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Visual Pollution and the Architecture of Façade Design: A Case Study in Jeddah

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ABSTRACT

Building façade creates street aesthetical image. Façade is one of the major design elements of building either commercial or residential. There are some studies discussed the issue of poor facade design and visual pollution in some countries, but there is gap in knowledge regarding this issue in Saudi Arabia. Therefore, this study aims to investigate visual pollution in Jeddah due to poor façade design. The investigation was carried out as a comprehensive case study that obtained data using a quantitative method in the form of a survey. The data comprised building façades in 70 streets of the northern and western zone of Jeddah. Photographs of the buildings were analyzed by four different design elements: color, material, shape, and height. Findings revealed that one of the major sources of visual pollution was a lack of consideration for the four design elements from adjacent buildings. Further, a lack of detailed regulation allowed for landlords to choose the design of their building's façade, which led to a lack of uniformity among buildings. The most common issue was the differences in height between buildings. In conclusion, this study illustrates that building regulations must provide specific design guidelines for façades to avoid and control visual pollution. This study hopes to create awareness for architects and landlords about the importance of considering façade design.

1. Introduction:

Many design factors affect the value of buildings and a building's façade is one of the most important factors of its value as it creates a connection between the inside and outside of a building. Building façades are also important because they create a city's image by acting as the interface between the urban space and the architectural space. The façade identifies the history and style of a building thus creating a building's identity (Arslan et al., 2018; Utaberta et al., 2012) and its design also generates communication with the outdoor environment. Additional aspects to take into account when considering façades are function, aesthetic, and voids (Fodah et al., 2019). Thus, studying façade design should be mandatory because it is an important aspect of building design (Arslan et al., 2018).

1.1. Aesthetical design elements for facades

To investigate and design façades, architects must consider design elements such as color, shape, form, function, aesthetic, void, energy-saving, maintenance, privacy, and budget. Several researchers have studied different aspects of façade design. For instance, Sánchez-Pantoja et al. (2018) analyzed the effects of new building design technologies on aesthetical perceptions of buildings. Hui (2007) discussed the importance of color, shape, and material in enhancing façades. Similarly, Utaberta et al. (2012) considered form, shape, color, material, and structure as major components of façades, while Jennath and Nidhish (2016) stated that color and form are the most important elements of aesthetically appealing design. These aspects, in addition to style, size, and age, are still major aspects when evaluating façades (Hui, 2007). However, these elements are not always considered and when studied 374 different housing units in the region of Porto Alegre in Brazil using observations, measurements, questionnaires, and interviews they found that maintenance was more important than aesthetics in façade design. This resulted in simple façades with no attempt at enhancing the aesthetical elements, especially in terrace houses.

1.2. Architect and non-architect perceptions of façade aesthetics

Ghomeshi and Jusan (2013) studied building façades in Malaysia and considered the design elements from both an architect's and a layperson's perspective. They found that the layperson's perspective preferred the use of physical cues, especially in one-floor buildings, such as wall, form, texture, appearance, materials, window size, and balcony. Ilbeigi et al. (2019) investigated the same issue in Iran and found that layperson's preferred medium complex façade design elements over simple or complex ones. These studies suggest that architects must consider non-architect perspectives of aesthetics and user-satisfaction when designing façades. In contrast, a study in Dataran Merdeka, Kuala Lumpur, found that laypeople did evaluate building façades according to visual elements like style, shape, and color and that without harmony between these decorative elements the city's image is negatively affected (Askari, 2009). Finally, in Iraq, a questionnaire taken by 100 citizens found that while people care about façade design a considerable number of participants did not know how it related to visual pollution (Ahmad, 2018).

1.3. Visual pollution and building regulations

Visual pollution is defined as an environment lacking aesthetic elements in its design (Alfathly, 2017) or when visual images are affected negatively (Al Qadri, 2015). It is an aesthetic problem and it means that viewers cannot enjoy the site (Nami et al., 2016). Architecturally, it is viewed as mismatching colors and missing traditional elements (Milod, 2017). Banerjee (2017) asserts that visual pollution may result from factors such as badly designed buildings and the excessive use of advertisements. Similarly, jassim (2011) and Chmielewski et al. (2016) stated that visual pollution is a result of improperly placed and designed advertisements especially on the ground floor of residential blocks. According to studies in Iraq, Algeria, and Yemen (Ahmad, 2018; Alwah et al., 2019; Balmard, 2019) results also found that mismatching colors, different building

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sizes, unfinished buildings, AC ducts, and advertisements on façades all contributed to visual pollution. According to the authors of these studies, these issues occur because of minimal building regulations to control and guide façade design; thus, to curb visual pollution, building regulations need to be implemented. For instance, in Dubai, neither landlords nor architects can choose the color of a building's façade. Color pallets must be submitted to the municipality for approval before a contractor starts working. The regulation was implemented in 2007 when the municipality realized that the city comprised random colors (visual pollution). Further, the regulations state that architects also submit design specifications like materials for approval. Also, in City of Mesquite the Community Development Department published a book for Principles and Requirements of Façade Design. Author states that visual balance is essential in façade design of buildings in Mesquite. Façade composition should achieve balance. Author goes on to asserts that the main rule for achieving balance is the use of symmetry. People perceive beauty when symmetry is measured in the composition of design (City of Mesquite, 2008).

1.4. Façade Design in Jeddah

Jeddah is a city in western region of Saudi Arabia, which is called Hijaz region. It is important to note that traditional architecture of Hejaz was very common with faced. In Jeddah Roshan, which is a wooden craft window, was very common elements in façade as shown in Fig.1. It contains, complex projected window with wooden crafts, and *Mangabi* stone. This design started after 1869 (Alitany, 2014). Then, In 1950, new faced design appeared in Jeddah Roshan was replaced with glass and alumenium windows and balconies as shown in Fig.2 (Shatwan, 2017; Shatwan, 2018). New contemporary façade became common by 1970 due to oil boom. After that, different materials, height and shapes started to appear in contemporary buildings since 2005, which will be discussed in this research.



Figure 1: Traditional façade in Jeddah (Roshan), Source (Author 2020).



Figure 2: Modern façade in Jeddah after 1970; Source (Author 2020).

2. Theory

2.1. Research aims

This research aims to investigate how the design elements used on façades in Jeddah, Saudi Arabia, have led to visual pollution in the city. Studies investigating façades concerning design elements exist however not in Saudi Arabia where culture and location have major impacts on building design. Therefore, this research hopes to fill a significant gap in the knowledge. This study was conducted using a comprehensive survey that included 210 building facades on 70 streets in Jeddah. Additionally, this study investigates how un-specified building regulations lead to visual pollution, which has also not yet been studied in Jeddah. All data were analyzed using the NVivo program. Finally, the novelty of this research can be summarized in three objectives.

- Analyzing how design elements are implemented in a block of apartments of 70 streets in Jeddah.
- Investigating how the use of improper design leads to visual pollution.
- Exploring how unspecified regulations in building codes cause visual pollution.

3. Methodology

According to Saudi Building regulations, buildings are classified into several types.

- Villas
 - A. Big Villa (two stories—palace more than 2000 square meters)
 - B. Villa (two stories—from 400 to 2000 square meters).
 - C. Duplex villa (two stories—from 150 to 400 square meters).
 - D. House (one story—200 square meters)

As the sizes of these homes decrease respectively so do the financial situations of their owners or inhabitants.

- Apartment blocks
 - A. Apartment blocks can range from one story up to 7 stories. Generally, if the building is in a commercial street, the first floor contains shops.
 - B. High rise buildings can reach up to 30 stories.

In Jeddah, apartment blocks are the most common type of residence, especially in comparison to other cities in Saudi Arabia, therefore they are the primary focus of this case study. Data were collected using photographs of 210 apartment blocks on 70 streets. All photos were taken by the author during 2019-2021. Buildings were chosen randomly throughout 5 districts as shown in Table.1 for (residential and commercial) in the western and northern zone of Jeddah and were photographed in the morning to depict color and materials clearly. These zones of Jeddah was chosen because it is more urban and developed than the southern zone of the city.

Table 1 Plan for Jeddah City showing the study districts, Source (Google map, 2021)

| | | |
|--|--|---|
| | | Alrawdah District |
| | | Hiraah street (Almarwah, alnuzhah, alnaeem, and Alnahdah Districts) |
| | | Almarwah District |
| | | Alworood District |
| | | Alsalamah District |

3.1. Data analysis

The NVivo program was used to analyze façade design elements focusing on the design elements color, material, height, and shape as they are considered a major design elements affecting visual pollution (Alfathly, 2017; Alwah et al., 2019; Banerjee, 2017; Milod, 2017). These elements were then compared to neighboring buildings to see whether architects consider adjacent properties in their designs. Finally, building regulations for façades in Jeddah will be analyzed.

4. Results and Discussion

4.1. Color as an element of design

Color is one of the major design elements and affects people both psychologically and physically. Asgarzadeh et al. (2012) demonstrated that simple color schemes should be used in complex designs to elicit positive responses from people. In terms of building façades, color can significantly improve the quality of the environment (Premier, 2019). Similarly, a study in Saint Petersburg found that the color of façades have a major effect on people’s visual comfort and creates a preferred and attractive visual environment. The same study found that while dark hues like black and brown are trendy they should not be used dominantly on façades as they can create negative effects on people’s psychology. This is especially true in winter when there is very little daylight (Asylgaraeva, 2018). In Al-Zubair city, a study on color, environment, and architecture found that painting building façades in vibrant pops of color affected the aesthetical element of the building negatively because Al-Zubair is a desert area (Khalaf, 2018).

In Jeddah, the author found that building façades were either, beige, brown, white, or gray. The dominant color is usually light beige or gray, and then darker colors are used for decorative lines and curves as shown in Figure, 3. Visual pollution is not caused by a single façade design but comes into play when looking at adjacent façades in the same street. According to Figure.3 , 76% of the studied streets buildings do not match the adjacent buildings in color. Thus, the diagram shows that only 24% of streets have buildings colour that match the colors of adjacent buildings. The study also found that no evidence of regulations regarding the color of the advertisements on the building’s ground floor. Shops can use any color they want without considering other buildings in the same street, as seen in Figure 4. It is found that one building can have up to our shop colors. These mismatching colors cause visual pollution because where the aesthetical part of the overall street design is ill-considered or disregarded.

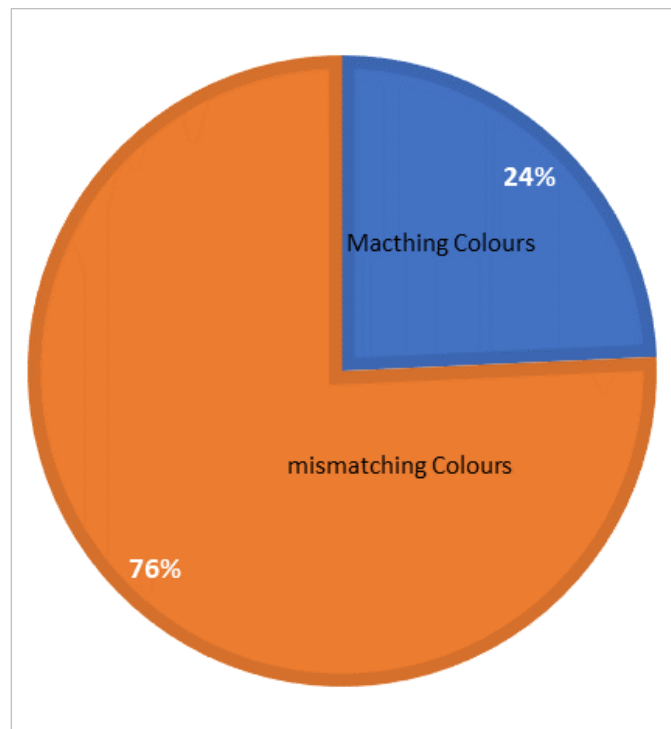


Figure 3. The percentage of streets with matching or mismatching façade colors, (Author, 2020).



Figure 4. Unmatching colors of shop frame in Almarwah and Alrawdah districts in Jeddah (Author, 2020).

4.2. Material and finishes as an element of design

Studies show that maintenance is a major factor when deciding on building materials (Da Luz Reis & Dias Lay, 2010). In façade design, materials should fulfill requirements such as fire resistance, being easily maintained, thickness, environmental safety, and energy-saving (Ahmad, 2018). In Jeddah, façade materials should also be humidity resistant since it is a coastal area. Figure 5, illustrates that, within 64.28% of streets, marble was the most commonly used material for residential façades. Next was paint, used in 24.28% of streets, and then cladding, used in 11.42% streets, was the least common.

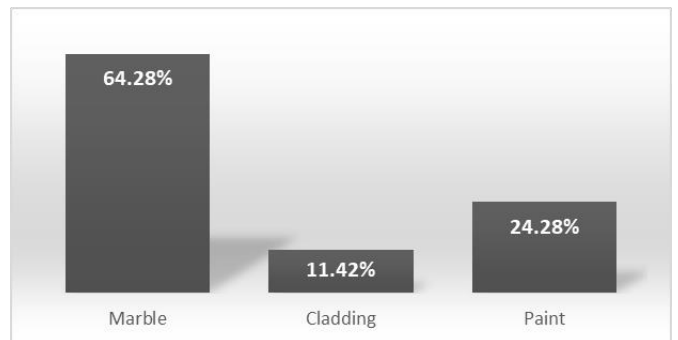


Figure 5. The number of streets that used particular building material for façades. (Author, 2020).

4.3. Shape and height as an element of design

The survey of 70 streets showed that mostly simple shapes were used for façade design. They also included vertical or horizontal lines as decorative elements as shown in Figure. 6. Complex designs and patterns are not common in Jeddah’s façades, and some buildings are decorated with curves or arches, but even these designs remain simple. Arches could be inspired from Islamic architecture, however, the way it is implemented in contemporary buildings does not reflect Islamic architecture or traditional architecture of the city, as shown in Figure, 7. Furthermore, the discrepancies in the height of the buildings could be considered an issue of visual pollution as well. Within the same street, one building was three stories high and the next was six stories (as shown in figure, 8). These height discrepancies affect the overall image of the street. Samir et al. (2019) claim that height differences play a major role in blocking daylight from interior space. This indicates that taking adjacent buildings, on the same street, into consideration when building façades should be mandatory.

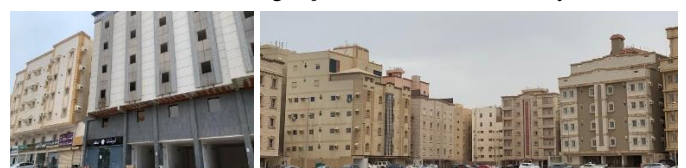


Figure 6. Simple shapes were used for façade design as vertical and horizontal lines in Almarwah District (Author, 2020).

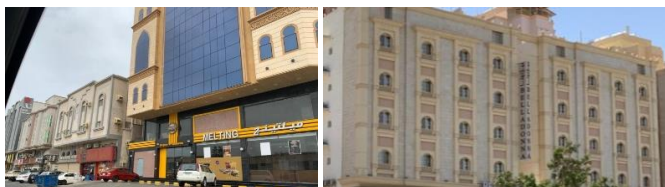


Figure 7. Arches in façade design to confirm simplicity in façade design, From left; Hira Street, Saqr Quraish street (Author, 2020).



Figure 8. Visual pollution caused by differences in height between adjacent buildings on the same street of different locations; From left: Alsalama district; Abdul Rahaman Alsidayri street, Alrawdah District; Alkayal Street, Alzahrah District; Hilmi Kutbi (Author, 2020).

Figure, 9 shows all four design elements combined were missing from 22.80% of streets. The heights of buildings differ from one building to another in 24.28% of streets. Then, 11.42% streets had mismatching colors, and 10% streets used mismatching materials. Only 2.80% of streets had issues with shape as this is not a common issue in Saudi Arabia. Contrastingly, 20 out of the 70 streets had used some repetition and matching design elements in façades as shown in figure, 10 and figure, 11. However, it is important to note that these buildings are owned by the same person and are in two newly built districts in Jeddah. Some of these buildings are in commercial districts but are built without any shops as per the landlord's request. Overall, throughout 70 streets, the four aforementioned design elements were not taken into consideration between adjacent buildings on the same street.

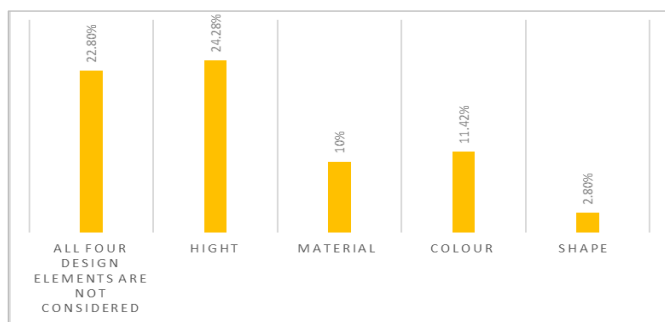


Figure 9. The percentage of streets with no consideration for design elements of adjacent buildings (Author, 2020).

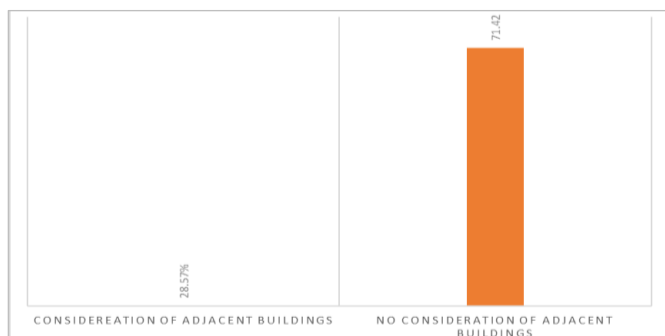


Figure 10. The percentage of streets with consideration of adjacent buildings in their façade designs versus those without (Author, 2020).



Figure 11. Similarity in façades design in one street in Alworood district (Author, 2020).

4.4. Building regulations of façades

Building regulations are the key to enhancing the quality of buildings (Aquino, 2020). Similarly, Samir et al. (2019) argue that the built environment of cities is the outcome of building regulations. He goes on to assert that the major issue with building regulations is that it is copied from another country's regulations without considering the varying aspects of each country. Also, building regulations might be harmful to an individual's freedom of design (Masharnan, 2014). However, it can be used to protect the city's architecture in terms of function and aesthetics (Balmard, 2019).

In Jeddah, building regulation focus mainly on building height and the gap between buildings. For instance, one of these regulations could clarify that in residential areas four floors, parking and roof are the maximum allowed height, but in business streets it can be more. For façade design there is no more regulations regarding color or shape (MOJ, 2021). From the study, it is clear that in business streets, landlords have the right to increase the number of floors per building, but can also keep the building one or two floors if they want. This led to having mismatching adjacent buildings and displays a lack of consideration for design elements such as harmony, unity, or repetition between buildings in the same street. Thus, because landlords can build as they please, other than the rule of not exceeding a number of floors, neighborhoods contain visual pollution.

5. Conclusion

In this research, the use of design elements such as color, material, height, and shape are investigated relating to whether adjacent buildings on the same street have matching façade designs. A quantitative method including data analyses and software programs was used to research the aim. The study strongly revealed that aesthetics were not considered in façade designs in Jeddah. Buildings are built without consideration for adjacent buildings and the street as a whole, thus creating visual pollution. All four design elements investigated were disregarded but height discrepancy was the most common cause of visual pollution. In terms of Color, most buildings use either gray, white, or beige paint for the overall façade but shops boards, on the ground floor, are chosen randomly and shops use whatever color they want to display their names.

Study findings show that there should be rules that provide detailed regulations for the design of building façades to stop visual pollution. The rules should include that buildings on the same street should use one or two matching colors for their façades. It should also ensure that shop boards be same color as the façade. Additionally, all buildings should be the same height. Landlords and architects should become aware of the importance of city aesthetics and how façade design plays a role in this. Furthermore, an awareness of adjacent building designs is needed to diminish visual pollution. Further research should include other types of buildings such as villas, which are common in different cities in Saudi Arabia.

5.1. Recommendations

Recommendation for Ministry of Municipal and Rural Affairs:

- Provide a new update for building codes to guide architects and designers with specific rules that maintain consistency and harmony of color, material, shape, and height to avoid mismatching designs on the same street.
- Stricter supervision from municipalities during the building process to ensure proper implementation of the new rules.

Recommendation for Universities:

- Architecture projects for students at Saudi universities should focus more on the façade design and how new building should be designed after studying the neighborhood.
- Public courses should be provided for architects and laypersons to explain the importance of aesthetic designs in building facades.

Recommendation for architects:

- Provide a full design document for residential and commercial buildings as a reference that can be used for future projects with a considerable budget to reduce cost and ensure sustainability.

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