraction. Some people say that they use these bridges for enjoying the urban landscape, some consider them as good places to spend leisure time and having a quiet space (Table 2).

In order to meet the needs of contemporary human beings, these bridges have the possibility to be a context for more new urban functions. It seems it is required to consider and review the context of forming these bridges. The social functions always lead to cultural interactions, which in turn can enhance the cultural level of the society; This would happen if the cultural differences arising from a different group of people, has a suitable context in case of architectural structure. Therefore, updating the current and user functions [of urban space] is a special necessity in contemporizing those functions (Table 3).

Architecture not only shapes a part of the culture in each society but also in some way constitutes the culture in each community. Due to the cultural and historical position of Safavid bridges in Isfahan, they are considered as a suitable context for the acceptance of different cultures. This cultural diversity in addition to having a role in identifying these buildings provides a context for creating social abnormalities, which itself originated from these cultural differences. The lack of security at different times of day and night are among these social anomalies. Applying suitable changes in physical and functional aspects of these buildings, together with the architectural extensions/enhancements appropriate with the building structure, can enhance its cultural level. Therefore, these cultural components could have a mutual interaction with the architectural aspects of the building, allowing the functional and physical review of them (Table 4).

The visual and structural impacts of materials always are among those components that are considered by people in historical monuments. About the monuments specifically, the

Table 3: Contemporizing the bridge space in harmony with the modern urban approaches

Category	Code	Subcategory
Contemporizing the bridge space in harmony with modern urban approaches	Creating a commercial and cultural space suitable for creating a calm environment	The importance of improving the user function in architectural structure
	The tendency to reconsider, review, or recreating an urban structure	
	The importance of contemporizing the possible activities and functions in these buildings to increase their public acceptance	
	The role of architectural extensions [after years of construction] in improving the cultural level of the building	The importance of different structural communications with the urban environment
	The effect of whole urban structure on a specific environment and the public willing for visiting different parts of the bridge	
	Physical changes in the building to promote its cultural level	
	The importance of creating new functions in harmony with time	Updating current functions
	Recreational function and the importance of contemporizing its function for creating a living urban space	
	The possibility of creating the temporary social activities such as charities and temporary art galleries	

Table 4: A bridge as a cultural body in interaction with the society and culture

Category	Code	Subcategory
Bridge as a cultural body in interaction with the society and culture	The effect of different cultures in accepting the bridges by various social classes.	The communication of building body with various cultural classes
	The importance of location in acceptance of individual cultural differences	
	The impact of different times of the day and night in creating a sense of calmness and safety	Attention to the impact of different dimensions of social security
	Valuation on building despite social anomalies	
	The role of building in changing social behavior	Interaction between the building and the social behavior of urban users
	The necessity of performing cultural activities to improve the cultural level of society	
	Improving the cultural level by creating new urban use	The communication between physical and cultural changes
	Physical changes in building for improving the cultural level	
	The role of architectural enhancement to improve the cultural level of the building	

target historical bridges in the current study, this attention leads to the survival of these buildings over time compared to the recently built bridges. Following the attendance of people in these bridges, the visitors will examine the building material in case of strength as well as their special properties; The building resistance throughout history is among other aspects that drew the people's attention (Table 5).

For buildings such as bridges, the natural bed is always of great importance. This is due to the existence of the natural riverbed. Therefore, it is possible to consider their bed as a part of these buildings' identity.

In other words, by disregarding the river's presence, the functional nature of these types of buildings is not justified. But, about the buildings such as the target bridges of the Safavid era in Isfahan, due to the occurrence of social and functional events in their context other than their role as a passage route and because of their historical characteristics, the bridges represent identity independent from their riverbed. This means that even if the river has no water, the bridges are welcomed. But, the people who are living in Isfahan city conceptually consider the presence of water as an important part of the bridges; in this situation, they are more eager to attend these ancient buildings. "Perception is the process of acquiring information from the human surroundings by him/herself. In process of acquiring

perception, the motivating object or event is located in a space outside its observer; but in perceiving an environment, the perceiver is part of the viewing environment and has an effective role in determining the limits and other features with his/her own behavior.

Environmental perception makes a person recognize the environment and shapes human behavior in the environment (Shahcheraghi & Bandarabad, 2015, 124). Part of the public enthusiasm for attending the space of these bridges is related to their perception of architectural elements of these buildings, that find their original function particularly in the presence of water. Some of the other reasons for their intensive presence are: The public interest in the natural bed, creating a sense of vitality in these urban spaces, the impact of water psychology on them, and finally paying attention to the river as a part of the bridges' identity (Table 6).

Memorability is a part of the perceptual sense of architecture acceptance. Due to the special location of these Safavid bridges in the urban context of Isfahan, they have a great influence on the memorable life of the citizens, who consider a sense of nostalgia in these buildings as a very influential factor on their attendance; so that, this memorable sense can affect their daily activities. This memorability impacts on the formation of their individual and social identity (Table 7).

Table 5: The impact of the bridge's structure on society

Category	Code	Subcategory
The impact of the bridge structure on society	Public attention to their materials and properties	The impact of materials and their properties
	Public attention to the strength of the monument	
	Public attention to structural components of the buildings	The importance of structure over time
	The quality impacts of the physical structure of building on its durability in the public mind	

Table 6: The impact of bridge's natural context on public social behavior

Category	Code	Subcategory
The impact of bridge's natural context on public social behavior	The impact of environmental factors like water on establishing a lively social space	The impact of natural context on public social behavior
	The importance of building, as a social and urban space, independent from its natural context (the river)	The importance of architecture-independent from the natural riverbed
	The importance of visual proportions in Iranian architecture and its relation with the natural elements of the riverbed	The impact of natural bed on the architectural proportions
	The impact of natural riverbed on the public as residents	The impact of the natural river bed on the acceptance of architectural building
	The impact of natural contexts on welcoming the visitors	
	The relationship between the natural environment and the public social activities	
	The impact of natural elements of riverbed on a spatial understanding of the building	

From the environmental psychology aspect, the bridge space represents the profound relationship between the audience and the bridge. Environmental psychology is the science of studying the mutual interaction of human and his environment (Shahcheraghi & Bandarabad, 2015, 19) that it is necessary to recognize this interconnection. The place identity is the first category of interest. Edward Relph describes place identity in the book titled "Place and Place lessen" and introduces the physical properties, activities, and meaning as the main components of place identity (Relph, 1976, 47). The place identity has a close relationship with individual identity; consequently, it forms the identity of each person. On the other side, urban identity is considered as a part of the place identity. In a city with the urban characteristics like Isfahan where its urban spaces represent in somehow an urban landmark, they are considered as part of the urban identity because of their historical characteristics. Thus, about the target bridges in this study, their identical role will become more effective because of being located in urban space and playing the current role as an urban passage route. Therefore, the social behavior resulting from these bridges function can also be considered as a part of the individual and

social identity; because bypassing time, these functions has resulted in kind of repetitive and particular social behavior (like allocating time to walking); It also leads to behaviors that form part of a person's individual identity. The audience of these bridges consider the Safavid era as a part of their identity and also attach special value to the other ancient monuments, contemporary to these buildings (like Naghsh-e-Jahan) as well. So obviously, the public presence of Isfahan people in these bridges greatly affects their psychology and environmental perception. It can be said that environmental psychology is an influential component for the presence of individuals in these urban places.

As previously stated in the section of cultural components, the different factors influencing the public presence in an urban space, around these bridges, would affect the sense of environmental vitality. One of the most important influencing factors is the sense of presence or absence of environmental safety that is considered as a significant item in the area of environmental psychology. The results acquired from the interviews indicate the necessity of more architectural considerations while creating new urban spaces

Table 7: The Memorable Identity of Bridge influences the perception and behavior of the society

Category	Code	Subcategory
A memorable bridge influences the perception and behavior of the society	Memorable and tend to outdoor sport activity	The relation between memorability and social behavior
	The impact of memorability on the acceptance of the building and its relation to environmental psychology	The relation between memorability and environmental perception
	Creation of memorability and identity	
	Attention to historical identity as a part of social identity	The relation between individual and social identity and the memorability of building

or reconstructing the space of urban bridges. Social behaviors in an urban environment will shape the public perception of their surrounding environment. The related components like the visual and perceptual sense of materials and their influence on an urban user will make the sense of place attachment. The ancient identity of these buildings- which previously was being reviewed by studying the influencing factors information of an urban place and individual identity- is one of the most important components constitutes the sense of place attachment. Moreover, the historical and memorable narratives also form a part of this sense of place attachment. It can be said that, due to the presence of a nostalgic sense to these public spaces, which dates back both to the family background and the quoted narratives, the residents of Isfahan city have a sense of attachment to these ancient bridges. The place attachment

means the people’s mental perception of their environment and their relative conscious sense of it, which makes an individual perception to be connected to the semantic context of the environment. This sense turns a space into a place with kind of special sensory and behavioral characteristics for a particular people. The place attachment, in addition to creating a sense of comfort from the environment, supports the cultural concepts desired by the people and also affirms the social and cultural relations of the society in a specific place (Falahat, 2006).

The natural riverbed influences the phenomenological senses of an urban user. ‘Martin Heidegger’ was considering the phenomenology as a process that brings things to appearance (Shahcheraghi & Bandarabad, 2015, 263). Moreover, the structures of target bridges in connecting with the riverbed leads to the emergence of a phenomenological sense; as in Khaju

Table 8: The Role of Environmental Psychology in target Bridges: understanding the mutual relation between human (the bridge addressee) and environment (the bridge context)

Category	Code	Subcategory
The Role of Environmental Psychology in [an urban] Bridge: understanding the mutual relation between human (the bridge addressee) and environment (the bridge context)	The relation between individual and place identity	The interaction of place identity and individual/Social identity
	The importance of urban identity and its relation to social identity	
	The relation of historical and cultural identity with the target historical buildings	
	The mutual relation of building history and the audience memory (the place identity and (the sense of place attachment	
	The relation of historical and cultural identity with the historical buildings	
	The importance of place identity in the relation of the audience with the public space	
	The importance of the building for the people as a part of individual and social identity	
	The impact of perceptual psychology on historical buildings	The interaction of environmental and individual psychology
	The creation of a conceptual perception of the environment by applying natural elements	
	The impact of the building structure and its surrounding environment on individual psychology	
	The relation between aesthetic and environmental psychology aspect	The social behavior and environmental perception
	The need for vitality in an urban space	
	The impact of architectural elements on creating a safe social space	The social safety and environmental perception
	Visual and perceptual impact of materials in creating the sense of place attachment	The affecting components on the sense of place attachment
	The impact of historical narratives on creating the sense of place attachment	
	The impact of architecture quality on the sense of place attachment	
	The importance of ancient item for the audience	
	Memorability and its relation with the sense of place attachment	
	The impact of architectural authenticity and identity on the acceptance of the building, and creating the sense of phenomenology in place attachment	
	The impact of architectural elements on creating the phenomenological senses	The interaction between phenomenological senses and social behavior and its relationship with architectural elements
The importance of calm space and its relation with the phenomenological elements		
The impact of buildings’ phenomenology on individuals		
The impact of the building structure in creating water sound and phenomenological sense of the building		
Considering the phenomenological concepts and physical impact of the building on creating this sense		

Table 9: The environmental aesthetics in the bridges

Category	Code	Subcategory
Environmental aesthetics in the bridge	The relationship between aesthetics and environmental psychology	The interaction of aesthetics and environmental psychology
	Attention to the aesthetic dimensions of the bridges	The aesthetics of architectural components and its relations with accepting an environment
	Attention to the aesthetics of the components	
	The importance of aesthetic concepts along with the performance	
	The aesthetics of the building independent from the main function and its natural bed	The aesthetics and functional dimensions
	The importance of environmental attractiveness for the people who reside there in the long turn	
	The difference between the performance and aesthetic aspects of the bridge at different times of day and night	The impact of lighting in creating a perceptual space
	The importance of lighting from the perspective of aesthetic sense	
The importance of lighting in creating an environmental beauty and security		

Bridge, the presence of water sound is one of the key elements that was considered by the interviewee as an inseparable part of the bridges (Table 8).

Environmental aesthetics is to study the experience of understanding the environment based on the inherent and direct value of perception (Berleant, 1998, 289). The environmental aesthetics has different dimensions, and their influence on the social acceptance of these bridges is observable in many different ways as the audiences can see the bridges admirable through their sensory perceptions arising from the environmental psychology of the bridges and urban calm space. On the other side, the aesthetics of architectural components (arches and their proportions) visually influence the addressee perceptions. Therefore, in some cases, this aesthetics can lead to the evaluation of the building independent from the natural bed of the river. Moreover, the other aesthetical dimensions that can be complementary aspects, such as lighting, can create different types of visual effects and define various aesthetics types at night and day (Table 9).

CONCLUSION

As stated, the extracted codes from interview texts were classified into eight general categories; each of them points to the subcategories if required. Sometimes, these subcategories are related to their other counterparts or might even affect each other (these relations can be seen in a conceptual model as shown in fig.3). The main categories of this study refer to the subjects influencing the social acceptance of the bridges. These categories are as follows: the aesthetics dimension, the environmental psychology and perceptions, the components affected by the memorable sense, the impact of natural riverbed on how the building is accepted, the visual and perceptual impact of materials, the interaction between different functions, the bridge architecture, the impact of various cultural classes on accepting the bridge and finally the ability to create social security. Based on the research done on the environmental

aesthetic of the target bridges, all the aesthetics dimensions are related to different components of environmental psychology. According to the lighting section, a correct action will affect creating a sense of security in addition to individual perception. On the other side, different aesthetics dimensions in these bridges include general aesthetics (the structural proportions of the bridge arches span), the detailed aesthetics dimensions (the proportion of the bridge opening), and the decorations will affect an individual mindset through various perceptions and finally change his/her behavior.

About the environmental psychology of the bridge, the following aspects have been considered: Understanding the mutual interaction between human (bridge audience) and the environment (bridge context), the place identity, the environmental psychology, the place attachment, and their impacts on social behavior, providing a sense of social security and finally their connection with all other architectural elements available in these bridges. The studies have shown that public presence is mostly affected by the components of environmental psychology compared to the other influencing factors. One of the most effective factors in creating perceptual components is the historical feature of the building that in turn will change the characteristics of social behavior. Since the environmental context for establishing the bridges over, it is the Zayandeh Rud River, as the most vital crosslines of Isfahan. Therefore, having a sense of attachment to this natural riverbed constitutes part of the place attachments to these bridges.

Totally, by reviewing this category, it can be inferred that public attendance is not only arising from the sensory perceptions influenced by their historical characteristics but also would be affected by the perceptual components of the contemporary attempts. In other words, the functional attempts (which have been mentioned earlier by pointing to one of these components) both directly and indirectly will affect this component. So, the memorability of these bridges that influence the social behavior and the perception derived from the individuals' historical sense

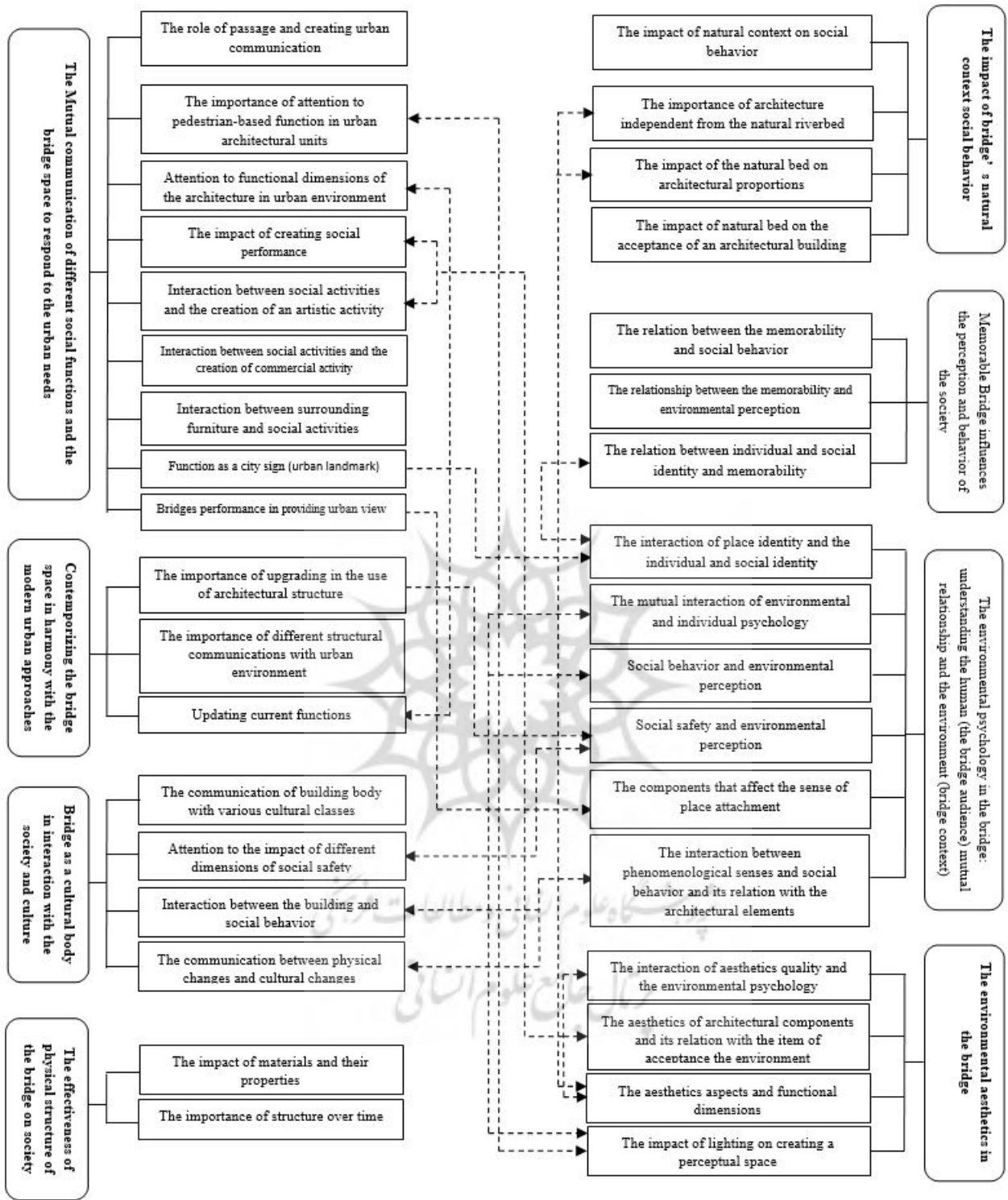


Fig.3: The Research Model

and life context similarly will influence the person's individual and social behaviors, and consequently their public presence in the environment. The component of mutual interaction between different social functions and the bridge space has

been considered here as an important component that can respond to the other urban needs, with a large percentage. By reviewing the sub-components of this part, it has been found that the bridges of the Safavid era in Isfahan act independently

as a collective space, in addition to representing the feature of a crossing route between two parts of the river. This independent function provides a calm space for citizens and attracts more people due to the presence of water in the river. But the bridge, even on days when the river dries up, provides a context for artistic and economic activities; that part of it is due to the structural details of the bridges. For example, the structure of space under the Khaju Bridge provides a proper acoustic quality for music activity and, since the bridges are allocated for crossing, they supply an ideal environment for performing the artistic activities. The authors suppose that this issue can be introduced separately as an independent component, owing to the significance of this issue.

In general, due to the historical nature of these bridges, they are not only considered as tourist attractions but also can bring vitality to the citizens on the urban scale, and consequently, create a space for urban interactions. On the other side, they need to be reviewed in case of functional dimensions due to their same important role in the urban structure. All the activities resulting from the presence of people in the bridge will greatly improve in cultural and economic dimension when their architectural and functional structure will be reviewed. This includes reviewing the body and the construction of a functional urban space both in the interior space of bridges and in their surrounding environment. A proper review of this category can improve and upgrade the cultural level of the environment that is largely dependent on creating a sense of security and the public presence in the environment when it is considered as a cultural body in interaction with the society and culture. As a result, that ancient item of these buildings is a very important feature that causes constant public presence in these bridges environment; and the physical changes can greatly increase the quality of this presence, despite the sense of social insecurity in some cases.

The structural quality and materials applied in these bridges are among those influential components that directly dependent on architecture. The way of using materials and their strengths besides the construction quality of the building all have a visual impact on the audience and make that urban place more attractive.

Therefore, in general, it can be said that the mentioned components cannot be introduced separately, as they influence each other or even have mutual interaction, in addition to the introduced classification. The way their relationship has been shown in the following conceptual model (Fig. 3).

Considering that the first question has been responded in the form of the extracted components, to address the second question, it can be said that all the extracted components of the contemporary time have a great influence in creating the

functional and collective space in the urban structure of Isfahan city; The ancient item and the nostalgic sense of these bridges provide a quality which can act as the architectural units with an urban performance, as long as the function is reviewed in the contemporary time.

REFERENCES

- Altman, I., (1975). *Environment and the social behavior; Privacy, personal space, territory, Grouding*. Wisconsin: Cole publishing company.
- Ansari, H., (2000). *Introduction to the sociology of Isfahan*. Tehran: Naghshe Jahan.
- Berleant, A., (1998). Environmental aesthetics. Translation: alafchi, *J. ziba Shenakht journal*, 1(16), 283-296.
- Elo, S. & Kyngas, H., (2008). The qualitative content analysis process. *J Adv Nurs*. 62 (1). 107-115.
- Falahat, M. S., (2006). The concept of sense of place and its forming factors, *Honar-ha-ye-Ziba Journal*. 1(26), 57-66.
- Farshad, M., (2017). *History of engineering in Iran*. Tehran: Mirmah Publications.
- Farshidnik, F. & Afhami, R., (2010). Iranian Bridge-Caravansaries Evolutionary process of unifying Caravansary buildings and Bridge structures, *Honar-ha-ye-Ziba Journal*. 2(41), 55-66.
- Ghobadian, V. (2013). *Climatic analysis of the Traditional Iranian building*. Tehran: Tehran University Publications.
- Hajianpour, H. & Javadi, R., (2016). A Study of Identification of the Concepts of Isfahan's Architecture in the Itineraries of the Safavid Era and their Transfer Circumstances to the Europe: a case study of the itineraries of Delavalleh, Tavernier, Chardin and Sanson. *Biannual Research Journal of Iran Local Histories*. 4(2), 29-40.
- Honarfar, L., (1971). *A Treasure of historical monuments of Isfahan*. Isfahan: Saghafi Publications.
- Lynch, D., (1960). *The Image of the City*. Cambridge: MIT Press.
- Mokhlesi, M. A., (2000). *Ancient bridges of Iran*. Tehran: Miras-e-farhangi-ye Keshvar publication.
- Moravej Torbaty, K. & Pour Naderi, H., (2014). Based on comparative study of historic bridges of Isfahan. *Bagh- E Nazar Journal.*, 10 (27), 61-70.
- Nazemi, E., Habib, F., & Majedi, H., (2016). Bridge function as urban space. *Journal of geography and environmental studies*. 4(16), 23-34.
- Relph, E., (1976). *Place and placelessness*. London: pi on.
- Shahcheraghi, A., & Bandarabad, A. (2015), *Environed in environment: Application of environmental psychology in architecture and urban design*, Tehran: jahad daneshgahi publication.
- Tavernier, J. B., (1984). *Tavernier itinerary*. Translation by Nori, A. Edited by Shirani, H. Isfahan: Sanaei library Publications.
- Wilkinson, D. & Birmingham, P., (2003). *Using Research Instruments: A Guide for Researchers*. London: Routledge.

