MALAYSIA ARCHITECTURAL JOURNAL

Malaysia Architectural Journal

Journal homepage:
https://majournal.my/index.php/maj
e-ISSN : 2716-6139

A Comprehensive Study of Architects' and Non-Architects' Perceptions of Building Facades through the Lens of Environmental Perception Theory

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ARTICLE INFO

Article history:
Received
Received in revised form
Accepted
Available online

Keywords:
Aesthetic perception, Building facade, User preference, Effective communication.

ABSTRACT

Human perception is a complex process influenced by numerous factors, including age, gender, education, religion, cultural background, and individual experiences. Understanding these perceptions in architecture and urban design is crucial for creating spaces that resonate with users. It is the most significant characteristic for conveying the appearance of the built environment. However, a disparity often exists among architects' and non-architects' preferences, resulting in a communication gap and user dissatisfaction with design outcomes. Sometimes, clients must accept the undesirable opinions of the architect against their will. The research investigates the differential perceptions of building facades among architects and non-architects. Through a combination of questionnaire surveys, Likert scale assessments, and interviews, insights were gathered regarding the aesthetic preferences of both groups. The findings reveal that architects and non-architects prioritize geometric features in facade design and decorations. Architects favor minimalist decorations, viewing excessive ornamentation as detracting from aesthetics. Additionally, architects demonstrate heightened awareness of building materials, reflecting their direct involvement in the construction process, whereas non-architects exhibit a greater sensitivity to using glass in facades. Both groups share similar color perceptions, with windows being the least perceived feature. So, the research emphasizes the significance of effective communication and collaboration between architects and users. By acknowledging and integrating user preferences alongside architectural expertise, architects can develop built environments that are aesthetically pleasing and resonate with a broader audience.

Introduction

Perception is a multifaceted process that extends beyond just seeing, encompassing all our senses to interpret our surroundings. The process is inherently subjective, shaped by individual characteristics

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such as age, gender, religion, education, geographical location, and cultural background. In architecture and urban design, aesthetic perception is paramount in conveying the essence of the built environment. This aesthetics stimulates the connection between the man-made environment and its users, nurturing a healthy living space. However, people use different criteria to judge building aesthetics based on their experiences. Therefore, addressing the divergent aesthetic preferences between architects and mass people causes a significant challenge. The reason for the fundamental difference is described by Devlin *et al.,* as architects spend more time on their education and professional experience, engaging in extensive study of the physical environment, observing architectural structures, and critiquing designs. These experiences influence the preferences of architects, making them more sensitive toward architecture and the built environment [14].

Despite the vital connection between the built environment and users, Salingaros *et al.* note that architects often overlook the aesthetic preferences and judgments of the users [5]. According to Jalali *et al.,* this attitude disrupts the effective collaboration between architects and users, with users sometimes compelled to accept architects' opinions against their preferences [6]. While research acknowledges differences in aesthetic responses between architects and laypersons, Devlin *et al.* state that empirical investigations remain scarce, hindering a comprehensive understanding of these differences and their implications [15].

Therefore, the research emphasizes the importance of the empirical method in examining the variations in architect and non-architect responses concerning building facades. By comparing these responses, the study aims to unveil valuable insights for architects, enabling them to understand mass perceptions better. Incorporating user perspectives in building facade design can foster inclusivity in the built environment, catering to the needs and preferences of citizens. Acknowledging the anticipated differences in interpretive ratings between architects and non-architects, the study pursues two primary objectives: firstly, to identify the primary visual attributes of building facades perceived by both groups and secondly, to explore differences in responses concerning these attributes. Through this investigation, the study aims to bridge the gap between architects and users, enhancing the collaborative design process and promoting a more inclusive built environment.

Literature review

Environmental perception theory

Conventionally, perception has been comprehended as a sequential course of action initiated by external stimuli, wherein informational mediums convey instructions to the sensory organs. This process results in the formation of perceptual objects in the observer that mirror the characteristics of the outside world. When perceiving environmental elements is the main focus of this process, it is called environmental perception. Environmental perception theory provides insights into how individuals perceive and interact with the built environment. Despite its historical marginalization, environmental perception has played a vital role in human survival and social life. The experimental stimulus-response model was used for most of the early research on environmental perception. These studies looked at how environmental stimuli cause behavioral reactions. However, when environmental psychology came along, people started to look at environments' physical and spatial features as essential parts of behavior. According to Choudhury S., two main traditions of psychological research have shaped the study of environmental perception: the psychology of perception and the social psychological tradition [16]. The psychology of perception looks at the environment in terms of how it feels physically, and the social psychological tradition adopts environmental perception in a more holistic approach. This paper shall discuss the physical and perceptual attributes of environmental perception. Key theorists explained how the built environment can be seen in terms of the physical-perceptual paradigm.

Egon Brunswik's probabilistic functionalism theory

Egon Brunswik's probabilistic functionalism is a theoretical framework that emphasizes the probabilistic nature of human perception and behavior. Brunswik posits that the environment offers numerous cues, but humans prioritize the most significant ones for optimal performance. In each scene, only a few cues hold real significance, and people allocate their attention accordingly. Brunswick emphasizes that no single cue is entirely reliable or inaccurate. Instead, each cue carries a probability of being a valid indicator of the true nature of the environment.

Brunswik introduced the concepts of ecological validity and cue utilization. Ecological validity refers to the true relationship between the environment and the perception cues, known as distal cues. According to Sadeghifar *et al.,* eight visual attributes serve as distal cues in the perception of a building facade: shape, color, decorations, materials, texture, roof, windows, and proportions. To simplify the distal cues, shape, proportion, and roof are grouped as 'geometry,' and texture is considered a part of 'decoration.' As a result, this paper finds geometry, color, material, decoration, and window as the five distal cues considered for visual attributes of a building facade (Figure 1).

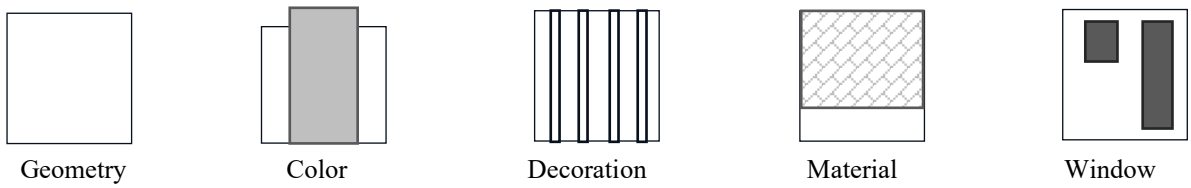


Fig. 1. Distal cues of a building facade

Cue utilization pertains to perceived beauty and is influenced by the probabilistic weights assigned to each cue by the individuals based on their experience, termed as proximal cues listed in Figure 2.

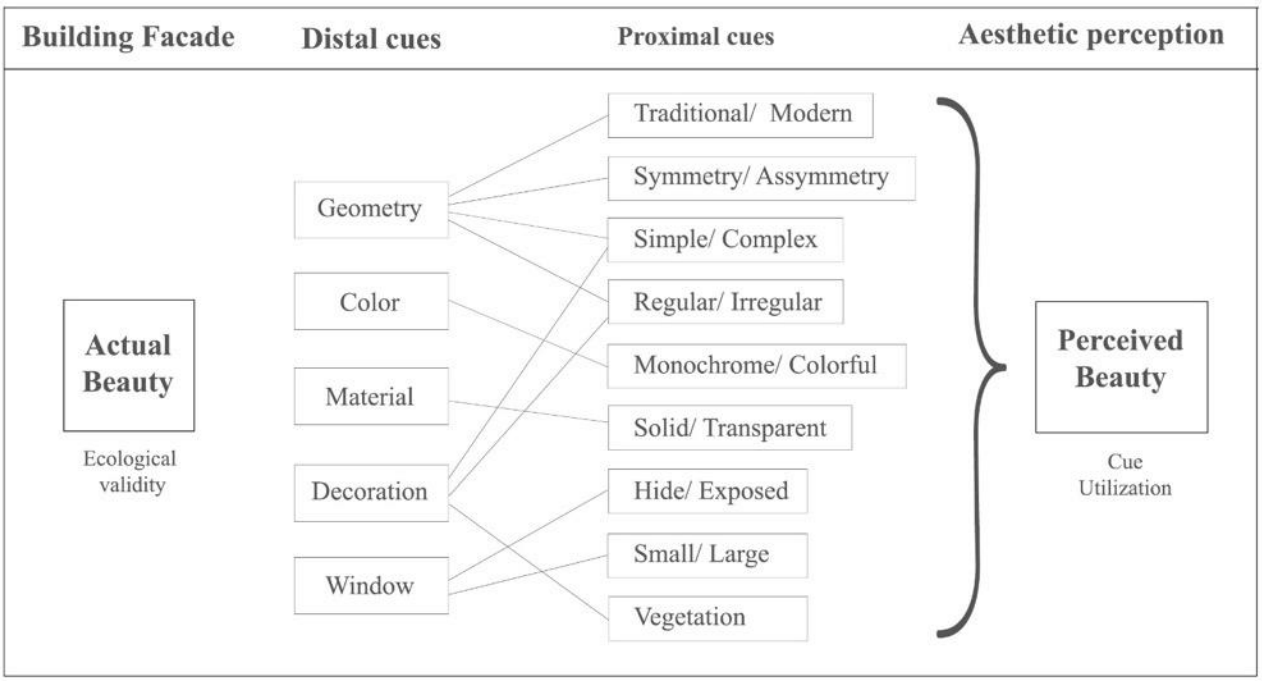


Fig. 2. Distal and Proximal cues of a building facade

The corresponding proximal cues associated with distal cues include traditional or modern geometry, symmetric or asymmetric geometry, simple or Complex form, regular or irregular decoration, monochrome or colorful, solid or transparent material, and small or large window size.

These proximal cues are influenced by individual experiences and perceptions, leading to varied interpretations between architects and the general public.

Neisser's Constructivist Approach

Ulric Neisser added another dimension to understanding environmental perception by distinguishing between perception based on environmental information and categorization driven by top-down cognitive processes. Neisser's constructivist approach posits that cognitive inferential processes are anchored in the socio-cultural context, emphasizing the role of cultural and historical factors in shaping perception.

The theories of environmental perception offer valuable insights into the difference between environmental cues and perceived cues. Aesthetic preference is a holistic process of categorizing perceived cues of an environment driven by a top-down approach. This process is inherently subjective and shaped by socio-cultural context. Therefore, a differential perception can be found among architects and the mass population. In design school, architects are trained to develop a refined sense of focus, learning to discern and appreciate the subtle nuances of art, design, composition, and spatial articulation. This education fosters a unique set of perceptual cues, or cue weights, that guide their interpretations of the built environment.

As a result, architects often develop preferences and priorities that differ from those of the general public. This divergence can lead to a potential misalignment between architects' design intentions and users' perceptions. Addressing these dynamics is crucial for creating design concepts that resonate with professionals and the broader public, ensuring that building facades are aesthetically pleasing and widely appreciated.

Methodology

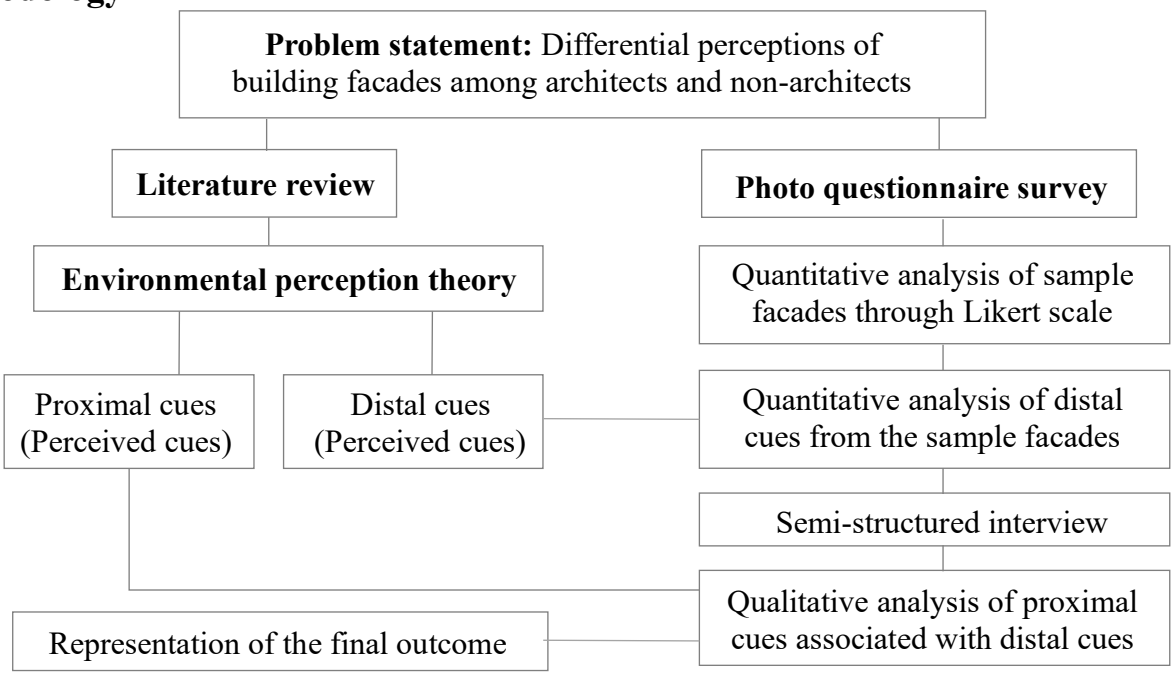


Fig. 3. Flow chart of the methodology used in the research

The correlational research method is used to explore the relationship between the cues of sample facades and peoples' perceptions. According to Askari *et al.,* Using photographs can be an effective method to answer questions about building facade preferences. So, a photo-questionnaire survey and interviews were conducted with twenty color photographs featuring different front facades, including

residential buildings, commercial buildings, community centers, administrative and public buildings. An approximate proportion was maintained when choosing the front elevation of the sample buildings, with a maximum height of 120 ft. The samples were thoughtfully selected to represent various architectural styles, considering the distal cues: Geometry, Color, Material, Decoration, and Window.

(a) Landmark Jamdani

(b) Jahaj Baari

(e) Blues Office

(c) Kabir Manjil

(d) Zulrin

(f) Grameen Telecom Bhaban

Sample images of residential building facades (a-d) and commercial building facades (e & f)

(g) Evercare Hospital

(h) Outfall Children Playground

(i) Frobel Learning Academy

(j) Gulshan Central Mosque

(k) Mayor Hanif Jame Mosque

(l) Aman Mosque

Sample images of community building facades (g-l)

(m) National Parliament Building (n) Ministry of Foreign Affairs

Sample images of administrative building facades (m & n)

(o) Bangabandhu Military Museum (p) Liberation War Museum (s) Chemistry Dept., Curzon Hall

(q) National Museum (r) Police Liberation War Museum (t) Dhaka International University

Sample images of public building facades (o-t)

Fig. 4. Selected sample images of 20 building facades in Bangladesh

Source: Architect Maruf Raihan's and Architect Noufel Sharif Sojol's websites and Internet images

Field survey

Four sessions were conducted to gather responses to the photo questionnaire survey. The participation was voluntary, and forty people participated in the survey willingly.

Fig. 5. Images of field survey with the group of undergraduate architecture students

Some fresh undergraduate students from Bangladesh University of Engineering & Technology (BUET) architecture department were chosen for the architect group. Twenty students participated, comprising twelve males and eight females (60% male, 40% female).

For the non-architect group, 1st year engineering students of the same institution were chosen as they were considered to have the most negligible bias regarding aesthetic preferences, representing the general non-architect population. The group comprised twenty individuals, including fourteen males and six females (70% male, 30% female).

Fig. 6. Images of field survey with the group of 1st year engineering students (non-architect)

During the sessions, the photographs were displayed in a row. The researcher explained the survey procedure, which included building categories, facades, and rating processes. After the briefing, questionnaire forms were distributed among the participants. The questionnaire sample is attached in Figure 7. The questionnaire was divided into three sections, followed by an interview.

The first phase involved collecting the participants' personal information, including their name, age, gender, and educational background. The second component was a five-point Likert scale rating used to evaluate the aesthetic preferences of the sample building facades. The participants assessed the facades on a scale of 1 to 5, with one representing "very unattractive" and five representing "very attractive."

In the third segment, participants were additionally requested to evaluate the noteworthy attributes of these sample facades. Distal cues from Figure 1 determined these attributes. They could select numerous visually appealing characteristics from a single facade depending on their inclinations.

In the fourth segment, participants were interviewed to ascertain their assessment reasons and the details of the most visually appealing facades. They were also questioned regarding the structures that received the lowest ratings to learn the causes of their dissatisfaction. The interview provides a window into the perceived cues of participants that influence their opinion of a facade. These perceived cues are the proximal cues derived from distal cues, as illustrated in Figure 2.

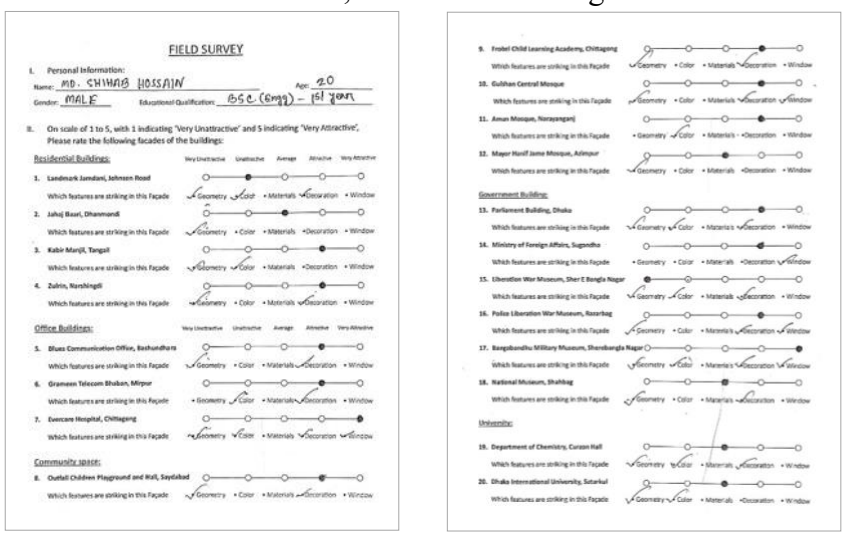


Fig. 7. Images of photo questionnaire response of a 1st year engineering student (non-architect)

Result

Tab. 1. Tabulation data of photo questionnaire survey of both architects and non-architects

Sample Building		Group	(1 point) Very un attractive votes	(2 points) Un-attractive votes	(3 points) Average votes	(4 points) Attractive votes	(5 points) Very attractive votes	Individual group points (votes x points)	Total points
Residential Buildings	a. Landmark Jamdani	N-Arch	2	6	10	2		52	118
		Arch			14	6		66	
	b. Jahaj Baari	N-Arch		4	6	8	2	68	128
		Arch		10		10		60	
	c. Kabir Manjil	N-Arch			4	10	6	82	170
		Arch				12	8	88	
	d. Zulrin	N-Arch		2	2	10	6	80	176
		Arch				4	16	96	
Commercial Buildings	e. Blues Office	N-Arch		4	6	6	4	70	164
		Arch				6	14	94	
	f. Grameen Telecom Bhaban	N-Arch		2	6	12		70	128
		Arch		6	2	10		58	
Community Spaces	g. Evercare Hospital	N-Arch			2	6	12	90	136
		Arch	4	6	10			46	
	h. Outfall Children Playground	N-Arch			12	8		68	132
		Arch		4	8	8		64	
	i. Frobel Learning Academy	N-Arch		2	4	12	2	74	160
		Arch			2	10	8	86	
	j. Gulshan Central Mosque	N-Arch		2	2	10	6	80	146
		Arch		4	6	10		66	
	k. Mayor Hanif Jame Mosque	N-Arch	4	4	6	2	4	58	144
		Arch			2	10	8	86	
	l. Aman Mosque	N-Arch		2	8	6	6	82	168
		Arch			4	6	10	86	
Administrative Buildings	m. National Parliament	N-Arch				8	12	92	188
		Arch				4	16	96	
	n. Ministry of Foreign Affairs	N-Arch		2	6	12	2	80	148
		Arch			14	4	2	68	
Public Buildings	o. Bangabandhu Military Museum	N-Arch				4	16	96	184
		Arch			2	8	10	88	
	p. Liberation War Museum	N-Arch	10	8	2			32	121
		Arch				11	9	89	
	q. National Museum	N-Arch		4	10	6		62	120
		Arch		6	10	4		58	
	r. Police Liberation War Museum	N-Arch		2	4	12	2	74	115
		Arch	4	11	5			41	
	s. Dhaka University Chemistry Dept.	N-Arch			4	14	2	78	148
		Arch		2	6	12		70	
	t. Dhaka International University	N-Arch	2		14	4		60	134
		Arch			8	10	2	74	

A mathematical procedure was followed to compare the perceptions among the architects and non-architects. The collected rating was analyzed by multiplying preference vote counts (row) by its corresponding rating point value (column). This procedure was followed for calculating the rating of the individual group for each building facade. Then, the total points of individual facades are computed for both groups in the last column of Table 1. The equation for total points calculation for each building facade is noted below.

$$\text{Total Points}_{\text{facade}} = \sum_{n=1}^{20} (\text{Preference Vote}_{\text{non-architect}} \times \text{Point Value}_{\text{non-architect}}) + \sum_{a=1}^{20} (\text{Preference Vote}_{\text{architect}} \times \text{Point Value}_{\text{architect}})$$

. In this equation, 'n' and 'a' sequentially represent the participants of non-architect and architect groups. The individual and total points are plotted in the stack column in Fig. 7. Dark and light grey legends in stack columns sequentially represent the participants' preferences of non-architect and architect groups. The unbalanced grey shades of each stack column provide a holistic idea of distinct perception ratings among architects and non-architects. The graph demonstrates the highest and lowest preferred facades and the combined preferred facades provided by individual groups.

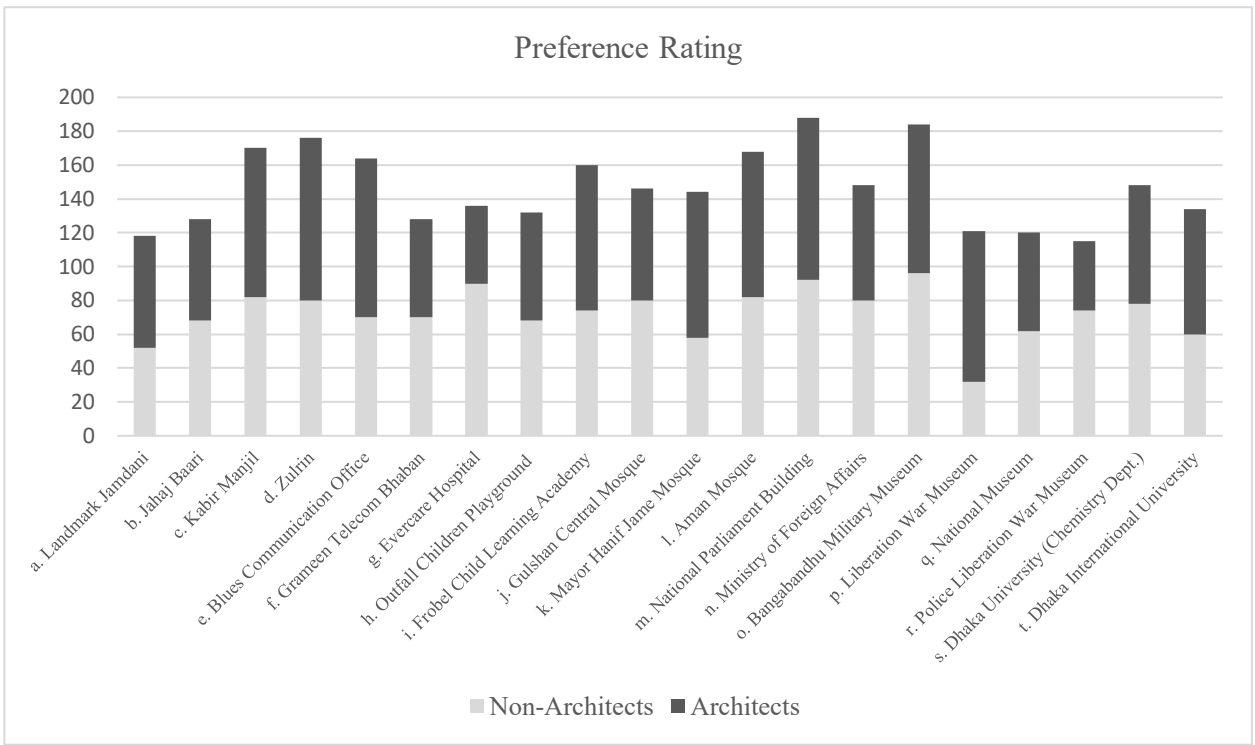


Fig. 8. Stack column of the total points of the sample facades

The findings from the third section of the questionnaire, the preferred attributes (distal cues) of the facades were calculated holistically to understand the prominent environmental cues in both cases of non-architects and architects. The preferred striking features among the five distal cues of the sample facades were counted for each group of participants. The numerical values were converted into percentages and plotted in individual pie chart diagrams in Figure 9. The individual pie charts provide a sequential priority for both groups regarding the preferences of the distal cues of the sample facades. As a whole, non-architects preferred the following sequence of distal cues they found prominent among those sample facades: Geometry>>Decoration>>Color>>Window>>Material. On the other hand, architects preferred this sequence: Geometry>>Material>>Color>>Decoration>>Window.

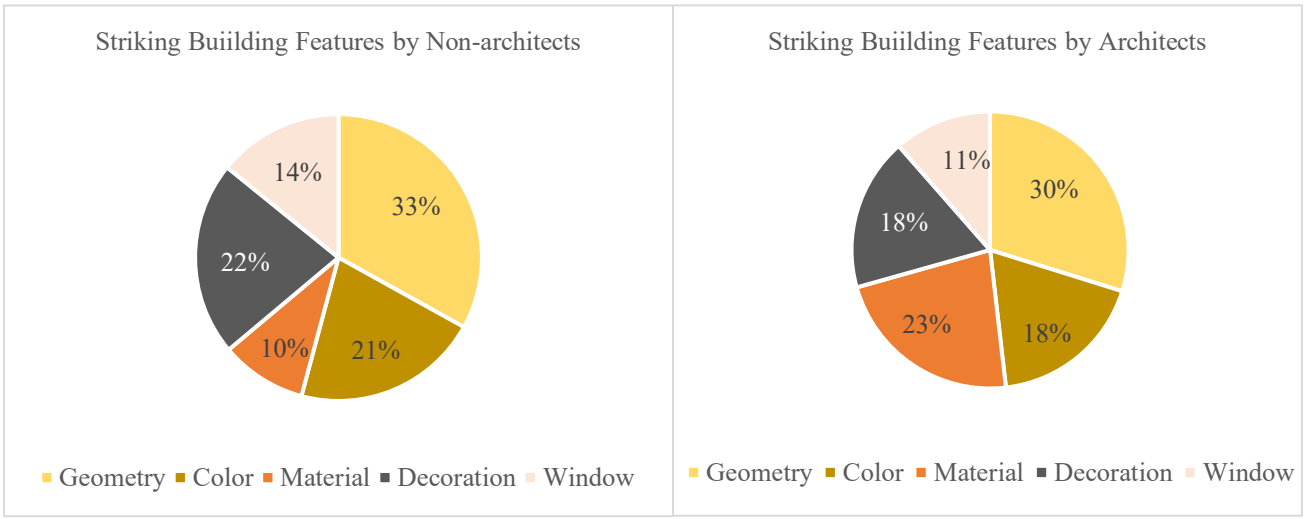
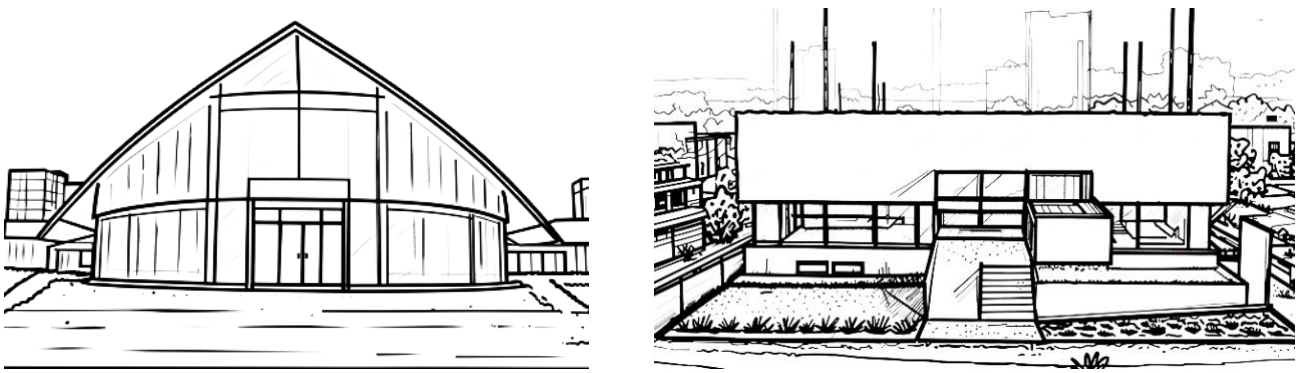


Fig. 9. Significance of Distal cues on sample facades

Discussion

From the individual interview session, the rationales behind the differences in preferences were sorted out for both groups. The pie charts of Figure 9 depict that in both preferences, the primary emphasis of distal cues is geometric features of the building facade, while window placements receive the least attention. Architects pay closer attention to actual building materials, while non-architects perceive mostly the color of the facades. Decoration is also crucial for both groups, while architects lean towards minimalist decorations with neutral colors. Both groups perceive Windows as the least prominent feature due to their smaller scale and integration with decorative elements, making them less recognizable.

Even when presented with the same distal cues, the prioritization of perceived or proximal cues differed significantly between architects and non-architects. Notable preference differences were observed for the sample facades of 'The Police Liberation War Museum' and 'Liberation War Museum' (Figure 8, columns r and p).



(a) (b)

Fig. 10. a) Traditional form of Police Liberation War Museum and b) Modern rectangular form of Liberation War Museum

Non-architects tended to favor the traditional form of The Police Liberation War Museum, which likely resonates with their familiarity and cultural expectations. In contrast, architects preferred the more sculptural form of the Liberation War Museum, particularly appreciating its flat roof and modern rectangular geometry. This divergence highlights the critical role that proximal cues play in shaping

the different aesthetic perceptions of both groups. For architects, the emphasis on form, structure, and modernist principles influences their preferences, whereas non-architects are more inclined toward traditional and familiar design elements.

Interviews also reveal that architects and non-architects are particularly drawn to decorative features in building facades, such as mullions, patterns, screening, and louvers (Figure 11). This shared appreciation is particularly evident in the preference for buildings like 'Grameen Telecom' and 'Aman Mosque' (Figure 8, columns f and l). The curved mullion patterns on the 'Grameen Telecom building enhance its commercial appeal, adding a dynamic element that complements the overall design. Meanwhile, the triangulated screening of the 'Aman Mosque' lends a serene and contemplative quality to the structure, capturing the spiritual essence of the space. These ornamental features resonate with both groups, reflecting a shared aesthetic sensibility. However, a notable exception was observed in the 'Evercare Hospital' building (Figure 8, column g). Architects rated this feature less favorably due to the chaotic patterns in the glass panels, which they perceived as disrupting the visual harmony. This contrast highlights the differences in how architects and non-architects evaluate decorative elements, particularly when balancing complexity and order.

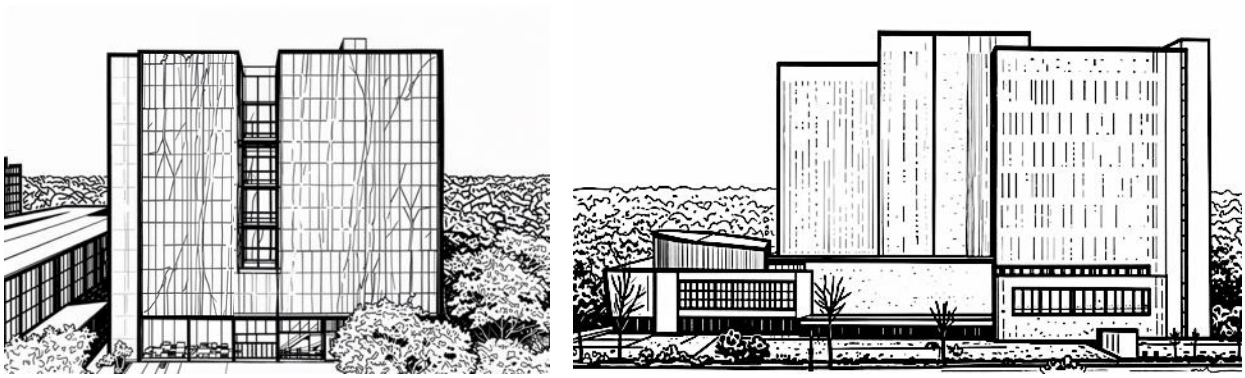


Fig. 11. a) Curve mullion patterns of Grameen Telecom office and b) Chaotic mullion breaks at each floor level of Evercare hospital building.

Both architects and non-architects favored the National Parliament Building and the Bangabandhu Military Museum (Figure 8, columns m and o). Interviews revealed the reasoning behind these preferences, highlighting the significance of these buildings with monolithic sculptural forms. The neutral grey color of the structures, combined with distinctive architectural features such as spherical domes, curved, cylindrical, or diagonal concrete walls, and unique openings and patterns, were the unique attributes of both buildings. These elements evoke a sense of grandeur and timelessness, making them particularly appealing to a broad audience.

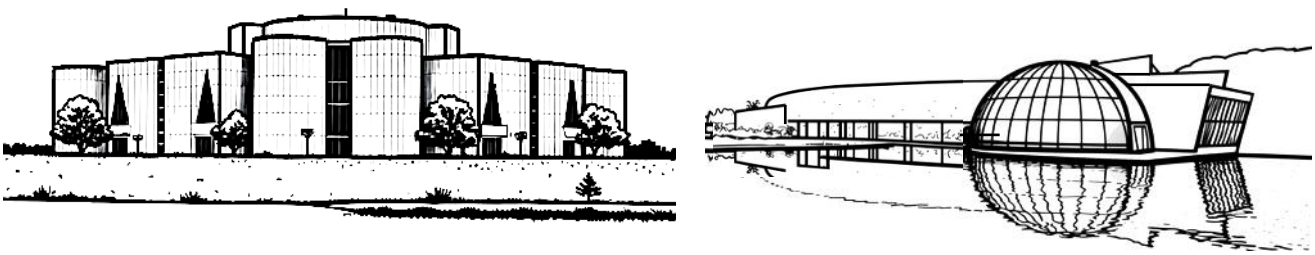


Fig. 12. a) National Parliament building and b) Bangabandhu Military Museum

Conclusion

The discussion highlights the complexity of aesthetic judgments concerning building facades, reinforcing Brunswik's assertion that no single cue can be entirely relied upon. Instead, individuals consider a combination of perceived cues when evaluating environmental aesthetics, reflecting the intricate and multifaceted nature of human perception. Through the lens of environmental perception theory, this study examined various distal and proximal cues that influence how people perceive architectural elevations. The research sought to uncover the similarities and differences in aesthetic preferences between architects and non-architects by conducting a photo-questionnaire survey and interview sessions. The findings reveal distinct patterns in how each group interprets and values different distal cues of architectural elevations. Understanding these disparities is crucial for architects to develop more inclusive design strategies in the future to bridge the gap between professional design intentions and user experiences.

Acknowledgment
The researcher would like to acknowledge Architect Maruf Raihan and Architect Noufel Sharif Sojol for providing the sample photographs used in this research. This research was self-funded and received no external grants or funding support.

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