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Prioritization The Elements and Components of The Facade Structure Based on Its Impact on The Audience's Visual Perception

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ABSTRACT

The facade of the buildings as a part of the urban landscape is considered one of the main elements of the urban bodies, which is first exposed to the view and judgment of the observers. Today, the lack or absence of analytical information about the facade and its components and elements and the importance and impact on the audience has led to the design and production of undesirable facades and visual disorder in cities. The aim of the study to know the elements and components of the facade of the building and the degree of impact on the visual perception of the audience, and seeks to answer the question that according to the audience's point of view, in what order is the priority and importance of elements and components in the facade structure and design? The present research has been carried out using a descriptive-analytical approach based on documentary-library studies, The structure of the facades of the building was identified using the existing theories, and then the key components were extracted by the frequency method and given to a group of architects and experts in the form of a questionnaire with a five-point Likert scale. Statistical analysis (factor analysis) of the data collected from 100 questionnaires indicated that in four main categories, elements, components, and aesthetic pillars of the facade, respectively, the middle part, inputs, texture of materials and aesthetic principles of the facade are important from the audience's point of view.

Keywords: *Facade, main parts of the facade, facade elements, facade components, aesthetic elements*

1. Introduction

The facade of the building is one of the most important elements that express its architecture [1].Facade is defined as the face of a building, especially the principal front that looks onto a street or opens space [2] and in fact, an important part of the imagery of architects and visual arts is realized in the facade [3]. From the point of view of D.K.Ching (2004), the surface of the exterior walls of a building, together with the surface of the roof, controls the penetration of natural factors into the interior spaces, and the way of combining the surfaces of the exterior walls with their openings will determine the overall form of the building, and surface of the external wall, which is considered to be the appearance or the main view, can be separated as a part of the design [4].From Lang's(2008) point of view, the

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facade of the building is the public image that can be presented by the individual to the society [5]. The exterior views of the building is the first space that people encounter when approaching the building and see its elements and continuously experience it [6]. The facade as an interface between the interior and exterior spaces is visually evaluated by the citizens, and people's perception is formed under the influence of the visual image created from the facade of the building [7].Therefore, the role of building facades as well as its coordination with the needs and perception of the audience is a challenge that thinkers and architects face on the way to achieving the desired architecture. From this point of view, the facade has a special place in the visual field and in the field of perception and behavior as far as it acts as a window of visual understanding and affects the visual perception of the environment and in addition to visual and aesthetic effects, it also has psychological and social effects. It has become the most effective element affecting the visual quality of the building and space [8].

Therefore, the facade of the building plays an important role in conveying and receiving meanings, as a whole that is made of individual elements, and it is the ability to express each of its individual elements, each of which has a meaningful existence [9].

Today, due to the lack of appropriate visual knowledge of designers and factors such as the rule of the culture of build and sell , applying the taste of the employer or owner, etc., we are facing visual anomalies in the facade of buildings. Because of in most cases, the facade of the buildings, in addition to not being in harmony with the needs of the building itself, creates an inappropriate view in the urban landscape and has negative effects on the residents of the cities. Therefore, the improvement of the visual and perceptual factors of the facade of the buildings can be realized when the design of the facade also takes into consideration the opinion and perception of the audience. Since today the perception of facades is more attention in the field of Municipal(urban engineering) and it has been less researched by experts in the field of architecture at the scale of architecture and from the audience's point of view, therefore most of the information is about recognizing the elements and components of the facade in general. In their research, Atarod and Kashi (2017) divide the facade of the building into four main parts: base, middle, roof and corner. Also, in addition to the four main parts, they introduce elements that include horizontal and vertical rhythms and facade lines [10]. In their research, Qarabeglu et al.(2016) identified and evaluated design criteria in the form of environmental response approach and sought to find components that respond to humans in landscape design. The research results have been classified in four dimensions: aesthetic, functional, sense of place and environment, and micro-criteria have been extracted for each category [11]. In their research, Karimi Azari and Safarnejad (2016) have discussed the importance and impact of the facade in Identity creation to the environment and the effective variables in facade construction that promote the identity and increase the sense of belonging of the citizens [12].Mohammadi (2018) in a research while explaining the process of perception, addressed the influence of the interpretation layer and the semantic implications of the explained feeling layer and then based on the environmental preference models, he identified the implications of various views [13]. Gordon Cullen (1961) in the book “A Selection of Urban Landscape” states that urban landscape is the art of visual and structural integration to the collection of buildings, streets, and places that make up the urban environment [14]. Achieving the perceptual structure of citizens can be clearly traced in the research of Kevin Lynch and Appleyard; Lynch examines the mental image of American citizens of Boston, Los Angeles, and Jersey City, which is the result of two factors:

On the one hand, one's memories, relationships, experiences and expectations (perceptual set in the link between the person and the landscape) and on the other hand, the three-dimensional knowledge received from the landscape [15].

According to the studies conducted and the results obtained from the literature review, it was observed that in the micro scale (architecture), the coordination of building facades with the needs and audience perception has been less addressed. Therefore, this article aims to know the elements and components of the building facades and the degree of impact on the visual audience perception, and finally, it prioritizes the elements and components in the facade structure based on the audience perception. According this, it is looking for an answer to the question that based on the audience's point of view, in what order is the priority and importance of elements and components in the facade structure and design? Therefore, the first question is what are the different parts in the facade structure of the building and what is the relationship among them? And then what is the priority of different parts of

the facade in the design and in the audience perception based on the opinion of the experts?

2- Theoretical Foundations

2-1-Environmental perception and visual perception

Perception is the biological and psychological process of obtaining information from the environment [5]. It can be said, "human perception is at the center of any environmental behavior because it is the source of all environmental information" [16]. Perception is gaining awareness and sensory understanding of information [17] and in other words, it includes feeling and receiving a large number of stimuli at the same time. However, each stimulus is not considered as a separate input. A set of stimuli are classified into groups (according to human interest, expectation, and needs) to be used as cognitive inputs to interpret the environment [18].The four main senses in sensing the environment are: sight, hearing, smell and touch. According to the German philosopher, Immanuel Kant, these senses are called aesthetic senses. Human senses are rarely used separately from each other. However, some senses are stronger or more important under certain conditions [19]. Grutter (2007) believes that vision is undoubtedly the most important sense among the five senses in architecture, and through this sense, humans acquire the environmental information [20]. Violette et al.'s research (2005) shows that the neural mechanisms between sight and hearing senses may be similar [21]. However, visual perception, meaning the experience of visual forces, is considered one of the available methods of understanding and accounts for more than 80% of visual people's sensory inputs. For this reason, often when we talk about perception, we mean visual perception [22]. Therefore, the experience of places is the product of the primary visual understanding of space [23].People's visual perception is influenced by three components: visible rays, space with objects and human eyes [24]. The ability of the eye is based on the irregular scattering of the number of rod and cone cells in different parts of the retina, and the most important part of the entire field of vision for us is the point of view. We look so that the image of what we intend to see is created exactly in the most sensitive part of the retina. A relatively small part of the retina, which forms only an angle between 2 and 5 degrees of the specific field of view, has the most accurate vision [20].Our perception of the world is spatial perception and space is three-dimensional [25].Gibson (1950) writes in the book "The Perception of the Visual World", we perceive this three-dimensional reality in perspective, which communicates with us by means of stimulating stimuli and their structure and received sensory changes. But in architecture, the introduction and examination of the facade of buildings in two-dimensional form creates better conditions in design and implementation, and architects in their profession and in the latest production documents for implementation, provide orthographic and two-dimensional views; although today, due to new software, new possibilities have been provided [26]. Lawson (2015) emphasizes that people usually attention to general points when describing building facades, based on this, architectural style, color, volume, perceptual value, materials, shapes and visual bulky elements, forms, surfaces and lights, curved lines, decoration details, elegance and scents, components and texture are among the main aspects that shape the character of that facade in the viewer's mind [27].

Perception in architecture

Experts have considered various aspects of architecture including function, form, and meaning, and in different historical periods, these aspects have been considered. Although the categories of form and function have been discussed a lot, nowadays the experts emphasize the meaning aspects. Some believe that many architecture concepts arise from the functional nature of the building and the previous experiences of the users of the spaces [28].In the view of the observers, who are often not living in the buildings, the form and in some cases the meaning aspects are considered and judged, and the designers of the facade of the buildings also consider the opinion of the audience in the design, but some believe that there is a difference between the opinion of the observer and the opinion of the designer regarding the perception of the view and the elements in the city scale. Appleyard believes that one of the reasons for the difference in the attitude of people and professionals is the difference in the way they look at the city. At the beginning, the designers visualize the site from a vertical perspective on the maps, while the local residents trace and imagine the environment with their own eyes and from the perspective of the pedestrian [15]. Therefore, if visual stimuli are removed or changed, our perception of their location, scale, size, color, texture, hardness, and other properties will undergo fundamental changes [25]. Based on

what has been stated, it can be emphasized that the process of feeling and perception of the facade by the observer is of special interest to designers, and secondly, the understanding of urban bodies and the facade of buildings has an aesthetic and symbolic aspect for most of the people who do not live or work in those buildings.

2-2-Facade

Any form that is a combination of line, page and volumes can be displayed with multiple faces and in standard manner, with three facades. Facade is one of the orthographic display methods in architecture; in fact, all three images are horizontal, vertical and profile view. However, in architecture, the vertical image is called facade [29]. The facade of the building do not end with the exterior and main facades, and each part of the building has multiple facade, however, the exterior facade of the building, which is in the view, is more important to designers. Harris (2014) writes that facade means the exterior front of the building, which is the front of the building in terms of architecture, and sometimes it is distinguished from other fronts of the building by elaborate architectural details [30].This homology of the building is the same facade overlooking the main street that is exposed to the public and has more details and complexity in the design. In another definition, facades are the surfaces of the building that are in common with the outdoor. Therefore, the facade is that part of the building that can be seen from the public space (street, square, etc.). The facade is not only the outer surface and the shell, but it can include more or less prominent volumetric elements according to the building form [31]. It should be noted that the facade is obtained when a facet of the building (object or volume) is parallel to the picture plane, in this case, many differences in levels are not observed in the view, so this type of image has a professional and executive use and often axonometry or perspective is used to show the real form of the building and its three sides. In addition, due to the difference in the levels of the facades on the side of the streets, the facades of these buildings can represent the building form largely. Pakzad (2003) believes that the facade is the boundary between the inside and outside of the building and as a three-dimensional element, it is the meeting place of private features and aspects, building architecture and public and urban aspects. In this case, the facade is considered a part of the body and even the urban landscape, and it has a wider role than the architecture role, as far as it acts as a window of visual understanding and affects the visual perception of the environment, and in addition to visual and aesthetic effects, it has psychological and social effects [8].According to Stein (2016), the facade of a building is an element that describes the identity of each building and is the most effective element affecting the visual quality and character of the building. Rob Krier also believes that the facade is one of the important aspects in describing the visual character of a building, a character formed from characteristics as identity, to distinguish between the facade of a building and another building that is visually observed [32]. Therefore, the visual character of a building expresses a set of physical characteristics of a building through the facade [33].

The main components of the facade

In the facade of buildings, two macro scales (urban scale) and micro (architecture scale) are defined. On the architecture scale, the facade is treated regardless of the context in which the building is located, and on a macro scale, the elements forming an urban wall are of interest, so the elements of the facade of the building are based on two aspects, the pillars and the facade components, and there should be a balance between these elements in making the whole body of compatibility, agreement and communication [34]. Moughtin et al.(1999) believe that a city view includes three horizontal parts (base, middle, crown) [35]. They know the difference between urban view and architecture view in scale and viewing distance. Tavassoli (1990) considered the foundation or base of the building to be the ground floor, where the entrances and other elements in it can create a horizontal rhythm with the type of arrangement and give order to the upper line of the ground floor[34]. The roof is the end of the facade and is like the crown of the building and the body of the building carries this crown. The roof line is the highest part of the building; It is the place where the sky and the building meet and where it ends. The roof line is a part of the sky line that can be seen from inside the town [35]. Dealing with the roof and the end floor is due to the fact that the building has a top and a bottom; the downside is the base of the building or its ground floor, which maintains its special relationship with the ground, and in the upside, it should be clear that the building has reached the end [9]. In addition to these three main parts, Rob Krier (2010) also introduces the corner as a visual issue that gives an opportunity for design expression with any synthetic element. He believes that the corners of the building are one of the most important points and it is mainly

related to the surrounding area [9].These corners are among the defining elements of urban bodies [1]. Tavassoli (2008) states that the corners and intersections in the body of the street are considered the most important factor in the connection of the body (different fronts) of the city block. The richness of the composition of the body of urban spaces, whether it is a square or a street, depends on the architecture and the combination of corners [34].

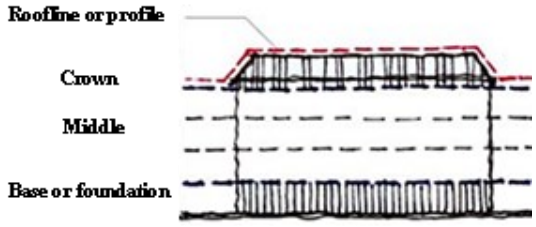

Figure 1 : main parts of façade(source :Moughtin et al., 1999:81)

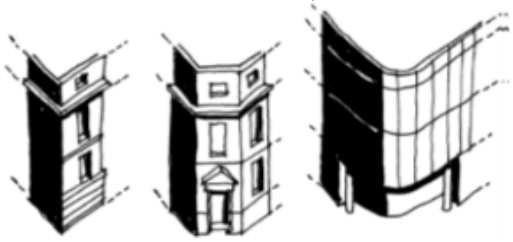

Figure 2 : several types of building corners (source: Fawcett, 2003, pp. 105-106)

The design of the corner is a visual opportunity that includes two fronts and makes it possible to design the entrance in this area for the building. Based on what has been said, the main parts of the facade can be divided into four parts, which include the base part that connects the building to the ground and the street floor, the middle part with the row of windows and probably includes the main floors. The roof part that connects the building to the sky with the roof line and the corner part that emphasizes the two sides of the facade. It should be noted that due to the two-dimensionality of the two sides in the orthographic image of the facade, it is better to change the title of the corner to the side or the side of the facade.

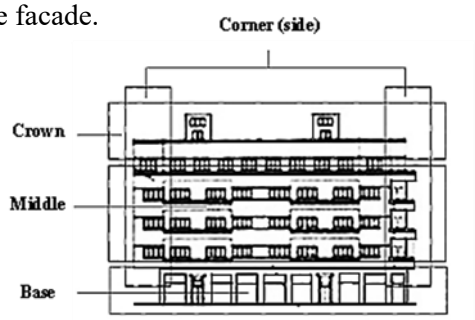

Figure 3: the main divisions of the façade (Source: Authors)

Facade elements and components

Tavassoli (1990) considers the facade components as elements whose repetition in the building and urban facade form vertical and horizontal rhythms, such as joists, stair shelves, balconies and porches, and prominent protrusions and depressions of the facade, etc. In addition, these elements create the (hypothetical) facade lines along themselves, and the elements of facade composition and volumes that influence the overall volume of the building includes facade lines and vertical and horizontal prominent elements [34]. He considers facade lines to be one of the most important geometrical elements connecting the facade of buildings and creating order, and he believes that these lines may not actually exist, but a combination of component lines and horizontal pillars or consecutive elements create this feeling in the observer. Therefore, it divides the facade lines into the following four categories:

1- The base line, which is the line of the lower edge of the street body and its border with the sidewalk;

2- The line above the ground floor, which is above the shops and some entrances;

3- Floor lines that arise from the connection of floor components such as windows; and

4- Roof edge line and parapet [34].

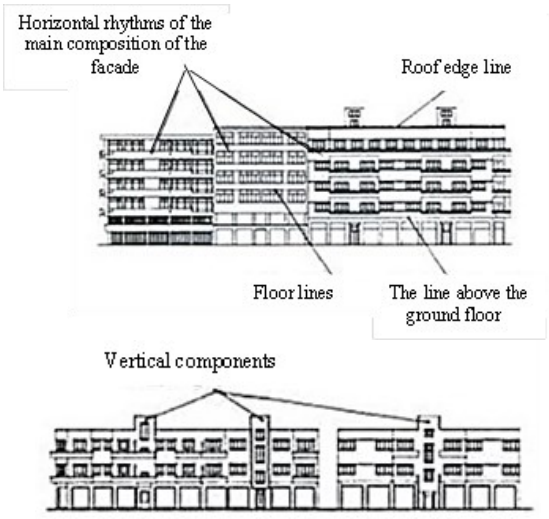

Figure 4 : components and facade lines (Source: Tavassoli, 2008:107)

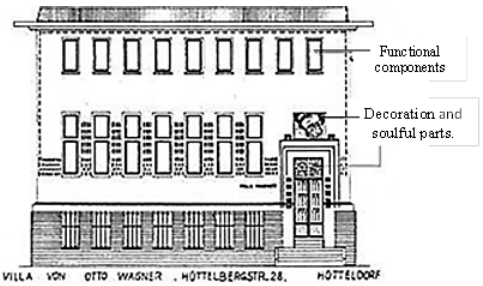

Figure 5 (right): components of the facade according to Rob Krier (source: Karir, 2010:66)

Carrier (2010) believes that vertical and horizontal prominent elements(Bay windows , balconies and porches) should not be randomly distributed on the surface of the facade and believes that facade components are either functionally necessary or are reliefs that give life to the facade [9]. Richard Hedman (2008) in the book of "Fundamentals of Urban Design", introduced the distance between buildings, the proportion of windows, the elevations and depressions of the facade, doors and other elements, the overall shape and form of the building, the location and method of solving the entrance, the materials, the texture of the facade, the shadow pattern resulting from the volume and decorative elements, scale of the building and architectural style as facade elements [37]. Rob Krier (2010) divides the facade components into two functional and soulful parts. What Rob Krier introduces soulful components is based on the classification of Tavassoli, decorations and extensions of the facade on the floors, and what Rob Krier introduces functional components, Tavassoli considers entrance and windows of the building. Also, Rob Krier (2010) elsewhere refers to the wall of the building, balconies and other protrusions or depressions as components of the facade [9].

Summary the facade structure

Reviewing and comparing the opinions of experts about the facade structure, some of which were expressed, indicates the lack of relevant foundations and differences in classifications, and it seems that the definitions provided do not fully express the facade structure, because some experts have expressed the definitions on an urban scale, and some have advanced to the level of decorative details that fit in the scale of architecture, and on the other hand, in some definitions, a facade element is expressed with two different words or terms. In the architectural scale, the facade can be defined hierarchically by looking at the whole and the parts, and in addition, the terms components, elements, pillars and parts can be used appropriately. In this way, in order to summarize the opinions, the structure of the facade of the building is divided into four categories:

1-The main parts of the facade: the base part, the middle part, the roof part (crown) and the corner or side part (Figure 5);

2-The main elements of the facade: entrances, apertures and openings, consoles and protrusions and recesses, balconies and porches, stair boxes, joists, facade lines (base line, upper ground floor line, floor lines and roofline or eaves)

3-Facade components: extensions, materials and texture, color, lighting elements

4-The aesthetic elements of the facade: the aesthetic principles of the facade (symmetry, balance, proportion, rhythm, harmony, contrast, unity, plurality, balance, etc.), horizontal and vertical or diagonal lines of the facade (Skyline, base line, etc.), Vertical and horizontal rhythms (rhythms resulting from the repetition of windows, balconies, etc.).In the table below, the parts, elements, components, and aesthetic pillars of the facade are introduced separately.

Table 1: facade structure - Source: Authors

Features and characteristics of the facade of the building			
The main parts of the facade	**Facade elements**	**Facade components**	**The aesthetic elements of the facade**
• Basic part • Middle part • Crown part (roof) • Corner part	• Entrances • Openings and apertures (window, door, sash, etc.) • Consoles and protrusions and depressions (vertical and horizontal failures) • Balconies and porches • Stair box • Columns and vertical elements • gutter • Patio or greenhouse	• Extensions (building facilities, boards, guards, canopies, shutters, window guards) • Decorations (Pediments , window frames, drop panel , motifs) • Material texture • Color • Lighting elements	• The aesthetic principles of facade (symmetry, balance, proportion, rhythm, harmony, contrast, unity, plurality, balance, etc.) • horizontal and vertical lines (skyline, baseline, etc.) • Vertical and horizontal rhythms (rhythms resulting from the repetition of windows, balconies, etc.)

3- Methodology

This study focuses on prioritizing the elements and components of the building facades by emphasizing the opinion of experts. The current study is of descriptive-analytical type and is among applied research. The information required to complete the article has been collected in library resources and documentary form and analyzed in a qualitative manner. The used library and documentary resources related to facade structures have been prepared from internal and external databases of scientific and research information, internet and university libraries. These sources are purposefully and directly related to the facade and have been selected from among the scientific and research achievements of experts in this field. Therefore, by reviewing the texts and using the coding method, the facade elements and components of the buildings have been identified, and then the facade structure has been divided into four general categories of main parts, elements, components and aesthetic elements of the facade, each of which includes sub-sections (Table 1). Since, the Likert scale to measure the point of view, feeling, judgment and in general, issues that can be invisible but affect the people behavior are used, and in this type of questionnaire, questions are raised that allow the audience to rank and scoring accurately, in order to determine the prioritization of facade structure ,based on the opinion of the audience and to data collection required by survey method, a questionnaire instrument (quantitative method) according to the Likert technique was used.

It should be mentioned that in this survey, the audience is not the general audience, but we have sought the opinion of the audience from the point of view of experts. The content validity ratio of the CVR questionnaire was calculated using the lawshe method and based on the subject-matter of 5 experts was evaluated as acceptable. Also, the questionnaire reliability was evaluated by calculating Cronbach's alpha criteria. The statistical population of this research included academic professors, professional architects, students and researchers in the field of architecture. Using the simple random sampling method, 130 of the mentioned experts were considered as the sample size, of which only 100 responded at the specified time. The obtained data are analyzed by factor analysis method (Friedman test). Since, the Friedman test is a non-parametric test equivalent to the parametric method of two-factor analysis of variance, which is used to compare the average ranks among the variable K (intragroup) with repetition measures. Therefore, in this research, prioritizing the elements and components of the building facades through SPSS software and Friedman's test was conducted. The model fit criterion was evaluated in 5 categories: factor loading, composite reliability index, convergent validity, divergent validity and partial least squares (PLS) fit index. The level of significance obtained identified the possibility of prioritization with Friedman's method as acceptable; therefore, the prioritization of the components was investigated and obtained by factor analysis and Friedman's test. It should be noted that the questions of the questionnaire were conducted to get the opinions of the experts based on their views about the audience's perception and in the case of a single building, it was set in a state where the audience can see the whole facade and the facade is in his field of vision. The content of the questionnaire, in addition to questions related to gender, level of education and field of activity, was adjusted in such a way that it includes the designers' opinion on the design and their opinion on the understanding of the audience. In terms of gender distribution of the respondents, 55% (equivalent to 55 people) are male and 45% (equivalent to 45 people) are female. This situation can be seen in diagram 1.

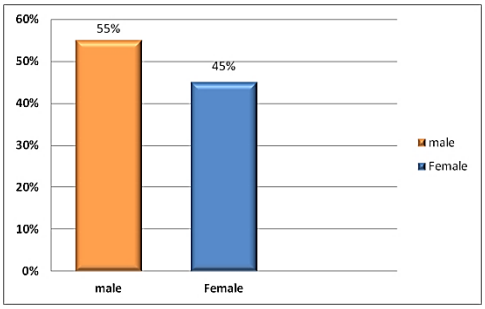

Chart 1: Frequency distribution of respondents by gender- Source: Authors

Charts 2, 3 and 4 show the data related to the general profile of the survey participants.

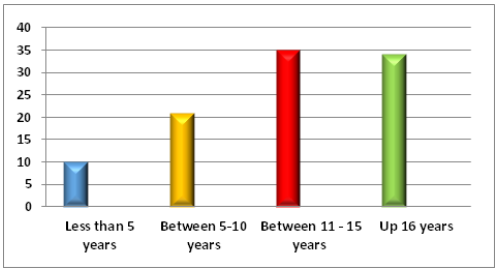

Chart 2: Frequency distribution of respondents according to record- Source: Authors

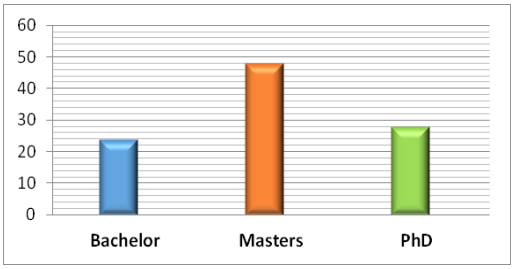

Chart 3: Frequency distribution of respondents according to education- Source: Authors

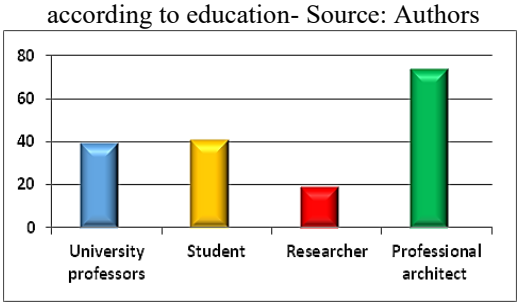

Chart 4: Frequency distribution of respondents according to the field of activity- Source: Authors

In order to determine the impact and prioritization in different parts of the structure of the facade, factor analysis was used in the two parts of audience perception and designers' opinion from the designer's point of view separately, in each indicator or component: main parts of the facade, “facade elements”, “facade components” and “aesthetic elements of façade” have been analyzed. The factor analysis of the four indicators mentioned in the facade based on the audience's view is shown in Figure 5

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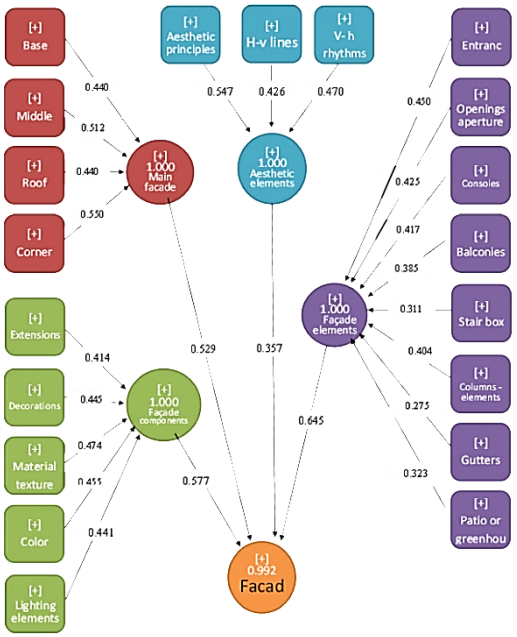

Chart 5: Factor analysis of the four factors mentioned in the facade regarding the opinion of the audience from the experts vision- Source: Authors

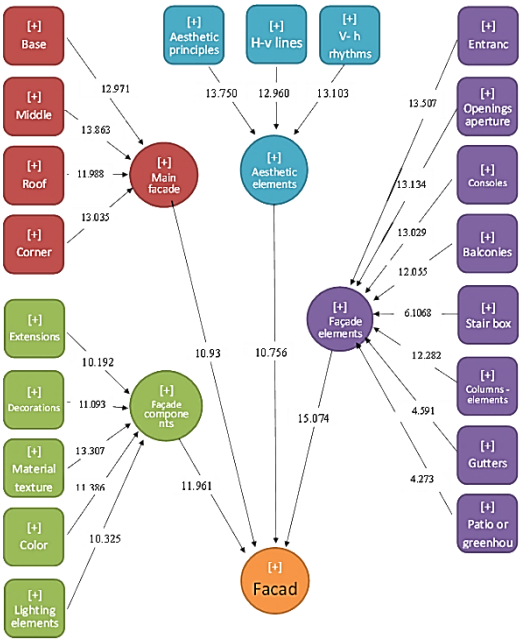

Chart 6 : t-test for correlation- Source: Authors

Model fit measure in five categories: Factor loading, composite reliability coefficient, convergent validity, divergent validity and partial least squares fit index were investigated and the results are shown in Tables 6-2.

Table 2: Factor loading and T- value value[1]- Source: Authors

T	Load	Relationship	
12.971	0.490	Base	Main parts
13.863	0.512	Middle	
11.988	0.440	Roof	
13.039	0.500	Corner	
13.507	0.450	Entrances	Façade elements
13.134	0.425	Openings and apertures	
13.029	0.417	Consoles	
12.055	0.385	Balconies and porches	
6.166	0.311	Stair box	
12.282	0.404	Columns -elements	
4.591	0.275	Gutters	
11.273	0.323	Patio or greenhouse	
10.192	0.414	Extensions	Façade compone nts
11.093	0.445	Decorations	
13.307	0.474	Material texture	
11.386	0.455	Color	
10.325	0.441	Lighting elements	
13.750	0.547	Aesthetic principles	Aesthetic pillars
12.960	0.426	Horizontal and vertical lines	
13.103	0.470	Vertical and horizontal rhythms	

Table 3: Composite reliability coefficient[2]- Source: Authors

CR	Relationship	
1.00	Base	Main parts
0.942	Middle	
0.942	Roof	
0.952	Corner	
0.933	Entrances	Façade elements
0.939	Openings and apertures	
0.944	Consoles	
0.921	Balconies and porches	
0.931	Stair box	
0.920	Columns -elements	
0.925	Gutters	
0.815	Patio or greenhouse	
0.756	Extensions	Façade components
0.845	Decorations	
0.894	Material texture	
0.798	Color	
0.901	Lighting elements	
0.977	Aesthetic principles	Aesthetic pillars
0.874	Horizontal and vertical lines	
0.794	Vertical and horizontal rhythms	

Table 4: The results of convergent validity analysis with the Ave criterion[3]- Source: Authors

Square	AVE	Relationship	
1/00	1/00	Base	Main parts
0/854	0/730	Middle	
0/950	0/903	Roof	
0/894	0/800	Corner	
0/935	0/875	Entrances	Façade elements
0/941	0/885	Openings and apertures	
0/921	0/849	Consoles	
0/924	0/854	Balconies and porches	
0/933	0/870	Stair box	
0/922	0/851	Columns and elements	
0/928	0/861	Gutters	
0/891	0/749	Patio or greenhouse	
0/936	0/877	Extensions	Façade components
0/918	0/844	Decorations	
0/892	0/796	Materials texture	
0/888	0/789	Color	
0/894	0/801	Lighting elements	
0/919	0/845	Aesthetic principles	Aesthetic pillars
0/891	0/794	Horizontal and vertical lines	
0/907	0/824	Vertical and horizontal rhythms	

Table 5: Divergent validity results by Fornell and Larcker method [4]- Source: Authors

20.Horizontal vertical rhythms	19.Horizontal vertical lines	18.Aesthetic principles	17.Lighting elements	16.Color	15.Materials texture	14.Decorations	13.Extensions	12.Patio greenhouse	11.Gutters	10.Columns - elements	9.Stair box	8.BalcoAnies porches	7.Consoles	6.Openings apertures	5.Entrances	4.Corner	3.Roof	2.Middle	1.Base	
																			0.956	**1**
																		0.993	0.479	**2**
																	0.995	0.140	0.807	**3**
																0.997	0.723	0.509	0.802	**4**
															0.974	0.389	0.123	0.760	0.339	**5**
														0.991	0.460	0.791	0.161	0.703	0.358	**6**
													0.870	0.532	0.789	0.338	0.107	0.442	0.729	**7**
												0.940	0.366	0.202	0.372	0.879	0.761	0.528	0.610	**8**
											0.974	0.304	0.656	0.370	0.414	0.150	0.858	0.894	0.504	**9**
										0.976	0.662	0.428	0.218	0.636	0.250	0.820	0.558	0.300	0.956	**10**
									0.914	0.502	0.670	0.584	0.666	0.587	0.633	0.709	0.502	0.156	0.653	**11**
								0.874	0.482	0.838	0.900	0.108	0.658	0.189	0.216	0.620	0.600	0.877	0.811	**12**
							0.988	0.673	0.902	0.920	0.432	0.262	0.905	0.331	0.845	0.388	0.897	0.393	0.178	**13**
						0.946	0.730	0.103	0.475	0.620	0.517	0.350	0.630	0.266	0.705	0.429	0.667	0.770	0.854	**14**
					0.953	0.558	0.843	0.569	0.812	0.874	0.309	0.130	0.840	0.730	0.152	0.779	0.335	0.100	0.326	**15**
				0.894	0.792	0.208	0.784	0.490	0.146	0.874	0.134	0.673	0.573	0.217	0.576	0.681	0.431	0.568	0.132	**16**
			0.945	0.397	0.410	0.537	0.125	0.520	0.133	0.537	0.817	0.828	0.759	0.536	0.173	0.890	0.791	0.116	0.260	**17**
		0.981	303	0.669	0.754	0.844	0.603	0.114	0.785	0.611	0.871	0.373	0.669	0.337	0.143	0.469	0.278	0.564	0.174	**18**
	0.985	0.896	0.575	0.610	0.897	0.638	0.602	0.488	0.468	0.760	0.653	0.565	0.790	0.560	0.945	0.767	0.383	0.690	0.955	**19**
0.856	0.717	0.258	0.845	0.234	0.797	0.845	0.760	0.590	0.147	0.158	0.810	0.141	0.524	0.790	0.855	0.337	0.811	0.433	0.782	**20**

Table 6: The general fit of the relationship [5]- Source: Authors

Impact	R2	Relationship	
24%	0/240	Base	Main parts
26%	0/262	Middle	
19%	0/194	Roof	
25%	0/250	Corner	
20%	0/203	Entrances	Façade elements
18%	0/181	Openings and apertures	
17%	0/174	Consoles	
15%	0/148	Balconies and porches	
10%	0/097	Stair box	
16%	0/163	Columns & elements	
8%	0/076	Gutters	
10%	0/104	Patio or greenhouse	
17%	0/171	Extensions	Façade components
20%	0/198	Decorations	
23%	0/225	Materials texture	
21%	0/207	Color	
19%	0/194	Lighting elements	
30%	0/299	Aesthetic principles	Aesthetic pillars
18%	0/181	Horizontal and vertical lines	
22%	0/221	Vertical and horizontal rhythms	
NFI=0/810 SRMR=0/041		Chi-Square=1221/505 GOF=0/247	

The above steps were also reviewed and carried out based on the designer's vision.

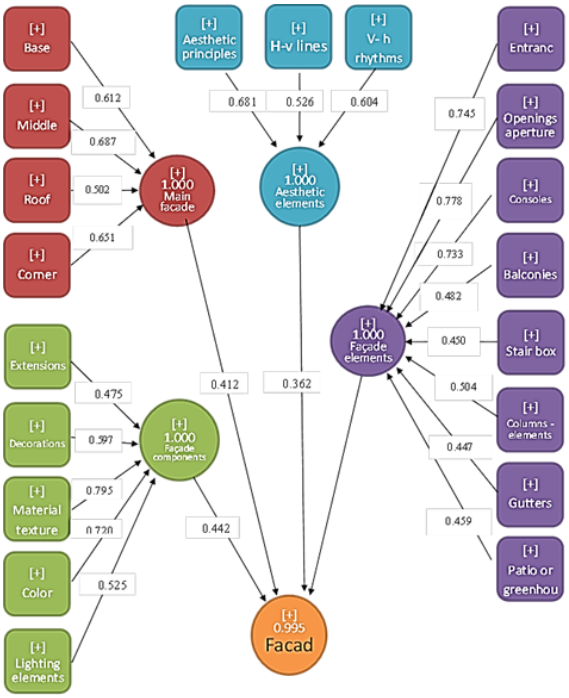

Chart 7: Factor analysis of the four factors mentioned in the facade from the designer's vision- Source: Authors

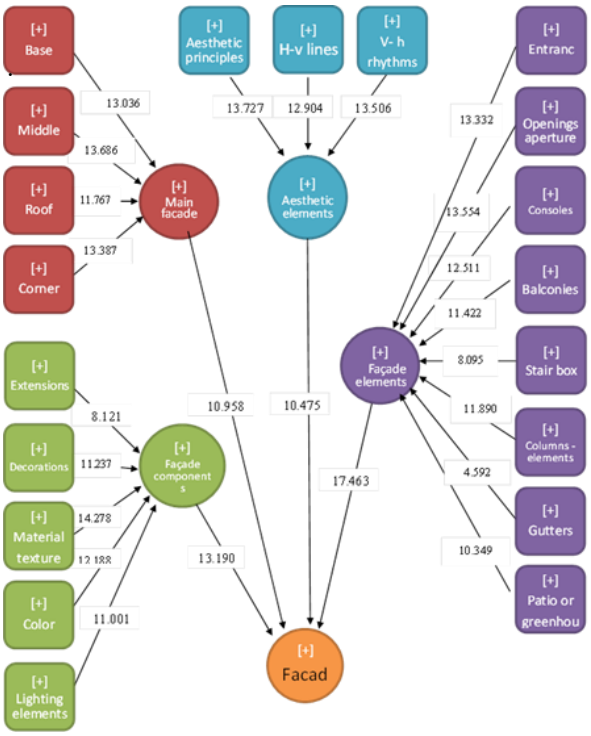

Chart 8: t-test for correlation- Source: Authors

4-Research findings

The prioritization of the desired indicators was done based on the impact on the audience using the factor analysis method and the Friedman test, the results of which are shown in tables 7 to 10. According to Table No. 7, among the main parts of the facade, the middle part is the first priority and the roof part is the last priority

Table 7: Opinions of experts in prioritizing major parts from the audience's vision- Source: Authors

No: 100 Chi-Square: 52/671 Degree of freedom: 3 Significance level: 0.000	Component	Factor value	Rate value	Rate in group
	Base	0/490	2/64	Third
	Middle	0/512	2/84	First
	Roof	0/440	1/77	Forth
	Corner	0/500	2/77	Second

According to Table 8, among the facade elements, the entrances have the first priority and the downspout have the last priority.

Table 8: Opinions of experts in prioritizing facade elements from the audience's vision- Source: Authors

	Component	Factor value	Rate value	Rate in group
No: 100 Chi-Square: 379/863 Degree of freedom: 7 Significance level: 0.000	Entrances	0/450	6/11	First
	Openings and apertures	0/425	6/08	Second
	Consoles	0/417	5/72	Third
	Balconies and porches	0/385	4/78	Fifth
	Stair box	0/311	2/91	Seventh
	Urban Columns & elements	0/404	5/50	Forth
	Gutters	0/275	1/70	Eighth
	Patio or greenhouse	0/323	3/12	Sixth

Table No. 9 shows that among the facade components, materials texture is the first priority and the extensions are the last priority.

Table 9: Opinions of experts in prioritizing facade components from the audience's vision- Source: Authors

	Component	Factor value	Rate value	Rate in group
No: 100 Chi- Square: 99/733 Degree of freedom: 4 Significance level: 0.000	Extension	0/414	1/75	Fifth rate
	Decorations	0/445	3/25	Third rate
	Material texture	0/474	3/58	First rate
	Color	0/455	3/39	Second rate
	Lighting elements	0/441	3/04	Forth rate

Also, based on the results of Table10, among the aesthetic pillars of the facade, aesthetic principles and horizontal and vertical aesthetic lines in the facade have the first and last priorities respectively.

Table 10: Opinions of experts in prioritizing aesthetic elements from the audience's vision- Source: Authors

	Component	Factor value	Rate value	Rate in group
No: 100 Chi-Square: 19/22 Degree of freedom: 2 Significance level: 0.000	Aesthetic principles	0/547	2/28	Fifth rate
	Aesthetic horizontal and vertical lines	0/426	1/72	Third rate
	Aesthetic vertical and horizontal rhythms	0/470	2/00	Second rate

In an overview, it was found that among the main parts of the facade, based on the opinions of experts and designers, the middle part affects the audience more than other parts, and also among the elements of the facade, the entrances are more than other elements; and in the part of facade components and aesthetic elements, materials texture and aesthetic principles respectively affect the audience more than other parts.The factor analysis of the four indicators mentioned in the facade was also examined based on the designer's perspective. The results indicate that among the main parts of the facade, the middle part is more interested in designers than other parts, and also among the facade elements, apertures(holes) and openings are more than other elements, and in the part of the facade components, the materials texture and in the pillars, aesthetic principles are more important to designers than other parts.

5-Discussion and conclusion

This research has been done with the aim of defining the facade structure and its indicators and prioritizing them from the perspective of the audience and the designer in the opinion of experts.

Based on the literature review and summary of the available sources, the facade structure was divided into four categories, which are:

1- The main parts of the facade include: the base part, the middle part, the crown part (roof) and the corner part;

2-The main elements of the facade include: entrances, apertures and openings, consoles, balconies and porches, stair boxes, columns and urban elements, gutters (downspouts) and patios or greenhouses;

3- Facade components including: extensions, decorations, material texture, color and lighting elements; and

4-aesthetic pillars of the facade, including aesthetic principles, aesthetic horizontal and vertical lines, and aesthetic vertical and horizontal rhythms.

A survey of one hundred experts (university professors, students, researchers and professional architects) was conducted using the Likert scale technique. After analysis, it showed the following results:- Regarding the summary of opinions, from the audience's point of view, the results indicate that among the main parts of the facade, based on the opinions of experts and designers, the middle part affects the audience more than other parts, and also among the elements of the facade, there are more entrances than other elements; and in the part of facade components and aesthetic pillars, the materials texture and aesthetic principles are more than other parts

affects the audience , respectively.- The results obtained from summary the designer's opinions show that apart from the first and second priorities in the facade elements part from the audience and designer's point of view, in the order of the entrances and openings, there are no significant difference was observed.

It seems that the designers and experts believed that the opinion of the audience is similar to their opinion, which is worthy of consideration. In the difference between the opinions of different groups in the statistical population, the comparison of the opinions of experts who are only engaged in teaching (university professors) and those who are only executive task (professional architects) shows that their view is different from the perception of the audience. In this survey, which was obtained based on the frequency of opinions of experts, there was no difference among the main parts of the facade based on the opinions of university professors and professional architects, and in both opinions, the middle part was given priority. Also, among the elements of the facade, according to the opinion of university professors, entrances are more important than other elements, and according to the opinion of professional architects, apertures and openings are in priority; and in the part of facade components and aesthetic elements, according to the opinions of university professors, vertical and horizontal colors and rhythms respectively affect the audience more than other parts, which in this case is also a priority for professional architects with the texture materials and aesthetic principles. The results of this investigation are shown in the following charts:

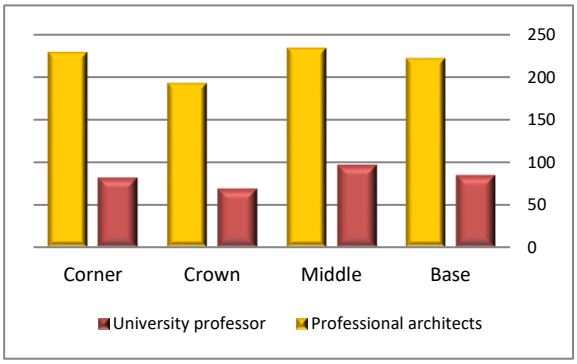

Chart 9: The comparison of university professors and professional architects opinions on prioritizing the main parts of the facade from the audience's vision- Source: Authors

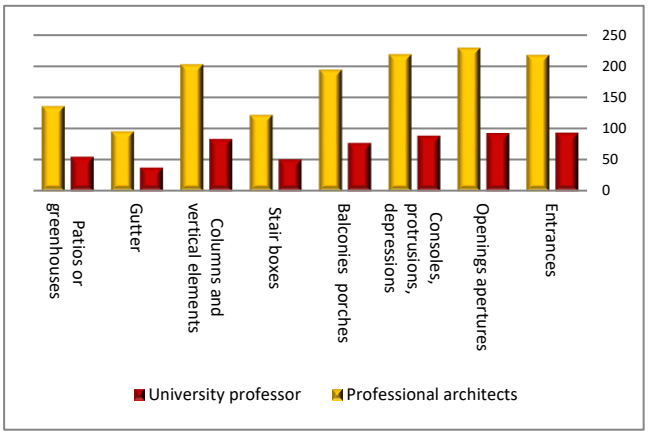

Chart 10: The comparison of university professors and professional architects opinions on the prioritization of facade elements from the audience's vision- Source: Authors

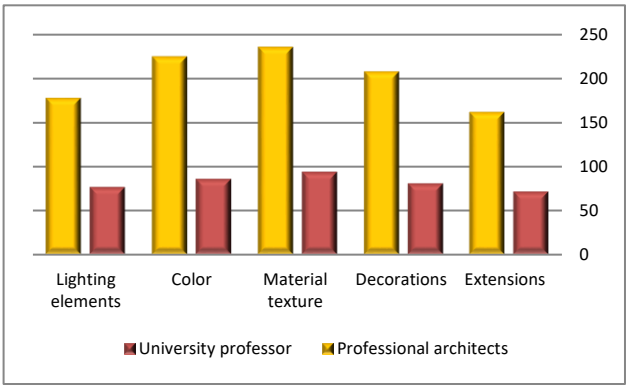

Chart 11: The comparison of the opinions of university professors and professional architects in prioritizing facade components from the audience's vision- Source: Authors

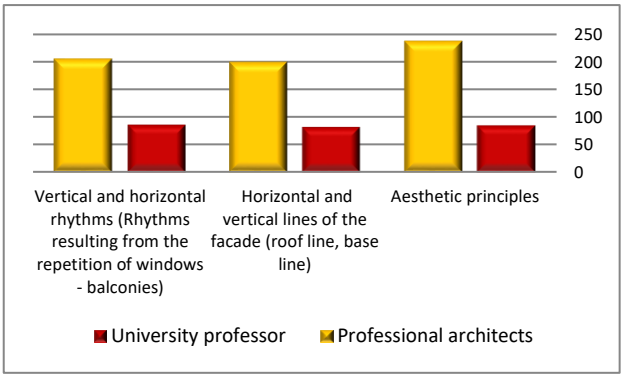

Chart 11: The comparison of the opinions of university professors and professional architects in prioritizing facade components from the audience's vision- Source: Authors.

Comparing the results obtained from the present research with similar researches shows that the classification obtained in the facade structure, although it has similar features with other classifications, but both in general and in details has been different. Among them: the part of the aesthetic elements of the facade, which is one of the most important parts in the design of the facade, has either not been seen in other researches, or has been treated as a minor part. In addition to that, in the sub-set of elements and components, details of the facade that have not been seen in other studies have been discussed. At the same time, the research results have been obtained from a general perspective and not from the perspective of visual perception and expert perspective, and none of them sought to determine the priority of elements and components.

Postscript

1- t -value in all items must be greater than 1.96.
2-Composite reliability coefficient: This index was introduced by Verts et al. (1974), which is used to examine the internal consistency of the measurement model in the Pls method, using the composite reliability criterion (CR),If its value is greater than 0.7, it indicates the appropriate internal stability for the measurement model.
3-The Average Variance Extracted (AVE) criterion was proposed by Fornell and Larcker (1981) as an index to measure the internal validity of the measurement model. In simpler terms, this index shows the degree of correlation of a construct with its indicators. A minimum value of 0.5 is considered for this index.
4-Divergent validity also measures the ability of a measurement model to differentiate the observables of the hidden variable of that model with other observables in the model, and is actually a complement to convergent validity, which is measured through the Fornell -Larcker test. The diameter of this table should be larger than the numbers below and on the right.
5-partial least squares fit index: SRMR value is equal to 0.041, which should be less than 0.08 and this condition is met. The NFI value equal to 0.810 should be close to one, which is also acceptable. The Gof value is used as a measure to measure the overall performance of the model.
This index is manually calculated as the average R2 and the average shared values. The limits of Gof index are between zero and one and one of the three values is 0.01, 0.25 and 0.36 as weak, medium and strong values, respectively. The average shared values of this model is 0.918 and the average R2 is equal to 0.247. Finally, the GOF index of this model is 0.247, which indicates an average value and generally a fitness model.

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