# Identification of Building Façade Functions by Using Fuzzy TOPSIS Technique

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Received: 25 July 2019- Accepted: 12 May 2020

**Abstract**

Housing is viewed as a collection of characteristics that are used to satisfy goals, such as comfort and visual quality. Identifying the most important functions of façade, results in improving quality. In this regard, the façade plays a crucial role in creating the borders of inner space in contact with its surroundings and can be considered as an interface. This study aimed to investigate and rank the most prominent functions of the façade in relation to the inside and outside of a home as a connector and barrier and find out the differences between the importances of façade functions of different indoor spaces of a home. The parameters were extracted through a theoretical study for the previous related studies, the functions of the façade were first investigated and categorized and then data was collected by using questionnaires completed by experts of housing design. The Delphi technique was used in this regard. In order to rank of the functions of a façade regarding different interior spaces of the home, fuzzy TOPSIS technique, one of the approaches adopted in (MCDM), was used. Findings revealed that the key functions of the façade were sufficient daylight and good visual access for living room, control of natural ventilation and air flow for kitchen, privacy for the master bedroom and prevention of noise pollution and management of climate and natural disturbances for children bedroom. It also indicated that making connections with the outer space in the living room, kitchen, and hall are more important, however, in parents and children bedrooms, separation is significantly important.

***Keywords***: Façade; Interface; Inside; Outside; Fuzzy TOPSIS.

## 1. Introduction

The inner space and its location are the most important factors in a house. Although a house is a closed three-dimension space, a correct designing can make a good connection with the outer area and provide peace and comfort for the residents. The inner space is meaningful in connection with the outer areas such as alley, street, river, farm, village, city, sea, earth, sky, nature and at last the whole universe (Shidfar, 2013). At the same time, invulnerability of the building has always been important and man has always tried to enclose the area where he lives by the use of walls and barriers (Arnheim, Zucker, & Watterson, 1966). In principle, dwelling is an activity that takes place in both inside and outside spaces and the flow of it starts from the outer side and goes on into the inner space (Jurgenhake, 2006). The inner space can be known as the place where residents can find safety so they can live life in a way they have learned and enjoy the solitary and also refresh their minds and bodies (Haeri Mazandarani, 2010). Therefore, according to Jurgenhake (2006), the outside part of the building, which is known more commonly as the façade of it, is the point at which the transition from interior and exterior and the other way round happens.

It is believed that human being tends to have distinct territory naturally. Private space defines the boundaries or territory of one or more people and the public space belongs to everyone. The important issue in this regard is the interface between these two (Tavassoli, 1997). In the modern world, we do not need to find a refuge against predators and neither do we need to look for prey to survive. As Skinner (2003) said, what the outer side of a building does is to enable us to have connection with the outside world, or retreat inside.

Generally, any kinds of relation between these two spaces result from two dependent aspects which are creating separation and/or correlation. Although these two concepts seem contradictory, they can come in one place in a building (Von Meiss, 1990).

## 2. Literature Review

### *2.1 Concepts of façade*

The origin of the word "façade" is from Latin *facies* which means "face" or "appearance". This word is wand in German which originates form wenden or wandlung meaning to change (Krier, 1988). In Persian, it means something that can be seen as the outer side of something else such as a building or a structure (Dehkhoda, 1931).

Heusler & Kadija (2018) stated that façade is considered as an interface between interior and exterior in terms of performance and appearance of the building. Façade, interpreted as a threshold, is an architectural device which controls the flow between two spaces. This flow can provide a visual access and can also control the amount of

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the noise entering the building and people entering or leaving the place. This interface can be taken into account as an element which regulates the flow from a controlled space to an uncontrolled one and vice versa (Hashemi, 2016). Porter (2004) pointed out that threshold is a transitional zone that signifies inside, outside and the beginning of dwelling.

Badarnah (2017) indicated that, building envelope shows a link between the outer area and the inner occupied one and plays the role of a barrier and shield in order that the building can adapt with changes.

Façade is an interface between the inner part and the outer part and also is a three-dimension element which has been located in the intersection of private (architectural) features and public (urban) features. The connection of these two spaces, which are actually two different worlds, has caused that façade as well as windows and entrance imply a role as a joint (Pakzad, 2003). Joints are considered as fundamental components of a building, the most important part in the art of creation, and the main device for connecting the building to the outer world (based on Semper's definition) (Frampton, 1995).

Taking into account the approach of the current study, façade is considered as a joint and a border between the inner space and outer environment.

*2.2 The concepts of inside and outside*

According to Collins Dictionary, on the one hand, outside means being out of somewhere or something, the outer side of something which is in contact with the environment. Inside, on the other hand, refers to the inner part of something (Shahlaei & Mohajeri, 2015). Venturi (1977) believed the contrast between the two has always been a sign of contradiction in architecture.

The concepts of inside and outside are created when places are in interaction with each other. Being inside has been defined as being far from what is outside and since human being was able to realize this definition, they have begun to experience being residents of an area (Norberg-Schulz, 1993). As Damyar and Nari Ghomi (2013) mentioned, human being, naturally tends to be shielded and to be inside, so inevitably realizing the outer space in followed by this fundamental concept.

Inside and outside are two distinct territories which are connected to each other when man goes from one to another. They reflect the experience of inversion of space and bipolarity, and among all visual art, just architecture should be in connection with both of these spaces so that it reflects this mental inversion (Arnheim et al., 1966).

The reason is that connecting the public and private arenas of life is among the duties of architecture. Even though the experience of living in these two spaces is different, moving between them provides the chance to experience the continuity. Architecture, as an art, combines the spaces with the aim of making connections between people and society. Thus, there is no contradiction between inside and outside but there might be contrast, discontinuity, continuity, and inflection (Kim, 2015). Arnheim (1978) believes that the connection between interior and exterior as two components of a single concept is the most important natural feature of an architect's work.

We separate the inside from the outside in the house but this is never absolute and despite the borders are created by walls, inside should never be considered as prison and there must be connections with outside. That is because human needs the outer space in order to vitalize the inner one (based on Bollnow's opinion) (Cilliers, 2016). By breaking up the surrounded elements such as walls and barriers, they eliminated the duality of interior and exterior (based on the fifth De Stijl manifesto: Towards Collective Building) (Conrad, 1971). This connection, as Wright believes, is an elegant and comprehensive one. To feel the sense of settlement, the outside should be felt while being inside, the outer space should drag itself to the inner part and these two should merge. In his point of view, in an organic architecture, it is difficult to say where the starting and ending point of a home is (Grutter, 2010). Through various degree of insideness and outsideness, each places will have different identities for different people, and human experience takes on different qualities of meaning and feeling (Mahboobi, Mokhtabad Amreie, Etesam, & Attarabbasi, 2018).

Accordingly, the inner and outer space could be considered as two spaces which are created in connection with each other. The way they are approached and also their attachment and detachment are very significant in architecture. Façade, as a joint between these two spaces, has different functions which will be mentioned in the following section.

*2.3 The functions of façade in relation with the inside and outside of a home*

The difference between architecture and other arts is that this art is in connection with places like churches and shrine which are typically considered as peaceful and relaxing places. The first experience of being inside is impressed at home as a shelter (Arnheim et al., 1966). The experts and researchers who have investigated the concept of home have presented different viewpoints about it and each of them clarifies different aspects of this concept. Here are mentioned some of these:

- Home is the main location for the being of humanity where a child discovers its existence. It is a place whose residents leave it and come back to it regularly. Home, in his idea, gets us inside and presents the need of settlement (Norberg-Schulz, 1971).
- Home is a small section of real world and it resembles the whole world and represents man's attitude towards life (Moore, Allen, & Lyndon, 2000).
- Home is the most basic social institution, not just a structure. He claims that even for the primitive man, who used the concept of house as a shelter, its positive aspect of existence was to create a peaceful place for the members as a social institution (Rapaport, 1969).

- Home is a place where its residents feel relaxed and convenient and the inner space is a place where the family lives. He believes the whole home is like a room. In his idea whatever we call home today, used to be called room (Pirnia, 2004).

In fact, as Le Corbusier (1975) mentioned, home is a shield which adapts to different conditions while creating a good connection with the environment around. To this aim, building envelope plays an undeniable role in relation with the functions of the inner space and although it is an element influential in the aesthetical definition of a structure and it is the first place to protect the inner side from the surrounding environment due to the nature of its design and also its position (McFarquar, 2012). In a plan which reflects the performance of man's actions the borders between inside and outside are just lines separating the two worlds while these two are not separable in reality in action and cognition and the most significant challenge to the architect results from the paradoxical contradiction difference between these two factors: Firstly, the inability to merge the inner spaces with the independent outer ones, and then the necessity of this merging as components of an inseparable environment (Arnheim, 1978).

Man has always been dependent on environment both mentally and physically. However, this is not always pleasant since there are always threats and dangers which have made him create a place to guarantee his safety (Shahlaei & Mohajeri, 2015).

The façade is a complex architectural element between inside and outside of the buildings that have the capability to function as a protective or regulatory element against climate changes. Façade's regulatory function of benefits from adjusting microclimate in the environment by controlling solar radiation and airflow across the façade which results in adjusting the surface temperature of the building near the interior (Hosseini, Mohammadi, Rosemann, Schröder, & Lichtenberg, 2019).

Façade as an interface between the outer space and the inner one, controls the interaction between the two by filtering the unpleasant factors of the outside to adjust the conditions inside. Six functional factors that should be met by a building are: acoustical performance, thermal performance, visual performance, indoor air quality performance, building integrity performance, and spatial performance (According to Rush and American Institute of Architects). Building envelope along with other structural systems play important roles in developing these factors (Lee & Tiong, 2007).

The main goal of designing building envelope is to maintain the thermal, visual, and acoustical comfort of the building consuming the lowest amount of energy. As a result, controlling factors such as heat, noise, and light should be taken into consideration while designing a building (Aksamija, 2009).

A suitable building envelope should meet four important conditions. The first one is protecting the residents against danger. The second one is providing beauty and attractiveness in order to improve the face of the building. The third one is posing minimum negative impact on the environment. The last one is providing the mental necessities of the residents such as the ability to have connection with the outside world in order to prevent isolation and to provide natural daylight (Leung, Chau, Lee, & Yik, 2005).

The functions of a façade to provide a comfortable place for residents, are providing visual access, preventing moisture from penetrating inside, preventing excessive sunlight absorbance, protecting residents against noise pollution from outside, letting natural light in and wind resistance, according to Aksamija (2016). It should be noted that providing natural light through windows needs considering other aspects such as the amount of visual access to the outside environment to create the chance to experience outside events while limiting the visual access to indoor and protecting privacy (Pourdeihimi & Haji Seyyed Javadi, 2008; Fazeli, Mahdavinejad & Bemaniyan, 2019). Window dimensions can effect on airflow into the building, natural ventilation, and defining total energy consumption. The use of windows has been largely investigated for energy consumption, thermal comfort, and air quality (Sedigh Ziabari, Zolfagharzadeh, Asadi Malek Jahan & Salavatian, 2019). Von Meiss (1990) believed that a window is a sign of human life which is like an eye allowing residents look at the outside world without being seen. As Parsa (2011) said, one should be able to observe the changes in weather condition and should feel day and night as well as the landscape. The best definition of window is through experiences that a person has. Here, there is no inside, nor is there outside. Behind is the room and in front is the world (Krier, 1988). Façade is an interface between two worlds which lets these two reach a common concept as well as adopting common rules. It is considered as a space which is transient and dynamic through which contrasts can be merged (Kurokawa, 1994). In fact, spacing between structural components can be attaching and detaching at the same time. One the one hand, Detachment creates an independent identity for each element in city or building. On the other hand, attachment creates an integrated and unified generality which in turn has a unique and interlaced identity (Ahmadi, 2012). According to what was mentioned above, different functions of façade are summarized in Table 1.

Furthermore, based on what was mentioned regarding façade, its functions, and the concept of inside and outside, "façade" is an architectural component which functions as an interface between inside and outside.

Lives of the residents flow in private and public areas of a home. Living room and kitchen as a location for family gatherings, bedrooms (parents' bedroom and children's bedroom) as locations for providing privacy, and hall as a location for relationships with relatives and guests are the top five places in modern homes where people spend most of their time. According to the previous studies done in the field of housing studies,

façade should allow a connection with the outside so that the residents are provided with a suitable inside space while preventing outside disturbances from penetration. In this regard, the functions of façade are categorized into two main categories. Façade as a connector and as a barrier. Functions of a façade as a connector indicate factors that the inner space needs to make connection with outside with the aim of providing them. Functions of the façade as a barrier show factors that the inner space needs to detach from the outside to provide them. The functions of façade in these two categories are summarized in Table 2.

Table 1
Different functions of a façade

| |
|---|
| Separation of inside and outside |
| Coherence of inside and outside |
| Selecting the amount of connection between inside and outside |
| Connection with nature and society |
| Providing safety |
| Preventing threats from outside |
| Controlling the air quality inside |
| Control of natural ventilation and air flow |
| Controlling visual access to inside |
| Allowing for good visual access |
| Controlling moisture |
| Resistance against wind power |
| Providing of natural daylight |
| Controlling light, air and temperature inside |
| Preventing excessive sunlight absorbance |
| Preventing noise pollution |

Table 2
Two main categories of façade functions

| | | |
|---|---|---|
| **Functions of a façade as an interface between inside and outside of a home** | **Functions of a façade as a connector** | allowing for good visual access |
| | | control of natural ventilation and air flow |
| | | provision of sufficient daylight |
| | **Functions of a façade as a barrier** | provision of safety and security |
| | | protection of privacy and private zones |
| | | prevention of noise pollution |
| | | monitoring of climate issues and natural disturbances |

## 3. Research Methodology

In the present study, first, a broad range of the concepts and definitions of façade, inside and outside in architectural aspects, functions of a façade as interface between the inside space and the outer one are gathered and used as the input for the rest of the study. Considering the aim of the study, to rank the functions of façade in regard with five essential parts of a home, Delphi technique used to collect the data in order to reach consensus about the importance of functions. Studies usually detect "what is available", while Delphi technique attempt to notice "what can or should be" (Norouzian-Maleki, Bell, Hosseini, & Faizi, 2015). Then the average weight for criteria calculated and to do the ranking of the functions Fuzzy TOPSIS technique was used which is among the methods of Multiple Criteria Decision Making (MCDM). Functions of façade were chosen as alternatives and the essential parts of home as criteria. As a matter of fact, living spaces are measurement for investigating the importance of the functions of façade while ranking them. Also, the main goal, alternatives and criteria and the relationship between each criterion and alternative in fuzzy TOPSIS technique is shown in Figure 1.

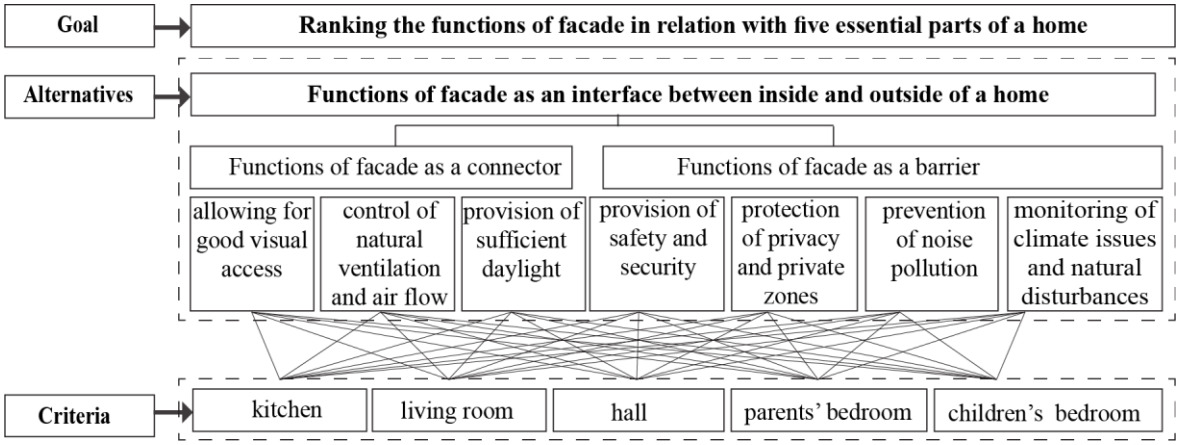


Fig 1. Alternatives and criteria relationship in fuzzy TOPSIS technique

*3.1 Fuzzy TOPSIS technique*

MCDM is widely used in ranking alternatives considering different criteria and its definition is finding the optimum solution among different ones. In these problems, the decision maker desires to solve an MCDM problem. This kind of problem can be precisely shown as a matrix where A1, A2, …, Am are all the possible solutions which a decision maker can choose among. C1, C2, … Cn are the criteria to investigate the solutions. Xij is the ranking of alternative Ai according to criteria Cj and wj are the weight of criterion Cj (Chen, 2000; Yang & Hung, 2007).

$$\tilde{D} = \begin{array}{c} \\ A_1 \\ A_2 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \cdots & C_n \end{array} \\ \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}^{k}_{22} & \cdots & \tilde{x}_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \cdots & \tilde{x}_{mn} \end{bmatrix} \end{array}$$

$$w = \left[\tilde{w}_1, \tilde{w}_2, \ldots, \tilde{w}_n\right]$$

One of the methods for solving MCDM problems is fuzzy TOPSIS technique which was first introduced by Chen and Hung in 1992. They developed the concept of TOPSIS to create a method for solving Multiple Criteria Decision Making problems in fuzzy environment. One advantage of using this approach is defining relative importance using fuzzy numbers. In this method, the final ranking of alternatives is done via simultaneous calculation of their distances from the fuzzy positive-ideal solution (FPIS) and fuzzy negative-ideal solution (FNIS). The optimum alternative has the minimum distance from positive-ideal and maximum distance from negative-ideal (Goli, 2013). Table 3 shows the steps of fuzzy TOPSIS technique in a summarized manner (Chen, 2000; Wang & Lee, 2009; Yang & Hung, 2007).

Table 3
Fuzzy TOPSIS steps

| | **fuzzy TOPSIS technique for ranking alternatives considering different criteria and finding the optimum solution among different ones** |
|---|---|
| **Step 1** | Determining criteria and alternatives |
| **Step 2** | Form a committee of decision-makers |
| **Step 3** | Construct the decision matrix and evaluate the ranking of criteria according to their importance |
| **Step 4** | Construct the normalized fuzzy decision matrix |
| **Step 5** | Construct the weighted normalized fuzzy decision matrix |
| **Step 6** | Determine FPIS and FNIS |
| **Step 7** | Calculate the distance of each alternative from FPIS and FNIS |
| **Step 8** | Calculate the closeness coefficient of each alternative |
| **Step 9** | Determine the ranking order of all alternatives, according to the closeness coefficient |

*3.2 Data collection*

To collect the data and to investigate the relationship between functions of the façade as alternatives and five essential parts of a home as criteria and also to do the ranking of the functions, firstly, a questionnaire was prepared and then Delphi technique was used to fill out the questionnaires. Delphi technique is widely used to collect information from a limited number of participants in a limited domain of expertise (Young & Jamieson, 2001; Esmaeilpoorarabi, Yigitcanlar, Guaralda, & Kamruzzaman, 2018). In most Delphi studies, participants are between 15 and 30 people and the survey is conducted in a several-week period. The participants cannot be chosen randomly and since there are few of them, the features of them and their reliability have to be investigated precisely. All the participants have to be experts in desired fields (Ludwig, 1997).

In the current study, 17 out of the 27 distributed questionnaires were completed in the due time. The professors of Iran University of Science and Technology, Tehran University and Shahid Beheshti University had been asked to complete the questionnaires using Likert scale. As Gob, McCollin, and Ramalhoto (2007) mentioned, this scale is widely used to assess attitudes, ideas and preferences. The value of the scores in the questionnaires has been defined as follows:
1: no relation, 2: low relation, 3: average relation, 4: high relation, 5: very high relation.
The mean matrix extracted from the results of the questionnaires are depicted in Table 4. Average scores in this table show the importance of each function in relation with each essential part of a home. In this table, the highest level of relations is shown in green.

Table 4
Mean matrix

| | | | **Essential parts of a home (Criteria)** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Kitchen** | **Living room** | **Hall** | **Parents' bedroom** | **Children's bedroom** |
| **Functions of façade as an interface between inside and outside of a home (Alternatives)** | **Functions of façade as a Connector** | allowing for good visual access | 4.00 | 4.71 | 3.64 | 3.43 | 3.79 |
| | | control of natural ventilation and air flow | 4.86 | 4.43 | 3.86 | 4.14 | 4.29 |
| | | provision of sufficient daylight | 4.36 | 4.86 | 3.50 | 3.86 | 4.50 |
| | **Functions of façade as a barrier** | provision of safety and security | 3.86 | 3.93 | 3.71 | 4.64 | 4.36 |
| | | protection of privacy and private zones | 3.93 | 4.21 | 3.21 | 5.00 | 3.64 |
| | | prevention of noise pollution | 2.29 | 3.36 | 2.71 | 4.79 | 4.57 |
| | | monitoring of climate issues and natural disturbances | 3.93 | 4.36 | 3.64 | 4.43 | 4.57 |
| | | **Average weight of criteria** | **0.19** | **0.21** | **0.17** | **0.21** | **0.21** |

## 4. Discussion

In this section of the study, some points are mentioned regarding the subject of the study. According to Table 4, it has been found that among the mentioned criteria (essential parts of a home), living room, bedroom for parents, and bedrooms for children have the highest average weights (0.21).
In living room which is the most functional area for family and their gatherings, the highest amount of time is spent there and among the duties of façade, the following functions are more significant: provision of sufficient daylight, allowing for good visual access, control of natural ventilation and air flow, monitoring of climate issues and natural disturbances, and protection of privacy and private zones.
In parents' bedroom, provision of sufficient daylight and allowing good visual access are not of priority since this room is mostly used at night when neither of these functions are needed while protection of privacy and private zones is the most significant function of façade related to this.
As for children's bedroom, the provision of sufficient daylight, monitoring of climate issues and natural disturbances, control of natural ventilation and air flow as well as provision of safety, security, and prevention of noise pollution are of priority.
As for the kitchen, considering the functions such as cooking, control of natural ventilation and air flow is significantly vital and the provision of sufficient daylight as well as allowing good visual access are very important as women spend a great deal of time there. With regard to hall, considering the limited functions of this place while guest is there, no priorities can be considered. (Separation of hall and living room from each other was among the questions which was effective in the results).
According to the mean matrix shown in Table 4, five functions of façade in children's bedroom, parents' bedroom, living room, and three functions in kitchen have the ranking of 4 or more. In this regard, the ranking of all functions is less than 4 in hall. As a result of this, it can be concluded that the more private the area is in a home, the more significant is the role of façade as an interface because with the increase in privacy of the inner space, its contrast with the public arena will be more and that is why in designing façade, more factors should be taken into consideration so that façade will be able to compromise the contrast in this situation. The average weight for criteria (essential parts of a home) is shown in Table 5 and divides the functions of façade into two groups of connector and barrier.

Table 5
The average weight of criteria

| | Essential parts of a home | | | | |
|---|---|---|---|---|---|
| | **Kitchen** | **Living room** | **Hall** | **Parents' bedroom** | **Children's bedroom** |
| **Average weight of criteria in relation with functions of façade as a connector** | 0.21 | 0.22 | 0.17 | 0.18 | 0.20 |
| **Average weight of criteria in relation with functions of façade as a barrier** | 0.17 | 0.20 | 0.16 | 0.23 | 0.21 |

According to this table, on the one hand, creating relations between the inside and outside is more important in living room, kitchen and hall. On the other hand, in parents' bedroom and children's bedroom detaching the inside and outside has been prioritized. In fact, in public arenas of home, creating connection with outside is important while in private arenas detachment is of greater importance than connection. The overall measurement results from the calculations using fuzzy TOPSIS technique in order to do the ranking for alternatives (functions of façade) are summarized in Table 6.

Table 6
Importance ranking of functions of a façade

| **control of natural ventilation and air flow** | **provision of sufficient daylight** | **monitoring of climate issues and natural disturbances** | **provision of safety and security** | **protection of privacy and private zones** | **allowing for good visual access** | **prevention of noise pollution** |
|---|---|---|---|---|---|---|
| 0.76 | 0.69 | 0.68 | 0.63 | 0.61 | 0.55 | 0.34 |

Based on the results shown in Table 6, control of natural ventilation and air flow (0.76) and provision of sufficient daylight (0.69) are considered as two highest rankings of functions of façade, while prevention of noise pollution (0.34) and allowing for good visual access (0.55) are two lowest rankings of fuzzy relevant importance.
As shown in Table 5, control of natural ventilation and air flow is important in 1, kitchen 2, living room 3, children's bedroom 4, parents' bedroom 5, hall, respectively. The provision of sufficient daylight is crucial in 1, living room 2, children's bedroom 3, kitchen 4, parents' bedroom 5, hall, respectively.

Moreover, according to the results of rankings regarding the functions of façade, another categorization can be present in this stage. In this classification, control of natural ventilation and air flow, provision of sufficient daylight, monitoring of climate issues and natural disturbances as well as the provision of safety and security are considered as primary functions of façade for providing basic needs of residents while protection of privacy and private zones, allowing good visual access and prevention of noise pollution are secondary functions, which will all end in residents' peace and improve quality of life. This new categorization as primary and secondary functions is shown in Table 7.

Table 7
Primary and secondary functions of a façade

| **Functions of façade as an interface between inside and outside of a home** | |
|---|---|
| **Primary functions** | **Secondary functions** |
| control of natural ventilation and air flow | protection of privacy and private zones |
| provision of sufficient daylight | allowing for good visual access |
| monitoring of climate issues and natural disturbances | prevention of noise pollution |
| provision of safety and security | |

## 5. Conclusion

From this research, it is possible to conclude that home as a shelter and a place to rest, has always been influential in improving the quality of life. The most important part of a home is its inner space. This space is a place which is surrounded by the environment around it and makes connections with the outside using different ways so as to meet the needs of the residents. Talking about home (even as a shelter) is not necessarily a place detached from outside.
Taking into account the aim of the study, it can be mentioned that a façade as a barrier or a connector is an architectural phenomenon. Façade is an architectural component in the border of inside and outside which from a functional point of view acts as a barrier and a connector. From a spatial point of view, it creates both continuity and discontinuity and resolves the differences between the spaces on both sides; differences such as crowdedness and solitary, private and public, natural and artificial, which seem contradictory but are complements in action.
At home, each area is located somewhere between absolute detachment and absolute transition facing with the outside. Therefore, they have to choose between these

two extremes because places are given different values based on their relative position inside and outside.

From the outcome of our investigation, it is possible to conclude that in living room, kitchen and hall as public arenas of a house, establishing connections with outside is of importance while in bedrooms as private spaces detachment from the outside is more important and façade as a barrier plays a more significant role.

Furthermore, based on the findings of the study resulted from the investigations through fuzzy TOPSIS technique in ranking the functions of façade, it can be concluded that control of natural ventilation and air flow and provision of sufficient daylight are considered as the most important functions. Natural ventilation is one of the most influential factors in creating comfort. Considering the decline in fossil-based energy types, new solutions such as passive designing for conditioning has helped a lot in reducing energy consumption because mechanical air conditioning systems are complicated and demand high levels of energy. In this regard, one of the most effective ways to provide air conditioning is a suitable design for façade.

The possibility of natural daylight penetration in a closed space is effective in improving the quality of life while increasing the health level of the residents as well as their efficiency.

In conclusion, it is evident that this study has shown better recognition of functions of façade in designing phase will result in improving the quality of life in the inner space of a home.

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