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## Public Parks Aesthetic Value Index

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### 1. Introduction

#### 1.1 Aesthetic

Aesthetics is a branch of philosophy dealing with the nature of beauty, art, and taste with the creation and appreciation of beauty. It is more scientifically defined as the study of sensory or sensory-emotional values. Broadly, scholars in the field define aesthetics as critical reflection on art, culture and nature.

Traditionally, aesthetics is specific to the philosophy of art on level of beauty of any object but later, it was expanded to include the sublime with careful analyses on the characteristics. Studies on the aesthetics level experience and its attitude being conducted had lead to a survey of the scope of aesthetics together with an account of redefinition of the term.

According to Kant (1964), the theory of beauty has four clear aspects which are freedom from concepts, objectivity in the judgment, the disinterest of the viewer, and evenness in obligation. Freedom from concepts refers the cognitive powers of human understanding and imagination judge in identifying an object, such as stone. In this situation, the replacement of a certain individual object by a group of object would bring the experience of pure beauty when the cognitive powers are held to be in harmonious. Consequently, this results the second aspect that is the objectivity in the judgment since the cognitive powers are common to all who can classify that group of object. However, this was not the basis on which the apprehension of pure beauty was obligatory. According to Kant (1964), it derived from its disinterest because pure beauty not necessarily brings the fully agreement of the visitor to its aesthetic level nor does it raise any desire to possess the object but it just make satisfaction in a distinctive intellectual way.

##### 1.1.1 Aesthetic value

Aesthetics value can be defined as theory of the level of beauty of a certain natural resources (Slater, 2006). This term appear when there was some interest among researchers to assess the level of aesthetic quantitatively instead of just qualitatively. It is about the objectivity and universality of judgments of pure beauty. It can also be defined as the individual judgment of the quality of beauty.

The main debate over aesthetic value concerns on social and political matters, in many different points of view. The central question concerns whether there are existing aesthetics

expertises that have aesthetic interests and whether their view represents a fair view since, from a sociological perspective, it only just a portion of the whole population.

### 1.1.2 Environmental aesthetics

This paper would explain on public parks which are related to environment. In this case, according to Fisher (2003), environmental aesthetics applies naturally in the study of the aesthetics of nature conducted under the influence of environmental aspects concerns. The rapid growth of concern for the natural environment over the last third of the 20th century has brought the welcome reintroduction of nature as a significant topic in aesthetics such as the aesthetic interactions with nature, the aesthetic value of nature, and the status of art about nature. Nature began to be seen as comprising landscapes compelling in their own wild beauty and objects valuable in their smallest natural detail.

Environmental aesthetics consists of two terms which are environmental roots that emphasize on the aesthetics of nature, and aesthetic appreciation that focusing on the notion of environments of all sorts as objects of appreciation (Fisher, 2003). Based on these, nature is regarded not as an object to be exploited, but as something with an autonomous and worthy existence in itself. A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community but is wrong if otherwise.

According to Berleant (1998), environmental aesthetics applies to the researches on the aesthetics of nature of all sorts of environments either human made or natural conducted under the influence of environmental concerns. This environmental aesthetics also incorporates city planning, landscape architecture and environmental design, and it is significant because, whether applied to nature or built environments because it directly associating the modern structure or design to the standard theories in aesthetics. In short, Thompson (1995) found that although the authorities have an obligation to preserve beautiful high aesthetic value parks, they also have an obligation to preserve aesthetically valuable nature areas.

### 1.1.3 Aesthetic value judgment

Judgments of aesthetic value rely on our ability to discriminate at a sensory level. Aesthetics examines our affective domain response to an object or phenomenon. According to Slote (1971), a personal view on the level of aesthetic cannot represent the view of the community because each individual in the community also have their own view unless all of them have the same perception.

Since beauty is not a tangible object, judgment of aesthetic value is subjective to any individual perception. For example, it can be related to desirability or expectation on certain aspects of the nature. This assessment would also be based on many other kinds of issues such as senses, emotions, intellectual opinions, culture, preferences, values and behavior (Slater, 2006).

Aesthetic judgment is not only focusing on sensory discrimination but also linked to capacity for pleasure (Kant, 1964). The sensory discrimination that raising the pleasure would results the enjoyment. However, in order to judge something as having high aesthetic value, it needs a third requirement, that is it must involve the viewer's capacities of

reflective contemplation. In short, judgments of aesthetic involved sensory, emotional and intellectual all at once.

#### **1.1.4 Factors of aesthetic value judgment**

There are some factors that could contribute in viewer view or perception on aesthetic value level. Negative reaction such as disgust shows that sensory detection is linked to body language, facial expressions, and behaviors (Slote, 1971). Aesthetic judgments also linked to emotions that partially embodied in physical reactions. For example, watching a well-design landscape parks may give the viewer a reaction of awe and consequently, physical reactions.

In the other hand, aesthetic judgments may be affected by culture or norm of the community. Other factors that could affect the judgments are desirability, economic, political, or moral value.

Aesthetic judgments can be highly parallel or highly contradict between viewers (Mothersill, 2004). In the other hand, aesthetic judgments were partly intellectual and interpretative. Therefore aesthetic judgments were usually based on the senses, emotions, intellectual opinions, will, desires, culture, preferences, values, subconscious behavior, conscious decision, training, instinct, sociological institutions, or combinations.

### **1.2 Index**

Index is a numerical standardized value of evaluation of a variable that is in composite form, meaning that this variable was formed through the integration or combination of several other variables.. The evaluation process of this composite variable is not an easy process since there is no standard value used as a base of comparison of the evaluation. Therefore the indices are the best way to be introduced to determine that particular standard value.

A Public Parks Aesthetic Value Index, proposed in this paper is a measurement that aggregates numerous aesthetic value indicators into one consolidates and objective value representing the status of aesthetic value in public parks in relation to some specific use. The mode of assessment was carried out with a full consideration on certain criteria as suggested by Haslina (2006).

### **1.3 Public parks**

Public parks is a bounded area of land, either in the form of natural or man-made state, dedicated to recreation use and generally characterized by its natural historic or landscape features. It is used for both passive and active forms of recreation and may be designated to serve the residents of a neighbourhood, community, region or province. This area is maintained by a local or private authority for recreation which can stimulate the morale and transform the cities to become more attractive and entertaining to visitors (Cranz, 1982).

Parks commonly resembles a certain formation of landscaping which any individuals who visit it would find more relaxing and feeling enjoyment of any recreation activities, for example picnics and sporting activities. Many smaller neighbourhood parks are receiving increased attention and valuation as significant community assets and places in heavily populated urban areas.

Traditionally, public parks are classified by their horticulture design, recreational value and public friendliness. It often provide leisure and sports areas for children and teenagers. It may also equip with semi natural or man-made habitats such as woodlands, heaths and wetlands. The formal garden designs and high composition of flora species characterized the horticultural history of public parks.

Rapid population growth rate and prolonged economic expansion consequently results a high degree of urbanization which could led to serious degradation of living environment and public amenities including air and water pollution, expanding temperature diffusion and decrement of public open space areas.

In order to have the functioning public parks in giving relaxation, enjoyment and pleasuring to the community, besides a good management and proper location, public parks should have a good aesthetic value. Aesthetic value for public parks can be defined as the level of beauties of natural beauty of public parks. However, the assessment of aesthetic value cannot be done in a straight forward approach because as mention earlier, this term is subjective to qualitative variables which are in composite form that means it consists of several aspects that need to combine together. Therefore the index of aesthetics value needs to be applied and measure to assess the aesthetic value of the parks. Index is a numerical standardized value of the composite form.

### **1.3.1 Characteristics of aesthetic values in public parks**

Aesthetic values in Public Parks are normally characterized with five scopes; tree, fauna, lake, flower and building (Haslina, 2006).

#### **1.3.1.1 Tree**

The basic value of the tree in public parks could be based on emotion, aesthetic or strictly utilitarian. However, visitors seldom perceive the value as strictly aesthetic or monetary gain. In some areas, public used to spend on tree care and management which reflects the approximate value of trees. Trees may be selected to be planted in the public parks based on texture, fragrance, size, shape and colour. The replanting of best and cost effective tree species could create beauty environment and pull the visitors to come.

#### **1.3.1.2 Fauna**

Fauna is one of the aesthetic aspects in public parks. The existing of fauna species such as birds and fish would make the parks more harmonious, relaxing and enjoyable. Fauna species could revitalized flora survival needs and hence support each other. In the other hand, the abundance of greens in public parks could cause a significant increment in wildlife population.

#### **1.3.1.3 Lake**

Public parks, especially in urban areas are normally provides the visitors with lake as a choice for recreation. The physical attractiveness of a particular area contributes to its aesthetic value. The well-managed lake would provide the visitors not only the natural visual element but also a serene sound and smell. These aesthetic characteristics of the lake make up the reason that visitors might find lake as beautiful and attractive.

#### 1.3.1.4 Flower

The function of flowers in public parks is well-documented. The evolving, flourishing process of civilization has increased the usage of flower in the form of civility, art and religion. For example, the Japanese people regarded flowers as materials for spiritual expressions (Haslina, 2006).

#### 1.3.1.5 Building

Besides location, the appropriate design for the intended function of the building is one of the important elements of value. The style and functional utility of a building are necessarily interrelated to create a success. In the valuation process, the aspects that are critical are functionality of the layout, design attractiveness, the appropriateness of the material and its quality and workmanship applied.

### 1.4 Elements of design aesthetic value

According to Janick (2010), there are four main design elements which become the visible features of all objects. They are as follows.

- a. Colour – Refer to visual sensation produced by different light wavelength that may be described in term of its hue, intensity and chroma.
- b. Texture – Refer to the visual effect of tactile surface qualities.
- c. Form – Refer to the shape and structure of a three dimensional object
- d. Line – Refer to one dimensional interpretation of form that delimits the shape and structure

### 1.5 Aim of study

Non-existence of this public parks aesthetic value index in Malaysia brings the issue of the uncertainty whether the existing public parks are functioning well in giving relaxation, enjoyment and pleasuring to the community and visitors. This study aims to introduce an index to assess the level of aesthetics value of public parks and applied it to assess the aesthetic value level of a certain public parks in Malaysia.

## 2. Methodology

### 2.1 Study area

This research had been conducted in Shah Alam Lake Garden, Selangor, Malaysia which is one of the popular recreational public parks among domestic tourists in Selangor (Fig. 1). This garden, consists of three man-made lakes is located in the city centre and provides the community and visitors with water-sports besides some basic leisure activities. This urban public parks, managed by government has a beautiful, green and unique landscape with the presence of many different bird species.

### 2.2 Data collection

Due to the assessment of aesthetics value is subjective to individual's perception as mention earlier, the first stage of this research is a qualitative study with questionnaire as a tool of data collection.

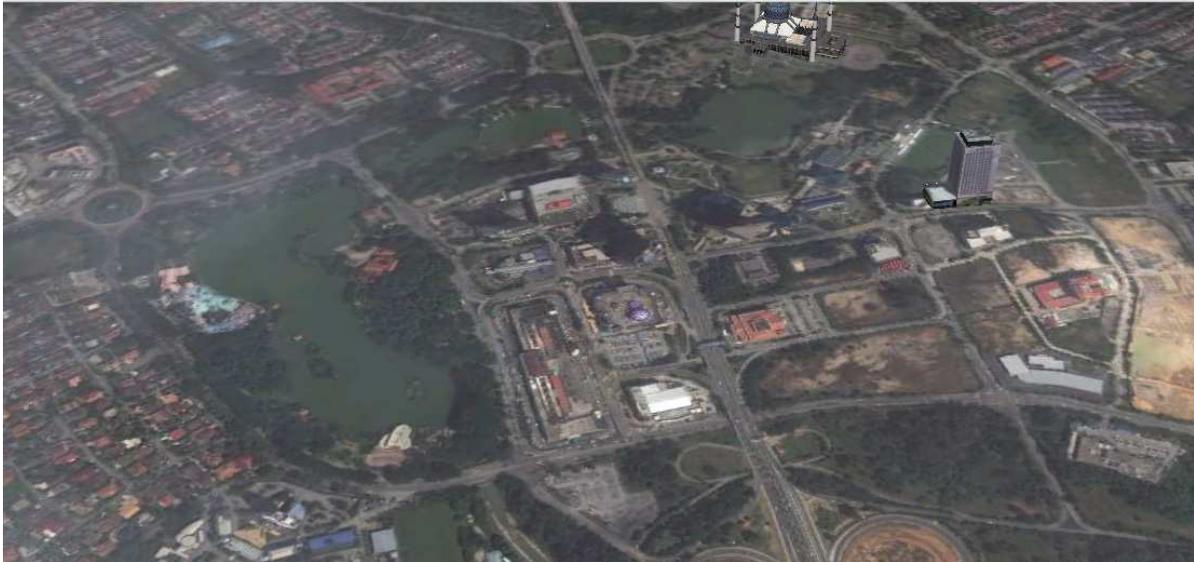


Fig. 1. The map of Shah Alam Lake Garden

The field survey was conducted on weekdays, weekend and public holidays. The respondents involved those who were present at the lakes at the time when questionnaires were given. Besides that, the respondent age of above 16 years old was also been point out in order to ensure that the respondents could give the grading to the aspects fairly. The questionnaires were designed based on the information obtain through discussions with experts. The questions provided in the questionnaires were straight forward and highly focusing on the aim that was to assess the respondent perception on the aesthetic level of the parks.

This questionnaire has two parts, Part 1 and Part 2. Part 1 involved the ranking of importance of five aspects in study while Part 2 involved the ranking of aesthetic value of each aspects attribute. Likert scale was used as aesthetic value grading scale for each sub-aspect from 1 to 10 where 10 means very high value. Moreover, Likert scale was also used as importance scale for each aspect from 1 to 5 where 5 means not important at all. Five aspects in study were as follows.

a. Aesthetic value of Tree

After the final round of discussion with experts, this section focused on the form, colour, shape, scent, sound, appearance, function, site selection, and quantities and diversity of species that could influencing the visitors to visit the park.

b. Aesthetic value of Animal or Fauna

After the final round of discussion with experts, this section focused on the quantities and diversity of species, sound, disturbance, smell, colour, shape, habitat and its function in the parks.

c. Aesthetic value of Lake

After the final round of discussion with experts, this section focused on water quality in term of presence of fish, colour, lake design, sound, disturbance, odor, site selection and its function to visitors.

d. Aesthetic value of Flower

After the final round of discussion with experts, this section focused on type of species, shape, form, colour, sound, aroma, site selection, design, quantities and its function.

e. Aesthetic value of Buildings

After the final round of discussion with experts, this section focused on design, level of cleanliness, material quality, number of buildings, suitability of the location and its functionality.

### 2.3 Sampling technique

Sampling was conducted using convenience sampling techniques. In convenience sampling, the sample selection is based on availability and accessibility. This technique is quite suitable in this study due to the high mobility of visitors and also unknown activities among visitors.

After calculations of sample size based on the population size obtained, it was found that as many as 407 respondents need to be taken as a sample size from the whole population. Although convenience sampling technique was applied, the sample of respondents was still taken from the whole area of the lake to ensure that the results would represent the whole visitors of the lake from all areas. Although the likelihood of the sample being unrepresentative of the visitor population would be quite high, the information could still provide a fairly significant insight and become a good source of data in exploratory research.

### 2.4 Data analysis

Second stage of this research involved quantitative study where all the qualitative data being analyzed and quantify to give a certain value to indicate the aesthetic level. Descriptive analysis was first used to determine the importance of each aspect in determining the aesthetic level. Table 1 shows the results of the analysis. It was found that the most important aspect for the respondents to visit the parks was tree with mean value of 2.00 followed by lake, flower and fauna with mean value of 2.34, 3.06 and 3.33 respectively. The aspect of buildings was considered as not important to be including in the assessment with the mean of 4.25. From the observations and feedbacks from visitors, the buildings in the parks doesn't have any uniqueness that can be consider as important enough to attract them to visit. Therefore, the aspect of building would not be analyzed in the second stage.

Aspects	Mean	Median
Tree	2.00	2.00
Fauna	3.33	3.00
Lake	2.34	2.00
Buildings	4.25	5.00
Flowers	3.06	3.00

Table 1. Descriptive analysis of the aspects in study

### 2.4.1 Principal Component Analysis (PCA)

PCA is a technique for simplifying a data set by reducing multidimensional data sets to lower dimensions for analysis. It is an orthogonal linear transformation that transforms the variance covariance matrices to a new coordinate system such that the greatest variance would lie on the first principal component and so on while at the same time still retaining the characteristics of the data set.

The correlation between variables or aspects and component, indicated by factor loading was used as a basic for classifying the dominant variables in each component. If the factor loading value is more than 0.7, the attribute can be considered as dominant and plays a main role in that component (Nunnally, 1978; Hair, 2009) because it would account for more than 50% of the variance in all variables.

The next step of analysis was the usage of Principal Component Analysis (PCA). The reason of applying this analysis was to extract the main attributes from all attributes of each aspect. This is important as in index development, the number of attributes must be optimum in order to represent a good indicator for assessment tools. The index with a lot of attributes would seldom represent a good status indicator. Moreover, another important step in developing or creating an index is the selection of only the most important or dominant attributes as these attributes play a big role in determining the status of the variable such as the status of aesthetic value of the public parks in this study. Since in PCA, the first component is always dominant compare to the other component, the selection of the main attributes was done only in first component.

However, this dominant component cannot be chose straight away as the indicator used in index as there is still some effect of correlation between components. According to Hair (2009), factor loading is the coefficient used to interpret the role of each variable and factor and the unrotated solution may not provide a true pattern of variable loadings due to the presence of this effect. In order to solve this problem, the whole extracted component need to be rotated. According to Rencher (2002), the most popular rotation technique is the varimax technique which seeks rotated loadings that maximize the variance of the squared loadings in each component. Indirectly, this varimax rotation could eliminate the effect of correlation between components.

As mention earlier, only four aspects were being considered after the aspect of building had been omitted. In the preliminary round, PCA was run separately for all five aspects to determine the main or dominant attributes in each aspect. As mention earlier, the index is the composite variable that was formed through the combination of several other variables. Mohamad Roslan et. al (2007) found that the index that can best explaining the real condition or situation is the index that focused on dominant variables in each scope or classification. In this study, it refers to dominant variables in the scope of tree, fauna, lake and flower.

Table 2 shows the component structure of trees after the varimax rotation process of PCA. The Table reports the factor loadings for each variable on the components between the item and the rotated factor. In this case, the factor loading value of 0.7 was chosen as as threshold value explained earlier. It was found that the attributes of maintenance, species selection and form has the factor loading value of 0.773, 0.766 and 0.741 respectively which are higher than the threshold value.

Attributes	Component	
	Component 1	Component 2
Form	0.741	-0.027
Colour	0.425	0.419
Maintenance	0.773	0.101
Quality	0.202	0.699
Species selection	0.766	0.031
Function	0.058	0.840
Quantity	0.499	0.376
Location	-0.078	0.762

Table 2. Results of PCA analysis for the aspect of tree

From the feedback of the visitors, different form of trees can create an attractive view to the park while giving an aesthetic visual to them. At the same time, a proper tree maintenance existed in the park becomes an added value in term of aesthetic value.

Table 3 shows the results of PCA analysis for the aspect of animal or fauna. It was found that higher factor loading recorded for habitat and selection of species with 0.872 and 0.839 respectively. From the feedback of visitors, the varieties of species play a pull factor to attract them to the parks.

Attributes	Component	
	Component 1	Component 2
Species selection	0.839	-0.025
Quantity	0.503	0.490
Habitat	0.872	0.094
Sound	0.067	0.779
Cleanliness	0.663	0.260
Function	0.095	0.843

Table 3. Results of PCA analysis for the aspect of animal or fauna

Table 4 shows the results of PCA analysis for the aspect of lake. There were two attributes that have the value of factor loading more than threshold, colour and quality with 0.905 and 0.903 respectively. From the feedback of the visitors, both attributes are important in influencing their first impression.

Attributes	Component	
	Component 1	Component 2
Quality	0.903	0.136
Design	0.309	0.712
Colour	0.905	0.162
Cleanliness	0.575	0.524
Sound	0.261	0.650
Function	-0.041	0.851

Table 4. Results of PCA analysis for the aspect of lake

Table 5 shows the results of PCA analysis for the aspect of flower. It was found that only one component could be form from the analysis and from this component, five attributes were major attributes. They were quality, odour, quantity, colour and species selection. These five attributes were related to each other because if choices of species were good enough, it reflected the qualities, quantities, colour and odour. In short, a good quality species produced a good flower.

Attributes	Component
Species selection	0.746
Quantity	0.773
Quality	0.810
Colour	0.754
Odour	0.796
Function	0.586

Table 5. Results of PCA analysis for the aspect of flower

From all these Table 2 to Table 5, it was found that most major attributes that could be a major pull factors for the visitors to visit were in the aspect of flower. In the final analysis of PCA, all main attributes in each aspect were analyzed together. In this stage, the data was separate into two parts, 300 of them in one part, used to determine the main attribute in exploratory while another 107 were used in validating the exploratory results. This process was done because the results of this stage would be use in creating the index and therefore need to be validating to ensure that the index is valid to be use. The data set of 300 respondents still covering the whole public parks areas and the same applied for the data set of 107 respondents.

Table 6 shows the results of PCA analysis for data set in determining the main attributes in exploratory. It was found that odour of flower, colour of water, quality of flower, quantity of flower, water quality and colour of flowers were the main attributes from all selection attributes, having the factor loading value of 0.805, 0.766, 0.756, 0.734, 0.704 and 0.700 respectively.

Attributes	Component	
	Component 1	Component 2
Tree formation	0.141	0.800
Tree maintenance	0.273	0.771
Tree species selection	0.175	0.727
Water quality	0.704	0.255
Colour of water	0.766	0.177
Flower species selection	0.679	0.164
Quantity of flower	0.734	0.186
Quality of flower	0.756	0.175
Colour of flower	0.700	0.172
Odour of flower	0.805	0.172

Table 6. Results of PCA analysis for data set to determine the main attributes

Table 6 shows that from the exploratory results, it was found that six attributes could be taken as aesthetic value index indicators from 26 attributes. They were odour of flower, colour of water, quality of flowers, quantity of flowers, water quality and colour of flowers following the order. This order or arrangement is important in the next stage of analysis. Consequently, running the same process for the validation data set gave the same arrangement of attributes though the factor loading value is not same.

### 2.4.2 Benchmarking analysis

Benchmarking analysis is the analysis used in comparing the current project, methods or processes with the best practices in order to drive improvement. The objective of this analysis is to set an appropriate reliability and quality matrices for the output based on similar present products.

This method had been used by Mohamad Roslan et. al (2007) in their study on the creation of ground water quality index. They found that this method is suitable and highly sensitive. However, in their study, they used the quantitative data of several prospect water quality indicators.

After the analysis of PCA, the next stage is to develop the index. This study would offer some uniqueness in the index formation; the index is not in statistical equation but in graphical feature (Figure 3). Each vertex represents the attributes, extracted from the PCA and arranged in clock-wise order. This graphical feature which is part of benchmarking analysis was drawn to calculate the index with the help of mean analysis. From this graphics, the index was calculated as the percentage of the polygon area drawn using the data to the whole polygon area as shown in the green area in Figure 3.

Procedure of developing the index using Benchmarking Analysis is as follow.

1. Fix the value of analysis with the scale of 0 to 10 for each main attribute extracted from PCA
2. Built the polygon
3. Calculate each triangle (Fig 2) area inside the polygon drawn based on the value from data using formula (1).

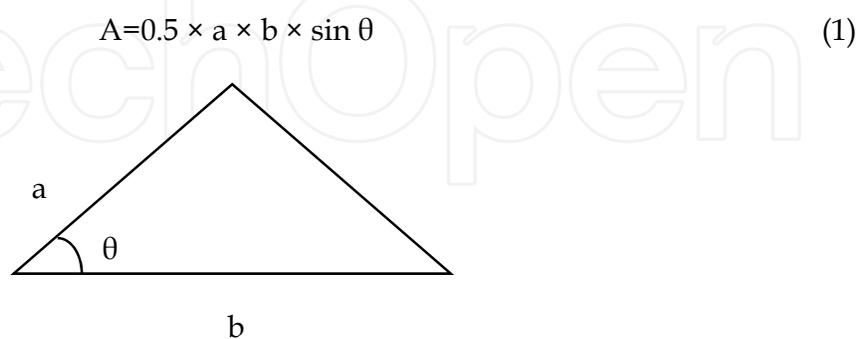


Fig. 2. Triangle in the polygon

4. Determine the ratio of the area using formula (2).

$$IV = A/L \times 100 \quad (2)$$

Where IV=Index value

A= Total triangle area

L=Total polygon area

5. Evaluate the aesthetic value using the index.

### 2.4.3 Sensitivity analysis

This analysis was also conducted to the model to determine its sensitivity to the change of the value. For example, determine the changing rate of the index when any attribute fall from 10 to 9 in benchmarking scale. In this case, it was found that the index value would fall as much as 3.33% for any single attribute that fall as much as one unit in benchmarking scale.

### 2.5 Creation and calculation of the index in the study

Before the polygon can be drawn, the mean analysis for the main attributes extracted from PCA need to be conduct to determine the level of aesthetic level for each attribute within the Benchmarking scale of 0-10. This analysis involved all respondents without separation. Table 7 shows the mean analysis for six main attributes. It shows that during the study, the attribute of quality of flower has the highest ranking compare to the other five attributes with the value of 5.12.

Attributes	Mean
Water quality	4.13
Colour of water	3.99
Quantity of flower	4.75
Quality of flower	5.12
Colour of flower	4.90
Odour of flower	4.28

Table 7. Mean analysis for six main attributes

The values in Table 7 were used in drawing the polygon and consequently the Public Parks Aesthetic Value Index. Fig. 3 shows the polygon used to calculate the index with the scale of 0-10. Using the procedure and formula as mentioned earlier, it was found that the value for Shah Alam Lake Garden Aesthetic Value Index is 20.44.

This study also furnished the index with the grading system; develop using the concept of the polygon area to help in grading the aesthetic value index through benchmarking analysis. Five grades were applied in this product that is excellence, good, satisfactory, poor and very poor (Table 8). These grades were set up using the benchmarking level scale of 9, 7, 5, 3 and 1 for all six attributes.

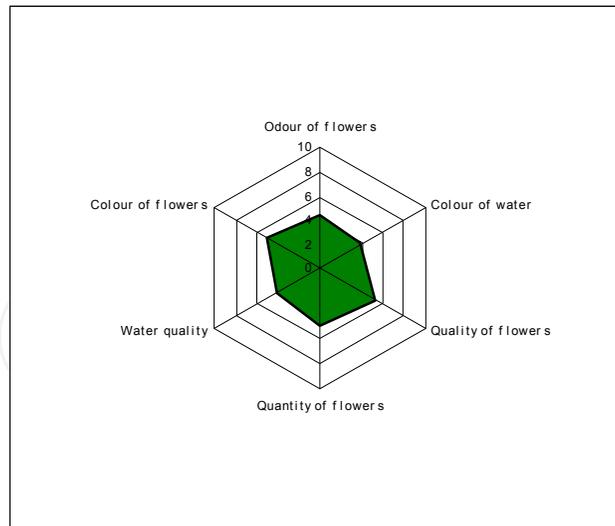


Fig. 3. The index with the mean value for each variables

Grades	Value range
Excellence	81.00 - 100.00
Good	49.00 - 80.99
Satisfactory	25.00 - 48.99
Poor	9.00 - 24.99
Very poor	0.00 - 8.99

Table 8. Grading system

The final stage of this study is to apply the index to calculate the aesthetic value index of the study area. Based on the grading range (Table 8), the index value for Shah Alam Lake Garden Aesthetic Value Index of 20.44 can be classified as poor. From Figure 3 and Table 7, it was shown that almost all attributes were given grading scales less than 5 except the quality of flower. This contributes the overall grade level.

### 3. Conclusion

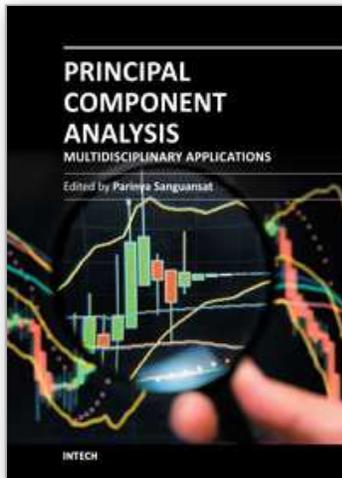
Taking into considerations the five criteria related to the assessment of aesthetic value index as mentioned by Haslina (2006) which primarily focuses on the beauties and the 'in' thing, this index would be a valuable tool in the management of aesthetic value in tourist attraction sites such as public parks, lake gardens and recreational forests. The minimal constraint in application made it suitably applied in assessing the aesthetic value under the sun.

This index was created with the data gain during daylight. Therefore, the main indicator variables in the index became dominant during daylight. However, the assessment for the night session may refer to another set of indicator variables. This brings the potential of future study on this aspect.

Another potential scope of future study is to use the quantitative method in measuring the value or grading for each attribute in the index instead of just collecting the data through a large size of respondent perception's. This could be done with the utilization of several high technology equipments.

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## **Principal Component Analysis - Multidisciplinary Applications**

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This book is aimed at raising awareness of researchers, scientists and engineers on the benefits of Principal Component Analysis (PCA) in data analysis. In this book, the reader will find the applications of PCA in fields such as taxonomy, biology, pharmacy, finance, agriculture, ecology, health and architecture.

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