Explaining The Impact of Facade Architectural Components on the Visual Clutter (Case Study: Selected Facades of Tehran)

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ABSTRACT: Nowadays, clutter and visual clutter have become common characteristics of cities. The main cause of this confusion and visual clutter is the presence of urban facades with an abnormal appearance that stands out in the city. Meanwhile, the first image seen of a building is its facade, which can play a role in creating the order or visual clutter. This heterogeneity is more apparent in the facades of Tehran city, especially in the vicinity of its main streets, which have the most daily passers-by. However, what parts of the facade have caused visual clutter, and what was the most colorful visual part of the facade in this context? In the field of visual clutter, urban facades can be as effective as urban walls. Materials, colors, changing styles and contexts, different compositions of forms. These can be the factors that create and increase this visual clutter in monographs. In this research, by examining the three streets that collect garbage in the areas that have had the highest number of building permits issued in the last ten years, single facades with visual clutter have been identified, and then by examining the components of these facades, the common characteristics of each in terms of components have been identified. The composition of the facade was checked. This research shows that additions, materials, colors, and windows have the greatest impact on the visual clutter of urban facades in the examined samples.

Keywords: Urban Facade, Visual Clutter, Facade Architectural Components, Urban Facades, Tehran City.

INTRODUCTION

The appearance of today's cities suffers from abnormality, disproportion, and inconsistency, which primarily affects the beauty of the building and the city, causing unpleasantness and creating visual clutter. Since the facade is one of the most effective elements affecting the visual quality and beauty of the building and the quality of urban spaces, it is important. The facades of buildings in Tehran in recent years have created a heterogeneous and abnormal visual structure, which has led to the creation of visual clutter as a problem. If the current trend continues, with the current development rate of the cities, it will no longer be possible to correct and treat this heterogeneity and visual clutter created in the city facades. Therefore, it is appropriate to take a step in order to identify the effectiveness of facade architectural components in creating visual clutter and to identify the most effective facade component and the causes of visual clutter caused by it, so that in the process of improving and renovating facades, taking into account the potential talent of the place and the context used these results.

This research aims to identify the most effective architectural elements of facades in creating visual clutter of single urban facades.

Theoretical Foundations
Facade

In the Dehkhoda-Nama dictionary, it is defined as follows: "Nema means sign, diagram, manifestation, appearance, what is visible and in front of the eye, what is seen from the outside, and in the term of foundations, the external facade of a building or mansion.» The exterior facade of a building can show its value and structure (Huxtable, 2004). The facade of a building, as a communication interface between the interior and exterior spaces of the building, is more interesting to visitors. Some facade elements create a positive perception in the user's mind, while others may have a negative effect. Studies show that specific architectural facade design features, such as the entrance door and the size of openings/windows, affect perception formation (Yammiyavar & Roy, 2019). The facade

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shows the degree of order and coordination of the architect's building design, facilities, and artistic taste. A facade is like introducing the situation of the residents of a building to the public. The facade is the face of the building and the best way to express the state that the architect places in the city's shell (Zeinali, 2019, 8).

In the Faculty of Architecture, there is a special conventional definition of "facade" based on which to draw a facade without considering the depth and perspective of the building, as well as the point of view and the distance between the viewer and the building, all the visual information of the external wall of the building is on a parallel plane. That wall is moved, and a two-dimensional image of the facade is presented (Sadegh Pey, 2014, 24). In architectural discussions, the architectural facade transforms a three-dimensional design into a two-dimensional one (Hedman & Jaszewski, 2013, 174).

Facade Components

Many components and factors are involved in discussing the facade and its visual effects. Since the discussion of the present research is focused on the architectural components of the facade, the study of the facade components from the theorists' point of view can help to extract these components. For this reason, in Table 1, opinions about the components of the facade are given.

According to these stated items, the components of the facade are generally considered to include the following items without considering their details:

1- Materials (including color, texture, and quality)
2- Form and Shape (including building proportions, geometric, volume porosity, and protrusion)
3- Lines (including framing lines, material implementation lines, and roofline)
4- Ornaments and style
5- Extensions (advertising boards, channels, coolers, spills, protective fences, covering extensions)
6- Windows
7- Door

Visual Clutter in Facades

When it comes to the urban facade, first of all, the quality of the facade of single buildings and their characteristics are considered. Part of the functions of the facade is only related to the single building, and the other part is related to the adjacent facades next to each other. Field observations, as well as the study of rules and regulations regarding the criteria of a desirable facade, show that the investigation of the factors that cause anomalies in urban facades in the form of two general categories, anomalies related to a single building and anomalies caused by the proximity of buildings to each other, will yield more accurate results. had (Mozaffari & Latifi, 2015). In this research, the discussion is about the effect of monographs. Table 2 shows the opinions about visual clutter and its causes.

Study Area

After examining the amount of construction in the last ten

Table 1: Views of facade components

Researcher	The view about facade components
Hedman & Jaszewski, 2013	- Lines - Windows and openings - Prominence and depression - Form and Shape - Materials - texture
Hui, 2007	-Color - Form - Materials
Utaberta et al., 2012	- Color - Form - Material - Ornaments
Wijaya et al., 2019	- Form - Dimensions - Ornaments - Texture - Color
Yammiyavar & Roy, 2019	- Door - Windows - Form
Erdoğan & Zeybek, 2019	- Form and Geometry - Color

Table 2: Different views about visual clutter and its causes

Researcher	Point of view
Lynch, 1964	An environment that is not clear and distinct in mind and variety in an excessive amount that destroys clarity causes confusion and visual clutter. Also, the lack of coordination, lack of rhythm and continuity, and the dominance of one component over another due to its frequency or intensity are considered the cause of illegibility.
Hedman & Jaszewski, 2013	The cause of visual clutter is the lack of harmony between the elements. Paying attention to the single building and the lack of coordination of the components in a whole unit. Hedman says that the cause of the clutter in the city is new materials, innovation in construction methods, and lack of design order. It also excessive contrast causes visual clutter.
Arnheim, 1984	Clutter happens when the relationship between the components of an image is weak and general and orderly principles do not govern it. Confusion results if the components of the irregular composition are without order within themselves (lack of unity) and there are no considered relationships between them.
Bentley et al., 1985	If the number of visual components is large, visual clutter occurs.
Lang,1987	Visual confusion occurs as a result of complex structures that have a large number of components, and there is no coordination in ordering and composition.
Nakano, 2007 & Rosenholtz	Displaying a large number of data simultaneously or disorganizing and lacking proper communication of visual data leads to visual clutter.
Doyon-Poulin et al., 2012	Accumulating much-unrelated information is introduced as the cause of visual clutter.
Steg et al., 2013	The simultaneous presence of several stressors and the accumulation of information and data.
Voronych, 2013	The multiplicity of independent visual elements expresses the cause of visual pollution and clutter in cities, and the solution is to create visual balance.
Grutter, 2020	The cause of visual clutter: diversity without unity and order, lack of coordination of data with previous information, unexpected diversity of data, the multiplicity of data exceeding the capacity of receivers, multiplicity and diversity of independent components compared to non-independent components that can be combined have

years, three areas with the highest amount of construction in this period were selected as selected areas for selecting streets. According to the data of the statistics center, construction in regions 4, 14, and 15 has been more than in other regions in recent years. In the next step, it is necessary to identify important streets in these areas and select them for study. Since the principles of facade design in urban spaces with different scales and conditions are different, it is necessary to adjust the variables for the selection of case samples in order to validate the results. An important point in choosing streets is the width of the roads. Considering the limits of human vision, the height of the buildings should be at least 1 to 2, and the maximum ratio of 1 to 1 concerning the width of the road so that the view of the building is complete. Since the basis of measuring visual clutter is the way of human vision and most recent constructions have more than 3 and 4 floors, it is better to choose streets with a passage width of more than 24 meters for visual clutter. The selected streets in the specified areas are as follows:

- District 4: West 196th Street (between Bagheri and the third Square of Tehran Pars) (A)
- District 15: Rahimi Street (between Khatam Al-Anbia Boulevard and Suezi St. (B)
- District 14: Aeme Athar St. (between Nabard and Mirzazadeh St.) (C)

MATERIALS AND METHODS

In this research, facades have been analyzed by surveying experts and members of the facade committee. Respondents were selected through the snowball technique, and 20 experts were asked to select ten images from the three panes with more visual clutter. For this purpose, all the three-paned facades were coded and provided to the respondents in the questionnaire (Figures 1-3). After checking the answers, 18 facades that had gained more points were selected as case samples due to the criteria.

The code of the selected facades is as follows:

A1, A2, A15, A18, B1, B2, B10, B16, B33, C1, C3, C10, C12, C13, C14, C15, C16, C21

Then, experts were asked about the impact of facade components (materials, lines, style and ornaments, additions, form and Shape, windows and doors) in a separate questionnaire based on the Likert scale. The data of the results were analyzed in SPSS software, and the average scores regarding the asked indicators in each facade were extracted. By comparing these data, the indicators whose average score is more than 3 (average on the Likert scale) were identified, and the common

Fig. 1: Urban Façade A- coded Facades of District 4 of Tehran (West 196th Street)

Fig. 2: Urban Facade B-coded Facades of District 15 of Tehran (Rahimi Street)

Fig.3: Urban Façade C- coded Facades of District 14 of Tehran city (Aeme Athar Street)

features of the facades that had scores above the average for each component were compared.

RESULTS AND DISCUSSION

Table 3 shows the results of averaging by SPSS software for each visual component according to the questionnaire data. Since, based on the Likert scale, a score of 3 represents the average level and more than that represents high or very high values, here also the average impact of each component with a score of more than three is highlighted.

After specifying more than average scores (number 3) in the table, all the facades according to the components effective in creating visual clutter (score more than 3) in the category of materials, lines, style and ornaments, extensions, form and Shape, windows and the door were examined separately so that the common characteristics of their components in each group were measured and investigated.

Analysis the Criteria

Materials
Figure 4 shows the impact of the materials of each facade in creating visual clutter. According to this diagram and the results

of Table 3, facades A15, B2, B16, C3, C12, C13, C15, C16, and C21 have average and more than average visual clutter in the field of materials. Table 4 shows the common features of these facades.

Lines
Figure 5 shows the effect of the lines of each facade in creating visual clutters. According to this diagram and the results of Table 3, the facades of code A2, B1, C10, C13, C15, and C21 have more than the average amount of visual clutter in the field of lines (lines of execution of materials and framing). In Table 5, the common features of these facades have been examined.

Style and Ornaments
Figure 6 shows the effect of the style and ornaments of each facade in creating visual clutter. According to this diagram and the results of Table 3, the facades of code A2 and C13 have more than the average amount of visual clutter in style. In Table 6, the common features of these facades have been examined.

Extensions
Figure 7 shows the effect of the additions of each facade in

Table 3: Average scores of the Likert scale based on the indicators asked of the respondents

| Façade code	Criteria							
	Door	Window	Form & Shape	Extensions	Style and ornament	lines	Materials	effective Criteria for causing visual clutter
A1	1.50	2.95	45 .2	4.15	2.45	2.45	3.00	Extensions
A2	1.80	3.45	3.30	2.30	3.85	3.25	35 .2	Style and ornament Window Lines Form and Shape
A15	1.45	2.60	2.60	2.80	1.95	2.45	3.20	Materials
A18	2.25	3.35	2.35	4.70	2.85	2.25	2.45	Extensions Window
B1	2.15	3.40	3.00	4.50	2.45	3.20	2.95	Extensions lines Window
B2	45.!	2.20	2.55	1.45	1.90	2.40	3.05	Materials
B10	2.05	3.00	3.70	2.55	2.95	2.95	2.30	Form & Shape
B16	3.10	3.65	3.25	1.95	2.40	3.00	4.10	Materials Form & Shape Window Door
B33	1.50	2.00	3.65	1.70	2.50	2.45	2.35	Form & Shape
C1	3.35	3.45	2.70	4.55	2.60	2.35	2.45	Extensions Window Door
C3	2.80	3.10	2.75	3.65	2.25	1.95	3.40	Materials Extensions Window
C10	2.40	3.55	2.85	4.35	2.30	3.25	2.95	Lines Extensions Window
C12	3.20	4.00	2.65	4.60	2.95	2.90	3.10	Materials Extensions Window Door
C13	2.65	2.95	3.35	3.20	3.65	3.50	4.05	Materials Form & Shape Lines Style & ornament Extensions
C14	2.60	3.45	3.20	2.15	2.70	2.95	3.00	Form & Shape Window
C15	2.80	3.85	2.55	4.45	2.60	3.45	3.35	Materials Extensions Window Lines
C16	2.25	2.25	2.40	1.75	2.35	2.90	3.55	Materials
C21	2.75	2.05	3.50	3.45	2.65	3.05	3.50	Materials Form & Shape Lines Extensions
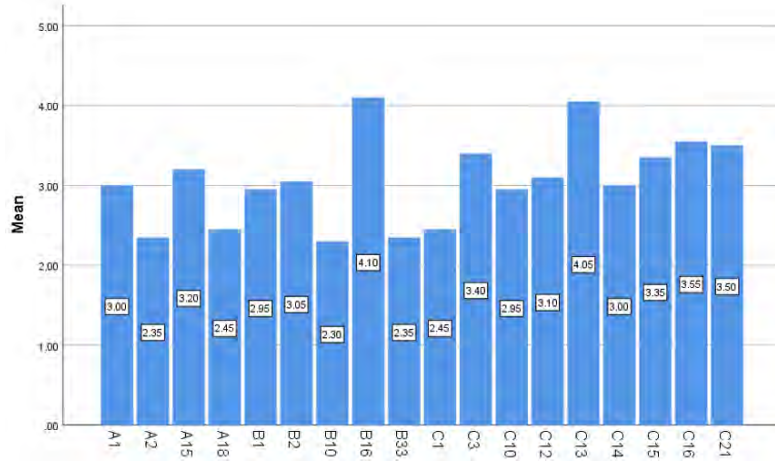
Fig. 4: The mean graph of materials in creating visual clutter of each of the studied facades

Table 4: Examining the common characteristics of selected facade materials

| | C12 | B16 | C15 | C21 | C3 | C13 | C16 | B2 | A15 |

Common features: the color of some facades, oldness, and poor quality of materials in some facades.

9

The common element among codes A15, B2, C13, C16, C21, and C3 is the color of their materials (dark gray and reddish brown colors). Façade C15, C12, and B16 have something in common regarding the quality of materials and the oldness and contamination of facade materials.
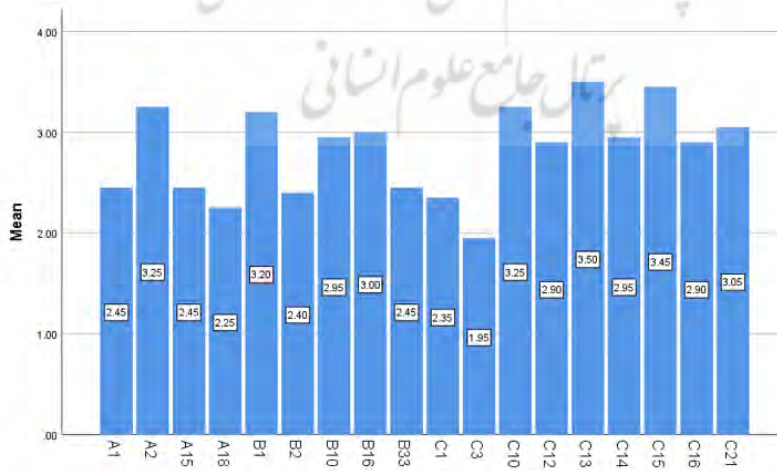
Fig. 5: The mean graph of lines in creating visual clutter of each of the studied facades

Table 5: Examining the common characteristics of selected facade lines

Number of Facades						
	C21	C10	C15	C13	B1	A2
6	Common features: the number of framing lines in A2, B1, C10, and C15, having uneven lines (curved and diagonal) in the front part in A2 and C21, the number of horizontal and vertical lines of material implementation in C13					
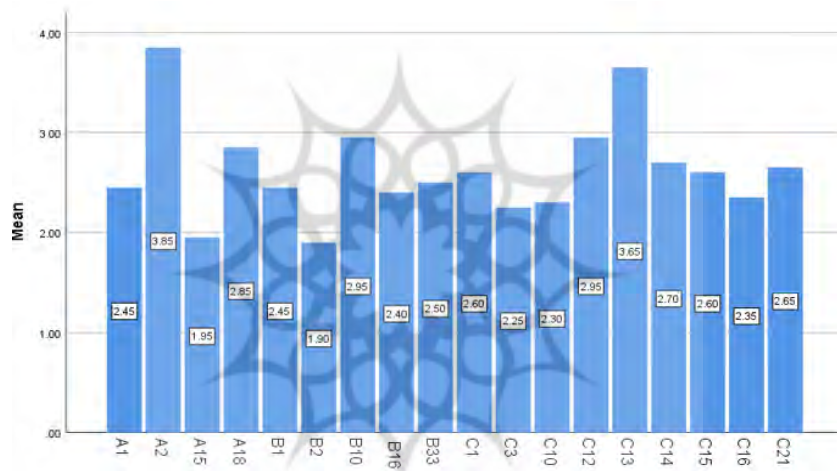
Fig. 6: The mean graph of style and ornaments in creating visual clutter of each of the studied facades

Table 6: Examining the common characteristics of selected facade lines

Number of Facades		
	C13	A2
2	Common features: One of these facades is designed in a Roman style, and the other in an eclectic style	
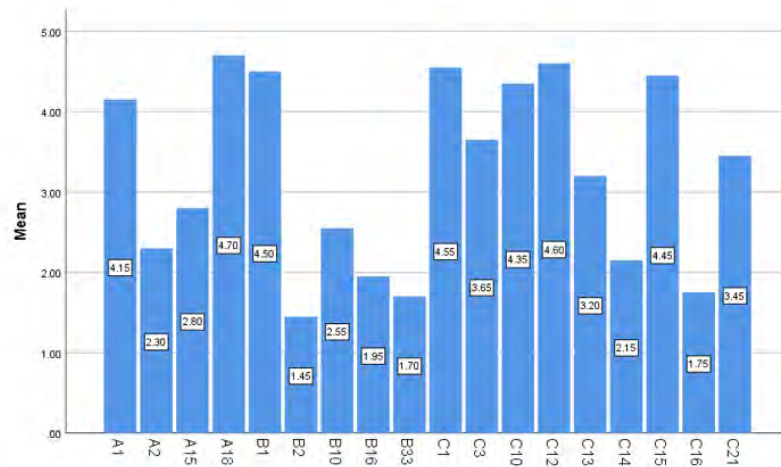
Fig. 7: The mean graph of extensions in creating visual clutter of the studied facades

Table 7: Examining the common characteristics of selected facade Extensions

	C12	C21	C15	C10	A18	C13	C3	C1	B1	A1
10										

Common features: All selected facades have adjoined billboards and uncoordinated advertising writings. These buildings are either offices or have shops in their lower part.

creating visual clutter. According to this diagram and the results of Table 3, the facades of code A1, A18, B1, C1, C3, C10, C12, C13, C15, and C21, have more than average amount of visual clutter in the field of extensions. In Table 7, the common features of these facades have been examined.

Form and Shape

Figure 8 shows the influence of the form and Shape of each facade in creating visual clutter. According to this diagram and the results of Table 3, the facades of code A2, B10, B16, B33, C13, C14, and C21 have more than the average amount of visual clutter in terms of form and Shape. In Table 8, the common features of these facades have been examined.

Window

Figure 9 shows the effect of the window of each facade in creating visual clutter. According to this diagram and the results of Table 3, the facades of code A2, A18, B1, B16, C1, C3, C10, C14, and C15 have more than average amount of visual clutter in the context of the window. In Table 9, the common features of these facades have been examined.

Door

Figure 10 shows the effect of the door of each facade in creating visual clutter. According to this diagram and the results of Table 3, the facades of code B16, C1, and C12 have more than average visual clutters in the door field. In Table 10, the common features of these facades have been examined.
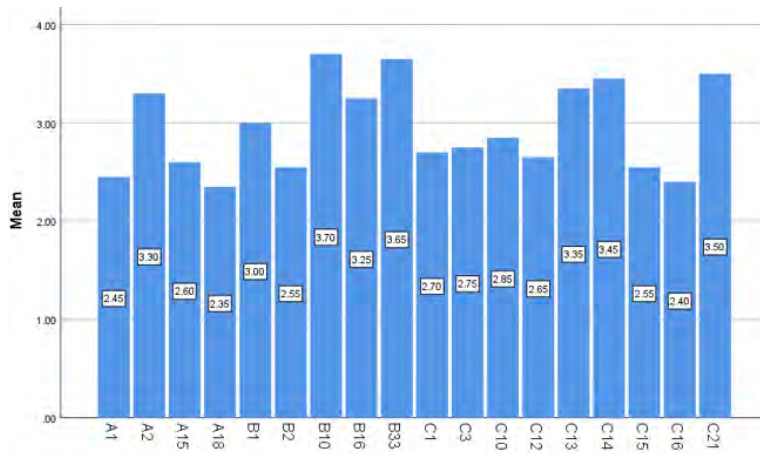
Fig. 8: The mean graph of form and Shape in creating visual clutter of the studied facades

Table 8: Examining the common characteristics of selected facade Extensions

	C21	C14	B10	C13	B33	B16	A2

7   Common features: using heterogeneous shape combinations together (cylinder next to the cube - pentagon next to the cube - arc, and crescent next to the cube - trapezoid, and cube) in C14, C21, A2, and B10 facades. Unusual proportions of length to width of the facade and excessive narrowness in the facade of B33. The use of redundant shapes and multiple shapes in facade construction in C13 and facade B16 seems to have been chosen due to the inappropriate texture of the Shape, which is more related to the materials.

Number of Facades
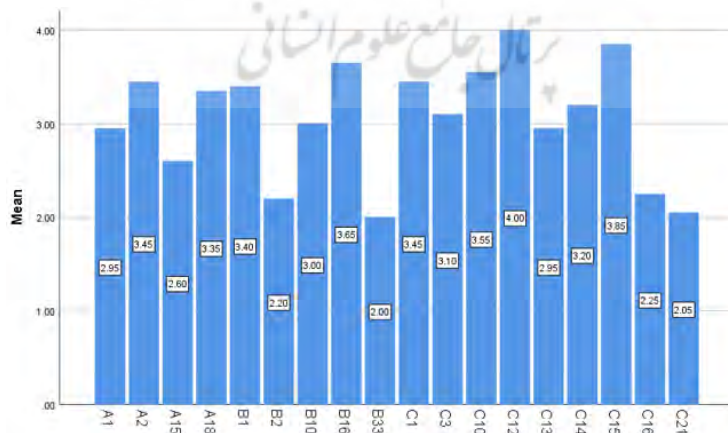
Fig. 9: The mean graph of the window in creating visual clutter of the studied facades

Table 9: Examining the common characteristics of selected facade window

Number of Facades										
	C15	C10	C12	B16	A18	B1	C1	C14	C3	A2

10   Common features: multiplicity of window framing in facades A18, B1, B16, C12, A2, C10 - geometric variety of window models in one facade in A2, C14, B1, C12 - variety of window proportions in facades A2, A18, C10 , C15- the color of the reflex glass in facades C3, C1, C14
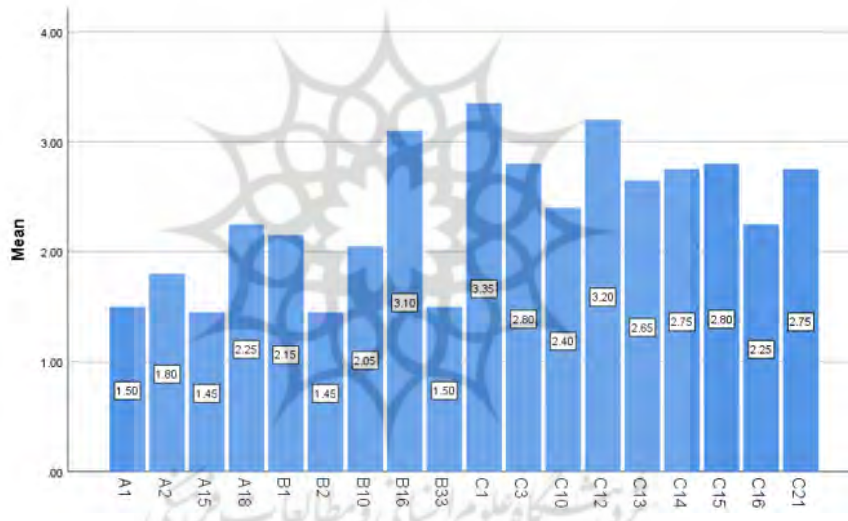

Fig. 10: The mean graph of the door in creating visual clutter of the studied facades

Table 10: Examining the common characteristics of selected facade door

Number of Facades		
C1	B16	C12

3   Common features: in the C12 and C1 facades, the door part of the facade is mostly the door of the commercial space and the shop window. The facade door of B16 is also inconsistent with the facade and other components in proportion and color.

CONCLUSION

According to the facades examined in this research, it seems that more facades were selected in terms of extensions and windows and then in terms of materials. In the field of additions, since most of the selected facades had uncoordinated extension boards and advertising writings, and these things are outside the discussions of the architects' design, the organization of the municipality can help to improve it. However, in the field of materials, their color and the quality of their maintenance have the greatest impact on visual clutter. Generally, dark colors (gray and gray) and reddish brown are seen in the selected facades, and their use in the field of materials has caused visual clutter. In the field of windows, the biggest cause of visual clutter in single facades is the variety of window proportions, the multiple internal divisions of windows, and the use of glass with high reflexes in the window.

The lowest number of selected facades was in the field of doors and style, and ornaments. The facades that have scored more than the average in visual clutter are generally facades with limited commercial space on the ground floor, and in fact, the door visible in the facade of the shop's glass door is covered with advertisements. Also, the lack of color and proportional harmony between the door and the window can be effective in causing visual clutter. The selected facades, in terms of style, also had Roman style and unconventional, eclectic style, which shows the unacceptability of Roman facades in Iran and the unpleasantness of the contradiction of style in the facades.

According to the results of this research, the suggested solutions in order to reduce the visual clutter in the views can be the following:

1. Use of materials with neutral colors
2. Coordinating and equating additional panels on the facade
3. Reducing the internal framing of windows
4. Horizontal alignment of windows in single facades
5. Applying simple and conventional styles and avoiding complex and unconventional styles in facade design
6. Reduction of additions and visual excesses in shop windows in mixed-use buildings
7. Using materials that maintain their quality over time.
8. Not using reflective glass in windows.

AUTHOR CONTRIBUTIONS

M. Tahmasbifard performed the literature review and experimental design, analyzed and interpreted the data, and prepared the manuscript text and edition. F. Habib helped in the literature review and manuscript preparation. Z. Zarabadi performed some of the remained experiments.

CONFLICT OF INTERESt

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication or falsification, double publication and, or submission, and redundancy, have been completely witnessed by the authors.

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