VISUAL IMPACT ASSESSMENT (VIA)

A review on theoretical frameworks for urban streetscape

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Abstract. This paper reviews several theoretical frameworks of visual analysis used in computer-based Visual Impact Assessment (VIA) for design decisions in architecture, urban landscape and urban planning. The discussion will focus on the underlying issues of preferences and predictions between designer and lay-public, methodologies of visual analysis, and computing media technologies due to fact that these components primarily contribute towards the result of VIA. Two different sets of visual analysis (i.e. designer's and layman's points of view) are presented based on Sanoff's (1991) arguments that lay-public preferences are always become a second opinion compared to the judgments by designers. These theories will then be developed and used in the VIA experiments to understand the impact of the visuals in different media for viewers' understanding. This paper concludes with a discussion and suggestion of analysis framework to be used for the visual experiments.

1. Introduction

While the current convergence of technologies are powerful to offer designers beyond visualization, communication, collaboration and decision-making, many still rely on conventional medium of expressions and CAD applications. According to Groak (1998) this new technology offers 'new possibilities, extending the scope of good design and, in particular, of increasing the real involvement of clients and users in the design process. Mahdjoubi & Wiltshire (2001) claimed that computer visual simulation or

visual impact analysis (VIA) field is not much closer to an established conceptual framework today than it was 20 years ago. They further highlighted the absence of agreed standards for the production and evaluation of visual simulations carried out by Sheppard's as early as 1982 and later after five years there was still a lack of hard evidence to test existing theory and practice. This gap and the recent widespread use of convergence of technology in the field of landscape design have created an urgent need to develop a conceptual understanding and framework that will be used to test the prevailing assumptions and provide the basis for the development of accepted theory in this field. Three major components will be critically reviewed which are (1) decision-making in VIA, (2) visualization in landscape and (3) visual simulation (Sheppard, 1989). Another important factor includes the possibilities of new and emerging computing media used at different design stages to represent the environments.

2. A review of Visual Impact Assessment (VIA)

Visual impact assessment (VIA) is one of the important fundamentals that should be discussed in planning and design stages for decision making process before any new development taking place especially environments that concern with visual quality. According to CALTRAN (2005), the level of assessments for VIA are ranging from 'informal analysis' to 'complex analysis' and determined by many factors. This includes numbers of viewer groups affected, existence of scenic resources, degree and totality of the proposed changes in the visual environment, local concerns or project controversy, and cumulative impacts along the transportation corridor. Mahdjoubi & Wiltshire (2001) summarised Appleyard's critique of current practice, advocated the following criteria for assessing simulation quality and ensuring response equivalence:

(a) 'Realistic' and 'accurate' to reflect how the project will be experienced.
(b) 'Comprehensible' and 'evaluatable' to enable people of all educational levels to be able to understand the content of the simulation and evaluate it for their own purposes.
(c) 'Engaging' and 'interesting' to keep the viewers focused on the message conveyed by the simulation.

They further explained that these prescriptive and untested ideas however leading to Sheppard (1989) to refine and propose five criteria to improve comprehension, credibility and bias-free visual simulation. These are:

(a) Representativeness: the degree to which simulations represents typical views of the project.
(b) Accuracy: the degree of similarity in appearance between the 'simulated' and the 'real' scene.
(c) Visual clarity: the degree to which detail, parts, and overall content of the simulation can be easily understood and recognized.
(d) Interest: the degree to which simulations hold the interest of the audience.
(e) Legitimacy: the extent to which the correctness of the simulation can be demonstrated and justified.

3. Urban Streetscape

According to Owen (1987), traditionally, streets have been considered chiefly as transportation conduits. He further added that, in recent decades, however, the realization has grown that multi-objective street design is crucial for the support of a variety of public activities, commercial efforts, and residential conditions. Marshal (2005) mentioned that urban street had traditionally united three physical roles: that of circulation route, that of public space, and that of built frontage. He further explained that these three elements may be loosely equated with the linear concern of the transport engineer (the street as one-dimensional 'link' in the traffic network), the planar concern of the planner (street-space as land use) and the three-dimensional concern of the architect or urban designer. The life of the streetscapes is strongly determined by the surrounding physical environment created namely the elements and characteristics of the streets. Following the work of Rudofsky, Appleyard, Lynch, Jane Jacobs and others, designers have emphasized the pedestrian life of the street and the visual and functional elements necessary to support that life (Owen, 1987).

4. Visual Quality

Visual quality of an urban streetscape is built from a street environment that includes primarily on the physical components, climate and human factors. Every component is interrelated and will give different visual impact to the overall surrounding and most importantly the function of the streetscape. Thus the role of VIA is extremely important to control or minimize the change of good visual quality of a space or place before imposing a new development. Similar to Sanoff (1991) explanation, if we are concerned with improving the quality of the physical world around us, it is evident that there needs to be increased awareness of the impact of the visual environment of

people's everyday lives. As Lange and Bishop (2005) stressed that it was estimated that 80 percent of our impression of our surroundings comes from sight.

5. Judgment and Preferences

(a) VIA is often developed and drawn to a greater concern by professional namely landscape architects, urban designers or VIA experts. Sanoff (1991) studied on Craik and Zube 1976 works highlighted that VIA assessments can be developed as observer-based assessments of the environmental quality consisting of preferential judgment and comparative appraisals. The first represents subjective reactions to specific environments, while the latter judge the quality of specific environments against a standard of comparison. These approaches however can increase the tendency of 'biasness' by professional due to the familiarity of the places and designs, and the existence of knowledge and skills within the field. As a result many decision may end up as preference which specifically relates to a personal 'liking' based on experience rather than judgment, that refers to 'critical opinion based on an assessment of merit' or against a standard of comparison (Wherrett, 1996).

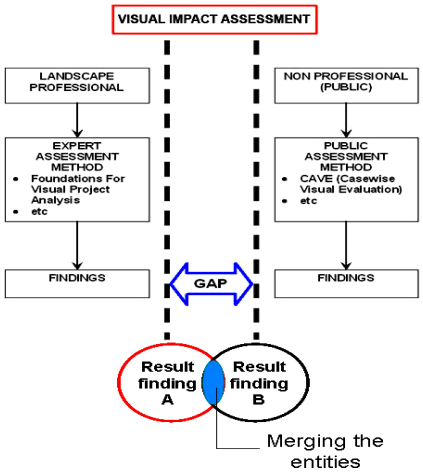

Figure 1. The *'gap'* of assessment results between professionals and users point of view

As Sanoff (1991) highlighted, conventional architectural practice usually undervalues the expertise of the users and denies their involvement in

decision-making. Quite often, design professionals and the public do not share the same aesthetic values. Even though public may no be able to explain or make a good interpretation for VIA, their involvement is necessary from the point of the primary users on the environment, for the improvement of the analysis and reliability of the judgments. From this standpoint, the following challenges are suggested (as illustrated in Figure 1):

(b) Which visual modes give better results for professional and public understanding of the subject matters?
(c) To what extend VIA findings can be used for design-decision?
(d) What are the common denominators and specific categories between professionals and public judgments (or preferences)?

7. Visual Impact Analysis Methods

In recent years, a substantial effort has been dedicated to the development of software tools for design collaboration and shared decision-making (Tsuyoshi, 1994). This work clearly suggested that simulation tools have the potential to improve communication, and above all, favor participation in the design process. However, more research is needed to clarify the potential of simulation tools to arouse interest (Mahdjoubi & Wiltshire, 2001). There are a few methods in VIA that have been developed and currently used by the professionals to assess design environment before making any decision. These methods focused on domains of visibility analysis, mapping techniques, zones of visual influence and viewpoint analysis. Amongst these, the most commonly used are zones of visual influence and viewpoint analysis. In order to measure these components, VIA can be divided into two categories namely:

(a) Visual sensitivity.
(b) Scale or Magnitude of the visual effects.

Taylor, Zube & Sell, 1987 have suggested the Landscape Evaluation Paradigm four components in a VIA model (Sanoff, 1991):

(a) VIA expert: This is based on the assessment conducted by the VIA professionals assuming the ‘judgments’ will be more objective and reliable.
(b) Psychophysical: It suggests landscape is valued for its ability to stimulate responses in observers.
(c) Cognitive: This is considered because of the intellectual or social associations that they make with various settings.

(d) Experiential: Landscapes are evaluated from the active participation in the environment.

It has been recommended by The Landscape Institute (2002) that apart from having a scope of the assessments which often involved the regulatory authorities, the methodology designed for the VIA should be flexible enough to allow modification. This includes their attributes within the urban streetscape context which will influence the VIA results and must be measureable. The attributes within the VIA for such cases should consider the extent of potentials, the views or viewers affected, the distance of view, the degree of visual intrusion of obstruction caused, and the impacts upon character and quality of views (Shetland Islands Council, 2006). Sanoff (1991) suggested four guiding principles to measure landscape and visual impact:

(a) Validity: It is established through the actual relationship between what is purported to be measured.
(b) Reliability: It is the consistency of results with repeated testing.
(c) Sensitivity: Represents the ability of the technique to measure actual differences.
(d) Utility: It is the applicability of test results for a given group or situation.

In the context of urban streetscape, the attributes can be based on the three landscape aspects that have been suggested by The Landscape Institute (2002) as guidelines for landscape and VIA. Three physical roles of urban streetscape are circulation route, public space and built frontage that covers the physical and prescriptive attributes. Assessment for this often involves quantitative and qualitative evaluations. However, that assumption can be correct only if the quality of information generate by VIA method is acceptably high. Effective decisions are possible to the degree that the information upon which they are based is both accurate and appropriate to the issues at hand (Feimer et al., 1979).

8. Computing Media Technologies as Visualization Tools

The rapid development of the computing media and convergence of technologies as visualization tools have introduced new opportunities and representations of visual and other senses to have a better understanding of the environment. Mahdjoubi & Wiltshire (2001) identified five areas on the potential of the current media and what researchers have developed

primarily to engage and associate computer and new media for VIA. These are:

(a) Interest engagement in simulation evaluation: While efforts on the development of software tools for design collaboration and shared decision-making is higher, more research is needed to clarify the potential of simulation tools to arouse interest.
(b) Comprehension in simulation evaluation: Apart from simple presentation, comprehension as an aid of participation in the decision-making process suggested to associate multiple media for a better understanding and higher participation.
(c) Representativeness: Visual simulation material, as a means of building or landscape representation, often resulted in an unfaithful representation (often act as a 'selling point') of the environment.
(d) Realism and accuracy in environmental simulation: Work in this field often produced mixed results. They may have rated some abstract simulations highly, as they believed they contained enough visual properties to achieve response equivalence.
(e) Visual realism and level of detail: The strongest criticism of the visual realism approach is related to their lack of flexibility and poor understanding of how designers work. Photorealism was criticised for being too complete and non-negotiable. It seems that design-trained viewers were more sensitive to the architectural details contained in the model.

9. Conclusion

This research has given an overview of VIA development from various perspectives. It is clear that more knowledge is required, before researchers can provide useful guidance on the framework of computer-aided VIA in the context of urban streetscape or environmental design at large. The questions on the visual modes that are useful and give better results still to be the main concern. At present, the common denominators and specific categories of results from professional and users point of view are still limited thus suggesting a gap for this research to be carried out. The demand becomes critical with the strong environmental designers relying on visualization tools, multimedia representation and other computer-aided design software that often conflict with the needs of designers design decision.

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