

## **CHAPTER 3: LITERATURE REVIEW**

In response to the problems discussed in the previous chapter, it is necessary to preserve traditional Thai shopping environments as a cultural heritage by identifying their significant aspects such as importance and cultural relevance. To be able to preserve these important aspects, it is necessary to identify and understand people's different perceptions and preferences for these shopping environments, both traditional and modern environments. The understanding of people's perceptions can help those who are involved in the process of designing, managing, and developing shopping environments to preserve and enhance the important aspects of traditional shopping environments in the new global economy. An environmental perception research approach is used to understand people's perceptions and identify important aspects of their perceptions for the environment.

The focus of this dissertation is on the preservation of traditional shopping environments by using a perception and preference study of different shopping environments. This literature review chapter discusses previous literature that provides an underlying theoretical and methodological basis for this research. To identify and establish research design and research components, it is necessary to draw upon literature from related areas, especially the broader area of environmental perception and assessment, as an appropriate approach to study shopping environments. Since the whole body of literature is large, and not all of the literature in the field is related to this research, this review is, therefore, selective. It deals with literature that provides approaches, directions, methodologies, or implications for this research.

This literature review provides an overview of different research paradigms of environmental perception and assessment studies, which include expert and public paradigms in environmental perception and assessment research. The review subsequently focuses primarily on environmental preference research, including a discussion of study components, specific models and methodologies, theoretical frameworks, and cumulative findings related to this research.

### **I. Environmental Perception and Assessment Study**

The review of environmental perception and assessment studies is discussed in the following order. First, the overview of research paradigms is discussed. This section includes discussion of two major research paradigms in this field: expert evaluation and public evaluation paradigms.

Second, environmental preference research is reviewed. This section discusses environmental research by components, study models, theoretical explanations, and cumulative findings from previous environmental preference and related research. Each of these sections is discussed in detail below.

## **Overview of Research Paradigms**

Many approaches are used to understand and evaluate these environments. The approaches include those that apply expert judgment and those that use public evaluation. Both approaches can be conducted in subjective and objective manners. Different scholars in the field of environmental psychology have attempted to categorize these literatures into sets of categories (Carlson, 1977; Groat, 1995a; Helliwell, 1978; Zube, Sell, & Taylor, 1982).

Helliwell (1978) divides research on landscape appreciation into landscape architect approach, psychological approach, and mathematical model approach categories. Carlson (1977) describes research on the aesthetics of natural environments as objectivity, quantification, egalitarian, and formalist. Zube and others (1982) refers to landscape perception research as expert, psychophysical, cognitive, and experiential. Groat (1995a) categorizes research on the meaning of places as theories of place, prototypicality and expert judgments in aesthetic evaluations, and meaning of home. Although these authors' focus categories vary, there are common agreements among their work. The categories are described by criteria such as: sources of judgment (expert and non expert), psychological constructs (psychophysical and cognitive), methods of measurements (quantitative or qualitative), and measurement concepts (physical qualities, stated preference or scenic beauty, and experience).

Since the previous reviews used different categorization, it is necessary to re-categorize the previous studies to fit the scope of this research. In light of these categorizations, there are categories that provide a wide context for this research. These categories can be divided by the sources of judgment into expert and public evaluation paradigms. The expert evaluation paradigm is comprised of formalist and experiential approaches, in which experts solely perform the judgments. The public evaluation paradigm is comprised of qualitative, psychophysical and cognitive approaches, in which the general public perform the judgments. A study may fit into more than one category if more than one approach is applied. The categories are displayed in the following table. A discussion of each approach is provided. Since the public evaluation paradigm is more related to this research, it receives more detailed discussion.

**Table 3.1: Categories of Research on Environmental Perception and Assessment**

<b>Categories of Previous Research on Environmental Perception and Assessment</b>					
<b>Sources of Judgment</b>	<b>Subjective Evaluation</b>	<b>Objective Evaluation</b>	<b>Measurement Methods</b>	<b>Data Collection</b>	<b>Type of Research</b>
Expert	Formalist Approach: by Designers and Resource Managers		Qualitative (Descriptive) Quantitative (Subjective Rating)	Physical characteristics: form, pattern, line, shape, and texture Composition:	Resource Management, Resource inventory
	Experiential Approach: by Geographers		Qualitative (Descriptive)	Direct experience and interaction with the environment	Sense of Place, Phenomenological Analysis
Public or Non-Expert Layperson		Qualitative Approach: Place Meaning	Qualitative (Verbal Descriptions from Respondents)	Interview and Open-Ended Questionnaire	Meaning and Perception of Place
		Psychophysical Approach: from Environmental Psychologists	Quantitative (Measurement: Human Response to Specific Visual Stimuli)	Survey Data: Rating Scale, Ranking, Sorting, Pair Comparison, Semantic Differentiation	Experimental and Quasi-Experimental Design
		Cognitive Approach: from Environmental Psychologists	Quantitative (Measurement: Holistic Evaluation, Perception or Cognitive Response to the Physical Environment)	Survey Data: Rating Scale, Ranking, Sorting, Pair Comparison, Semantic Differentiation	Perception Study, Landscape Evaluation and Appraisal, Scenic Beauty

### **Expert Evaluation Paradigm**

The expert evaluation paradigm is based on the assumption that objective analysis of trained professionals or experts is a valid form of evaluation of the environment and translation of its qualities into useful strategies that can be used in design and management (Zube et al., 1982). This paradigm is applied in different fields such as design profession, resource management, and geography. This paradigm includes research on physical characteristics of the environments by design and management-related professions and on the experiences of active observers of the environments by geographers. This paradigm is divided into formalist and experiential approaches.

### **Formalist Approach**

The formalist approach is employed by scholars in design and management fields such as urban design and design, planning, and management of landscape and visual resources. This approach applies descriptions of physical characteristics in both qualitative and quantitative formats. Qualitative descriptions of physical characteristics are described in terms of physical qualities

such as form, shape, line, and texture, or by compositional qualities such as unity, proportion, harmony, contrast, and diversity. Quantitative ratings are also performed by assigning numerical value to the landscape according to predefined categories such as balance, proportion, unity, uniqueness, harmony, contrast, and diversity. This approach can deal with both specific and general settings and provides implications for design and management of the physical environment.

However, the formalist approach is criticized as being subjective, lacking user involvement, and incompatible with users' perceptions. As proved empirically, the categories described by the formalist approach or by designers do not match the categories derived from the lay public (Groat, 1995b; Kaplan & Kaplan, 1995). The qualities described are also difficult to quantify or precisely define, and can be unreliable because their subtle relationships are subconsciously viewed (Helliwell, 1978). In general, this approach may not be able to account for meanings and visible activities, which are more significant than built structures in shopping environments. However, this approach may provide insight for inventory and pilot processes for the study of physical characteristics of shopping environments.

### **Experiential Approach**

This approach suggests that the aesthetic quality of an environment is inseparable from its meaning to people. Both aesthetic quality and meaning are difficult to separate from a particular context and from other emotional experiences (Zube et al., 1982). This approach is usually based on phenomenological exploration and sense of place. It considers landscapes' values to be based on the experience of human-environment interaction, whereby both elements are shaped in the interactive process (Zube et al., 1982).

The phenomenological perspective is employed both in architecture and humanistic geography. This approach uses a descriptive form of evaluation based on the researchers' roles as active participants who observe and interact with the environments. The advantage of this approach is that it accounts for interaction among physical and social elements, and meaning. However, it is criticized as being subjective, in that people may not view the environment the same way as the researchers do. The resultant evaluations and meaning from the experts may not be related to those of the people that the researchers refer to, or may not account for the differences among subgroups of users (Groat, 1995a). Although this approach deals with specific and existing places, it provides little implications for design and management of physical environments. As previously discussed, this approach can offer insight into the study of certain aspects of shopping

environments, such as exploring the sense of place, established identities, and the experience of being in the place.

## **2. Public Evaluation Paradigm**

The public evaluation paradigm is derived from qualitative research in the social sciences and quantitative measurement from psychology. This paradigm is conducted by researchers using collective judgments from non-expert public or laypersons who have no professional training or skill. The public evaluation paradigm is divided into qualitative and quantitative approaches.

### **Qualitative Approach**

The qualitative approach is based on objective descriptions of environmental characteristics, qualities, and meanings by laymen. The data are collected via interviews or open-ended questionnaires. This approach accounts for respondents' own constructs in descriptions. It is usually used to study familiar and local places, where the respondents are insightful. It yields understanding about the individual's identity with place and the meaning of place to the individual. An example is a study by Newell (1997), which applies a non-visual verbal survey to examine environmental preference and choice of valued and favorite places identified by individuals. Although it is based on people's relationship with place, this approach does not provide general implications on design and management of environments, due to its lack of generalizability.

An important work using this approach is Lynch's (1960), which collects cumulative displays and descriptions of people's cognitive maps of a city. The results are concluded in terms of physical characteristics of place that aid recollection or imageability, such as edges, paths, nodes, districts, and landmarks. This study can provide understanding of imageability of public spaces such as shopping environments. A shopping environment can contain nodes, paths, and landmarks within its space, and at the same time can perform as a node or district within a city.

This approach provides the reasons for respondents' reactions to environments. It can be used to triangulate another quantitative approach to help interpret the results in terms of underlying reasons. This approach is successfully used along with quantitative analysis to help interpret results. An example of the use of qualitative data to clarify quantitative results can be seen in a study by Woods (1995), which is discussed in detail in the following section.

## **Quantitative Approach**

The quantitative approach is derived from the stimulus-response approach of experimental psychology, which views the environment as a source of stimulus to which the individual responds (Zube et al., 1982). This aspect can be perceived with or without cognitive processing. The non-cognitive psychophysical approach can be seen from the works of Gibson (1966; 1979), Brush and Shafer (1975), Shafer and Brush (1977), and Daniel and Boster (1976). The cognitive approach can be seen in the more recent works of Stephen and Rachel Kaplan (Kaplan, 1985; Kaplan & Kaplan, 1995; Kaplan, 1979; Kaplan & Kaplan, 1983), and Thomas Herzog (Herzog, 1984; Herzog, 1987; Herzog, 1995a; Herzog, 1995b). In the context of shopping environments, the cognitive process seems to play an important role in perception and preference for this type of environment, since it relates to several aspects such as functions and value. Therefore, the cognitive approach is discussed in more detail.

The cognitive approach is based on the cognitive theory that human reaction is both innate and learned (Kaplan & Kaplan, 1983). It involves assessment through analysis of general public or selected populations' evaluations of environmental properties, based on natural reactions to visual stimuli. Environmental properties are assumed to convey a stimulus response relationship to observer's evaluations and behaviors.

The cognitive approach also involves human meaning associated with environmental properties. Information is received by human observers in conjunction with past experiences, future expectations, and socio-cultural conditions (Zube et al., 1982). This approach measures human response by 1) using holistic judgment criteria such as preference or scenic quality and dimensional analysis methods in exploratory model; 2) measuring relationships between significant variables and other predictors to identify predictive ability; or 3) using predefined stimuli as independent and control variables in experimental or quasi-experimental design. The exploratory model accounts for perception patterns, contents of stimuli and how they are organized. The predictive model predicts the dependent variable according to independent predictor variables. The experimental model accounts for the effect of stimuli by control and intervention of stimuli and level of intensity or amount of stimuli.

However, this approach is criticized for dealing primarily with what happen in people's perceptions rather than in the physical environment. It measures constructs being used, but does not account for interaction between people and the actual environment. The constructs used by the respondents may be different and incomparable among respondents. Moreover, this approach

tends to deal with specific existing environments and provides less precise results in cases of an exploratory approach. This approach tends to provide limited implications for design and management based on the sample of tested stimuli. In spite of these disadvantages, this approach is still the most useful in studying people's perceptions of and preferences for shopping environments, since it relates the most to the required information for answering the posted questions. The cognitive approach, particularly the preference approach, will be discussed further in the following section.

All of the above approaches provide an understanding of how environments can be evaluated and studied in relation to people's perceptions. The expert evaluation paradigm—formal and experiential approaches—provides an understanding of environmental characteristics and the meaning of the environments. The public evaluation paradigm—quantitative and qualitative—provides a rationale and methodological basis for the study of shopping environments. This research attempts to deal with perceptions of the ordinary shopper; therefore, it follows the public evaluation paradigm. A research field of the public evaluation paradigm, called environmental preference research, is chosen and discussed further in the next section.

## **II. Environmental Preference Research**

Environmental preference research is a research field that follows public evaluation paradigm. As discussed in the last chapter, environment-behavior study provides an approach to this study, through people's perceptions of the environments. The preference approach is used to learn about preferences and perceptions with regard to environments. This section describes studies that use preference approaches. Although the focus is on preference studies, other perception studies are closely related. Therefore, some perception studies, without measuring preference, are also discussed.

The previous studies are described by study components, study models, cumulative results, theoretical explanations, and a review of the most relevant study. The study components are comprised of settings, responses, and users. Study models include exploratory, predictive, and experimental models. Cumulative results are derived from significant and common findings from the reviews of previous studies. Theoretical explanations are the theoretical components and frameworks underlying research in this field. The discussed theoretical components include preference framework (Kaplan & Kaplan, 1983) and arousal theory used by several studies in

urban environments and design review (Nasar, 1997). In the last section, the most relevant study of preference for shopping environments (Woods, 1995), is reviewed.

## **1. Research Components**

A framework of environment-behavior phenomena is composed of four components—places, user groups, socio-behavioral responses, and time (Moore, 1997). However, time was not commonly addressed in environmental perception and preference research, and in most cases, was controlled by the use of photographic media, in which images were captured at specific times. Therefore, the three components discussed are the major components of environment-behavior research. The following part of this literature review focuses on these 3 components: settings, responses, and users. Settings refer to the environments being studied. Responses refer to the measurement or outcome of the reaction being recorded, and users refer to the respondents who represent general users of the environments and provide the responses. Each of these components is discussed in detailed below.

### **Settings**

Settings refer to the specific environments being examined. A variety of environments were studied for different purposes in different fields. People's perceptions and preferences for the environments depend on types. Different types of environments provide different functions, and convey different meanings to different people. Different environments are studied separately, except when they were compared. In general, the focused environments are sampled to contain the representative characteristics, elements, and conditions. In some studies, unique conditions are manipulated to test their effects on perception and preference.

Preference researches have been conducted on a wide variety of environments, from distant to intimate, and from large to small-scale. The settings are categorized as natural, urban, mixed, residential and building façade, and interior. The purposes include natural resource management, aesthetic appraisal, design review, building code and regulations, environmental improvements, test of theoretical components, and most important, understanding specific human-environment relationships. Perception and preference researches are conducted in the fields of environmental psychology, natural resources managements, urban design and planning, architectural psychology, and landscape perception and assessment.



## **Natural Setting**

Preference research has been widely used in studies concerning natural environments, particularly in the natural resource management field. The purposes were to understand and identify attitudes of people toward nature and its important characteristics and elements, to assess the effects of human influences in the natural context, and to understand the perceptions and preferences for natural environments of people from different subgroups of the population. The information gathered can be used to help policymaking, to preserve and improve natural resources, and to provide recreational services. The implications of such studies concern specific groups of the population whose consent and desires need to be met.

Studies by Stephen Kaplan provide a basis for research in natural environments. Kaplan (1979b) suggests that there are both communalities and differences in people's perceptions of natural environments. This argument provides the possibility to solicit the regularity of perceptions and preferences using an objective concept such as preference rating. Another work (Kaplan, 1979a) introduced a specific approach to identify perceptions of environments using preference rating. The so-called Content Identifying Methodology (CIM) provided a specific procedure to obtain perceptions from patterns of preference derived via dimensional analysis, which used a factor analytical method. This approach yields human perceptions of environments in terms of categories possessing common contents and spatial configurations (Kaplan, 1979a). Preference rating and CIM will be discussed further in the following sections.

Following the CIM approach, researchers such as Thomas Herzog have attempted to understand people's perceptions and preferences for different natural settings. These settings include field and forest (Herzog, 1984), mountains, canyons, and deserts (Herzog, 1987), and waterscapes (Herzog, 1995b). These studies attempt to study the environments as a function of content categories, viewing time, and preference predictors such as coherence, spaciousness, complexity, mystery, texture, and identifiability. The results from these studies provide important perceived characteristics of the environments and the relationships among preferences for specific categories and predictors.

Landscape style as an influence of humans on natural environments is also studied. Yang and Brown (1992) compared preferences for different landscape elements and styles of people from different cultures; they found that there were differences in preferences. Among three styles, traditional Japanese was the most preferred. People tend to prefer landscape styles other than their own. In this study, the Korean sample preferred the western style, while western tourists

preferred the traditional Korean style. This study provides insight into the relationships between preference and style.

Although most of the perceptions of natural environments are positive, Bixler and Floyd (1997) examined negative aspects of perceptions of natural environments. Three domains of variables (fear, disgust, and adaptation level) were examined with preference for wilderness. The authors found that negative perceptions of characteristics and activities associated with the wilderness were negatively related to lower preference for wilderland environments, but were positively related to preference for indoor environments. This preference pattern was specifically found in rural and suburban samples of the population, who were supposed to be more exposed to natural environments.

Several researchers have also assessed the effects of human influences on natural environments. The human influences of interest include the presence of people and man-induced conditions (Carls, 1974), users' attitudes toward development and facilities in natural recreation areas (Wohlwill & Heft, 1977), fittingness of man-made structures in natural settings (Wohlwill, 1979), and congruity or contrast for manmade features in natural recreation settings (Wohlwill & Harris, 1980). Although people generally prefer natural over cultural environments, some studies found that a moderate level of contrast in influenced natural environments is the most preferred.

### **Urban Environments**

Preference research dealing with urban environments has been conducted for several purposes, such as design review, planning regulation enforcement, and improvement of environmental conditions. Studies of urban environments focused on specific characteristics of urban settings such as urban skyline, urban signscape, assessment of effects of natural features in an urban context, and influences of differences in people's backgrounds on differences in perceptions and preferences for urban environments.

Studies on specific characteristics of urban environments include studies dealing with urban signscapes and tall buildings and the urban skyline. Nasar and Hong (1999) examined preference for signscapes in urban downtown streets and found that reducing sign obtrusiveness can increase preference for the scenes. In another study by Heath, Smith, and Lim (2000), preference for urban skyline was examined as the effect of silhouette and tall building complexity. Preference was found to be influenced by the degree of silhouette complexity resulting from the composition of tall buildings rather than the complexity of the tall buildings per se. The implications from

these studies can be used to enhance urban design aesthetics regarding characteristics of urban settings through regulations or codes.

Another important aspect of studies of urban environments is assessing the effects of nature in an urban context. The effect of natural elements such as vegetation has influenced a better perception of urban environment. The studies dealing with the effect of adding trees along city streets include one by Sheets and Manzer (1991); the effect of trees on sense of safety and preference has also been studied (Kuo, Bacaicoa, & Sullivan, 1998). Sheets and Manzer (1991) found that the addition of trees affected subjects' cognitions about the positive quality of life and land use of an area. Kuo and others (1998) found that tree density and grass maintenance had strong positive effects on preference and sense of safety. This finding was contrasted to the management and law enforcement ideas that vegetation can increase maintenance cost, and lessen fear and the possibility of crime (Kuo et al., 1998).

Herzog (1995a) examined urban environments containing prominent natural elements as a function of content categories, viewing time, and nine predictors. Older buildings, concealed foreground, tended nature, and contemporary buildings emerged as content categories. The author found that nature has strong influences on preference as proved by the fact that the nature category was the best liked, and that nature was a significant positive predictor of preference. The study also suggests maintenance as an important factor influencing preference.

### **Residential Areas and Building Facades**

Preference studies were also conducted on individual buildings in and compounds. The purpose was to understand the perceptual structure, to understand the meanings in architecture, assess urban design aesthetics, and the effects of style, age, and maintenance on building preference. Building is the most apparent and important element in urban environments. Perception and preference for buildings play an important role in perception and preference for urban environment.

To understand perceptual structure, Horayangkura (1978) conducted dimensional analysis and compared dimensional structures of perceptions derived from multidimensional scaling and factor analysis. Although he did not measure preference as a dependent variable, he did compare results from different methods of measurements, and found that the results yielded similar categories of perceived environments. The three categories found were urbanization (urban-nonurban),

evaluations (like-dislike), and organization (spatial quality) (Horayangkura, 1978). Evaluation, including preference, is always found in the structures of perception.

Preference studies were also conducted for urban design aesthetics and design review of buildings. Nasar (1994) reviewed previous findings and examined 3 types of aesthetic variables—formal, symbolic, and schema, and suggested that there are 3 aspects of affective experience: pleasantness, excitement, and calmness. Pleasantness can be enhanced by order, moderate complexity, and element of popular styles; excitement can be derived by high complexity, atypicality, and low order; calmness can be achieved by high order, and naturalness. Stamps and Nasar (1997), by exploring common design review principles, also found that architectural components of style or individual buildings accounted the most for preference, while other principles such as visual bulk, demographic factors, and personality factors accounted for much less preference.

Another aspect of preference studies on urban buildings has been focused on relationships between preference and interactions among specific qualities such as building age, and nature context (Herzog & Gale, 1996), and complexity and age (Herzog & Shier, 2000). Older buildings were preferred over contemporary ones when building care was controlled, but modern buildings were preferred to older ones without control of maintenance (Herzog & Gale, 1996; Herzog & Shier, 2000). Maintenance plays an important role in enhancing preference in older buildings and in the natural context of the buildings. The impact of the age and nature context was partly mediated by variables such as complexity, mystery, and coherence (Herzog & Gale, 1996). Complexity was also found interacting with rated age, which was negatively related to preference, except at the high level of complexity. The authors also found that a visible entrance and a distant view were preferred (Herzog & Shier, 2000). These studies reveal the importance of maintenance on preference in the context of age, complexity, and natural context.

Preference study has also been conducted on characteristics of individual facades. Stamps (1999) examined physical determinants of preference for residential facades by identifying the relationships of three factors: surface complexity, silhouette complexity, and façade articulation. He found that when the three were varied simultaneously, the most important factor for visual preference turned out to be surface complexity. Silhouette complexity was less important, and façade articulation was the least important. Therefore, preference for building façades can be enhanced by increasing surface complexity.

Studying building façades can reveal people's perceptions of the intended meaning embedded in buildings. Groat (1995b) conducted a study focusing on the meaning of architectural façades to find out whether Post-Modern architecture was more meaningful than Modern architecture, as stated by architectural critics. Analyzing perceptions of laypersons and architects, she found that laypersons could not distinguish between Post-Modern and Modern architecture. Architects were also found to use more complex categorizations, which was different from those of laypersons. Another aspect of study on meaning was conducted on the perceptions of Nazi and Classicist buildings of French-speaking Swiss, and Germans (Espe, 1995). Espe found that since Nazi style was used to express Nazi ideology, it was more recognizable to Germans than to Swiss. Although these studies on meaning did not use preference, they provide insight into how embedded meaning can be studied by using the perception approach. Thus, using a similar procedure, it is also possible to study meaning using the preference approach.

### **Interior Environments**

Perception studies of interior environments have focused on room environments and office spaces, with elements such as furniture and indoor plants. The purposes are to improve and maintain the quality of indoor environments, learn about perceptions, and understand the effects of styles, room elements, and indoor vegetation. The properties of concern are people's emotional responses, styles, configuration of elements of room and furniture.

In an attempt to assess room environments, Wools (1969) used a building appraisal method by producing rating scales—activity, harmony, and friendliness to use in assessing room qualities. Friendliness was used to assess room interior spaces, yielding the result that seating was the most important factor in room friendliness, followed by roof and window (Wools, 1969). Ritterfeld and Cupchik (1996) used a transactional approach to examine responses to dining and living rooms. Three categories, decorative, stylish, and familiar, were found. Subjects found affective judgment easier to make than cognitive judgments. The authors found that the desire to live in a room was best predicted by perceived beauty and personal involvement; involvement was fostered by rating the rooms before writing the story and by a first-person perspective. Familiar rooms were preferred most; and decorative rooms were seen as most informative about a person (Ritterfeld & Cupchik, 1996).

Preference studies were also used to deal with furniture and everyday objects. Whitfield (1995) compared the predictive ability of two theories of aesthetic behaviors deduced from the collative-motivation model (difference and complexity or novelty induced preference) and the preference

for prototype model (fit-in-category induces preference) using normal everyday objects. The findings conformed to the preference for prototype model, which indicated a link between categorical processing of a stimulus and its evaluation (Whitfield, 1995).

Another aspect of preference study of interior environments dealt with the effect of plants. Larsen, Adams, Deal, Kweon, and Tyler (1998) measured the effects of indoor plants on participants' productivity, attitude toward workplace, and overall mood in the office environment, using randomly-altered office space with no plants, a moderate number of plants, and a high number of plants. The authors found that productivity tasks had an inverse relationship to the number of plants, but self-reported perceptions of performance increased relative to the number of plants. Participants also reported higher level of mood, perceived office attractiveness, and in some cases, perceived comfort when plants were present than when they were not. Decreased productivity scores were linked to the influence of positive and negative effect on decision-making and cognitive processing (Larsen et al., 1998).

The versatility of preference and perception study allows the possibility to use such an approach when studying virtually any type of environment, including shopping environments, which are urban and interior environments. The findings from the review of setting component help shape this research in terms of research design and sampling of the environments.

## **Responses**

Responses are derived from human reaction to the environments. In environmental preference research, responses are measured using overall assessment concepts such as preference. Human functioning in the environment depends on information derived from the immediate environment (Kaplan & Kaplan, 1983). There are signs, mainly non-verbal, that guide behavior in specific environments (Rapoport, 1990). A large amount of essential information used to function in the environment is both endowed by nature and supplied by previous experience (Kaplan & Kaplan, 1983). People easily recognize visual information. Visual information or visual stimuli are effective in calling upon stored, associated information. The information used in functioning in an environment is visual and non-visual, and involves potentiality and possibility (Kaplan & Kaplan, 1995). Human functions are also spatially oriented. Both spatial and non-spatial information is coded in spatial terms. While requiring and storing information, humans also simultaneously evaluate it. Human judgment is largely unconscious, rapid, and intuitive (Kaplan & Kaplan, 1995).

People's perception and preferences are examined through their responses to stimuli, representing the characteristics and elements of the environments. In environmental perception and preference studies, the environmental stimuli commonly used are photographic media. People's responses to environmental stimuli are operationalized into measurement concepts. The measurement concepts commonly used are overall judgments, mostly affective judgment; that is preference. The following discussions focus on the use of color photograph as surrogates for the environment, as well as measurements of preference and related concepts.

### **The Use of Color Photographs as Surrogates for the Environments**

Photographic media have been widely used in assessment research because of their practicality and validity. Davis (1989) suggested from his examination of the historical relationship between photography and landscape studies that although technical limitations do exist, creative photography could be an ideal medium to communicate the symbolic and experiential qualities of geographic places (Davis, 1989). Ideally, it would be best to conduct a study using the real environments in question; however, it is not practical for research to take a statistically large number of respondents out to a variety of real environments (Dunn, 1976; Shuttleworth, 1980). It is also difficult to control the condition of the real environments, such as angle of view or lighting, in order that they be constant for different respondents. Another option is to survey those on-site respondents who are already present in the research site. The disadvantage of this option lies in the bias toward high preference, since people tend to visit the environment that they prefer (Shuttleworth, 1980). To overcome the impracticality and disadvantages of using real environments, photographic media can provide laboratory control for experiential variations in the environments (Daniel & Meitner, 2001; Shuttleworth, 1980).

Several researchers have proved that photographic media such as color slides and photographs are valid and useful tools to solicit people's opinions and attitudes about environments. Some researchers successfully tested the validity of photographic surrogates against the actual environments. Others did reviews or meta-analysis of results from several previous studies and found high correlations between results derived from photographic surrogates and those derived from the actual environments.

An early study tested whether photographic media are adequate surrogates for the evaluation of environments (Shafer & Richards, 1974). This study compared respondents' judgments of three types of presentation of scenes from various environments. The evaluations were done on actual scenes, projections of color slides taken from the scenes, and color photographs of the scenes.

The patterns of rating for each scene for the three presentations were compared; they proved adequately similar. The researchers concluded that presentations of color slides and photographs are adequate surrogates for actual scenes of the environments when most of the variations of elements in the scenes are depicted (Shafer & Richards, 1974).

Other studies have also confirmed the effectiveness of photographs in representing landscapes. Dunn (1976) compared preference judgments of onsite and photograph surveys, and concluded that photographs might be used to accurately represent landscapes, within the context of recreationist sample. Dunn suggested that the variations of features depicted and the technical quality of the photographs should be controlled. He also noted that respondents not only judged the scenes by their aesthetic quality, but also by behavioral quality with regard to scenes' suitability for particular activities (Dunn, 1976).

Shuttleworth (1980) reviewed eight previous studies attempting to test the validity of photographic media in environmental perception research. He summarized that all of the studies provided evidence that the assessments of photographic media were similar to those made for the actual environments. In addition, the similarity applied to both overall and detailed responses; however, it was less reliable for the latter. Shuttleworth also conducted a study comparing the ratings from the actual environment, their color photographs, and their black and white photographs. The results indicated no significant difference between overall evaluations and verbal response patterns between the evaluation of the actual environments and their photographs. However, black and white photographs yielded a wider variation in responses than the color photographs. He concluded that the results supported the validity of using photographs as surrogates for the environments (Shuttleworth, 1980).

The more recent meta-analysis study on design review indicates that from the analysis of 152 environments and 2,400 respondents, preferences based on photographs highly correlated (around .86) with preferences based on actual built environments (Stamps, 1994). Stamps also stated that from previous statistical analysis, preference variance due to photographic media was small (only about 4.8 percent) compared to the much greater effect of the scenes (44 percent) (Stamps, 1994).

However, Scott and Canter (1997) demonstrated that evaluations of pictures and the places they represented are theoretically and empirically distinct. In this study, 41 respondents sorted photographs of 20 familiar local places and the same actual places from their memories, and gave the reasons for their sorting. The results from statistical and content analyses indicated that



people conceptualize contents of photographs differently from the actual places. When sorting the photographs, people reacted more to the contents such as landforms and water; however, when sorting the memories of the actual places, they reacted more to the qualities not presented in the photographs, such as activities, people, sounds, and emotions (Scott & Canter, 1997).

However, it is arguable that the difference that Scott and Cantor found is based on physical place versus memory, rather than the effect of the photographs. Therefore, it is always important to be careful about the objectives and interpretations in this study. Whether the contents or the less tangible factors such as meaning or conditions of the places are being studied is important. Daniel and Meitner (2001) also concluded that still photographs might not be valid surrogates for environments that contain dynamic and non-visual elements (Daniel & Meitner, 2001).

From the previous research, it is concluded that color photographic media such as color photographs or color slides are valid surrogates in environmental perception and assessment study. However, they have to be used with caution: 1) the photographs should be able to capture the variety of contents and qualities being studied; 2) the variation of the elements presented in the environment should be controlled; 3) the technical quality of the photographs should be controlled across the samples; and 4) the respondent should be advised about what it is, precisely, that they are evaluating; that is, the environment represented by the photographs, not the memory or photography per se.

The previous studies have proven the reliability and validity of using photographs as surrogates for the environments. The review has provided the appropriate procedures for using color photographs as surrogates to solicit respondents' responds in this research.

## **Measurement**

Measurement is discussed by different methods such as rating, ranking, and sorting, by measurement concepts such as multiple and single scales, and types such as verbal and non verbal. Finally affective judgment, which is used in this research, is discussed.

### **Rating, Ranking, and Sorting**

As previously described, perception and preference research has used several measurements for deriving people's perceptions and evaluation. The major process is to have people evaluate the stimuli by rating, ranking, or sorting. Rating is normally based on the Likert scale, and can be bipolar (such disagree-agree) or via the none-the most manner. Rating can be less consistent,

since each photograph is not directly compared with another; moreover, sequential context can have an effect on rating score. Two scenes can be rated differently at different times. Bi-polar rating scales are often relatively insensitive to potential differences between respondent groups compared to other methods such as repository grid (Groat, 1995a). Ranking and sorting can be more reliable in judgment order, since photographs are carefully compared before being assigned into rank or group. However, rating is the most commonly used method, since it can be done easily and quickly, thus allowing simultaneous inclusion of large samples of both photographs and respondents. On the contrary, ranking and sorting are time-consuming and exhausting tasks; therefore, large samples of photographs and respondents are not convenient.

### **Multiple and Single Scales**

Several measurement scales or concepts have been used in different studies, depending on the purposes. These measurements can be both multiple and single measurements. Multiple measurements include semantic differentiation, in which a set of bi-polar expressive words is used in the rating. Some of the studies used a specific single measurement, such as appropriateness and fittingness. Others used more general measurements, such as similarity or affective judgment. Multiple measurements can be too specific and may not account for all of the constructs that people may have with regard to the environments. They need to be carefully predetermined to cover all the possible constructs. Single general measurements, on the other hand, can cover the overall constructs that people have about environments.

### **Verbal-Nonverbal**

Some of these measurements used a verbal rating, which the respondents rate accordingly. Others used non-verbal ratings that allow the respondents to use their own categories. Verbal rating can be biased from the wording, and can be understood differently by people with different backgrounds. Some specific judgment words can be too abstract or too difficult for people. Moreover, these words need to be carefully defined from previous studies or theories to be appropriate for use in the study. Several words can have the same or similar meaning, and can thus be confusing, thereby creating unintended high correlations between different independent variables. Rating and ranking have been used with verbal-specific multiple and singular scales, while sorting can also be used with similarity or free categorization. Respondents can freely use their own criteria in making judgments, especially in the case of similarity judgments. Verbal ratings are problematic when using with multiple scales such as semantic differentiation rating. However, verbal rating using single scale with overall judgment is not subject to the above problem.

## **Affective Judgment**

Among all of the different measurements, affective judgment has been proven to be easier to make than other judgments (Ritterfeld & Cupchik, 1996). It is also found to be a common pattern among people's perceptions across different environments (Horayangkura, 1978). Several affective judgments have been used in perception research. Among the most widely used are scenic beauty and preference. Preference is a result of perception, thus including innate and learned knowledge (Kaplan & Kaplan, 1983). It is easy to make. People are comfortable and make preference judgments frequently in their everyday lives. Preference tends to include many aspects within it, thus allowing extraction into dimensions. Preference rating reflects all sorts of individual and subgroup inclinations and dispositions. On the contrary, aesthetic appraisals reflect the layman's attempt to employ a commonly but imperfectly understood external standard (Kaplan & Kaplan, 1983).

Regardless of the measurement methods used, there were similarities in patterns of perceptions yielded by different measurement methods. Horayangkura (1978) compared patterns of perceptions of people for residential areas resulting from semantic differentiations (analyzed by factor analysis) and multiple sorting (analyzed by multidimensional scaling) and concluded that the structures revealed by the categories' characteristics are similar. Both are comprised of three basic categories: evaluation, spatial, and potency (Horayangkura, 1978). Evaluation, which is especially effective, is a major category people use in making judgment. Unfortunately, no study reported a comparison between single verbal rating and sorting task.

Review of previous studies using different measurements provides the basis for this research. With the advantages already discussed, single-scale rating is chosen for this research, since it is simple and takes less time to complete. The verbal type, using a simple, overall affective judgment, is appropriate to this research because it is easy and suitable for the lay public.

## **Users**

This part discusses the issues related to respondents as users of the environments, including consensus and differences in human reactions to the environments. Individual characteristics of users are the sources of differences in perceptions and preference for the environments. From an evolutionary perspective, some aspects of preference are innate, and therefore, universal, while others are learned and based on experience, and are thus different by groups.

## **Consensus and Difference**

Both consensus and difference in preference are found in preference research. From an evolutionary perspective, some aspects of preference for the environments are innate and tend to result in consensus in preference. These aspects include the tendency to prefer perceived characteristics that facilitate primitive living, such as prospect and refuge (Appleton, 1975). Others are the tendency to prefer characteristics that provide making sense of, and involvement with, the visual environments (Kaplan & Kaplan, 1983). These theoretical components demonstrate universal aspect of preference for the environment. This universal aspect can lead to consensus of preference that can be a requirement in effective implementations of environmental design, policymaking, and management, affecting overall or large portions of the population. Many studies have found that people recognize similar spatial configurations, and that some environmental characteristics such as vegetation and water are universally preferred (Kaplan & Kaplan, 1995). Consensus was also found to depend on scenic quality (more consent on high preference scenes) and on how well the visual stimulus matched subjects' mental image of the landscape type (Hagerhall, 2001).

Although consensus in the result of the study is useful for suitable action, differences are also valuable. Information about different reactions of different individuals can provide more detailed information about people and their environments. The differences lead to appropriate design and management of environments where certain groups of people are concerned. Moreover, it is necessary to identify these differences in case there is potential conflict between groups with different interests and needs. It is useful to identify the relationships between different groups of people, and different environments, through different reactions.

Perception and preference studies deal not only with characteristics of the environment, but also with the attempt to account for differences in perceptions and preferences that result from people's different backgrounds. Differences in preferences of people with different characteristics were studied as functions of groups. Differences in preference for the environments resulted from familiarity with the environments (Kaplan & Kaplan, 1995). Different groups of people have different schema of the environment due to their knowledge and familiarity (Rapoport, 1990). The sources of variations were attributed to different cultures, subcultures, demographic backgrounds, knowledge, and personality (Kaplan & Kaplan, 1995; Nasar, 1997).

## **Culture**

Culture is found to be a major source of variation in perception due to informal learning. Culture provides people a framework for interpreting the stimuli and meaning embedded in physical environments (Rapoport, 1990). People are familiar with the environments where they are from. Therefore, different people have different preferences, and they interpret environments differently.

Consensus and difference were found in cross-cultural studies. In two similar preference studies of Australian and American samples for Australian landscapes, patterns of preference across groups and perceived categories of landscapes were found similar (Herzog, Herbert, Kaplan, & Cook, 2000; Kaplan & Herbert, 1987). Differences were found in patterns of perception and magnitudes of preferences between Australian and American samples (Kaplan & Herbert, 1987). Different groups, based on their knowledge, perceived the specific contents of the categories differently (Herzog et al., 2000; Kaplan & Herbert, 1987). Familiarity may influence in the higher overall preference of the Australian sample for their own landscapes, especially the native sample.

Familiarity with the environment may produce different results. Yang and Brown (1992) found that there were differences in preferences for landscape elements and styles of people from Korean and Western cultures. Consensus was found in the highest preference for the traditional Japanese style. Difference is found in that Koreans preferred the western style, while the western tourist preferred the traditional Korean style (Yang & Brown, 1992). In this case, people's familiarity with their own cultural landscapes resulted in lower preference.

Familiarity, in some cases, may not responsible for differences in preference. Purcell, Peron, and Sanchez (1998) found that frequency in occurrence or familiarity experience could account for different affective experiences between architect and public groups. However, familiarity was not related to affective experience between laypersons from different age groups. When frequency of occurrence is irrelevant, the more cognitive processes come into play, resulting in preference for prototype model.

## **Training and Knowledge**

Training or formal knowledge is also a commonly found source of variation in preference for the environment. Training in environmental fields, especially design-related fields such as architecture, landscape architecture, and interior design, was found to influence preference for

environments (Buhyoff, Wellman, Harvey, & Fraser, 1978; Kaplan, 1973; Nasar & Kang, 1999; Pennartz & Elsinga, 1990; Purcell et al., 1998; Whitfield & Wiltshire, 1995). On the contrary, other training, such as planning, had no significant effect, while personal interest in environmental issues was found to influence preference for natural environments (Dearden, 1984). Training in the field provides people with more familiarity to certain types and aspects of environments, which results in their differences in preference as opposed to those of the general public. This is evident in the common finding that architects prefer high-style buildings, while laypersons prefer popular style (Nasar & Kang, 1999; Purcell et al., 1998). One reason responsible for the difference is that architects' perceptual schemes are different from those of the general public (Pennartz and Elsinga, 1990). The level of difference tends to increase with the increasing years in training (Whitfield & Wiltshire, 1995).

Since these professionals are responsible for design and management of environments, they need to acknowledge these differences, and learn how to obtain and use the information from the public in their works. Therefore, there is always a need for collecting information from the public for design and decision making about environments for people.

### **Sub-Cultural and Demographic**

Other group differences can be viewed as a sub-group of the population or demographic differences. These subgroups include age, living locations, gender, and income. The focus tends to be on age as a developmental trend (Herzog et al., 2000; Pennartz & Elsinga, 1990), and variables that tend to create differences in familiarity with environments. Other socio-economic and demographic backgrounds have hardly been found to be significant in creating differences in preference for environments (Dearden, 1984; Nasar & Kang, 1999; Strumse, 1996).

The differences among these groups require attention in design and management of environments. When the decision-making process concerns certain groups, preference and perceptions of these groups should be studied and taken into consideration. Moreover, the designers and managers should be aware of their differences in perceptions and preferences from the public, especially when the design or management objectives are for the public. Consensus and difference in preferences of people form an important factor to be identified in this research.

The review of three research components—settings, responses, and users—has provided basic components to the design of this research to deal with environments by soliciting responses from

people. Informed by the review of previous studies, all three components are incorporated in the design of this research.

## **2. Study Models**

In preference studies, three major proposes can be viewed as leading to three difference research designs or study models: exploratory, predictive, and experimental models. The exploratory model is used to identify aspects, factors, and characteristics of environments that are important to people, without or with limited predefined variables or relationships. The predictive model is used to predict or find the expected relationship between the dependent variable, preference, and pre-identified predictors. The experimental model is used to compare or assess the effect of certain conditions including different types of environments, different groups of people, or different conditions being studied. Many studies have applied more than one model to answer different research questions.

### **Exploratory Model**

The exploratory model is used to explore or identify the important aspects or characteristics that contribute to preference. These include a simple qualitative method such as analysis of the most and least preferred scenes, and more complicated quantitative methods based on data reduction techniques. All of the following methods share a similar purpose: to find meaningful patterns from available data.

#### **Analysis of the Most and Least Preferred Scenes**

There are several analytical methods used in the exploratory model of perception and preference studies. The very basic method used is descriptive analysis. This method includes visually-observed frequency, means, and standard deviation. One specific method used to find important factors or characteristics of the environments is analysis of the most and least preferred scenes. The procedure is: first, to rank all of the scenes by their means preference; second, select a group of scenes with the highest means and another group with the lowest means; third, examine the characteristics or contents that are common to the most and the least preferred scenes. The comparison of the common characteristics is expected to reveal the important characteristics, causing positive and negative tendencies in preference.

Analysis of the most and least-preferred scenes has been used in an earlier study by Kaplan and Herbert (1987). Kaplan and Herbert used analysis of the most and least preferred scenes to

examine the general tendency for scene preference of each of the three respondent groups. They found that the most preferred scenes for each sample tended to have a mix of water and mature forest, with some topographic variation. On the contrary, the scene showing a mining site was the least preferred. The analysis also revealed the differences between two groups with the same culture, which was attributed to the use of native plants (Kaplan & Herbert, 1987).

A more recent study, by Yang and Brown (1992), used analysis of the most and least preferred scenes to examine a set of landscape scenes, which included 3 styles and 4 elements. The most preferred scenes were comprised of water with reflections, and an open and long view. The least preferred scenes were uniform, and had rock or stone, little or no vegetation, rectangular elements, and blocked views. This analysis was also conducted on the scenes with each style, element, and on each of the two subgroups of respondents, Korean and western tourist. This analysis is useful for the present study because the scenes were predefined into subsection, styles, elements, and were tested with two subgroups; therefore, the categories were already established for comparison.

However, this method alone is not bias-free. The research may examine the scenes with certain criteria and categories in an expert manner, which may not be the same as the categories used by the general public. Experts' categories have been proved to be different from those of laypersons (Groat, 1995; Kaplan, 1973; Kaplan, 1985; Kaplan, 1979b). Therefore, to allow the perceptions of the public to emerge without bias from an expert point of view, objective methods of generating patterns have been used to derive the public's pattern of perceptions and preferences.

### **Dimensional Analysis**

This exploratory model involves finding what the important factors or variables in people perceptions and assessments of the environments are. With least to none predefined variables, the attempt is to generate patterns or dimensions of preferences. These patterns or dimensions are expected to be a set of meaningful and related stimuli that people react to in similar ways. This approach is largely a way to understand how people see the environments in categories. The general method is to reduce the large number of items or variables into smaller manageable and meaningful sets from data derived from rating and ranking or sorting.

The widely used analytical methods are factor analysis, multidimensional scaling (MDS), and (rarely) cluster analysis. By these methods, stimuli or variables are reduced into smaller number of groups with similar characteristics based on correlations or magnitudes. The groups called



factors, dimensions, or clusters are expected to yield meaningful and interpretable sets of stimuli relating to patterns of people's perceptions. The variables entered into the model can be rating or ranking scores of individual scenes or collapsed scores from semantic differentiation ratings. Factor analysis and cluster analysis are commonly used with rating data, while MDS can handle all rating, ranking or sorting data. Patterns or dimensions derived from the analysis consist of a group of items or stimuli, which can be adjective pairs or photographic scenes. Each dimension can be named and interpreted by the common characteristics of the items comprising the dimensions. Degree of representation can be determined by the loading scores, in case of factor analysis, or the furthest location in the analysis space, in the case of MDS.

### **Dimensional Analysis from Multiple Rating Scales**

The early studies attempt to find patterns of perceptions from multiple evaluative rating items. This approach can also be viewed as constructing smaller sets of scales from multiple possible evaluation criteria. The multiple rating items could be derived from semantic differentiation scales such as adjective pairs, or multiple ratings of several variables such as measurement of areas and perimeters of elements from photographs. These items were grouped together by factor analysis.

One example of the attempt to generate patterns or dimensions from multiple variables was the study by Carls (1974). Carls collected a set of characteristic variables such as areas and perimeters of different areas of scenes, and entered these into a factor analysis procedure. The derived factors or dimensions were used as independent variables in further analysis. This attempt was not very useful, since areas and perimeters with the same content, such as water, were grouped together. However, the method helps eliminate the unrelated items from further analysis.

An example of semantic differentiation items can be seen in the work of Calvin, Dearing, and Curtin (1972), who tried to assess preference for natural landscapes. 21 semantic rating scales and 6 area variables were factor analyzed. Three factors or dimensions (natural scenic beauty, natural force, and natural starkness) were found. Area variables were grouped in the last dimension, which was not related to the other two. This study grouped completely different items separately. It is probably more meaningful to group the items that are not completely different.

An example of the use of factor analysis to construct related scales from multiple rating scales was the work of Wools (1969). Wools used the rating of 49 pairs of adjectives on a 7-level hot-

cold scale to construct 3 scales using factor analysis. The analysis yielded three dimensions— activity, harmony, and friendliness. Friendliness was selected to use in a further part of analysis.

Different use of factor analysis can be seen in a study by Espe (1995), which used Q and R types factor analysis to generate patterns from both scenes and semantic differentiation ratings. Q-type factor analysis was used to group variables (columns), while R-type was used to group cases (rows). Q-type factor analysis yielded two factors. Only one, Nazi-Classical, was meaningful and interpretable. R-type factor analysis yielded three factors: simplicity and uniformity, brutality and intimidation, and heaviness and eternity. This approach is complicated, and similar to conducting two set of factor analysis on two different sets of rating, semantic differentiation, and scene rating.

The general disadvantage of using several rating scales on multiple scenes is that it provides 3 categories of information. Data were collected by cases (respondents), scenes, and rating scales. However, factor analysis only allows a row-by-column format, which means that one category has to be eliminated. This requires collapsing a category or summing data from one category into another one. For example all of the individual ratings of each scene may have to be averaged into one mean rating of that scene to be entered in factor analysis via a scene-by-scale format. Therefore, some information will be lost in that process.

This example can be seen in a study by Ritterfeld and Cupchik (1996) using factor analysis on the rating of 37 scenes from interior environments on 9 rating scales. The data obtained are a rating of each respondent on every scene and on each rating scale, comprising 3 sets, which need to be collapsed into row x column format to be able to be analyzed by factor analysis. Therefore, the three categories of data (by cases, by rating scales, and by scenes) were collapsed into two. This result led to a complicated judgment, since some of the information was eliminated (either cases or scenes). In this example, data of scenes were averaged; thus, characteristics or contents of the scenes do not get enough attention.

This disadvantage is not relevant if used properly, as in a case in which one category is not of interest. For example Sheets and Manzer (1991) also used factor analysis in an experimental manner. Factor analysis was used to group a set of 21 bipolar rating scales of experiment conditions, before and after trees were added. The result yielded 6 dimensions related to land use, quality judgment, constraints, and activity. Similar to semantic differentiation studies, the result provided scales from rating of the sets of verbal scales. However, this study does not focus

on the contents of the scenes, since the scenes were comprised of only two conditions scenes; therefore, the rating scores of scenes can be collapsed into averaged values without losing meaningful information.

### **Dimensional Analysis from Single Rating Scale**

The methods used to generate patterns from one measurement of multiple items are factor analysis and multidimensional scaling (MDS). Factor analysis requires data from a rating scale, and calculated mainly from correlations. The generated groups or factors can be rotated to the best fit for interpretation. The factor scores of each respondent on each variable can be calculated and used as variables in further analysis. Factor analysis requires a fairly large sample size to yield reliable and stable solution.

Multidimensional scaling is another method commonly used with sorting and ranking data, and the data can be based on preference, similarity or free categorization. The analysis can also be done either case-by-case or via aggregated solutions. The results are commonly displayed in the form of distribution of variables in two-dimensional spaces. Each dimension is interpreted by bipolar axis. It is noted that in the several dimensions solution, the later dimensions tend to be difficult to interpret. MDS does not require a large sample. However, there is subjective judgment in interpreting each dimension, and different researchers may interpret the same dimension differently.

Studies using this method include those by Groat (1995) and Nasar and Hong (1999). Groat (1995) used a multiple sorting task based on similarity and MDS to generate patterns of perceptions of laypersons and architects for post-modern and modern architectures. The analyses yielded different patterns between those of architects and laypersons, which means that each group employed different sets of categories in sorting the photographs, or that each group has different patterns of perceptions. The advantage of this particular procedure is that the respondents were allowed to use their own categories in sorting the photographs. This approach allows for a higher possibility for different categories to emerge than if a verbal specific categorization approach was used. Groat (1995) also suggests that respondents' verbal labels can be useful in interpretation. Similarly, Nasar and Hong (1999) used sorting of 19 signscape scenes based on similarity and MDS to generate 4 dimensions. 2 of the dimensions are meaningful and interpreted as related to obtrusiveness, and complexity. The two dimensions then were used as variables for further analysis.

However, different methods produce similar results. Horayangkura (1978) compared the use of factor analysis on multiple semantic differentiation scales and free sorting task with multidimensional scaling and concluded that the results revealed similar basic structures. The three basic structures found were urbanization (urban-nonurban), evaluations (like-dislike), and organization (spatial quality) (Horayangkura, 1978). This finding led to the understanding that some basic structures of perceptions exist regardless of methods used or methods used have less effect on the resulting patterns of perceptions.

### **Cluster Analysis**

Cluster analysis, although less used, is another available method used to group large number of cases or variables. Similar to R-type factor analysis, cluster analysis is normally used to group cases. The difference here is that factor analysis group items are based on criterion variables. Therefore, the meaning of each group or cluster is based on the criterion or cluster variables. Although cluster analysis is normally based on magnitude, it can also be based on correlation. An example can be seen in a study by Hagerhall (2000), which compared the results of grouping a set of 8 rating scales derived from theoretical explanations of landscape preference using cluster analysis and factor analysis. The results showed similarity of patterns; however, the results from cluster analysis were more difficult to judge. There was no clear judgment as to how many clusters should provide the desired solutions. This is a disadvantage of cluster analysis. It does not provide significant statistical judgment for the appropriate solution; subjective judgment is always required. Cluster analysis can easily produce different results, if different procedures are used.

In conclusion, the single evaluation scale is simpler and has been used as a major procedure in recent studies. Affective evaluation was proved as a primary judgment that is quick and easy to make (Kaplan & Kaplan, 1983; Rapoport, 1990; Ritterfeld & Cupchik, 1996). Preference has been the most commonly used of all affective judgments. Preference includes both natural and cognitive processing (Kaplan & Kaplan, 1983). Preference rating was suggested as an effective way to derive patterns of perceptions (Kaplan, 1985; Kaplan, 1979a; Kaplan, 1979b). A specific approach called Content or Categories Identifying Methodology (CIM) has been introduced by Kaplan and Kaplan as one of the major approaches in finding patterns from preference study (Kaplan & Kaplan, 1995; Kaplan, 1979a). This approach has widely been used in environmental perception studies, especially landscape perception studies.

### **Content Identifying Methodology**

Kaplan and Kaplan (1995) suggested that neither experts nor laypersons are aware of the process or categories leading to preference. Therefore, this methodology needs an indirect approach, within which how the environments are experienced can be derived without requiring the awareness of the respondents.

Content Identifying Methodology (CIM) was introduced by Stephen Kaplan (Kaplan, 1979a) and recommended by Kaplan & Kaplan (1995) as a method to solicit preference for environments from the public (also called Category-Identifying Methodology). CIM was based on the suggestion that preference is an appropriate measurement for assessing environments because it is a product of perception, which includes both natural and cognitive processing. Preference is also easy for the general public to understand and easy to make. People make preference judgments easily and naturally countless times in their everyday life (Kaplan & Kaplan, 1983). Preference rating can be used to derive patterns of perceptions from the derived dimensions that result from factor analysis (Kaplan, 1979a). The patterns of perceptions can be interpreted from the common characteristics of scenes, which include contents as well as organizations (Kaplan, 1979a).

CIM utilizes non-metric factor analysis called Smallest Space Analysis (SSA III) (Kaplan & Kaplan, 1995). The rationale is that non-metric factor analysis can provide smaller number of factors and more stable solution. CIM uses preference rating of individual scene as variables in factor analysis model. The derived factors are called dimensions. Each dimension is expected to contain scenes that consist of similar stimuli, to which people react similarly. Interpretations of these dimensions are expected to reveal patterns of perceptions that people have in response to an environment. Some of the previously found contents or categories are consistent among previous studies. These contents seem to be related to wayfinding, spaciousness, spatial organization, cultural modification, vegetation, and water (Kaplan & Kaplan, 1995). Others also found different categories such as types or environments, and level of maintenance. Content and categories interpreted from dimensions are normally discussed with explanations from preference framework (Kaplan & Kaplan, 1983).

### **Studies following the CIM approach**

CIM has provided a major approach for preference study, especially for natural environments. Other than the Kaplans, researchers such as Thomas Herzog have used the CIM approach in several studies dealing with different types of environments including field and forest (Herzog, 1984); mountains, canyons, and deserts (Herzog, 1987); urban alleys and narrow canyons

(Herzog & Smith, 1988); waterscapes (Herzog, 1995b); and urban nature (Herzog, 1995a). Another work is a study by Strumse (1996) on agrarian landscapes. These studies had a similar research design, which used CIM and non-metric factor analysis to obtain patterns of perceptions for the studied environments, and then used categories for comparison of preferences between categories.

**Table 3.2: Studies Using CIM Approach**

<b>Studies Using CIM Approach</b>			
<b>Studies</b>	<b>Environments (predefined)</b>	<b>Categories (extracted)</b>	<b>Types of Categories</b>
Kaplan R. (1973)	Paths or highway, natural areas, group of buildings, part of buildings	Nature, Part building with nature, Building complexes	Built and nature
Herzog (1984)	Field and forest environments	Large trees Concealed vantage points Unconcealed vantage point	Content and organization
Kaplan, R. and Herbert (1987)	5 Australian landscapes: escarpment, uplands, valleys, plantations, eastern woodlands	American: Open woodland/field, Rough-textured arid wooded, Open smooth texture, Vista not heavily wooded, Forest and forest vista Australian: Arid open coarse texture, Manipulated open spacious, Trees in forest	Spatial organization, texture, contents, type  Type, contents, spatial organization, human influence
Herzog (1987)	Mountains, canyons, and deserts	Deserts, Snowy mountain, Smaller mountains, Narrow canyons, Spacious canyons	Types of environments and spaciousness
Herzog and Smith (1988)	Urban alleys, urban nature, narrow canyons, non-urban nature	Urban alleys, Urban nature, Narrow canyons, Non-urban nature	Types of environments
Herzog (1995a)	Waterscapes	Mountain waterscapes, Swampy areas, Rivers lakes and ponds, Large bodies of water	Types of environments and spaciousness
Herzog (1995b)	Urban nature	Older buildings, Concealed foreground, Tended nature, Contemporary buildings	Age or styles, organization, and care (human influence)
Strumse (1996)	Agrarian landscape	Farming, Old Structures, Green grassy fields, Modern farming elements, New dominating structures, Flowers, Spruce plantation	Activity (human influence) and contents,
Herzog et al. (2000)	Australian natural landscapes: Rivers, dry lake beds, floodplains, terraces, mallee plains, cultural	American and Australian: Vegetation, Open smooth, Open coarse, Rivers, Agrarian, Structures	Contents, spatial organization, texture, type, human influence

In general, contents and organizations were the common characteristics differentiating categories. The notable contents found are large trees (Herzog, 1984), buildings (Herzog, 1995a), and farming activities (Strumse, 1996). It is notable that types are a major category. When different types of environments are included, it was noticeable to the people in the study. Examples of types are mountains, deserts, and canyons (Herzog, 1987) and urban alleys and canyons (Herzog

& Smith, 1988). Moreover, the variation within the type tends to be related to the concepts of size and spaciousness. For example, canyons were perceived as spacious and narrow (Herzog, 1987); and open natural landscapes were perceived as categories (Herzog, Herbert, Kaplan, & Cook, 2000; Kaplan & Herbert, 1987).

Additional categorical types that appeared were age and styles (Herzog, 1995a), care (Herzog, 1995a), and type of activity—traditional and modern farming (Strumse, 1996). General maintenance such as care (tended nature) and farming activities can be viewed as different types of human influences. Maintenance can be regarded as a positive influence, which increases preference, while other influences such as obtrusiveness or even modern farming are considered negative.

### **Cross-Cultural Comparison of Patterns**

CIM is also used in comparing patterns of perceptions between cultures. Kaplan and Herbert (1987) used CIM to obtain dimensions of scenes from Australian landscapes of two different groups, American and Australian respondents. The two sets of dimensions differed by the contents and number of correspondent scenes. The analysis showed 5 dimensions from the American sample, and 3 dimensions from the Australian samples. The difference showed how the environments were viewed differently by these two groups. The American sample saw these foreign environments in terms of physical characteristics such as openness of spaces, smoothness of texture, and degree of accessibility, while the Australian samples saw the environments in terms of types of western Australian landscape, which they knew better.

Another study by Herzog et al. (2000) used a similar CIM approach to compare patterns of perceptions for natural Australian landscape between Australian and American samples. The analyses from both Australian and American samples yielded six categories, which were the same. The common characteristics found were the features usually found in this type of research, such as prominence of vegetation, openness, depth structure, ground surface, water, and human influence. However, there was non-overlap in category composition between the two cultures. The major difference was the sign of human influence. The Australian sample saw willow trees as human influence, while the American sample did not. The magnitudes of preferences were also differed. The Australian sample liked their environments significantly more than the American sample in all categories except the open smooth and river categories. This finding could be viewed as a result of familiarity bias for the native environments.

This research attempts to identify important physical characteristics of shopping environments that influence preference. The identifying process follows the exploratory model. This research adopts the CIM approach to identify physical characteristics that influence preference of shopping environments. Preference rating is a part of the CIM approach that utilizes dimensional analysis of single-rating scale. In addition, multiple approaches, analysis of the most and least preferred scenes and dimensional analysis of preference can be used together to identify the preferred physical characteristics of shopping environments.

## **Predictive Model**

The predictive model is used primarily to predict preference by linear relationship between preference and independent variables. The purpose is to find out which predictor variables have a significant relationship with preference. The result can be used to determine whether managing or manipulating some environmental elements can increase preference for an environment. The variables used in predicting preference may be derived from exploratory research, practice, or theory. The common method is to measure preference as dependent variables and predictive variables as independent variables. The measurement of variable is required to be at least near interval data (ordinal data is normally acceptable).

Predictive model is also used to assess relationships, mainly linear relationships. The derived linear relationship provides understanding of the predictive ability of the independent variables and the interested dependent variable. Three major analytical methods have been used in previous research following predictive model. These methods include correlation analysis, multiple regression, and canonical correlation. Correlation analysis can provide basic understanding about how the variables correlate to each other. Significant positive correlation shows the potential of the variable as predictor for preference. Multiple regression analysis provides more useful results from the relationship between preference and multiple independent. It reveals strength of the relationship between preference and each independent variable while the others are held constant. Canonical correlation analysis allows inclusion of multiple dependent and independent variables. It reveals strength and nature of relationship as well as the contributions of each variable on both dependent and independent sets.



**Table 3.3: Predictors of Preference**

<b>Predictors of Preference</b>			
<b>Studies (methods)</b>	<b>Environments</b>	<b>Predictors of Preference</b>	<b>Significant Predictors</b>
Wohlwill (1968) (Trend analysis)	Geographic environments and modern arts scenes	Complexity	Relationship between preference and complexity took the form of a curvilinear (reverse U-shape)
Carls (1974) (Multiple regression)	Outdoor recreation landscapes	Area of stream, area of waterfall, area of lake, area of people, area of high development (all measured from pictures)	(Respectively) Area of waterfall, area of lake, area of stream were positive predictors of preference. Area of people and area of high development were negative predictors of preference.
Herzog (1984) (Correlation)	Field and forest	Coherence, spaciousness, complexity, mystery, texture, identifiability	For unconcealed vantage point category, identifiability, coherence, and spaciousness were positively correlated with preference. For large tree category, identifiability and mystery were positively correlated with preference, while spaciousness was negatively correlated with preference.
Herzog (1987) (Multiple Regression)	Mountains, canyons, deserts	Coherence, spaciousness, complexity, mystery, texture, identifiability	For all scenes, spaciousness, mystery, and identifiability were positive predictors For categories: For deserts, identifiability, complexity, and mystery were positive predictors. For snowy mountains, identifiability was a positive predictor. For narrow canyons, mystery was a negative predictor.
Herzog and Smith (1988) (Multiple regression)	Urban and natural environments	Mystery, physical danger, social danger, shadow, nature, vertical depth	For all scenes, nature, vertical depth, and mystery were positive predictors, while social danger was a negative predictor. For urban nature, mystery was a positive predictor. For canyons, mystery and vertical depth were positive predictors. For alleys, physical danger and social danger were negative predictors.
Herzog (1995a) (Multiple regression)	Waterscapes	Coherence, spaciousness, complexity, mystery, texture, identifiability	For all scenes, spaciousness, coherence, and mystery were positive predictors of preference, while texture was a negative predictor. For mountain waterscapes, spaciousness, coherence, and mystery were positive predictors. For swampy areas, only coherence was appositive predictor.
Herzog (1995b) (Multiple regression)	Urban nature	Coherence, complexity, legibility, mystery, refuge, spaciousness, typicality, nature, age	For all settings, coherence, mystery, and nature were positive predictors.
Whitfield (1995) (Spearman's coefficient of rank correlation)	Furniture (chair)	Representative of chair Appropriateness of shape Novelty Complexity	Representative of chair and Appropriateness of shape positively correlated with preference, while novelty negatively correlated with preference.
Herzog and Gale (1996) (Regression)	Urban buildings	Building care, nature care	Nature care was a positive predictor of preference on contemporary-tended, old-untended, and old-tended categories.
Nasar and Hong (1999) (Multiple regression)	Urban Signscapes	Complexity, obtrusiveness	Obtrusiveness is negatively related to preference
Stamps (1999) (Multiple regression)	Residential façades	Surface complexity, silhouette complexity, façade articulation	Surface complexity was a positive predictor

Herzog and Chernick (2000) (Correlation)	Urban and Natural (field and forest)	Perceived tranquility (mild and clam preference) as dependent variable Perceived danger, openness, setting care, and nature	For all scenes, openness, setting care, and nature were positively correlated with tranquility, while danger was negatively correlated. For natural setting, setting care was positively correlated with tranquility. No significant correlation for urban setting.
Herzog and Shier (2000) (Correlation)	Buildings	Complexity, age, maintenance	Complexity and maintenance were positively correlated with preference
Purcell et al. (2001) (Correlation)	Italian settings Industrial zone, houses, city streets, hills, lakes	Restorative scale, familiarity	Restorative scale and familiarity were positively correlated with preference.

### **Correlation Analysis**

Several studies used correlation analysis for assessing the relationship between preference and various predictors (Herzog & Chernick, 2000; Herzog, 1984; Herzog & Shier, 2000; Purcell et al., 2001). These studies are able to find significant correlations between preference and predictor variables. Although the analysis provides significant level, the method does not provide insight into the relationships. Correlation analysis does not account for correlation among the predictors. In case of several independent variables significantly correlate with preference, it is still difficult to make a conclusion, since the independent variables also highly correlate with each other. The main reason that many studies use this method is that they do not have enough sample size for multiple regression analysis.

### **Multiple Regression Analysis**

The more established method is multiple regression analysis, which can provide insight into the relationships between dependent variables and multiple independents variables. The results from multiple regression analysis reveal the nature of the relationship between significant independent variables and their predictive strength. The predictive strength and direction of relationships can also be determined from the derived value (Beta) of the variables with significant relationships. The amount of variance accounted for by the model can also be observed by R-square.

Multiple regression analysis is a major method in predictive models. Many studies used multiple regression analysis to predict preference by a variety of predictors (Carls, 1974; Herzog & Smith, 1988; Herzog, 1987; Herzog, 1995a; Herzog, 1995b; Herzog & Gale, 1996; Nasar & Hong, 1999; Stamps, 1999). In these studies, some of the predictors of interest were found significant as positive or negative predictors of preference. However, the predictions are specific for the settings or categories in which the relationships were found.

Generally, useful results derive from the works of Wohlwill (1968) and Carls (1974). Wohlwill (1968), although using trend analysis rather regression, found a significant relationship between preference and complexity. The relationship was found to be in a reverse U-shape, which provides understanding for many other studies with different results that both positive and negative relationships may depend on where the level of complexity of the environmental samples are on the reverse U-shape curve. Carls (1974) used multiple regression analysis to predict preference from different areas of elements from photographs of outdoor recreational landscapes. Areas of waterfall, lake, and stream were found to be positive predictors, while areas of people and development were negative predictors. This result was in agreement with other studies' findings that water was generally preferred, and that human influence tended to receive lower preference (Kaplan & Kaplan, 1995).

Most of the studies using this method tended to find different results; moreover, the results were specific to setting or category. For example, Herzog (1987) finds spaciousness, mystery, and identifiability as positive predictors for preference for all scenes. However, mystery was a positive predictor for the deserts category, while being a negative predictor for the narrow canyon category. This finding requires careful consideration. The results from multiple regression analysis are generalizable in some cases in which the settings are not specific, such as natural landscape. However, the results are specific when the settings are limited to specific landscape types. Moreover, this method only assesses linear relationships. In case the relationship is non-linear, the reported result may be unreliable. The general results, therefore, suggest possibilities but also require specific assessment. Cumulative results of long periods of studies, rather than results from each study, can provide practical and theoretical implications.

### **Canonical Correlation Analysis**

Canonical correlation analysis is another useful method to reveal the relationships between preference for different categories of environments and several predictors. The difference between canonical correlation analysis and multiple regression analysis is that the latter only allows one dependent variable, while the former allows multiple dependent variables. The results from canonical correlation reveal the nature of relationships from both significant dependent and independent variables and their strength of contributions. Moreover, canonical correlation can provide more than one set of relationships.

Although canonical correlation analysis is rarely used in this type of study, it has the advantage of revealing natures of relationships from multiple linear combinations of variables (Hair, Anderson,

Tatham, & Black, 1998). In preference study following a CIM approach, preference was considered by more than one dimension or category. Therefore, assessing or predicting relationships of predictors on each type may overlook the overall relationships of the whole set of variables. This type of relationships may provide more useful information than the results of separated multiple regression analysis.

**Table 3.4: Studies Assessing Multiple Relationships**

<b>Multiple Relationships</b>				
<b>Studies (Method)</b>	<b>Environments</b>	<b>Variables included</b>	<b>Relationship dimensions</b>	<b>Significant variables in each relationship (Set 1 and Set 2)</b>
Hanyu (1997) (Canonical Correlation)	Residential areas (After dark)	Set 1: Affective appraisal variables Pleasant, exciting, relaxing, fearful, interesting, active, Set 2: Visual property variables: Complexity, legibility, coherence, mystery, openness, typicality, naturalness, brightness, uniform lighting, visual nuisance, vehicles, familiarity	1. Evaluative and natural/open 2. Arousal and disorder 3. behavioral/active/save and well-lit/visible	1. Interesting, exciting, pleasant, relaxing and Openness, naturalness, complexity, mystery, vehicles 2. Fearful, active, distressing, exiting and Less typicality, vehicles, less legibility, complexity, less coherence, nuisance elements, less uniform lighting 3. Active, safe, interesting and uniform lighting, legibility, complexity, brightness
Hanyu (2000) (Canonical Correlation)	Residential areas (Daylight)	Set 1: Affective appraisal variables: Pleasant, exciting, relaxing, fearful, interesting, active Set 2: Visual property variables: Complexity, legibility, coherence, mystery, openness, typicality, naturalness, brightness, uniform lighting, visual nuisance, vehicles, familiarity	1. Evaluative and natural/open 2. Arousal and disorder 3. Physical/ behavioral activity and vehicle/clarity 4. Safe and brightness/vehicle 5. Distress/pleasant and well-kept manmade	1. Pleasant, relaxing, interesting, exciting, safe, active and Naturalness, openness, complexity, less vehicles 2. Exciting, active, fearful, distressing, interesting and complexity, less legibility, less coherence, familiarity, less uniform lighting, nuisance elements, mystery, vehicles 3. Active and vehicles, legibility, less mystery 4. Safe and brightness, less mystery, naturalness 5. Distressing, pleasant and less nuisance elements, less naturalness, brightness

As displayed in Table 3.4, the examples of studies using canonical correlation are the works of (Hanyu, 1997; Hanyu, 2000). Hanyu conducted similar studies to find relationships between affective appraisal variables and visual property variables for residential areas in daylight (Hanyu, 2000) and after dark (Hanyu, 1997). In both studies, three significant relationships—evaluative and natural/open, arousal and disorder, and behavioral/active/save and well-lit/visible—were found. Two additional relationships—safe and brightness/vehicle and distress/pleasant and well-kept manmade— were found in the daylight study. In this case, the daylight results seemed more relevant, and the first three relationships seemed stable. The results show 1) that the nature of first relationship was a positive evaluation similar to preference, and was related to openness,

naturalness, complexity, mystery and vehicle; 2) the nature of second relationships was arousal, and was related to disorder quality; and 3) the nature of the third relationship was active, and was related to clarity.

The results provide meaningful understanding for both relationships, and natures of the relationships from contributions of significantly-loaded variables. However, canonical correlation analysis requires a large sample size of at least 10 cases per variable (Hair et al., 1998). These two studies used a small sample size (under 30), with over ten variables; therefore, the results may be neither valid nor reliable. Moreover, Hanyu's criteria for interpretations of the results tend to be relaxed (using raw correlation), thus allowing many significant variables. Therefore, the relationships are vague due to several significantly-loaded variables. Hair and others (1998) suggest interpreting canonical loadings with loadings over  $|\cdot 30|$  as significant. This would be more conservative and provide clearer results.

### **Significant Predictors**

The predictive variables used include danger, mystery, sense of safety, identifiable, coherence, spaciousness, complexity, mystery, and texture, level of vegetation, age, nature, maintenance, typicality and familiarity, enclosure, complexity, order, fittingness and appropriateness, number of people and degree of development, or even negative measurements such as scary, disgusting, and uncomfortable.

Although many significant predictors were setting-specific, some useful implications can be observed from the results. Complexity may depend on the level of overall complexity of the environmental samples (their positions on the reverse U-shape curve). For relatively low complexity environments, complexity may be a positive predictor. On the contrary, for high complexity environments, complexity may be a negative predictor. Mystery seems to be a universal positive predictor of preference, except in narrow canyon (Herzog, 1987), where mystery was a negative predictor. For environments that were dominated by certain features such as large trees, snowy mountain or desert, identifiability was a positive predictor (Herzog, 1984; Herzog, 1987).

Predictors derived from rating may be affected by wording and the way that predictors are defined. Some predictors, such as legibility, mystery, prospect, and refuge, are difficult to define; respondents may understand them differently. Some of the predictors are similar, such as typicality, identifiability, and familiarity; therefore, they should not be used together. It may be

possible that predictors that have negative connotations, such as danger and obtrusiveness, seem to be negative predictors (Herzog & Smith, 1988; Nasar & Hong, 1999), while those with positive connotations, such as care or maintenance, seem to be positive predictors (Herzog & Chernick, 2000; Herzog & Gale, 1996).

A predictive model provides the possibility for this research to identify the relationship between preference dimensions of shopping environments and other shopping related variables. After preference data are factor analyzed and multiple preference dimensions are derived, canonical correlation analysis, an analytical tool in the predictive model, is appropriate to use in this research to identify relationships among preference dimensions and related shopping attributes as predictor variables.

### **Experimental Model**

The experimental model refers to the objective study of comparing the effect of group variables. Studies in this model include those that were used primarily to test the differences of preference magnitudes between categorical variables. Both environments and respondents were assumed to affect preference; therefore, they were used as categorical variables. The commonly-used procedure is experimental design, in which the means of dependent variable, preference, is compared between different independent categorical variables, sets of environments or groups of respondents. The common analytical method is t-test, Analysis of Variance (ANOVA), and Multivariate Analysis of Variance (MANOVA).

### **Variation of Preference**

The third group of methods is used for assessing the effect of group differences. In general, the preference means from different groups are compared whether they are significantly different. T-test is used to compare two means. ANOVA is used to compare more than two means of different groups on one dependent variable, while MANOVA is used to compare means of different groups on multiple dependent variables. The comparison can be done between the means of different environmental types or between the means of different respondent groups with different characteristics.

Different types of experimental designs are used in this experimental model. Most of the studies use one-way analysis to compare preference means of different environments. Other have more specific purposes such as using two-way (or more) analysis to compare two different independent

variables together. Another design is to use repeated measure design to assess the effects by comparing two or more levels of condition, in which each condition has more than one level.

### **Variation of Preference by Environment**

The means of preference from different types or subtypes of environments can be compared. The studied environments differ by types, styles, and conditions. These environments differ by people's perception (preference dimensions), design intention (styles), and manipulation (conditions). These variations of environments possess different characteristics that influence people's reactions; they thus receive different magnitudes of preference.

**Table 3.5: Studies Comparing Different Settings**

<b>Setting Comparison</b>		
<b>Studies and (Methods)</b>	<b>Type of Comparison and Compared Settings</b>	<b>Significant Setting Differences (all respondents)</b>
Dearden (1984) (MANOVA)	Type: Different land uses Peri-urban, Rural, and Wilderness	Rural was liked best, following by wilderness, and urban significantly least (no statistical significance provided)
Strumse (1996) (ANOVA)	Type: categories of Norwegian agrarian landscapes Farming, Old structures, Green grassy fields, Modern farming elements, New dominating structures, Flowers, Spruce plantations	Mean preference from highest to lowest: Old Structures, Flowers, Farming, Green grassy field, New dominating structures, Spruce plantations, Modern farming elements (no statistical significance provided)
Kaplan, R. and Herbert (1987) (ANOVA)	Type: categories of Australian Landscape By American sample: Open woodland/field, Rough-textured arid wooded, Open smooth texture, Vista not heavily wooded, Forest and forest vista By Australian sample: Arid open coarse texture, Manipulated open spacious, Trees in forest	American: most to least preferred: Forest and forest vista, Vista not heavily wooded, Open smooth texture, Rough-textured arid wooded, Open woodland/field, Australian: most to least preferred: Trees in forest, Manipulated open spacious, Arid open coarse texture
Herzog et al. (2000) (ANOVA)	Type: categories of Australian landscape: Categories by Australian and American samples: Vegetation, Open smooth, Open course, Rivers, Agrarian, Structures	Rivers was the most preferred. Following by Agrarian and Vegetation, and then Structure, Open Smooth, and Open coarse.
Yang and Brown (1992) (ANOVA)	Style: 3 landscape styles Traditional Korean, Traditional Japanese, Western 4 Elements: Space layout, Water, Vegetation, Rock	Japanese style was the most preferred especially with water element. Korean style with rock element is the least preferred.
Stamps and Nasar (1997) (ANOVA, t-test)	Type: Houses in design review process Style: High and Popular	Form highest to lowest means: Passed design review, Exempt from design review, High styles Bulk had little influence on preference Style had the most influence on preference, especially between popular and high styles.
Nasar and Kang (1999) (t-test)	Style: House style 10 styles houses	Post modern was the most desirable. International was the highest status. Farm was the most friendly.
Whitfield (1995) (Non-parametric test)	Style: Three styles of furniture Modern Georgian Art Nouveau	Preference: Georgian >> Modern > Art Nouveau Complexity: Georgian > Art Nouveau >> Modern (>> Indicates significance) Preference was found related more to preference-for-prototype model rather than collative-motivation model.

Wohlwill (1979) (Graphic Analysis of Mean Rating)	Condition: Development - Scenic, Plain, and Developed settings - Factory and Lodge - 5 Levels of contrast/obtrusiveness (predetermined)	For factory, appropriateness decreases as contrast/obtrusiveness increases, while inverse U-shape appeared for lodge. Preference showed similar but less obvious relationships. (No statistical significance provided)
Heath et al. (2000) (ANOVA)	Condition: Silhouette Complexity Tall building and urban skyline with: 3 levels of silhouette complexity 3 levels of façade articulation	Silhouette complexity had effect on preference, perceived complexity, arousal and pleasure. Façade articulation had effects on perceived complexity.
Sheets and Manzer (1991) (MANOVA)	Condition: Vegetation on Urban environment City streets with and without trees	Streets with trees were significantly perceived as; less industrial, higher quality of life, and higher affective pleasure. The effect of vegetation was both affective and cognitive.
Kuo et al. (1998) (ANOVA)	Condition: Vegetation on Inner-city landscapes Spaces in urban public housing with 2-level Tree placements, 3-level Tree density, and 2-level Grass maintenance	Tree placement had little effect on sense of safety but no effect on preference. Tree density and grass maintenance had strong positive effects on both sense of safety and preference.
Larsen et al. (1998) (ANOVA)	Condition: Vegetation in Workplace An office space with 3 levels of plants installed	Productivity was highest at no plant level and lowest at highest plant level. Office attractiveness increased by the plant levels. The best experience was at the moderate plant level.

### **Type of Environment**

The type of environment can affect preference. From a review of a variety of studies, Kaplan and Kaplan (1995) find that natural environments are more preferred than urban environments. A similar trend is also found in the preferred natural features in urban contexts, or less preferred built structures in natural environments (Kaplan & Kaplan, 1995). Differences can be observed in a study by Dearden (1984), in which preferences for different types of land use are compared. It is found that rural is the most preferred, while wilderness is the second, and urban is the least preferred.

For the categories of environments that are derived from dimensional analysis, each category or dimension is perceived differently by people; therefore, it is of interest to know the differences in preference. Strumse (1996) compared preferences for different agrarian landscapes and found that old structures are the most preferred, followed by flowers, farming, green grassy fields, new dominating structures, spruce plantations, and (the least preferred) modern farming. This finding suggests that traditional condition, old structure, and old style farming are preferred over the modern condition, new structure and modern farming.

Kaplan and Herbert (1987) and Herzog and others (2000) compared preference means for different Australian landscapes and found differences in preferences for different categories. Kaplan and Herbert (1987) found that their two groups perceived different sets of categories, while Herzog and others (2000) found similar categories. For all respondents, Herzog and others



(2000) found that river landscape was the most preferred; agrarian and vegetation landscapes were the second most preferred; and structure, open smooth, and open coarse landscapes were the least preferred. However, this difference may be specific to the specific setting and culture, and the results may be useful only in that context.

Other type comparison can be seen in a study by Stamps and Nasar (1997), which compared preferences for different types of houses in design review process. The compared houses included houses that passed design review, exempted from design review, and high style houses. They found that houses that passed design review have the highest mean, following by houses exempted from design review, and high style houses.

### **Style of Environment**

Style is a significant source of variation of preferences for different environments (Nasar, 1997). Stamps and Nasar (1997) found that in design review, style had the most influence on preference, especially between popular and high styles. For landscape styles, Yang and Brown (1992) found in a survey of Korean and western tourist samples that traditional Japanese landscape style was the most preferred, following by western style, and then traditional Korean style. Nasar and Kang (1999) compared perceptions of different house styles, and found that the postmodern style was the most desirable [preferred], while the international style had the highest status, and the farm style was the most friendly. For interior environment, 3 styles of furniture—Modern, Georgian, and Art Nouveau—were studied by Whitfield (1995). Georgian style was significantly preferred over Modern and Art Nouveau. Preference was explained as related to the preference-for-prototype model rather than the collative-motivation model (Whitfield, 1995). That is, people prefer furniture that fits their perception of prototype rather than furniture that is more complex in design.

### **Condition of Environment**

The last group of setting comparison is a comparison of settings with different conditions, which are development, silhouette complexity, and vegetation. Wohlwill (1979) compared preference for different types of landscapes with different levels of development. He found that preference decreased with increasing levels of contrast and obtrusiveness. Heath, Smith, and Lim (2000) compared different conditions of urban skyline that varied by levels of silhouette complexity and façade articulation and found that silhouette complexity had a significant effect on preference. They concluded that preference increased with the increasing levels of silhouette complexity.

Vegetation or nature feature universally induces preference (Kaplan & Kaplan, 1995). The major reason is that this feature has a restorative quality (Kaplan & Kaplan, 1995; Purcell et al., 2001). Sheets and Manzer (1991) compared the effect of vegetation on manipulated conditions of city streets before and after vegetation was added. They found that adding vegetation could improve the perception of better quality of life, less industrial look, and higher affective pleasure [preference].

Kuo, Bacaicoa, and Sullivan (1998) compared effects of tree placement, tree density, and grass maintenance of high-density residential landscape on the sense of safety and preference. They found that tree density and grass maintenance had strong positive effects on both sense of safety and preference. Security officials tended to believe that dense trees could induce fear; management officials believe that grass maintenance was too costly. However, the study's results proved otherwise. For interior environment, Larsen, Adams, Deal, Kweon, and Tyler (1998) compared the effect of vegetation in the work place and found that office attractiveness increased with plant levels. Nevertheless, the effect of vegetation could be conditional. They also found that the experience was best at moderate level of vegetation, and that productivity decreased with the increasing level of plants. This shows that although vegetation improves preference and mood, it decreases productivity in the work place.

### **Variation of Preference among Subgroups of Population**

Different subgroups of respondents showed different preferences for environments. The differences in preferences of subgroups of population are the results of familiarity and experience (Kaplan & Kaplan, 1995). The differences in familiarity and experience exist between respondents with different cultures, subcultures, demographic backgrounds; professional trainings, taste culture, and personal interest (Kaplan & Kaplan, 1995; Nasar, 1997).

### **Cross-Cultural Comparison**

Culture is an important source of knowledge and experience. People interpret physical environments using schema, which are a product of culture (Rapoport, 1990). People with different cultural backgrounds differ in their interpretation and familiarity with the environment. Kaplan and Herbert (1987) compared preference of American and Australian samples for Australian landscapes. The results showed a cultural bias on the part of the Australian sample. Australians rated all of the environments higher than the American sample. The two samples had different preferences for the environments (Kaplan & Herbert, 1987). Similar work by Herzog et

al. (2000) found the same cultural bias; however, preferences differ by certain categories—vegetation, open coarse, agrarian, and structure.

**Table 3.6: Studies Comparing Preferences of Different Subgroups of Respondents**

<b>Group Comparison</b>			
<b>Studies (Methods)</b>	<b>Environments</b>	<b>Type of Comparison and Groups Compared</b>	<b>Significant Group Differences</b>
Kaplan, R. and Herbert (1987) (ANOVA)	Australian landscapes: American:	Cross-cultural: American students Australian students, Wildflower society members	The American and Australian had different patterns of perceptions for the landscapes. (Cultural or familiarity) The Australian liked the over all landscape significantly more than the American. (Cultural bias or familiarity) The two Australian groups liked the landscape equally, but differed by specific scenes. (Knowledge in species)
Herzog et al. (2000) (ANOVA)	Australian landscape: Vegetation, Open smooth, Open course, Rivers, Agrarian, Structures	Cross-Cultural, Development, and Subgroup 1) Cross cultural: Australian and American Subcultural: Australian groups 2) Developmental: Primary school students Secondary school students College students Adults 3) Australian college student groups: Aboriginal, Landscape, Regular 4) Australian adult groups: Theater, Lions club, Teachers, DENR (environmental professional)	1) Australian had significantly higher overall rating than American (and higher on every category). Preferences significantly differed for Vegetation, Open Coarse, Agrarian, and Structure. 2) Age groups differed significantly in preference. Primary student had the highest preference, following by tied college and adult, and secondary had the lowest. Adults had the highest preference for Vegetation (alone), Open coarse and Rivers (tied), and lowest preference for Open smooth (alone), and Agrarian (tied). Primary students were always among the top, while secondary were among the bottom. 3) College students differed significantly in overall preference. Generally, aboriginal students had highest preference, and regular student had the lowest. Aboriginal students had the highest preference for Vegetation and Agrarian (alone), and tied for the rest except Structure (lowest). LA students were at the top for structures (alone) and open categories (tied), and last (alone) for rivers. 4) The adult groups differed significantly in overall preference. DENR staff had the highest preference, teachers the lowest and the other two tie in between.
Yang and Brown (1992) (ANOVA)	Three landscape styles with three elements Styles: Traditional Korean Traditional Japanese Western Elements: Space layout, Water, Vegetation, Rock	Cross-Cultural: Korean citizens Western tourists	Korean sample: From most to least preferred styles: Japanese, Western, Korean From most to least preferred elements: Water, Vegetation, Layout of space, Rock Western sample: From most to least preferred styles: Japanese, Korean, Western From most to least preferred elements: Water, Vegetation, Layout of space, Rock
Peron et al. (1998) (ANOVA)	Mixed outdoor environments from eastern Australia and northern Italy	Cross-Cultural: Australian sample Italian sample	Whether the scene was matching or mismatching had effect on preference. (strong on one group of respondents) The correlation analysis show positive relationships between familiarity, typicality, and preference proved limited support to preference for prototype model (limited to some of the scenes).
Purcell et al. (1998) (MANOVA)	Detached houses with popular and high styles from American and Australia	Cross-Cultural, Training, and Development: Australian: Architect, Engineer, General public Italian: young, old	Frequency of occurrence or experience could account for different affective experiences of architects and general public, whole could not account for different affective experiences of people from different age groups.
Strumse (1996) (ANOVA)	Norwegian agrarian landscapes Extracted categories Farming, Old	Demographic: Familiarity: Childhood geographical region, Present geographical	For familiarity: Present geography region had effect on Farming category. Present population density had effects Farming, Modern farming, and New dominating categories.

	structures, Green grassy fields, Modern farming elements, New dominating structures, Flowers, Spruce plantations	region, Childhood population density, Present population density, Subculture: Age (Before 1970 and After 1970), Gender, Organization membership, Expertise	For subculture: Age had effect on Farming category. Gender had effects on Green grassy fields and Flowers categories. Organization membership had effects on Farming and Flowers categories. Expertise had effect on Farming and Green grassy fields.
Stamps and Nasar (1997) (ANOVA, t-test)	Architectural styles Houses passed design review Houses exempt from design review High styles Effect of bulk	Demographic and Personality: City Sensation seeking Demographic; Age, Gender, Ethnic origin, Politics, City	Sensation seeking had no effect on preference. City had small effect. Demographic variables had no effect. Design review, bulk, demographic, and personality factors accounted for much less preference than did the architectural components of styles or individual buildings.
Pennartz and Elsinga (1990) (Q-sort, Content analysis)	Urban Environments	Development and Training: Adults Adolescents Architects	Adolescents used significantly more arguments related to immediate sensation of stimuli, such as color, light, and business. Architects used significantly more arguments related to spatial qualities, such as measure and scale, spatial coherence, visual diversity, spatial definiteness, and relation to environment. Adult was in the middle, but not significantly different.
Nasar and Kang (1999) (t-test, Correlation)	House style 10 styles houses	Subculture (5 taste culture): High, Upper middle, Lower middle, low, Quasi-folk low Variables: Education, Income, Home ownership, Race, Age, Marital status, Year in Columbus, Gender	There was no difference in comparison of rating means except high taste culture differed from the others on perceived status. Correlations showed high agreement among groups. Partially support the predictions, each group correlated highly with the adjacent groups. The correlations declined by the next group.
Kaplan R. (1973) (ANOVA)	Mixed: Building complexes, Nature, Part buildings	Training Architecture Students Landscape Architecture Students Psychology Students	Preference: Differences was strongest for building complexes, nature, and part buildings respectively. For nature, landscape and psychology had similar means, while architects had the lowest mean. For building complex, architects had the highest mean, close-seconded by landscape and psychology had lowest mean. For part buildings, landscape had the highest mean, following by architect and psychology.
Buhyoff et al. (1978) (Rank order correlation)	Natural landscape	Training Client group (general students) Landscape architects (experienced and no experienced), (perceived and personal)	Rank order of the clients significantly correlated with predicted rank of LA, but not personal rank. Non-experienced LA predicted rank order of the clients closer than the experienced architects.
Whitfield and Wiltshire (1995) (ANCOVA and Correlation))	Three furniture styles Modern Georgian Art Nouveau	Training Non design (Math) sample: 1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> year, lecturer Design (product and interior) sample: 1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> year, lecturer	For all styles: Non-design sample correlated significantly only with 1 <sup>st</sup> year design students. Design groups correlated significantly with each other. Separated style correlation showed significant correlation only among 2 <sup>nd</sup> , 3 <sup>rd</sup> , and lecturer of design group. Over training period, the degree of association increased between design lecturers and their students, and decreased between math train and design trained groups.
Dearden (1984) (MANOVA, Correlation)	Different land uses Peri-urban, Rural, and Wilderness	Training and Interest Sierra club members Planners Park users	No difference between Planners and Park users. Sierra club members preferred wilderness the most and significantly more than the others. Familiarity effected in housing density of adulthood and wilderness contact. Socioeconomic had no effect.

Cultural bias can also produce different results. Yang and Brown (1992) compared preferences of Korean students and western tourists for three different landscape styles—Korean, Japanese, and western. The results showed a reverse pattern of bias. The Korean sample liked Japanese style best, followed by western style, while liked their own style the least. On the contrary, the Western sample, though they liked Japanese style the best, liked Korean styles better than Western style.

Cross-cultural comparison is also used to test preference-for-prototype model. Peron, Purcell, Staats, Falchero, and Lamb (1998) compare preference means of matching and mismatching between Australian and Italian samples and environments. The results from comparison and correlation between preference and familiarity and typicality supported the preference-for-prototype model.

### **Sub-Cultural, Developmental, and Demographic Comparison**

Sub-Culture, Developmental, and Demographic comparisons are based on similar sets of variables. Sub-culture is normally defined by the sub-group of a culture, which includes age, carrier, group membership, and living location. Developmental comparison concerns learning and experience during childhood; it is thus based on age. Demographic comparison can include all of the personal characteristic backgrounds above, and other variables such as income, education, gender, marital status, and family size. Therefore, all of the above comparisons can be viewed as demographic comparison.

Taste culture is also a subculture, which is defined by education, income, and profession. Nasar and Kang (1999) compared preference means of 5 taste cultures on different house styles, and found no significant difference, except that high culture was significantly different from the other groups. They concluded that this difference was attributed to design training rather than the taste cultures (Nasar & Kang, 1999). However, this may also mean that taste is not defined by the above variables, which are normally regarded as demographic variables. Although demographic variables are always included in most studies, they do not always produce significant results, as is proved in a study concerning a design review process (Stamps & Nasar, 1997), and a preference study on land use (Dearden, 1984).

Strumse (1996) found significant differences in preference for different categories of Norwegian agrarian landscape by subgroups with different demographic backgrounds. Familiarity, defined by present geographic location and density, had an influence on preference. In addition, age,

gender, organization membership, and environmental expertise also had an influence on preference.

### **Developmental Comparison**

Although age is always included as demographic variable, from a developmental perspective, development and learning in childhood play an important role in preference. Herzog and others (2000) found differences among primary, secondary, college students, and adults. They argued that young children had a higher preference for natural environment than older children. This is because young children saw the environments as a potential playground, which they valued more dearly than the older students (Herzog et al., 2000). A perception study by Pennartz and Elsinga (1990) found that adolescents used more arguments related to immediate sensations from environmental stimuli, such as color, light, and business than adults. This result indicates a difference in perception between children and adults, which influences differences in preference magnitude.

### **Comparison between Trained Professionals and the Untrained Public**

Training in environmental design, such as architecture and landscape architecture, is always found significant in influencing preference for the environment. Kaplan (1973) compared preference means for mixed environments of architecture, landscape architecture, and psychology students and found significant difference in preferences. Architecture students had the lowest preference for nature, while having the highest preference for building complex and part building. Landscape architecture students generally had preference means closer to those of psychology students (Kaplan, 1973).

Difference in perception also accounts for difference in preference. Pennartz and Elsinga (1990) used qualitative data to study perception of environments of architects, adults, and adolescents. They found that architects used significantly more arguments related to spatial qualities, such as measure and scale, spatial coherence, visual diversity, spatial definiteness, and relation to the environment, than did other adults Pennartz and Elsinga (1990).

The difference in preference is found to increase by the period of training (Whitfield & Wiltshire, 1995). In their study of preference for three furniture styles, Whitfield and Wiltshire (1995) found that the degree of association between design students and their instructors increased by year of training, while decreasing from the non-design students.

Interestingly, although their personal preferences are significantly different from the general public (the clients), landscape architects are somehow able to predict their clients' preferences for landscape. Buhyoff, Wellman, Harvey, and Fraser, (1978) used rank order correlation to compare preference for landscape of experienced and inexperienced landscape architects and laypersons, and landscape architects' perceived clients' preferences. They found significant differences among these individuals' personal preferences; however, their perceived clients' preferences were closer. They also found that the precision of predicting the clients' preference was increased by working experience (Buhyoff et al., 1978).

Another environmental related training, planning, has been found no influence on preference; however, environmental interest group membership (Sierra club) had different high preference for wilderness than other groups (Dearden, 1984). Strumse (1996) also found significant influence of group membership and environmental expertise on preference for different categories of Norwegian agrarian landscape. Kaplan and Herbert (1987) and Herzog et al. (2000) found that the influence of subgroup on preference, such as interest group membership, and environmental expertise, is attributable to familiarity and knowledge about native plants and species.

An experimental model provides the possibility for this research to identify consensus and difference in preference of different groups of people for shopping environments. This model provides the ability to deal with both environments and characteristics of subgroups of people as sources of variations in preferences for shopping environments. ANOVA is an appropriate analytical method for comparing preferences for different environments, while MANOVA is appropriate for comparing preferences of different subgroups of shoppers for different types of environments.

## **Conclusion of Study Models**

From the review, three models provide different type of results contributing to the holistic understanding of the preferences and perceptions of people for environments. The exploratory model provides understanding of the preference patterns and how the environments are perceived. The predictive model predicts preference by predictor variables and reveals the relationship between preference and other variables. The experimental model reveals the differences of preferences for different type of environments, and between preferences of different groups. The three models together are used in this research to provide insight into how people perceive and prefer shopping environments, how preference for an environment can be enhanced in relation to

other shopping attributes, and the variation of preferences according to different types of environments and different groups of people. Specific methods from each model are taken as appropriate methods to use in this research. From the exploratory model, the CIM approach using factor analysis on preference rating is appropriate to use together with analysis of the most and least preferred scenes. From the predictive model, canonical correlation is selected for use in identifying the relationship between preference and other shopping attributes. Finally, ANOVA and MANOVA from the experimental model are selected to identify similarity and differences in preferences for different environments and of different groups of people.

### **III. Theoretical Explanations and Cumulative Findings**

This section discusses theoretical explanations and cumulative findings, which are a result of the accumulation of studies on different settings and with different populations. Large numbers of studies over long period have shown some consistent results. The cumulative results also lead to theoretical explanations. The following discussion focuses on theoretical explanations and cumulative results of preference and perception studies that have been used to discuss and explain the results in the context of perception and preference studies.

#### **1. Theoretical Explanations**

Theoretical explanations described are the theoretical components that are commonly used to explain the major factors influencing preference in the previous results. They also guide the design as well as suggest variables. Theoretical components include those that follow an evolutionary perspective; that are prospect-refuge (Appleton, 1975), affordance (Gibson, 1979), preference framework (Kaplan & Kaplan, 1983), and arousal theory (Nasar, 1997). Arousal theory is described in relation to the use of collative motivation and the preference-for-prototype model.

##### **Evolutionary Perspective**

One of the major approaches to landscape perception is evolutionary perspective (Sinha, 1995). The evolutionary perspective sees nature as a source of basic human needs such as habitat and food gathering. This perspective is believed to provide the source of universal preference for the environment, especially natural settings. The important work of Appleton (1975) described this process in terms of prospect and refuge qualities of the environment that influence human preference for the environment. Prospect was defined as the quality of environments that provide



the possibility to see, and refuge was defined as the quality that provides the possibility to hide. Prospect and refuge together provide the quality that influence preference for the environment: that is, the possibility to see without being seen (Appleton, 1975).

Later work from this perspective is that of (Kaplan & Kaplan, 1983). Kaplan and Kaplan extended the environmental affordance (Gibson, 1979) that people perceive the environment and physical elements in terms of what they afford. Kaplan and Kaplan argued that people prefer the environment that provides understanding and the possibility to do something in it (Kaplan & Kaplan, 1983). The qualities that influence preference for the environment are described as preference framework (Kaplan & Kaplan, 1983).

### **Preference Framework**

The important studies dealing with perception of natural environments can be found in the works of Stephen Kaplan. Kaplan argued against the experts’ perceptual categories, such as formal characteristics and uniqueness of the environments, and provided a basis for understanding people’s perceptions of visual environments from an evolutionary perspective leading, to holistic objective assessment. He suggested that perception includes cognitive processing; that is, perception and interpretation are inseparable and influenced by all cultural experiences (Kaplan, 1979a). Kaplan (1979a) also provided a functional approach to landscape aesthetics that people need to make sense out of the environment and what interest they can find in it. This argument led to the framework for landscape preference dealing with qualities such as understanding and involvement of the environments in both immediate and near future context. This framework enables better understanding of visual qualities of the environment embedded in the photographic media; that are 2 dimensional and 3 dimensional properties. This framework is displayed by the following matrix.

**Table 3.7: Preference Framework**

<b>Preference Framework</b>		
	<b>Understanding or Making Sense</b>	<b>Involvement</b>
<b>Immediate (2-dimensional)</b>	Coherence	Complexity
<b>Future (3-dimensional)</b>	Legibility	Mystery

Source: Kaplan and Kaplan (1983)

The 2-dimensional components (immediate context) include coherence (how the elements hang together), which provides understanding and making sense of the immediate environments, and complexity (amount of distinct elements), which provides involvement of viewer and the scenes.

The 3-dimensional components include legibility (knowing how to get around), which provides understanding of scenes, and mystery (promised opportunity to see and wander further), which provides attraction to scenes. More details about preference framework can be found in Kaplan and Kaplan (1983).

Nasar (1997) discusses another framework applied in urban design area from arousal theory of aesthetic experience. This framework sees aesthetic experience as different from individual to individual, each of whom may seek different levels of arousal from the environment. Therefore, preference for the environment depends on the arousal level that individual perceives from the environment. Arousal level is derived by the collative motivation and can be measured from the reactions to the stimuli that match and mismatch personal schema. The relationship of arousal and preference can be seen in the collative motivation and preference-for-prototype model (Whitfield, 1995). The collative motivation model assumes that preference is influenced by arousal level or interest. Interest is higher when the stimuli are more complex or differ from personal schema. Similarly, for the person who seeks high arousal, complex and novel stimuli tend to receive high preference. On the other hand, individuals seeking lower arousal level may prefer less complex environments and popular stimuli. Preference-for-prototype model, on the contrary, assumes that a person prefers the stimuli that match his/her schema or prototype of that type of stimuli or environment. Both collative motivation and preference-for-prototype models focus on variables such as familiarity-unfamiliarity, typicality-atypicality, and representativeness of the type.

The two frameworks are similar in their use of variables, which are complexity or diversity and coherence or organization. However, they are different in the role of arousal and cognition (Nasar, 1997). Kaplan and Kaplan's framework deals with both two and three-dimensional properties and also on timeframe: immediate and near future. Both of the frameworks suggest mediation between the dipoles. In general, preference is believed to be highest somewhere in the middle of the poles. An environment that rates too high on complexity or mystery may decrease preference. On the other hand, an environment that rates too high on coherence or legibility may be uninteresting. However, Kaplan and Kaplan, (1983) argue that a highly preferred environment can be high in both complexity and coherence or mystery and legibility at the same time. This argument suggests that the relationship between the understanding and involving components is not necessarily linear and bipolar.

Similarly for the arousal framework, preference and complexity has the relationship in the form of a reverse U-shape, with highest preference in the middle (Nasar, 1997). Interest increases with increasing complexity; however unlike preference, it stays relatively level after the maximum point at moderate level of complexity is reached (Nasar, 1997). In the collative model, preference and interest increase with the amount of complexity and the degree of difference from prototype until it peaks; then, preference decreases, while interest remains constant (Nasar, 1997). In the preference for prototype model, difference from the prototype cause decrease in preference, while fittingness into the prototype increases preference. Interest can be viewed as similar to involvement in the preference framework. Similarly, they do not have a linear relationship with preference.

## **2. Cumulative Findings**

Kaplan and Kaplan (1995) conclude from the previous research on preference for natural environments and provide significant findings on categories. Two basic types of categories are commonly found based on content and spatial configurations. Content-based categories include the degree of human influence or balance between natural areas and built form or cultural activities. Spatial configurations include the way that spaces are organized such as open, closed, wide, narrow, and deep views. The variables found to be related to preference are categories, preference framework (coherence, complexity, legibility, and mystery), and group differences (Kaplan & Kaplan, 1995).

Category variables are the variables derived from dimensions of scenes extracted by factor analysis. They are shared patterns of how respondents see the environments. These shared patterns are similar to the schemas or prototypes of the environments from people's perceptions. The cumulative mean scores of categories can be used to predict preference. For example, previous researchers have proved that natural related content-based categories such as water or vegetation receive higher preference than the manmade categories. Similarly, open and deep spatial configuration categories tend to induce higher preference than shallow and closed space (Kaplan & Kaplan, 1995).

Kaplan and Kaplan (1995) also suggest that the preferred scenes tend to be high in at least one of the qualities from preference framework. Mystery has been proved to be the most frequent positive predictors of preference. However, a high level of one quality without another cannot

cause high preference. For example, a very complex scene may lack coherence, thus receiving low preference. Similarly, high mystery alone without legibility cannot increase preference.

Finally, group differences can influence preference. Familiarity is the simple source of differences in preference. Familiarity is a product of experience; therefore, people with different experiences may have different preference for the environment (Kaplan & Kaplan, 1995).

Differences in experience can be derived from difference in familiarity with local environment, culture, sub-culture, formal knowledge or expertise, and interest. However, differences in these familiarities can have both positive and negative influences on preference.

### **Variables**

Nasar (1997), from a review of urban design aesthetic studies, categorizes two types of variables from empirical evidence—formal and symbolic variables. Formal variables emphasize the physical properties of the environment, while symbolic variables emphasize the connotative meaning of the physical properties (Nasar, 1997). Formal variables include the groups of variables related to complexity, order, and spatial. Symbolic variables include the groups of variables related to naturalness and built nuisances, style, schema discrepancy, and individual and socio-cultural differences (Nasar, 1997).

### **Complexity**

Complexity is found to have an inverse U-shape relationship with preference (Nasar, 1997; Wohlwill, 1968). Kaplan & Kaplan (1995) also discuss the relationship between complexity and preference, stating that at least the preferred scenes need to contain a moderate level of complexity. This finding is parallel to the inverse U-shape in other studies, in which preference was found highest in association with a medium level of complexity. Complexity is used as non-negative connotation of the quality. Complexity was sometime used synonymously with diversity and visual richness.

### **Order**

Order is also related to organization variables such as coherence, fittingness, congruity, legibility and clarity (Nasar, 1997). Legibility provides understanding of spatial quality or wayfinding. Coherence, fittingness, and congruity are related to how the elements hang together, which enhance harmony. Clarity seems to be closer to identifiability, which is related more to recognition process. Both of these variables are related to and can also be enhanced by contrast rather than harmony.

## **Spatial**

Spatial variables are related to spatial configuration or organization of space. They are identified as open, closed, deep, shallow, and wide. Spatial variables are also common to categories from studies using a CIM approach. Open and deep space seem to receive higher preference than the narrow and closed space. Spatial organization that provides the possibility to explore further, or that has high mystery, seems to induce high preference (Kaplan & Kaplan, 1995). Spatial is also sometimes measured as a variable, such as spaciousness or openness. These variables were also found positively related to preference.

## **Naturalness and Building Nuisance**

Naturalness and building nuisance are also found frequently as dimensions of perceptions derived from a preference study using a CIM approach (Kaplan & Kaplan, 1995). Naturalness is defined by vegetation such as trees, grass, and other related natural features. Building nuisance includes human influences in natural environment such as buildings, roads, parking lodges, and utility elements. Naturalness in an urban environment tends to induce higher preference, while building nuisance or human influence in natural environment tends to receive lower preference. Another type of human influence that can be seen as having a positive effect is maintenance. Maintenance positively influences preference in the context of natural and urban environments.

## **Style**

Style conveys meaning and a source of differences in perception and preferences (Nasar, 1997). Style can convey connotative meaning about building and designed objects. Building styles such as Classicist and Nazi and Modern and Postmodern have been found differ in preference (Espe, 1995; Groat, 1995). House styles, such as popular and high styles, are also different in preference (Nasar & Kang, 1999; Purcell, Peron, & Sanchez, 1998; Stamps & Nasar, 1997). Furniture styles are also different in preference (Whitfield, 1995). Landscape styles received different preferences (Yang & Brown, 1992).

## **Schema Discrepancy**

Schema discrepancy also affect preference. People have schema or prototypes that represent a prototype of an environment. They are also familiar with the prototype. When presented with an environment, people compare the environment with the schema that they have for that type of that environment. The environment that differs from the prototype or schema induces different preferences from the prototype. Different groups tend to have similar schema for the environments; however, they react differently to the mismatch of the schema. Design experts

such as the architects are known to have higher preference for environments that differ from the prototype, while laypersons are known to have higher preference for the environment that match the prototype (Nasar, 1997).

### **Individual and Socio-Cultural Differences**

In general, group differences tend to be identified by demographic background variables such as age, gender, and income; however, Nasar (1997) discusses individual differences in terms of internal state, purpose, personality, and culture as factors influencing preference. Internal state or mood of the respondents when rating the scenes was found to influence their rating. Respondents in a more pleasant mood rated the scenes as more pleasant than those in a less pleasant mood (Nasar, 1997). Purpose also plays a role in preference. Scene ratings have been found to vary in relation to the purpose of the rating or the respondents' plans (Nasar, 1997). This finding is parallel to the involvement level of the respondents with the environments (Ritterfeld & Cupchik, 1996).

Personality may also affect preference. Although this aspect has not been adequately studied, Nasar (1997) suggests that personality types according to the Myers-Briggs Type Indicator (MBTI) influence preference for the environment. Each type has a different preference for different types of environment. This quality may also contribute to the difference in preferences between architects and the public, since the architects tend to comprise of different type of personalities from the general public. Kaplan (1977) studies environmental attitudes and personality type using a standard test; and concludes that the personal test yields useful results regarding person inclination with natural environment.

Finally, group differences such as culture and sub-culture are believed to influence preference. People who belong to the same culture or subculture tend to have shared learning and experience. Nasar (1997) refers to taste culture as group differences by sub-culture in America. Taste culture is distinguished largely by education and occupation and believed to have different standards for aesthetic judgment (Nasar, 1997; Nasar & Kang, 1999). Taste culture also accounts for the difference between designers and the public, since designers are defined as a high culture group against the rest (upper-middle, lower-middle, low, and quasi-folk). This difference was the only one that was proved significant by empirical research (Nasar & Kang, 1999).

The review of previous studies thus far, provides implications for this research as follow:

- 1) The review of research components guides the design of this research in the sampling settings, the use of single-verbal rating scale, the use of photographs as surrogates for the environments, and consensus and difference in preference from different groups of people.
- 2) The review of the study models provides specific methods for this research for different purposes. To identify important characteristics, the CIM approach, including preference rating and dimensional analysis, and analyses of the most and least preferred scenes are taken from the exploratory model. To identify relationships between preference and shopping attributes, canonical correlation analysis is chosen from the predictive model to use in this research. Finally, to compare differences in preferences for different environments and of different groups of shoppers, ANOVA and MANOVA from the experimental model are used.
- 3) Theoretical explanations and cumulative results provide framework and variables to be measured and observed in this research. Preference framework—coherence, complexity, legibility, and mystery—and affordance provide theoretical explanation for the results. Other cumulative results inform this research; variables to be observed such as content and spatial based categories, purposes and behaviors, and socio-economic backgrounds.

The previous review of literature provides basis for the design of this research. Components, models, specific methods, and variables are derived from the review. In the next section, the most relevant study is discussed, according to the similarity in setting, approach, models, methods, and variables used in this research.

## **IV. A Critique of the Most Relevant Study**

Woods (1995) *Environmental Factors that Influence Preference and Price Expectation of Commercial Landscapes and Storefronts* is by far the study most relevant to this research in setting, methodologies, and related variables. These similarities can be described by the following:

- 1) This study deals directly with shopping environments, that is, open shopping centers.
- 2) The use of three models, exploratory, predictive, and experimental. In the exploratory model, Woods used an analysis of the most and least preferred scenes and a CIM approach to identify factors that influence preference and price expectation of commercial landscapes and storefronts in open shopping centers. In addition, he also used content analysis of verbal

descriptions from the respondents. In the predictive model, he used regression analysis to identify relationship between preference and expected price of products. In the experimental model, he used ANOVA to compare means of preference among different groups of people, by their shopping behaviors and socio-economic backgrounds.

- 3) Woods used variables that are related to the study of preference for the environments and shopping environments. These variables include shopping frequency, shopping behaviors, and socio-economic backgrounds, such as age and household income.

### **Research Setting**

The settings were open shopping centers (as opposed to enclosed shopping malls) in the southeast America (the Carolinas). 49 scenes were taken and systematically selected from the total set to reflect the common characteristics of the settings. To ensure equal distribution of characteristics, 7 by 7 matrix of characteristics were applied in scene distribution of characteristics. Woods not only used the procedures common in CIM to select the scenes, but also applied the additional control of removing signs, people, evidences of poor maintenance, and elements that are not part of commercial settings.

### **Research Design**

In the first part, Woods measures preference and price expectation separately using a 1-10 preference rating scale. Woods's argument for the use of price expectation is that preference alone might not account for economic factors relating to shopping environments. The scenes were presented via an on-screen slide projection in dark classrooms in two different random orders. The respondents were comprised of three student groups (marketing, psychology, and communication) and a church group, making the sample sizes of 177 for preference rating and 176 for price expectation rating.

The second part of the survey includes a free comment survey on 7 selected scenes. One scene is randomly selected from each cell of the matrix, and all scenes were alternatively used in the free comment survey. The respondents were asked to give a brief description of each scene. Another part included a background survey, in which 11 questions asked about important shopping factors and 8 questions asked about shopping behaviors other demographic backgrounds.

First, the means preference were ranked and analyzed for common characteristics of the ten most and ten least preferred scenes based on means preference. Second, the preference rating data were analyzed using non-metric factor analysis (SSA III). The criteria were loadings not lower



than  $|\lambda| \geq 0.40$  were considered significant and included in the interpretation. Scenes that loaded significantly on none or more than one dimension were eliminated. At least three scenes were required for each dimension to be interpreted. Third, free comments from the survey were analyzed using content analysis. The results were used to help interpret the most and least-preferred scenes and the extracted dimensions. Finally, data from the rest of the survey were analyzed using ANOVA on the averaged scores of each dimension. The ordinal rating and large number of categories were collapsed into 2-4 categories to meet the frequency requirement.

Since the interest here lies on preference, only preference results are reviewed. The most preferred scenes showed common characteristics such as: articulated façade from researcher's review, and plants and preferred architectural elements and materials from respondents' comments. The least-preferred scenes showed common characteristics as vase pavement with little or no plant and linear with almost no articulation façades from researcher's review. The respondents' comments for these scenes were negative, such as: old/outdated/rundown and plain/dull/boring.

## **Results**

Factor analysis yielded 4 factors for preference—Plain façades and barren landscapes, articulated façades with a sense of mystery, Neo-traditional architecture, and Pleasant generic scenes. Plain façades and barren landscapes were associated with the same negative comments as the least preferred scenes. Preferences for this dimension differed significantly between the church group and the students, and between levels of the importance of advertisements. Articulated façades with a sense of mystery were associated with positive comments such as nice, pleasant, attractive, and good architectural elements. Preferences for this dimension differed significantly by respondents groups, and importance of brand names, parking, things to do, and recreational shopping frequency.

Neo-traditional architecture was associated with the comments good architectural elements, nice, pleasant, and attractive. Preference for this dimension differed significantly by importance of parking and things to do. Pleasant generic scenes were associated with comments such as: plain, dull, boring, clean and well kept, and large. Preference for this dimension differed significantly by importance of brand names, parking, advertisements, and things to do.

Preference was found to have a positive relationship with price expectation. Woods suggests that with the absence of signs, people tend to fall back on their preference to make judgments about

price expectation. Findings on factors influencing preference are façade articulation, variety of architectural features, enframement and focal point, landmarks, shelter, and prospect and refuge.

### **Critique**

This study provides a useful basis for this research in methodology, variables used, and implications. The triangulation of three methods—analysis of the most and the least preferred scenes, factor analysis, and content analysis of the free comment survey—provides complete understanding of factors influencing preference. This study also provides useful variables such as shopping preference, shopping frequency, and recreational shopping.

However, there are some points that require careful reviews of methodology, results, and generalization. First, the fact that preference and price expectation highly correlated can be because preference judgment, in the commercial environment context, somehow already accounts for price. Since preference is an overall assessment, when people make their preference judgment for a shopping environment, they may already include judgment of price of the products and services provided. Price expectation, therefore, may be a sub-section of preference for shopping environment. Measuring two dependent variables at the same time negates the stability of the solution from factor analysis, since the sample size needs to be split into halves. Woods's total sample size for factor analysis of preference rating is only 177, which is substantially less than the minimal suggestion of 5 cases per variable (Hair, Anderson, Tatham, & Black, 1998).

Second, half of the sample size of Woods' study consisted of student respondents. A student sample is not ideal for generalization, since they are not very good representatives of the general public, especially for the evaluation of commercial environments. Students seem to have different lifestyles regarding shopping than the general population, who are mainly responsible for personal and family shopping. Third, the use of a 1-10 scale may be affected by the idiosyncrasy of using a rating scale. That is, some respondents may use only the high portion of the scale, while others may use only the low portion in spite of the fact that they might have to evaluate items similarly and equally. The major effect of using a 1-10 scale occurred when Woods collapsed variables for ANOVA procedure. Variables measured using 1-10 rating scales were collapsed into 3 categories. In this case, the respondents who rated items similarly but used different portions of the scale had these items always assigned into different groups, even though they may have intended to rate the variables similarly.

Fourth, the use of a series of ANOVA tests on the entire dimension may increase the experiment-wide type-I error. Woods did not mention concern or compensation for this possibility. Hair and others (1998) argued that multiple tests at .05 level each can inflate the type-I error for the whole experiment to be over .05. Finally, Woods applied controls for sign, people, and maintenance; therefore, his results and implications do not account for variations in environmental conditions such as people and maintenance level. In reality, shopping environments cannot be devoid of signs, people, and environmental noise (unintended features). Moreover, maintenance is always found to be an important factor in preference judgment of the environment, especially in an urban context.

In spite of the mentioned issues, Woods' study provides a valuable example of the application of the CIM approach to the setting of shopping environments, which is different from natural environments where CIM is normally applied. The variables used in Woods' study also suggest shopping-related and background-related variables for this study.

## **Summary**

This literature review chapter has discussed the relevant literature related to different paradigms of environmental perception and assessment and perception and preference research. The review of previous studies was described by different paradigms of environmental perception and assessment. The perception and preference approach, from the public evaluation paradigm, was discussed in detail. The previous research was reviewed with regard to research components, study models, cumulative results, and theoretical explanations that establish the basis for the design of this research.

The studies reviewed provide a theoretical and methodological basis for the present research, and many related variables have been drawn from them. The methods of sampling the environments, the use of photographs as surrogates for the environments, the measurement of single-verbal rating scale, and users as a source of variation in preference have been drawn from the reviews of the research components. Preference as an overall affective measurement, Category Identifying Methodology, the analysis of the most and least preferred scenes, and related analytical methods including dimensional analysis have been drawn from the exploratory model. Canonical correlation analysis has been drawn from predictive model to use to identify relationship between preference and other shopping attributes. ANOVA and MANOVA have been drawn from experimental model to use to identify consensus and differences in preference for different

environments and of different groups of shoppers. Finally, variables related to preference for the environments and variables related to shopping research have been drawn from the cumulative results and the most relevant study.

The following chapter, methodology, discusses the specific methodological issues and procedures that are derived from previous research. The methodology chapter describes objectives, research questions, research design, including data collection techniques, survey procedures, analytical methods, and variables used in this research.