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Aesthetic preferences of laypersons and its relationship with the conceptual properties on building façade design

Mohammad Ghomeishi

Department of Architecture, Damavand Branch, Islamic Azad University, Damavand, Iran

ABSTRACT
This article investigates the differences in aesthetic preferences on external facades on non-architects. A combination of a card sorting technique, a semi-structured interview, and a Mind sketching technique is employed. Data analysis was carried out using the qualitative techniques of content analysis. Findings reveal that non-architects were able to identify what they like and dislike regarding their preferences on façade designs. It reveals that among the conceptual properties, Originality Meaningfulness, Clarity, Simplicity were the most used properties by non-architects. However, non-architects’ aesthetic preferences and their suggestions for change to the given facades were found to be inconsistent. It can be concluded that involving potential users in the architectural process must be assisted by a design professional.

1. Introduction
Environmental aesthetics is seen as approval of the environment as its effective senses in a pleasing way (Carlson 2000) and is concerned with the subjective responses of humans to their environment (Nasar 1989). Numerous architectural variables or qualities are expressing symbolic meaning to observers that include building configuration, spatial configuration, materials, illumination and pigmentation (Lang 1992). There are also some non-physical variables that express architectural symbolism, such as the names of places due to the meaning inherent in the name. All of these variables are processed as visual information by cognitive responses concurrent with a level of categorization and inferential processing that may or may not be conscious (Kaplan 1992). It is challenging...
for the architect to understand the non-architects needs correctly and to quantitatively review and track the responses of non-architects towards revised alternatives for the design. Therefore, design processes are ineffective and the quality of the design is not definite (Chang and Jun 2019).

In analysing environmental effects on the building design, aesthetic aspect is important (Nasar 1997). Nuffida (2004:1) indicates that "Aesthetics is related to the identification and comprehension of factors contributing to perception of an object or a process considered beautiful or giving pleasant experience". Nevertheless, aesthetics is connected to the ability of people’s understanding to create and enjoy the arrangements which is pleasant.

Nasar (1988) has mentioned the direct influence of aesthetic quality on perceiving the quality of life of individuals and their sense of well-being. It must be said that environmental aesthetics include the individual reaction towards the visual quality of the environment. The goal is to test the psychological phenomenon to identify how the aesthetic qualities and the attributes of the environment connect to the individual response towards the environment. According to Ataov (1998), the aesthetic quality of the environment can be evaluated through people’s feelings and behaviour. This feeling and behaviour is a result of their previous experience with the environment.

The important issue in the environmental aesthetics is to apply the perception to the environmental design in a way that could be evaluated favourably by the public (Nasar 1988). Accordingly, the aesthetic quality can influence the sense of well-being, or its effectiveness on the subsequent reaction to the settings and also inhabitants. Adding to this, Chon (2004) has mentioned that aesthetic quality can influence the spatial behaviour or in other words people are attracted to an attractive and avoid unpleasant and unattractive environments.

In reviewing designs, Nasar (1994) indicates that visual characters are organized for the good of people. Consequently, Stamps (1999) has mentioned that design review is connected to aesthetics. This purpose is connected with the way psychologists operate the aesthetic response. This is what psychologists call favourable emotional evaluations (Ulrich 1983; Wohlwill 1974). According to Russell and Snodgrass (1987), emotional reactions refer to interior modes for example arousal or pleasure which are linked to the environment. Therefore, identifying the factors which have a role in perception of individuals regarding beauty of an object seems necessary. Nevertheless, Gjerde (2010, 3), indicates that “an aesthetically pleasing experience is one that provides pleasurable sensory experiences, a pleasing perceptual structure and pleasurable symbolic associations”.

Previous studies have identified factors that influence cognitive and perceptual aspects of environmental attributes (Nasar 1994; Gifford et al. 2002; O’Connor 2008). These cognitive properties or what Gifford et al. (2002) call conceptual properties include, complexity (the number of different noticeable features and the distinctiveness between those features), ruggedness, novelty, coherence, meaningfulness, excitement, pleasant-ness, familiarity, friendliness, and being relaxing (Herzog et al. 2011; Kaplan and Kaplan 1982; Herzog and Smith 1988; Nasar 1988; Gifford et al. 2000, O’Connor 2008). According to Volker (2010) the objective is to include a small set of properties which would cover most of the cognitive territory linked with preferences.

Previous studies have found that certain cognitive properties are connected to building preference. For example, Wohlwill (1974), and Imamoglu (2000) have found that moderate complexity is the preferred level in buildings. Imamoglu (2000) has found moderate complexity in novelty. Herzog (1992) has also found that coherent is also connected to aesthetic responses.

As a conclusion cognitive response is directly related to the public reaction towards the buildings. However, not all cognitive responses are connected to individual reaction towards the environment. Therefore, to identify the conceptual properties related to aesthetic responses of the individuals, this study attempts to identify the conceptual/cognitive properties related to aesthetic responses of non-architects in evaluating building façade. By identifying the conceptual properties of non-architects, architects as the main designer of the buildings could have a better understanding of non-architects’ reaction in evaluating building façade. As a result, integration between architects and non-architects could occur and architects could appreciate non-architects’ response on the façade and finally, user satisfaction will end to PEC (Person Environment Congruence).

The above notions suggest that aesthetic evaluations of buildings are shaped and can be predicted. These predictions are of great interest to architects because they may be used to understand relations between users’ perceptions and the designer of each architecture design.

Overall aesthetic judgments of the built environment involve cognitive evaluation of building attributes, emotional reactions, and affective appraisal in terms of the connotative meanings particular building attributes express (Stamps 2000; Araya, Faust, and Kaminsky 2019). This notion is supported by Hershberger and Cass (1974) who argues that it is the forms, colours, and spatial configuration of the built environment that may influence overall aesthetic response. Studies demonstrate that the aforementioned personal variables can be linked to the tendency of architects and non-architects to distinguish

According to Buxton (2005), design is about user experience rather than the creation of products. It seems that stresses that the physical objects ought to engage one in an experience that is largely shaped by affordances and character embedded in the product itself. In the context of architecture, one’s experiences tend to be associated largely on visual properties. As a result, more than 98% of design controls are on visual properties of buildings (Habe 1989). Furthermore, Reis and Dias Lay (2010) confirm that the main aesthetic problems are more related to external than to internal features. Visual composition aspects have an important influence on residential satisfaction with external dwellings aesthetics, besides maintenance aspects that influence the appearance and the image of housing. An important area of concern concerning visual composition is the different ways designers and users perceive composition. Rapoport (1980) has established that there are significant differences between designers and non-designers in responding to built-environment. In selecting attributes of building aesthetics, architects and non-architects tend to demonstrate several disagreements (Gifford 1980; Gifford et al. 2000; Ghomeshi, et. al 2012b). Nevertheless, Luck and McDonnell (2006) and Luck (2007) state that the context of the interaction is considered to be a factor that will influence the exchange of information between the architect and users.

The above discussion implies that user participation is an essential feature for architects to develop suitable product for its users (Ojiveaar, Ovanovic, and Den Otter 2009; Jusan 2010a, 2010b; Van der Lindern, Dong, and Heylighen 2019). Financially, it is necessary to involve users, directly from the beginning of the project because their knowledge could be used to identify specific and relevant aesthetic needs for the building (Blyth and Worthington 2010; Ojiveaar, Ovanovic, and Den Otter 2009). It has been found that ignoring user’s participation in the making of living environments may cause expensive future modification (Jusan 2010a; Ochan and Dogan 2013). According to Ojiveaar, Ovanovic, and Den Otter (2009), user participation is a new consideration for many of design offices. Currently, discussion on this issue is still lacking and threats of not involving users in the design process are growing as users are becoming more aware of design concepts and showing a stronger willingness to influence designs. Nevertheless, McDonnell and Lloyd (2014, 350) state that, “Design practices that are participatory in nature rightly recognize the specialist knowledge of the societal and user communities who participate in the design of objects, environments and services that will affect them”.

User participation is also of high importance for social acceptance of the future product. A question thus arises: how might user knowledge be conveyed to architects to help them understand the aesthetic needs of users?

Therefore, this article attempts to discuss a form of user participation in the architectural design process based on identification of relevant physical cues by non-architects on architect’s residential façade design.

2. Research methodology

Qualitative technique in this study intends to go in-depth into the non-architect’s mind, since this was considered essential for the research to observe how non-architects respond to certain physical cues. Qualitative technique could help the researcher in this study to examine the relationship between man and environment (Patton 2002; Miles and Huberman 2005). According to Nelson, Treichler, and Grossberg (1992), qualitative research involves the careful examination of social phenomena. Also qualitative research can clarify the experience of non-architects’ reactions to user participation. Polkinghorne (2005) indicates that qualitative research can elucidate the living experiences of the participants and is deeply grounded in awareness. According to Schram (2006) and Marshall and Rossman (2010), qualitative research involves the art of interpretation and seeks to make more complex phenomena. Finally, qualitative research methodology was utilized in this research to enable the investigation of the complexity of person-environment congruence in greater depth and detail (Cassell and Symon 2004).

Using qualitative methodology could help this study since it allows the flexibility to follow unexpected ideas from non-architects as the respondents and explores the process effectively (Conger and Kanungo 1998). Since this research concentrates on user participation and to observe how the differences between the two groups could be integrated, qualitative research seems to be the best strategy to obtain the objective in this research. It also helps the researcher go in-depth into the respondent’s mind and obtain the preferred conceptual properties (non-visual properties) that could not be established from the questionnaire survey. Qualitative methodology in this research also allows the respondents to judge the building façade without giving them any clue on the different types of physical cues used therein. This could help the researcher identify the knowledge of non-architects regarding different physical cues.

2.1. Method of data collection

Qualitative data collection in this study consists of three parts. At first closed card sorting technique was
used for the participants to categorize their preferred designs as given to them at the beginning of the data collection. Once the respondents had categorized the designs into the given categories, a semi-structured interview was conducted to identify the motivation behind their selection. Once the semi-structured interview was conducted the same participants were asked to sketch the changes they preferred hence “mind sketching” in the designs given to them to aesthetically improve the design (Figure 1).

2.1.1. Card sorting
Closed card sorting was selected as a method for sorting the visual images in this study. It was selected to help the researcher understand the non-architects mental model and offered an approach into how non-architects would group the designs based on their preferences (Spencer and Warfel 2004).

Card sorting helped the researcher to categorize the façades. Once the façades have been categorized, the semi-structure interview could help the researcher to identify the conceptual and physical building’s attributes related to non-architects’ aesthetic judgments.

Since this research is focused on the aesthetic features of façade designs, it will use closed sorting techniques with three categories. Categories are defined as 1- like, 2- neutral, and 3- dislike to evaluate the degree of aesthetics among non-architects. The respondents are asked to categorize the images into these particular categories based on their aesthetic preferences. It has to be mentioned that although Nasar (1997) and Devlin and Nasar (1989) have been using like and dislike categories to evaluate the aesthetic quality among the respondents, the researcher argues that using three categories and adding the “neutral”, “like” and “dislike” categories helped the researcher with a better separation of the façade designs. This relieved the respondents from the limitations to put the designs into either like or dislike categories, with the addition of a middle category. The respondents were given ten residential facades) and were asked to put the façade designs on categories which are defined as Like, Neutral, and Dislike based on the aesthetic preferences.

2.1.2. Interview
The researcher interviewed the same participants that took part in the sorting technique in order to understand what they produced. The interview helped the researcher get closer to the respondents. It also helped identify the different needs of the respondents and made the participants show the changes that they made in the design. Interview was necessary for this research since the researcher intends not only to see the differences but to understand the reason respondents select certain cases. This helped not only to understand the conceptual properties of the designs, but to establish the physical properties that participants like or dislike in a façade.

2.1.3. Mind sketching
This research intends to identify what components are relevant to the respondents’ aesthetic preferences, and since it was intended to give the respondents the freedom to locate and compose according to their preferences using pictorial data. In particular, the respondents were asked to modify the designs that were poorly rated by those in the earlier test. This was meant to see if it is possible to modify (make change) the design by involving non-architects in the design process. This study tries to use mind sketching techniques to involve participants in the design process.

Figure 1. Research methodology framework.
process and to integrate the differences between architects and non-architects.

Mind sketching in this study was carried out based on the respondent’s modification and the level of formality involved in the sketching. The process of Mind sketching was simultaneous with the card sorting technique; whereafter the process of card sorting and semi-structured interview of the respondents, the researcher conducted mind sketching with the same respondents. The researcher at the beginning of the qualitative method, asked the respondents to sort the ten selected visual designs into three categories (Like, Neutral, and Dislike). This helped the researcher on the mind sketching. The researcher tried to involve the participants in the design process of the user participation process by allowing the participants to make changes in the designs based on their aesthetic preferences. For this to happen, the researcher asked the participants to select a façade (same façades used for sorting) from the “Dislike” category which they had previously sorted to make their possible changes.

The participants were asked to select a design they thought they could change from “dislikeable” into “likeable” with some modifications. After selecting the preferred design, respondents were provided with a black and white low contrast copy of the design with coloured markers and asked the participants to mark, hatch, sketch, design, and make changes until they thought that the modified version is suitable for a shift from “dislike” to “like”. It has to be mentioned that in cases where the participant felt confused not knowing what to do, the researcher was involved to help the participant in designing the attributes they intended to add or remove from the design. Another problem that occurred during the mind sketching was that in some cases the participants did not know how to design their preferences, therefore they just verbally described what they like in the design. Therefore, the researcher marked and reordered all the process using a digital voice recorder in order not to miss any of the suggestions. This study intended to identify the optimal sample size to choose based on previous studies. In a set of 50 illustrator examples of sorting investigations, sample sizes vary from 5 to 200, with a median of 30 to the upper part.

2.2. Visual data

This research concentrates on multi-story residential apartment design. However, it must be said that since this research focuses on façade design of multi-story residential apartments which have not been constructed, the size of the multi-stories has been limited to less than 10 stories to have a manageable size for data collection and analysis. And it must be mentioned in this research since apartment size is a case of symbolic aesthetics, the apartment size was not considered in this study, and no question was asked regarding the apartment size, and instead, this study concentrated on the physical building attributes which are related mostly to the formal aesthetics of buildings. And because of this during the façade selection, the researcher tried to find facade designs with almost equally sizes in order to reduce the apartment size influence on the aesthetic preferences. Therefore, the only apartment that was found to have almost equal size was between 6 to 7 story residential apartments.

At this stage, a total of 34 façades were collected and given to 12 architects in order to select façades they thought were rich in aesthetic features and contained the 36 physical and various non-physical building attributes such as complexity, familiarity, simplicity, coherence, meaningfulness, pleasantness, and originality. At the end, 10 façades were selected which contained the characteristics related to this study.

A set of 10 full-colour A4-size digital images were used in the qualitative study (Figure 2). The reason for the ten images was primarily because it was intended to select façade designs that contained different attributes in their designs so that all the thirty-six physical cues could at least appear once in the façade (not a single design that contained all the thirty-six physical cues was found). Secondly, during the pilot study the researcher found that non-architects intended to make comparative judgments about the designs and using ten (instead of one) could help the non-architects understand the differences. Also using more than ten façades during the pilot study, revealed that the non-architects can easily get confused about their preferences. It was then decided to use visual images instead of photos taken from constructed buildings to avoid the misleading problems such as lack of good construction, surrounding buildings that might affect the design, the quality of the photo, and poor maintenance, which according to Reis and Dias Lay (2010) have significant influence on the exterior. Furthermore, the concentration is on the second phase of user participation process which is the designing stage (Saleh 2006); in which, the design is not constructed and is yet at the visual level. For a review of the physical building attributes in each façade.

According to Sanoff (2008) and Plimmer and Apperley (2002), artificial realities allow the users to interact with the computer intuitively and directly and to increase the number of interactions per time unit. Therefore, visual instead of constructed design was selected for the study for the non-architects to observe a design before it has been constructed to feel useful and to observe that their changes can affect and influence the final design.

The scope of this research was to evaluate aesthetic judgments of non-architects based on physical characteristics of the façade. Therefore, since Nasar (1998) and Reis and Lay (2010) posit that the name of the architect influences the non-architects’ judgment, this
research avoided designs from famous architects. Consequently, the researcher was not interested in the architect and instead concentrated on the physical building attributes of facade design. Thus, single-surface facades were selected to minimize the different building surfaces, heights, and dimensions so the non-architects could concentrate on the physical building attributes and not the style of the buildings.

It was decided to use the design in a colour format instead of black and white. Although researchers such as Akalin et al. (2009) have suggested using black and white but those such as O’Connor (2008) and Heft and Nasar (2000), have indicated that building colour plays an important role in people’s aesthetic preferences. Therefore, it was decided that the design should be in colour format. The pictures were shown on individual pages to reduce the chance of interrelationship between picture ratings (Larson and Delespaul 1992). To control the order effect (Daniel and Meitner 2001), the sequence for showing the pictures was assigned randomly to each respondent. All respondents recorded their judgments after the pictures were shown. They were asked to evaluate the visual preferences for each façade based on like-dislike and neutral categories.

2.3. Conceptual properties

Table 1 demonstrates the conceptual properties (known as non-physical building attributes) used in
this study. By identifying the conceptual properties, a better understanding of non-architects’ aesthetic preferences could be appreciated and architects as the main designers of the buildings could have a reference to distinguish how non-architects perceive buildings. Therefore, by taking into consideration these conceptual properties, integration of the differences between architects and non-architects can be possible (Menold and Jablokow 2019).

2.4. Sampling techniques

Sampling of the qualitative method was conducted at Universiti Teknologi Malaysia Library. A total number of 30 respondents were selected to be involved in this method (Tullis and Wood 2004; Jusan 2007b; Hong and Lee 2018; Kumar 2019; Lee 2019). Due to the time and cost that affected this research, systematic random sampling was selected for this part of the research. Therefore, every tenth Malaysian student that entered the library was selected to take part in the qualitative sampling which would be followed by the mind sketching technique. This would be continued until it reached the number 30.

According to O’Connor (2008) aesthetic response to building attributes, in general, occur irrespective of age, gender, culture, occupation, socio-economic group and so on. Thus selecting students as respondents would not be irrelevant for this study. While it may be architects and planners who determine or select façade attributes, this study was interested in the evaluation of façade attribute treatments by non-architects. Therefore, this research concentrated on non-architecture students of Universiti Teknologi Malaysia.

3. Data analysis

Descriptive analysis of sorting technique was conducted using statistical SPSS (19.0) software. It must be said that the descriptive analysis was done in order to observe the facades into the three categories of like, dislike, and neutral, therefore no further statistical analysis was conducted in this section. The verbal data gathered from semi-structured interview and mind sketching sections were analysed using content analysis.

Categories and coding schemes were derived from two sources: the data themselves and previous related studies. The researcher tried to see whether which of the codes could fit in one category. For example, answers that were coded “creativity” and “novelty” would go under one category by the name of “originality”.

After coding all the interviews, the codes were related to the cognitive and conceptual properties that were established from the literature. By relating the coding to the variables all the codes that had the same meaning went under one category. Based on Reynolds and Gutman (1988) number 5 was selected to see the power of each code, each of the responses were counted separately to see the power of the code in each respondent if the codes were more than 5 the code counted to be rich but if the codes were under 5 that showed that the code was not rich.

After coding the whole text, its consistency was rechecked. Since all the respondents were students from University Teknologi Malaysia, it was not hard to obtain strong codes. Although there were codes that were specific to some of the respondents they were not powerful enough to be counted.

Content analysis was used to establish the frequency of selection in the sketching section. The researcher followed the content analysis technique used in the semi-structured interview.

4. Results

4.1. Closed card sorting results

Table 2 indicates the results of closed card sorting. A total of thirty respondents sorted ten façade images based on three categories which were: Like, Neutral, and Dislike. Figure 3 demonstrates the bar chart of the frequency and percentage of each façade based on respondent sorting. These percentages represent the percentage of the participants in the study who put each card into each of the three categories. Each row sums to 100%. The results reveal that there was far more agreement among the participants about what category Card #9 belonged in (namely Category Like, which 76.7% of the respondents put it in). Another example is the Card #10 that was more distributed across all three categories. Also Card #6 was the least liked (only 16.7%) among the cards given to non-architects. (Refer to Section 3.6.5.1 for a complete list of Cards).

The results of closed sorting was the first stage of qualitative technique which helped divide the 10 given

Table 1. Conceptual properties used in this study based on previous research.

<table>
<thead>
<tr>
<th>No</th>
<th>Conceptual Property</th>
<th>Synonyms</th>
<th>Antonyms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Complexity</td>
<td>Involved</td>
<td>Simple</td>
</tr>
<tr>
<td>2</td>
<td>Friendliness</td>
<td>Sociable</td>
<td>Unfriendly, Unsociable, Cold</td>
</tr>
<tr>
<td>3</td>
<td>Rugged</td>
<td>Strong, Potent</td>
<td>Wimpy, Weak, Delicate</td>
</tr>
<tr>
<td>4</td>
<td>Originality</td>
<td>Unique, Creative</td>
<td>Unoriginal, Typical</td>
</tr>
<tr>
<td>5</td>
<td>Clarity</td>
<td>Coherent, Unified</td>
<td>Ambiguous, Confusing, Disorganized</td>
</tr>
<tr>
<td>6</td>
<td>Meaningfulness</td>
<td>Expressive, Symbolic</td>
<td>Inexpressive, Message Less, Meaningless</td>
</tr>
<tr>
<td>7</td>
<td>Relaxing</td>
<td>Calming</td>
<td>Distressing</td>
</tr>
<tr>
<td>8</td>
<td>Exciting</td>
<td>Excite</td>
<td>Boring</td>
</tr>
<tr>
<td>9</td>
<td>Pleasantness</td>
<td>Enjoyable</td>
<td>Unpleasant</td>
</tr>
</tbody>
</table>
facade designs into three categories in order to further investigate the non-architects’ preferences. Once the given cards were sorted by the respondents, a semi-structured interview was conducted to find the aesthetic preferences of the respondents in the selected cards based on their sorting cards and to observe their suggestion for modifications of a facade which was in the Dislike category (Yeoman and Carvalho 2019). Mind sketching technique was the later technique which was based on the facades in the Dislike category.

4.2. Conceptual properties related to non-architects

Frequency of mention by non-architects is reported in Table 3. It demonstrates the number of indications in terms of “like”, “dislike” and “suggest to changes” by non-architects which on the given facade designs they prefer to have and had selected. The data on the conceptual properties for non-architects is derived from the semi-structured interview and has been selected based on the frequency of mention. It must be said that during the interview the researcher did not directly ask regarding the conceptual properties, instead, if the respondents mentioned any word or

<table>
<thead>
<tr>
<th>Card No.</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>13</td>
<td>43.3%</td>
<td>5</td>
<td>15.7%</td>
<td>12</td>
<td>40%</td>
<td>30</td>
</tr>
<tr>
<td>#2</td>
<td>15</td>
<td>50%</td>
<td>9</td>
<td>30%</td>
<td>6</td>
<td>20%</td>
<td>30</td>
</tr>
<tr>
<td>#3</td>
<td>7</td>
<td>23.3%</td>
<td>17</td>
<td>56.7%</td>
<td>6</td>
<td>20%</td>
<td>30</td>
</tr>
<tr>
<td>#4</td>
<td>9</td>
<td>30%</td>
<td>12</td>
<td>40%</td>
<td>9</td>
<td>30%</td>
<td>30</td>
</tr>
<tr>
<td>#5</td>
<td>11</td>
<td>36.7%</td>
<td>14</td>
<td>46.7%</td>
<td>5</td>
<td>16.7%</td>
<td>30</td>
</tr>
<tr>
<td>#6</td>
<td>5</td>
<td>16.7%</td>
<td>8</td>
<td>26.7%</td>
<td>17</td>
<td>56.7%</td>
<td>30</td>
</tr>
<tr>
<td>#7</td>
<td>10</td>
<td>33.3%</td>
<td>14</td>
<td>46.7%</td>
<td>6</td>
<td>20%</td>
<td>30</td>
</tr>
<tr>
<td>#8</td>
<td>14</td>
<td>46.7%</td>
<td>12</td>
<td>40%</td>
<td>4</td>
<td>13.3%</td>
<td>30</td>
</tr>
<tr>
<td>#9</td>
<td>23</td>
<td>76.7%</td>
<td>1</td>
<td>3.3%</td>
<td>6</td>
<td>20%</td>
<td>30</td>
</tr>
<tr>
<td>#10</td>
<td>10</td>
<td>33.3%</td>
<td>11</td>
<td>36.7%</td>
<td>9</td>
<td>30%</td>
<td>30</td>
</tr>
</tbody>
</table>

**Figure 3.** Bar chart of the ten facades evaluated by non-architects façade number.

<table>
<thead>
<tr>
<th>CONCEPTUAL PROPERTIES</th>
<th>Like (frequency of mention)</th>
<th>Dislike (frequency of mention)</th>
<th>Suggest to Change the design (frequency of mention)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Originality</td>
<td>42</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Clarity</td>
<td>9</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Complexity</td>
<td>2</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Simple</td>
<td>12</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Friendliness</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Meaningfulness</td>
<td>8</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Ruggedness</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Exciting</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Pleasant</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Relaxing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The frequency of mentions in the Dislike category consist of the antonym of the conceptual properties which were: un-original as opposite to Original, Disorganized as opposite to Clarity, Unfriendly as opposite to Friendly, Meaningless as opposite to Meaningfulness, Delicate as opposite to Ruggedness, Boring as opposite to Exciting, Unpleasant as opposite to Pleasant, and Distressing as opposite to Relaxing.

**In the case of Complexity, although the opposite of complexity was simplicity, but since** the respondents mentioned simplicity in both like and Dislike categories, high complexity was used to define the dislike category. For example respondents mentions of the design being too complex was the reason for disliking the facade, or the respondents mentions of the design being simple was the reason for selecting the facade in the like category definition which was related to the conceptual properties the researcher would consider it as the mention of conceptual properties. With a cut-off value of five
(Reynolds and Gutman 1988), the results reveal that not all conceptual properties derived from the literature have met the minimum requirements in order to be accepted as the properties that influence the designs. The results show that only four out of nine conceptual properties (Originality, Complexity, Clarity and Meaningfulness) are adequate. Although Reis and Dias Lay (2010), indicated “negative house design evaluation emerges to be related to its excessive simplicity with lack of diversity and visual richness, and inadequate visual motivation”, but this research revealed that for non-architects, including originality, complexity, clarity and meaninglessness as four major conceptual properties of the facade in the designs is vital. It seems that non-architects concentrate on only these four conceptual properties. The non-architects tend to evaluate the buildings with these four. Therefore, in order to satisfy non-architects’ preferences, architects must appreciate these which according to Kahana et al. (2003) and Moore (2005) will eventually lead to user satisfaction and PEC.

5. Originality

The results in Table 3 demonstrate one of the most important conceptual properties that non-architects liked in the designs (F = 42) is originality. In contrast, non-architects have mentioned only 16 times they disliked due to unoriginality. Interestingly, if they are given a chance to change the design of the facade they prefer to have a novel and creative design (F = 10). For example, Respondent #1 mentioned that she liked the designs because of their creativeness and uniqueness. The same respondent disliked designs since they were not original and common. Once the respondent was asked “what she would do if the architect asked her to change the facade?” She answered, “the design should be more creative”.

It could be concluded that in agreement with Gifford et al., (2002), originality (defined on the rating form as unique, creative and original) is significantly related to overall aesthetics in non-architects’ perspective.

This study adds that non-architects are also interested to have originality in their design. This could help architects understand that non-architects are in total agreement with them on having originality or what Reisner-Cook (2009) calls “specialness” in their designs. In fact, non-architects based their judgments of designs on originality and uniqueness.

5.1. Clarity

The results of Table 3 reveal that non-architects have mentioned “clarity” nine times (coherent, unified) as related to good overall aesthetic design for the facades. On the other hand, the frequency of mention for disliking the designs (F = 4) have not met even the cut-off level (F = 5) in order to be accepted. This seems to suggest that non-architects do not regard a disorganized design as the reason for their dislike. When asked to change the design to be an aesthetically preferred one, the non-architects preferred to modify the design in order to have clarity (as a conceptual property) in their designs (frequency of mention 5). For example, in case #1, the respondent mentioned that she liked the designs that we’re unified. Paradoxically, when she was asked about why he disliked the designs and to make changes in the design, clarity was not mentioned by the respondent. Adding to this, once the respondent was asked to “explain the criteria for selecting designs that looked aesthetically good” the respondent mentioned, “one important factor for me is that the overall designs look organized and coherent”.

As a conclusion and in contrast with Gifford et al. (2002) which found out that in non-architects, clarity is not a strong conceptual property, the results of this study did not replicate the previous research and realized that when the non-architects are deciding about the overall aesthetics of a facade, clarity is an important conceptual property.

5.2. Complexity

In this study complexity has been divided into two separate groups of design namely, “complex design” and “simple design”. In this way, the differences could be seen easily (Ramzy 2015). Referring to Table 5.2, the results demonstrate that complexity as a conceptual property which influences non-architects in making decision for a good design was only mentioned two times. Alternatively, the respondents mentioned (F = 12) simplicity as an essential conceptual property when selecting a good facade design. When the non-architects were asked about the “reasons for disliking the designs?” complexity was mentioned eight times, whereas simplicity was mentioned five. Again, when the respondents were asked to suggest changes for the design, complexity and simplicity were mentioned five and six times as important conceptual properties for non-architects. For example, respondent 12 did not mention complexity or simplicity for the selected design. However, for the disliked designs, she said: “I don’t like the designs because they are too complex and to change the design, I would make it to be simpler and less complex.”

Additionally, complexity in this study has a linear relation as similar to some of the previous findings (e.g. Devlin and Nasar 1989; Kaplan 1992; Nasar, 1987). As a conclusion and in agreement with Gifford et al. (2002) simplicity and complexity are related to significantly high aesthetic expectations. However, when referring to liking a facade, complexity was not
considered as an appropriate conceptual property for non-architects. In other words, non-architects do not like a complex building. This finding seems in agreement with Rapoport (2016) who argues that although non-architects may favour environments with the best complexity level, but they may prefer to shift through environments that contain different complexity levels beginning from the least and low to the most and highly complex environment.

5.3. Meaningfulness

The data show that in liking the designs, Meaningfulness (F = 8) was an important conceptual property. However, meaninglessness was also mentioned five times for disliking the designs. Nevertheless, when it came to modifying the designs to have a better facade, the respondents have mentioned only three times to have a meaningfulness facade design. As an example, Respondent 10 mentioned that he liked the designs for their meaningfulness, and disliking the design for their meaninglessness. However, when he was asked to change the design, he did not mention anything about this particular conceptual property. The respondent said “good designs are the ones which have symbolic meanings for you, and they will tell you that they are modern and fashionable”.

Meaningfulness is related to the appropriate architecture language to be used in the making of architecture. Nevertheless, the task of the architect is to create a physical environment that is readily identifiable by the members of the society and their own. On the other hand, Reisner-Cook (2009) reveals that the task of the architect is to create meaningful places. This study adds to these studies that architects must take into consideration that for non-architects, meaningfulness is also an important conceptual property which they will base their judgments on. Therefore, taking into consideration that meaningfulness is essential for non-architects is an important task for architects in order to design a building which satisfies non-architects in order to reach PEC. However, Gifford et al. (2002) found that in non-architects, meaningfulness is not a strong conceptual property. The results of this study reveal that meaningfulness is an essential and important conceptual property for non-architects when they are deciding on the overall aesthetics of facade designs. This could be because of the different buildings used by the author where the researcher used office buildings which seemed that meaningfulness was not a task for non-architects, but since this research is concentrating of residential apartments, meaningfulness was an important task for non-architects, since they see themselves as potential end-users of the apartments.

6. Direct involvement of non-architects in the given façade (mind sketching)

The mind sketching technique applied in this research is the extension to the interview data with the same respondents (30 respondents). In practical terms, this is a direct act of user-participation which was carried out by “changing” the design given to the respondents. This was carried out by asking the respondents to sketch directly on the given building facade. The act of drawing allows the respondents to focus on a particular feature of the map (building facades). According to Emmel (2008), sketching helps the interviewer with a record that is possible to interrogate along the drawing process, and when it is completed, this is what Marques et al. (2018) calls Cognitive Mapping.

There are a number of ways a researcher may analyse mind sketching. In this study, the researcher used “physical cue counting” to identify which concepts were identified by participants within the maps and how often (Turns, Atman, and Adams 2000).

Table 4 demonstrates the frequency of mention by the respondents based on the number of the façade. It shows the number of times in which the respondents have selected a facade to make changes on in the mind sketching. All ten facades used in this research were at least selected once to be modified. Facades 5, 8, and 10 with once selection are the less preferred facades for the respondents for modification. On the other hand, façade 6 with seven selections is the most preferred. As a triangulation with the card sorting technique seen in Table 5.1, facade 6 is the least preferred with nearly 57% negative responses. (Sketches of respondents are reported in Appendix F).

6.1. Tendency of physical building attributes in mind sketching

The results of mind sketching technique revealed that out of thirty-six physical cues tested in this study, only six (glass cladding, windows size, balcony size, rectangular windows, vertical or horizontal windows, and curve shapes) were used by the respondents in the

<table>
<thead>
<tr>
<th>Facade number</th>
<th>Frequency of selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>4</td>
</tr>
<tr>
<td>#2</td>
<td>2</td>
</tr>
<tr>
<td>#3</td>
<td>4</td>
</tr>
<tr>
<td>#4</td>
<td>6</td>
</tr>
<tr>
<td>#5</td>
<td>1</td>
</tr>
<tr>
<td>#6</td>
<td>7</td>
</tr>
<tr>
<td>#7</td>
<td>2</td>
</tr>
<tr>
<td>#8</td>
<td>1</td>
</tr>
<tr>
<td>#9</td>
<td>2</td>
</tr>
<tr>
<td>#10</td>
<td>1</td>
</tr>
</tbody>
</table>
mind sketching techniques to be added by the respondents and only two (Arches, and Brick cladding) were selected to be removed.

It could be argued that the knowledge of different physical cues was not sufficient to enable the respondents (non-architects) with any decision without professional supervision. This research concurs with Jenkins and Forsyth (2009) that non-architects lack the ability to analyse physical cues. It could be suggested that non-architects could select these physical cues because these are the basic elements of an architectural design. An interesting conclusion is that non-architects know what they like, they also know what they dislike, but they do not have the skills to put together all these physical cues in the design.

In this section to have a better understanding of the results, mind sketching has been triangulated with the interviews and One-Sample t-test results of Chapter 4 to identify the differences in using direct and indirect participation by non-architects.

6.1.1. Wall material

Table 5 shows the results from the interviews and mind sketching in the wall material category. It revealed that only brick cladding has an acceptable frequency of mention and change (based on cut-off point 5) with respect to the wall material. The respondents have liked fourteen times and disliked it ten times in their designs. But in the suggestions for change it has been only mentioned twice. On the other hand, when it came to changing the design using mind sketching, the respondents have mentioned four times adding brick cladding to the design but have mentioned five times removing the bricks from the selected facade.

Another interesting result in this section of the research is that out of fourteen times that the respondents have mentioned liking brick cladding in the selected design, they have added only four times brick cladding on their mind sketching experience. While the respondents that dislike brick cladding have removed brick cladding only five times in their mind sketching experience (Table 5.7).

An interesting observation in the wall material category is that the relationship between the results of the oral interview and the mind sketching are not necessarily parallel. Although respondents have selected metal cladding as a good technique in their preferred designs, but when it came to drawing and making changes in their design, they have not selected this material in the design change.

For stone cladding and concrete, respondents have not mentioned an acceptable number both in the semi-structured interview and mind sketching. It could be concluded that stone cladding and concrete are two neutral materials for respondents, and that the respondents have not expressed the feeling about the two materials. Another conclusion could be that although respondents have expressed their feelings about brick cladding, glass cladding and metal cladding, there is a significant difference between the visual oral interviews using the ten photos and mind sketching interview.

6.1.2. Wall appearance

The results of Table 6 show a neutral expression of reflectance on the respondents’ designs but with a strong expression on colour uniformity. Although respondents have mentioned colour uniformity in their visual oral interviews, as an important physical cue in the building they have not suggested changing the colour on their mind sketching experience. Once again it could be concluded that respondents are not
capable of expressing their preference in the modification of the design.

6.1.3. Wall form
Based on Table 7, the results show that only four (rectangles, squares, circles or ovals, and curved shapes) out of ten physical cues in the wall form category have met the acceptable frequency of mention by respondents and the other physical cues are neutral on the visual oral interview. However, the results reveal that although four of the physical cues have an acceptable frequency of mention by the respondents (based on cut off level of 5), only one (Curved shapes) has met the acceptable number of selections by the respondents in the mind sketching technique. It must be said that, Curve shapes was not in the TACS of Gifford et al. (2000), but this research revealed that curved shapes is an important factor which needs to be added to the physical building attributes.

Yet the results show that other than curved shapes which are an important physical cue for respondents in visual oral interview and mind sketching, the other three acceptable physical cues are different. For example, the respondents have mentioned that circular shapes (F = 22) are an important form in the interview, but in the mind sketching they have not added circle in the selected design. Another example is that respondents have mentioned square shapes (F = 16) as a dislike form in their design, but in the mind sketching they have only selected one time to remove or change the square shapes. Once again it could be concluded that respondents are not capable of expressing their changes into the design.

6.1.4. Wall texture
Table 8 reveals that respondents have not regarded the uniformity of smoothness (F = 0) and material smoothness (F = 0) as important in their visual oral interview and mind sketching. This is due to the lower frequency of mention in both aspects. It seems that respondents have a neutral expression of the two categories. Although respondents have mentioned sharp/rounded, horizontal lines and vertical lines in their oral interview, they have not selected the physical categories for the mind sketching interview.

For example, respondents prefer not to have sharp edges in their designs, and when they were asked to suggest changes, they have indicated eight times that they intend to change the sharp edges into rounded. In the mind sketching, they have only selected four times to change the design and added rounded edges instead of sharp edges. It could be concluded that in the wall texture category, the non-architects know what they like and know what they dislike, but they do not know how they would compose them together in the design.

6.1.5. Windows size, form, and balcony shapes
Table 9 suggests only two physical cues (windows size and balcony size) to have been at an acceptable level in both oral interview and mind sketching. It shows that the respondents dislike the windows size (F = 8) and balcony size (F = 11) and added these physical cues in their mind sketching interview. Another interesting result is that although the respondents have not mentioned an acceptable level in their oral interview about rectangular windows shapes and vertical or

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**Table 7.** Frequency of mention and frequency of change in wall form (interview and mind sketching).

<table>
<thead>
<tr>
<th>Categories</th>
<th>PHYSICAL CUES</th>
<th>Frequency of selection (interview)</th>
<th>Frequency of changes (Mind sketching)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Like</td>
<td>Dislike</td>
</tr>
<tr>
<td>Wall Form</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stepped stories</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Regular stepping</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Articulation</td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Triangles</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rectangles</td>
<td></td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Squares</td>
<td></td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>Circles or Ovals</td>
<td></td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>Polygons</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shells</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>*Curve shapes</td>
<td></td>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 8.** Frequency of mention and frequency of change in wall texture (interview and mind sketching).

<table>
<thead>
<tr>
<th>Categories</th>
<th>PHYSICAL CUES</th>
<th>Frequency of selection (interview)</th>
<th>Frequency of changes (Mind sketching)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Like</td>
<td>Dislike</td>
</tr>
<tr>
<td>Wall texture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uniformity of Smoothness</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Material Smoothness</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sharp-Rounded</td>
<td></td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Horizontal Lines</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Vertical Lines</td>
<td></td>
<td>11</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 9. Frequency of mention and frequency of change in windows size, form, and balcony shapes. (Interview and mind sketching).

<table>
<thead>
<tr>
<th>Categories</th>
<th>PHYSICAL CUES</th>
<th>Frequency of selection (Interview)</th>
<th>Frequency of changes (Mind sketching)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Like</td>
<td>Dislike</td>
<td>Suggest to Change</td>
</tr>
<tr>
<td>Windows size, form, and Balcony</td>
<td>Window Size</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Square shape Window</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Rectangular shape</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Circle shape</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Other shapes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Vertical or horizontal windows</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Balconies/porches</td>
<td>7</td>
<td>11</td>
</tr>
</tbody>
</table>

horizontal windows, but they have selected (F = 5) to add rectangular windows shapes and (F = 9) horizontal windows to their mind sketching design. The other three physical cues (square shape windows, circle shape windows and other abstract shapes) seem to be neutral to the non-architects.

As a conclusion, non-architects are significantly familiar with window and balcony sizes. The respondents knew what they wanted and also suggested these two physical cues in their mind sketching designs.

6.1.6. Extra decorations

The results in Table 10 show that only one physical cue (arches) has an acceptable frequency of mention (F = 7). The respondents did not like using arches in the design and preferred to remove them. At the same time, they also chose (F = 7) to remove the arches in their mind sketching interview. It could be argued that other than arches the respondents have a neutral expression about other physical cues.

7. Facade no 6 as an example of mind sketching

It is discovered that, out of the ten facades tested, it was Facade 6 which was most preferred for change. Figure 4 demonstrates Facade 6 where respondents have modified the original design. The respondents tended to modify only specific parts of the design.

As shown in Table 11, the respondents have mostly concentrated on five physical cues, which are curved shapes (F = 4), Window sizes (F = 6), vertical or horizontal windows (F = 7), balcony size (F = 3), arches (F = 3), and columns (F = 4). Interestingly, the results show that only the arch and column have been removed, and other physical cues have been added or changed through this facade design.

Triangulating the results of mind sketching with the oral interviews provide evidence that most of the physical cues that have been highly valued in the sketching by the respondents have had an acceptable frequency of mention in the oral interview. However vertical or horizontal windows shape has not met the acceptable level (cut off level of 5) in the oral interview but has had a high value in the mind sketching technique. Articulation, vertical lines, square shape windows and columns, are also the physical cues that have not met the acceptable level.

8. Conclusion

The results of this section provide evidence on the conflicts between what non-architects like, dislike, and prefer in their ideal designs. It seems that non-architects are not able to make a final judgment on using certain physical cues in order to have an aesthetically good design.

It is essential for the architects to involve different users in their designs. However, studies have not identified that involving user in which part of a design could have a better feedback for architects. This research shows that involving users in the facade design could not have positive feedback for architects because of the lack of knowledge among non-architects. It seems necessary for the non-architects to be assisted by the architects for a positive feedback.

The results of conceptual properties (non-physical buildings attributes) related to aesthetic preferences revealed that non-architects evaluated building
facades based on four conceptual properties hence originality, complexity, clarity and meaningfulness. However, it has to be mentioned that since the conceptual properties are non-physical building attributes, they could not be applied in the direct user participation and if architects wish to take into consideration these conceptual properties, user participation may not be a fruitful and concrete process. Nevertheless, architects must take into consideration these four conceptual properties in order to reach person-environment congruence.

The results of physical building attributes show inconsistency between direct user participation (mind sketching) and indirect user participation (interview).

Table 11. Physical cues added for removed by the respondents in Facade 6 (mind sketching).

<table>
<thead>
<tr>
<th>Categories</th>
<th>PHYSICAL CUES</th>
<th>Frequency of changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Material</td>
<td>Brick</td>
<td>Added or increased</td>
</tr>
<tr>
<td>Wall appearance</td>
<td>Color uniformity</td>
<td>1</td>
</tr>
<tr>
<td>Wall Form</td>
<td>Articulation</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Squares</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Curve shapes</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Vertical Lines</td>
<td>1</td>
</tr>
<tr>
<td>Wall texture</td>
<td>Window Size</td>
<td>6</td>
</tr>
<tr>
<td>Windows size and form and Balcony</td>
<td>Square shape Window</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Vertical or horizontal window</td>
<td>2 vertical</td>
</tr>
<tr>
<td></td>
<td>Balconies/porches</td>
<td>3</td>
</tr>
<tr>
<td>Extra Decoration</td>
<td>Arches</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Column</td>
<td>4</td>
</tr>
</tbody>
</table>
The results of Table 5.14 show a tendency when non-architects are asked what they like and dislike in a facade (interview) and how they like the physical attributes (mind sketching). Although both direct and indirect user participation influences the design, each of the techniques has its limitations and without professional assistance, non-architects are incapable of a positive influence on the given design.

It could be argued that although respondents have selected certain physical cues to be modified in the design, but the number of physical cues mentioned and used in the card sorting followed by semi-structured interview and mind sketching is as few as eight (out of 36). This could be due to the lack of respondents’ knowledge of different physical cues. Therefore, involving potential users in-direct participation without educating them on the physical cues would be of little help to the architects to conclude the integrated design. This agrees with Luck (2018) study. Not only the knowledge of different physical cues is missing in non-architects, the knowledge of combining and mixing different physical cues to have a better aesthetic quality is also another problem among non-architects. Finally, without proper knowledge and training, non-architects’ involvement in the design stage would not offer much help to the architects for a better design. Therefore, in order to have a conclusion, the architect should assist non-architects in the design-stage (and not the construction stage) of user participation by educating the non-architects regarding the: selection of material, use of material, and combination of materials. Also, demonstrating design alternatives as one of the user participation criteria to the non-architects could help the architect to understand what the non-architects prefer in the design.

9. Suggestion for further study

- It is clear that non-architects are not able to design a wide range of architectural forms and shapes. Given that they used basic changes indicates that they were not able to express their desires. Therefore, giving a group of high-rated facades and asking which feature they like to see in low-rated facades can be more useful
- Due to the limitation of qualitative methodology, the researcher could not take into consideration the proportion of windows size. The next level of this study could be that proportion of the size of the windows could be tested.

Notes on contributor

Mohammad Ghomeishi holds a PhD in Architecture from the Universiti Teknologi Malaysia (UTM). Currently an Assistant professor at the Islamic Azad university, Damavand branch. His research interests include, aesthetics in architecture design, user satisfaction, cognitive responses, and user participation.

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Studies, International Institute for Science, Technology and Education.


