

# COMPARATIVE INVESTIGATING OF ADAPTIVE REUSE AND SUSTAINABLE ARCHITECTURE WITH SOCIAL APPROACH

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## Abstract

*The construction of new buildings consumes significant amounts of materials and natural resources that can impose large costs. Adaptive reuse of historical buildings, besides the economic savings can be as lively historic centers. And also the urban centers can be more active, and as memory recall. This study is a comparative investigating that integrates the principles of sustainable design (social approach) and reuse of historic buildings. This research is an applied research, which has been investigated by correlation research. Material for the study was obtained through field studies and library studies and by choosing Heidarzadeh House (Renovated building function: Cultural) and Ordoubadi House (Renovated building function: Official) as the case studies; it is used for hypothesis testing. Analyzing historic houses shows that Tabriz's historic houses are based on existent cultures, the principals that can be seen less in our contemporary architecture. Five features of social sustainability are determined and analyzed in case studies. This paper is aimed at expressing social historical message of the adaption and seeing which functions are suitable to define in historic houses. Preserving and reusing historic buildings has long-term benefits for the communities that value them. When done well, adaptive reuse can restore and maintain the heritage significance of a building and help to ensure its survival, (memorial centers) and also the societal value of*

*a given site; that is, the importance to the community of the use of a site by community members or visitors (a place for social interaction). It is obvious that new relationships between human and architecture is settled through reuse. It seems social approach consideration in choosing new user is an applicative way to answer to user's needs.*

**Keywords:** *Adaptable reuse, Sustainable, Social approach*

## A. CONCEPTS AND STUDIES

### 1 INTRODUCTION

#### 1.1 Adaptive Architecture

Adaptive Architecture is concerned with buildings that are designed to adapt to their environment and to their inhabitants whether this is automatically or through human intervention [1]. Buildings are no longer static objects. More and more frequently, they adapt to their environments with the aim of being more sustainable and of providing more comfortable conditions for their inhabitants. They can adapt to their users to make spaces more convenient, information rich and more useful in different circumstances. Adaptable buildings have the ability to change use with market conditions, enabling

them to have a longer life [2]. There are basically three 'schools' of adaptive architecture; adaptive reuse, functionally generic architecture, and adaptive systems. These further break-down into more specific building systems and design approaches [3].

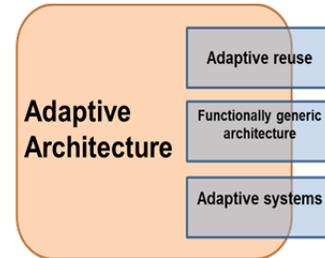


Figure 1: Schools of adaptive architecture

### 1.2 Adaptive Reuse

Altering existing buildings for new functions is not a new phenomenon; in the past buildings that were structurally secure have been adapted to fit changed needs or new functions without questions or theoretical reflections. For example during the Renaissance period, monuments from ancient times were transformed for new uses. During the French Revolution, religious buildings were transformed for industrial functions or military uses after they had been confiscated and sold. These interventions, however, were done in a pragmatic way and in many cases without heritage preservation as an intention. Instead, the driving force behind these examples of 'reuse' was functional and financial, in essence. Today, however, working with existing buildings, repairing and restoring them for continued uses has become a creative and fascinating challenge within the architectural discipline. The process of wholeheartedly altering a building is often called 'adaptive reuse'. In contemporary conservation theory and practice, adaptive reuse is considered to be an important strategy towards conservation of cultural heritage [4]. The adaptive reuse of a historic building has a major role to play in the sustainable development of communities.

The design of any research begins with a question. The question of this study is "what is the impact of social sustainability on adaptive reuse?" So two historic houses were chosen as case study, to investigate the importance of social interactions in adaptable reuse.

## 2 METHODOLOGY

This paper focuses on the adaptive reuse and the social parameters that affect the renovated building function. This is an applied research, which employed correlation research. It is eligible to find out new meanings related to historic houses to define proportionate new user. The research methodological approach adopted a mixed-method research. Material for the study was obtained through field studies and library and by choosing Heidarzadeh House and Ordoubadi House as the case study. The library studies include the information and concepts of adaptive reuse and the extant literature over years. The field study about Heidarzadeh and Ordoubadi houses shows that architecture of Tabriz's historic houses is based of history, culture, religion and their moral values. This is an important point in adaptive reuse. The field study was conducted through questionnaires. Questions were asked from clients and also staffs. The data was analyzed using SPSS. The results of analyzing the answers are presented in five tables. Each table contains one factor of social adaptability factors that are concluded from results. This is an applied research and the methods of data collection are obtained through field studies and library. The field study was conducted through questionnaires. Questions were asked from clients and also staffs. The survey was conducted in three parts: physical, social and psychological questions. These items are three important factors in social sustainability.

The questionnaire developed for this study comprised of 33 questions. At first, a short description of adaptive reuse is mentioned. The questionnaire has been divided into four parts. The first part contains general questions. The second part's questions are for clients. The third part contains questions

that are common between clients and staffs and the last part is only for staffs. Questions evaluate both physical and social aspects of the houses.

### 3 SUSTAINABILITY IN ARCHITECTURE

Concept of sustainability in architecture can be studied in two main areas. Each of them, meet any of above purposes and in some cases overlap.

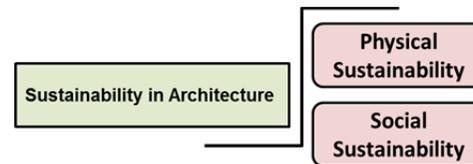


Figure 2: Sustainability in architecture

“Physical sustainability” also is called as ‘climate sustainability’ or ‘green architecture’. It deals with energy optimization, but the other context is non-physical sustainability that is called: “Social sustainability” [5]. Architectural design can play an important role in finding solutions to impact on social interactions. Sustainable design can create sustainable ways of living in a community. As social structures can affect the architecture, the opposite is also possible. In fact, this attitude causes “quality improvement” and “stabilization of happenings in architecture” [5]. This is why social issues are selected to analyze in reused historic buildings. Historic buildings as memory recalls play an important role in life of peoples of the communities.

### 4 SOCIAL SUSTAINABILITY

Every members of each community are the social capital. They are supply of social and human resources [6]. In each community, social capital is inspired

of the society’s virtues and it is linked to macro, intermediate and micro levels [7]. Reused buildings can improve these social resources or destroy them. The process that are invented to achieve social justice, physical quiet, preservation of cultural heritage, education and etc. are named ‘community soft infrastructures’. These terms was used by Len Duhl , to describe the elements of society that are important in social welfare [6].

#### 4.1 4.1. Social Attitudes to Architecture

Social scientists reject climate, economic and technologic factors as primary factors in forming building and believe architecture is affected by culture and community. Indeed, they believe architecture is the result of interaction between nature, community, worldview, living styles, material and spiritual needs, individual and group needs, economy and technology. Amos Rapoport does not deny the relationship between architecture and natural and economic factors, but he believes that the most effective factors are meanings and factors inspired by human mind like: traditions, living styles, symbols, taboo and etc. [5]. It can be said that “a historic house” is a place that shows sociocultural characteristics well, because Iranian traditional architecture has an outer body (physical body) that is its materials, texture and colors and has a meaning that is inspired by social, cultural and religious thoughts. This research offers hope of developing relationship between human and architecture by living in such buildings that are consistent with social behavior and culture.

### 5 SOCIAL SUSTAINABILITY AND ADAPTIVE REUSE

The benefits of adaptively reusing heritage buildings are Environmental, Social and Economic.

#### 5.1 Environmental

When adaptive reuse involves historic buildings, environmental benefits are more significant, as these buildings offer so much to the landscape, identity and amenity of the communities they belong to.

One of the main environmental benefits of reusing buildings is the retention of the original building's 'embodied energy'. The CSIRO defines embodied energy as the energy consumed by all of the processes associated with the production of a building, from the acquisition of natural resources to product delivery, including mining, manufacturing of materials and equipment, transport and administrative functions. By reusing buildings, their embodied energy is retained, making the project much more environmentally sustainable than entirely new constructions [8]. In other word, we try to develop higher environmental qualities.

### **5.2 Social**

Keeping and reusing historic buildings has long-term benefits for the communities that value them. When done well, adaptive reuse can restore and maintain the heritage significance of a building and help to ensure its survival. Rather than falling into disrepair through neglect or being rendered unrecognizable, heritage buildings that are sympathetically recycled can continue to be used and appreciated [8]. Adaptability, security, flexible schedules and a healthy life are some related topics.

### **5.3 Economics**

There are several financial savings and returns to be made from adaptive reuse of historic buildings. Embodied energy savings from not demolishing a building will only increase with the predicted rise of energy costs in the future. While there is no definitive research on the market appeal of reused heritage buildings, they have anecdotally been popular because of their originality and historic authenticity [8].

In order to realize sustainable urban development, conditions should be provided to allow infrastructure to provide sustainable social development and social welfare citizenship. In this context we can note: social justice, climate design, commitment, responsibility, strengthen family foundations, aesthetic perception and legibility [5], improving utilization of urban spaces and citizen satisfaction.

## **6 SENSE OF COMMUNITY**

McMillan & Chavis's (1986) theory is the most broadly validated and widely utilized in this area in the psychological literature. They attempt to describe the strong sense of social stimuli and the process by which these elements work together to create a sense of community. A widely held academic definition of this term is "the sense of community is a feeling members have of belonging, a feeling that members matter to one another and the group, and a shared faith that member's needs will be met through their commitment to be together" [9]. They prefer the abbreviated label "sense of community", and propose that sense of community is composed of four elements. It seems to be proper to define public user function in historic buildings. Because a cultural or an official building also is a small community, we generalize these four elements to our case studies to match and analyze the features.

### **6.1 Membership**

The first aspect of Sense of Community is membership in that community. People become members of a community when they feel emotionally secure, personally invested and a sense of belonging or identification in the community. These features of membership "fit together in a circular, self-reinforcing way, with all conditions having both causes and effects".

### **6.2 Influence**

Secondly, people that have a sense of community must feel that their opinion can have influence over what the group does. The most influential people within a group are those who acknowledge the importance of other people's needs, values and opinions.

### **6.3 Integration and Fulfillment of Needs**

Another element that is fundamental to people experiencing a sense of community is that people are rewarded for their participation in the community. This attribute is fundamental for people maintaining their sense of community.

#### 6.4 Shared Emotional Connection

The final element that creates people's sense of community is that the members have a shared emotional connection. This element seems to be the defining feature for people to experience a true sense of community [9].

### 7 DYNAMISM AND VITALITY

We call a place 'live', when it is vibrant, event filled, exciting and responder to subjective expectations of citizens [10]. Citizens should be involved in spaces and diverse community groups should be attending in historic places. Diversity in functions, activities, timing of use, groups of people are strategies for achieving this aim, also green spaces play an important role in vitality of places. Whatever the place is event filled and live, the 'I' will be closer to 'WE' [11].

### 8 WHY HISTORIC HOUSES? (SUSTAINABLE HOUSING)

An important characteristic of vernacular architectures of the past was an accommodation -indeed, an anticipation- of spontaneous adaptation. Vernacular building technology is not the product of any formal development process. It is the product of cultural evolution involving the peer-to-peer negotiation between owner/builders and their community, owners and craftsman, apprentice and master-craftsman, and the habitat, time, and the environment. Together, these result in a system of building and design convention peculiar to a location and regional culture. Today, they have tended to become stratified as 'styles' in the modern era, their evolution stunted by the compulsion toward 'cultural preservation' in the face of contemporary nation-states compulsion toward sociocultural homogenization. Many of their building methods are no longer functional or practical in the contemporary context because of so many generations of stunted evolution, missed technology integration, changing economics, and environmental changes. They are mimicked for aesthetics alone. But for a long time they embodied a very organic, collaborative, human process of

habitat cultivation -albeit operating at a pace measured usually in generations [3]. As mentioned, Iranian historic house is a place that shows sociocultural characteristics well, because Iranian traditional architecture has an outer body (physical body) that is its materials, texture and colors and has a meaning that is inspired by social, cultural and religious thoughts. There are some features which caused to select the historic houses as sustainable places to study in this paper.

#### 8.1 Socialization

Reception is an activity that people have been interested in different periods. Researches in these fields show that social interactions were very important point in designing houses.

#### 8.2 Flexible design

The concept of 'a house for the whole life', providing people's different needs, is welcomed by building foundations. Due to increasing complexity of family structure, housing should be flexible. As a result social sustainability will increase. In almost all of the Tabriz's historic houses, the plans are symmetrical. But due to limitation of spaces and their dimensions, they forced to cause some plan metric changes. The eastern part of plan is integrated as library.

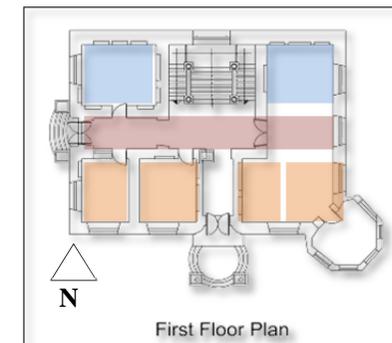


Figure 3: Spatial changes in Ordoubadi House

### 8.3 Green spaces

Green spaces enhance neighborly relations, and are good opportunity for socialization of children. Anthony Francis Clarke Wallace believes yards with no green spaces, fails to control the family domains and local communities.

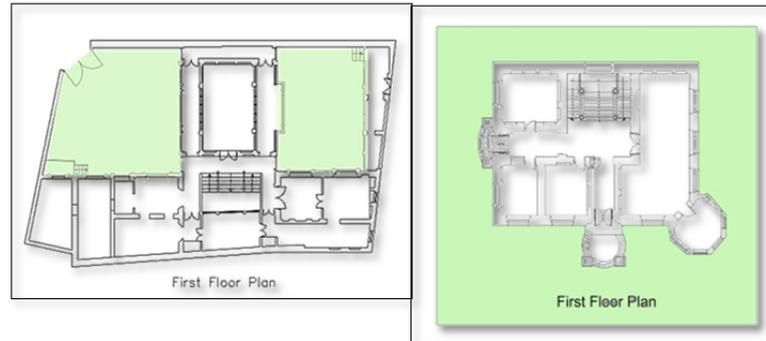


Figure 4: Green spaces in Heidarzadeh House (left) and Ordoubadi House (right)

Heidarzadeh House has two separate yards (interior and exterior yards) that are separated by a beautiful hall ornamented with wooden-worked windows (Orosey) windows. The hall is used as conference hall.

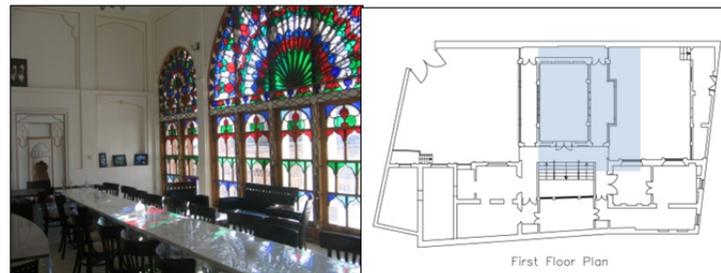


Figure 5: Main hall (Conference hall) (left). The location of main hall in Heidarzadeh House

### 8.4 Comfort

To study 'comfort' in Heidarzadeh and Ordoubadi Houses, we asked some questions. Sustainability attempts to create maximum comfort for people, so we investigate some factors that influence comfort [12]. We asked some questions about noise and other factors.

Comfort  Relax  Security  Safety  Health

## B. FIELD STUDIES

### 1 SURVEYED HOUSES (THE CASE STUDIES)

Two houses- Heidarzadeh house and Ordoubadi House- are studied in this paper.

**1.1. Heidarzadeh House** is a historical mansion situated in Maghsoudieh suburb of Tabriz, Iran, on the south side of Tabriz Municipality building. There is no document showing the date of construction of this historical house, but studies revealed that the house constructed about 1870 by Haji Habib Lak. The house was registered in the list of National Remains of the Country in 1999 under the number 2524. It covers an area of 900 square meters and has two floors. The house has two interior and exterior yards which are separated by house.

In the basement, there is a Howz-Khaneh (a large room with a small pool with a fountain in the middle) ornamented with colorful bricks and vault. Other parts of the house are connected together through a hall. The building was ornamented with wooden-worked windows (called Orosey), stuccoes, colorful glasses, brick works and paintings. The main room (Shah neshin) is one of the most attractive rooms of the house. Heidarzadeh house was restored in 2001. It is currently used as Tourism Information Center of East Azerbaijan province and Tabriz.

**1.2. Ordoubadi House** is a historical mansion situated in Artesh street of Tabriz, Iran. The house belongs to the First Pahlavi Period. This is another example of the fine work and skill of Iranian architects. The structure of stone and brick in façade, has distinguished it from other historic houses. The house is one thousand and six hundred square meters area and is a three story building. This building is now used as a Center of National Archives In North West in Tabriz.



Figure 6: Heidarzadeh House (left). Ordoubadi House (right)

## 2 QUESTIONNAIRE

The questions do not include the word "social adaptability", but the answers are obviously related to social adaptability. For example, "comfort" and "relax" are two aspects of social sustainability and the question "How much noise disrupts the comfort of employees?" evaluates the comfort and relaxation degree in adaptive houses. The questions have been analyzed with SPSS software. Because of comparative attitude, the analysis for both Heidarzadeh and Ordoubadi houses are gathered together.

In this part we explain the relationship between questions and the research question. The aim of asking general questions is that we want to conclude that which aspects of social sustainability affect what kind of people? In other word, we analyze the people issues in the "people and building relationship" in social adaptability.

### 2.1 Results and analysis of general questions

In this part, we asked questions about gender, age, level of education, field of study, time and date of visiting houses. The period of visiting time was one month, from Jun 1th to July 1th. The time of visits of Heidarzade House is during the day, morning and afternoon, but visiting time of Ordoubadi House is only in the morning. This is an important point that giving public functions such, cultural, to historic buildings attracts people more, and so the social interactions and emotional connections will be increased. The other point is that when users are in touch with historic buildings easily, the sense of belonging to place is much more. It seems that the cultural function for reused buildings can easily answer this need.

Table 1: Visiting reason- Heidarzadeh House (left). Ordoubadi House (right)

	Que.1	Que.1
	Percent	Percent
Staff	3.2	45.2
Client	35.5	32.3
total	100	100

Table

2: Age range- Heidarzadeh House (left). Ordoubadi House (right)

	Que.3		Que.3
	Percent		Percent
20-25	3.2	20-25	9.7
26-31	3.2	26-31	12.9
32-37	25.8	32-37	12.9
44-49	41.9	38-43	3.2
Total	74.2	Over50	16.1
		Total	54.8

Table 3: Academic majors- Heidarzadeh House (left). Ordoubadi House (right)

	Que.3 Percent		Que.3 Percent
High school graduate	19.4	Less than high school	3.2
bachelor	32.3	High school graduate	6.5
master	22.6	Bachelor's degree	29.0
Total	100	master	12.9
		Ph.D	3.2
		Total	100

## 2.2 Results and analysis of client's questions

In this part, we asked questions about parking space, reception room, and bathrooms. These questions are not directly related to social issues, but since lack of necessary facilities excretes people, it is necessary to provide such facilities. Compared with Ordoubadi House, there are parking spaces provision in Heidarzadeh House.

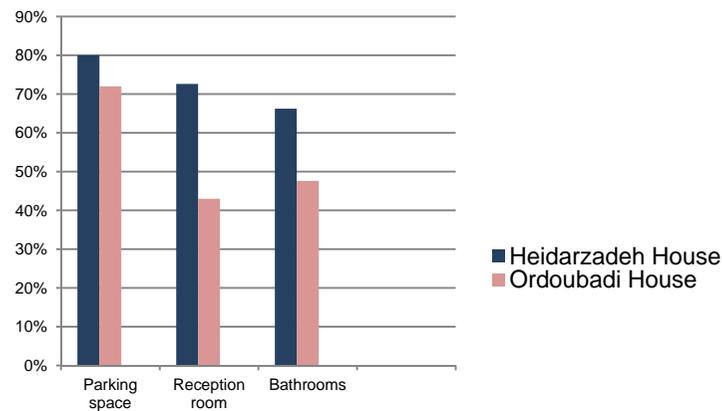


Figure 7: Parking spaces, Reception room, Bathrooms

The next part is related to comfort and relax item. In this part we evaluate some factors that effect on people's feelings when they enter the house. In fact, people can easily obviate their needs.

Table 4: Some comfort and calmness parameters in social adaptability



Adaptive reuse is basically integrates the needs of living in historical places as memory recalls and doing jobs, and when you do your job, it means you are a member of community and influence on it.

Table 5: Sense of community parameters in social adaptability



## 2.3 Results and analysis of common questions between client and staff

These questions are about physical and also social items. Questions are about accessing to other rooms, interior spaces and facades. The answers show that the accesses between rooms are not suitable enough. Stairs play the main role in linking rooms with each other. And also the answers shows that people can easily access to other offices when they are in Heidarzadeh House and the Neighborhoods are consistent with existing offices.

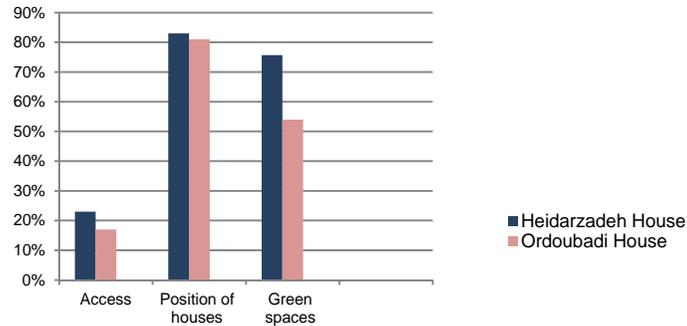


Figure 8: Access, Position of houses, Green spaces

As mentioned, green spaces have an affective role in gathering people and instill a sense of calm. Both reused buildings have access to green spaces and can be seen when you are in interior spaces. Some other questions like "Whether interior spaces connected with small or large outdoor spaces?" are asked to evaluate the popularity of green spaces in houses. For obtaining dynamism in adaptive reuse there are some topics to notice:

Table 6: Dynamism and vitality parameters in social adaptability



Some questions like "Are there spaces of beauty for use as a museum?" or "Is the façade of the building suitable for museum or not?" (Questions number 19 and 21), are about cultural issues that have an important role in infusing sense of belonging.

Table 7: Some cultural parameters in social adaptability



2.4 Results and analysis of staff's questions

In this part we tried to ask about some functional items that employees are faced, questions about dimensions of rooms, store rooms, parking spaces. The other type of questions was about some qualities. For example, 'how much noise disrupts the comfort of employees?' (Table 8). These items are related directly to comfort factors like safety and relaxation. It seems that working condition in Heidarzadeh House is more suitable than Ordoubadi's.

Table 8: Noise - Heidarzadeh House (left). Ordoubadi House (right)

	Que.1 Percent	Que.1 Percent
Yes	35.5	29
No	19.4	48.4
total	44.9	77.4

The most of questions are about flexibility in design and the comparative investigating of two kinds of functions is about social diversity. Social diversity has also other parameters that are named below:

Table 9: Social diversity parameters in social adaptability

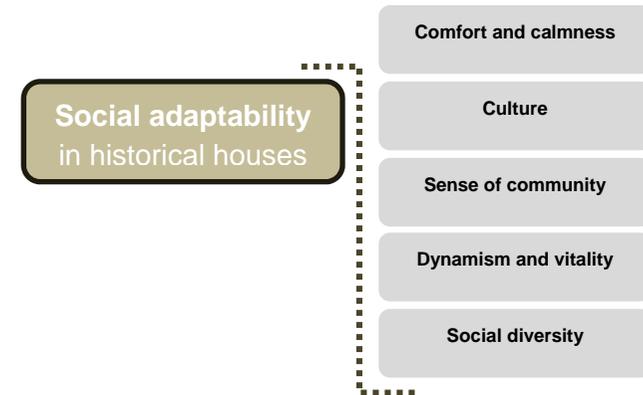


### 3 CONCLUSION

Because of rapid growing of population, parts of urban spaces, especially ancient centers, falls into disrepair and decrepitude. These places lost their quality of living and life balance, so the ‘Urban decays’ are the results. Experience shows that in many of the interventions in urban decays, only economic and physical issues are considered and the other effective aspects are ignored. Social and cultural aspects are one of the important bases in environmental quality.

Defining new functions to old buildings (reused architecture) is a suitable way to giving life to people of society. Historic buildings as memory recalls have a positive impact on people’s lives. The question is “how we can change the functions of buildings in a sustainable way?” and “what is the relationship between social sustainability and the function of the building?” For answering this, we chose two reused buildings in Tabriz and asked users to verdict.

For achieving a proper judgment, some items that cause social sustainability, were introduced: Comfort, Relax, Security, Safety, Health, socialization, flexible design, green spaces. By analyzing the answers and comparing with mentioned items, the answer was released: people prefer to see historic buildings as cultural places. It seems that in social and also physical aspects, the cultural reused buildings have better impact on users. During this, we reached to 5 important factors that are very effective on defining functions in historic buildings:



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