

Visual Perception and Visualization Tools for Visual Impact Assessment (VIA) on Urban Streetscape

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Abstract. *Two different surveys were conducted for visual impact assessment (VIA) on urban streetscape namely – the visual perception and visualization tools. The first was focused on the visual perception between designers and non-designers of the undergraduate students from four different public universities in Malaysia representing landscape architecture and business administration courses whereas the latter concentrated on students with a background of landscape architecture and quantity surveyor to evaluate static and dynamic visualization tools. The paper discussed the findings of the visual perception and visualization tools surveys, and its impact towards improving VIA on urban streetscape.*

Keywords. *Visual perception; visualization tool; visual impact assessment; urban streetscape*

Introduction

The early findings of this research have been presented in ASCAAD 2007 and 2009 as well as ICERT 2008 primarily highlighting the research designs and survey methods. Two major surveys had been carried out in a control environment in 2007 and 2008 comprised of visual perception and visualization tool surveys. It was conducted in such a way to reduce unnecessary factors for example noise and sunlight that could disturb the respondents' concentration on the surveys. The surveys were developed separately using two different sets of respondents that comprised of the subset of experts and lay public groups. The expert groups were represented by students with design background and lay public representing the non-designers.

Considering the limitation of the scope of the

research, the respondents of the visual perception survey were focused on undergraduate students from four different public universities in Malaysia representing landscape architecture and business administration course. It was conducted in classrooms available in the universities using computerized graphic procedures (digital photo questionnaires). This survey adopted the visual analysis framework suggested by Sheppard (1989) and Sanoff (1991). On the other hand, the respondents for the visualization tools survey were only concentrated on one public university in Malaysia that offered landscape architecture and quantity surveyor. This survey was carried in a selected computer lab available in the faculty that was able to run the four tested visualization tools comprised of the static and dynamic visualization suggested by Bishop and Lange (2005a). According to Bishop and Lange (2005b) the ability to

interact with visualization was the key to its use for discovery, and may also be important in communication. One of the Kuala Lumpur Conservation urban streetscape areas was selected to evaluate and test the visual attributes for both surveys based on the available visual quality issues of the conservation area.

The results of both surveyed were then analysed using a descriptive statistical to show the patterns of selection toward the visual attributes tested on both groups. The visual perception survey was analysed based on the three landscape aspects that are the elements, characteristics and characters of the streetscape. The analysis showed that there is a possibility that visual perception among respondents have distinguishing equivalents especially on the common factors. The visualization tools survey analysis showed that both groups preferred a visualization tool that compliments the working hypothesis mentioned by Bishop and Lange (2005b) which represented an interactive tool that allows the fullest advantage of human sensory and cognitive systems to be explored. The paper discusses (1) the findings of visual perception and visualization tools surveys, and (2) the impact of the findings toward improving the VIA on urban streetscape.

Visual Impact Assessment (VIA)

Visual Impact Assessment (VIA) is a method of assessment that is widely used to justify the impact of visual quality for an urban environment including urban streetscape setting. Visual impact assessment (VIA) is one of the important components in the environmental impact assessment (The Landscape Institute, 2002) to preserve and create a good built environment especially in an urban environment.

The VIA is normally assessed by the VIA experts such as the landscape architects, urban designers, architects or trained people in the related field using expert methods. But the reliability issues on the expert assessment results always have been argued due to the absence of the lay public involvement in

the assessment exercise. In order to solve this problem, Palmer and Robin (2001), and Daniel (2001) suggested two different assessments, nevertheless resulting a 'gap' of both feedbacks without any conclusive consensus. With regard to this issue, is there any possibility to have a consensus VIA which can represent both groups in getting more reliable results?

One way is to understand and justify the distinguishing equivalent factors on the visual perception between the experts and lay public towards VIA. According to Gordon (2004), visual perception is a knowledge driven process that able to suggest a good basis of the level of distinguishing equivalent of visual perception between experts and lay public. Another important factor is the rapid growth of the information and visualization technologies used in many cases to suggest a better understanding of space, form, objects and the relationships within urban streetscape and architectural representations.

VIA in principles involved three major components that are the assessors, the method and the visualization tools. The assessors are representing in two groups – the experts and the lay public, while the methods are comprised of the expert's-based and perception-based approaches. The visualization tools represented communication tools for VIA from still to interactive visualization.

The framework of the survey

The framework for the visual perception survey was based on the visual perception analysis between the experts and lay public toward the three landscape aspects suggested by The Landscape Institute (2002) which were the elements, characteristics and characters in selected urban area as perceived environment. The study focused on the psychophysical paradigm (Zube et al., 1982) from the groups suggested by environmental psychologist mentioned by Bishop and Rohrmann (2003) as below:

1. Identification (for objects and structures, according to existing knowledge);

2. Aesthetic evaluation (perceived beauty);
3. Personal liking (subjective pleasantness, familiarity, historical and symbolic value);
4. Manipulation (modifying an environment for personal utilization).

In this research, the visual perception analysis was carried out via a survey based on the computer still photos in a control environment comprising of the groups of experts and lay public as respondents. They were chosen from the selected four public universities that offered Landscape Architecture and Business Administration courses. There were 209 respondents involved in the survey where 103 (49.3%) designers and 106 (50.7%) non-designers. On the other hand the visualization tools study was to evaluate the impact of the medium on the design decision between designers and non-designers. Static and dynamic visualization tools have been introduced prior to the test based on Bishop and Lange (2005b) recommendations. This survey was conducted in a control environment with relevant computer hardware and software to run the survey process. 133 respondents involved in the survey, 57(42.9%) representing designers from the landscape architecture school and 106 (57.1%) respondents from the quantity surveyor school represented the non-designers. All respondents were from a public university in Malaysia undergone four types of visualization medium – digital still image, Quicktime VR (QTVR), animation and interactive visualization.

Findings of the visual perception survey

Visual identification survey

In visual identification survey, the respondents were tested with three landscape aspects comprised of six visual attributes related to the selected streetscape setting. The visual attributes were arranged randomly and the respondents need to match them with the prepared statements in the questionnaire booklet. The results indicated almost similar pattern of visual identification between designers and

non-designers even though the designers obviously have the knowledge advantages for design decision.

Perception choice survey (existing and proposed streetscape)

The perception choice survey required the respondents to select six visual attributes given based on the worst to the best categories. Two sets of streetscape setting were imposed –the existing and the proposed streetscape setting (the visual was manipulated using computer graphic technique). The result also indicated that majority of respondents from both groups were able to justify the visual attributes given based on the categories.

Visual appraisal

The survey was done to justify the significant mean between the two groups on the visual appraisal. The respondents were asked 6 questions related to these photos and the respondents need to rate the questions based on numerical scale 1 to 7. It showed that the significant different is focused on Visual Attribute 2 mainly due to the ability of making visual perception 'judgement' may reduce for more a more complex visual attributes (Figure 1).

Visual spatial ability

The survey tested between designers and non-designers on individual visual spatial ability of the visual perception in the urban streetscape setting. The results showed that both groups have strong distinguishing equivalent in term of identifying the spatial characteristic of the selected urban streetscapes. They agreed that the visual attributes given suggested the decreasing of positive visual quality in that traditional urban streetscape setting (Figure 2).

Findings of the visualization tools survey

Four types of survey questions were imposed to the respondents – (a) Perception Choice, (b) Appraisal (c) Content and (d) Function. The results of the surveys are mentioned below:



Figure 1
Visual attributes 1, 2 and 3
(from left to right).



Figure 2
Visual attributes of four dif-
ferent types of urban street-
scape settings (clockwise
– Streetscape 1, Streetscape 2,
Streetscape 4 and Streetscape
3).

Figure 3
Samples of streetscape settings from computer generated images used as one of the visual medium for the visualization tools survey.



Perception choice

The respondents were asked to rank the visualization tools from the easiest to the most difficult to handle. The results showed that still digital picture was the easiest followed by animation, QTVR and the most difficult to handle was the interactive visualization. Apart from this, the respondents need to identify the most preferable medium for the streetscape visualization. In this case, both groups recommended interactive visualization followed by animation, QTVR and still image.

Appraisal survey

In second part the respondents were asked to rate the question using numerical score from 1 (Highly inappropriate) to 7 (Highly appropriate). The analyses were carried out based on the comparison of the frequency rating by respondent from each visualization tools surveyed and then the mean of the overall groups. The results showed that still image was the least preferable as compared to the dynamic visualization tools. Designers preferred animation whereas non-designers for interactive visualization. The most preferable visualization tool selected by both groups was the interactive visualization.

Content survey

The respondents were given a series of checklist questions and scored them with numerical rating

scale based on the factors being appraised. Based on the survey results, the least interesting visualization tool by both groups was the still image. In contrast, the most interesting visualization tool by designers was the animation whereas the non-designers selected interactive visualization. In terms of ease of usage, the designers favoured still image unlike non-designers was animation (Figure 3). Still image picture and QTVR were declared difficult medium to understand the content due to the limitation of visual exploration and information.

Function survey

This survey was to find out the respondents exposure on the given visualization tools. It was clear that still image was the most common visualization used as compared to the interactive tools. QTVR was declared as seldomly used.

The impact of the findings for VIA on urban streetscape

The research findings suggested a few key impacts that contributed towards improving VIA on urban streetscape considering the limitation of the survey performed. These were:

- Both group assessments have shown a strong indication on distinguishing equivalence on the elements aspects namely the elements, charac-

teristics and characters that were common and lesser amount of complexity. The key contributions factor to this was mostly dependent on the complexity of the visual.

- Visual perceptions decision varied from designer and non-designers thus required both groups evaluation.
- Visual with negative attributes tend to give strong influence to the VIA decision from both groups to three landscape aspects as compare to the positive one.
- The common knowledge and preference about urban streetscape features gave an advantage to find similarity among respondents (as mentioned by Junker and Bucheker, 2008 that this similarity came from their culture, origin or level of education).
- The similarity of visual perceptions between designers and non-designers was limited to non-complex visual attributes.
- The choices between static and dynamic visualization tools were much more dependent on prior visual experience exposure.
- The easiest visualization tools did not suggest being the best choice of tools for VIA assessment. Preference on the dynamic visualization tools was the primary choice due to the ability to reveal more abstraction of information and better viewpoints.
- The indication of distinguishing equivalence exist in both groups (designers and non-designers), suggest a possibility that the VIA decision using perception-based approach made by a group of experts or lay public can be used as a consensus decision to get more reliable VIA results.

Conclusion

This research suggested the possibility of the distinguishing equivalent between the experts and lay public gained from designers and non-designers surveys. The findings of this research have the potential to contribute towards the direction of getting

a more reliable VIA result. Among the key factors that contributed to the design decision of VIA were the visual complexity, the user's prior knowledge or visual experience, the choices of visualization tools and the depth of information represented by the visualization tools. Improvement of the data would be better with bigger input of respondents on the human visual perception with different sets of environment such as modern streetscape, urban park and pocket spaces.

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