

**THE RELATIONSHIP BETWEEN URBAN SHADE AND PEOPLE'S
ACTIVITIES IN OUTDOOR SPACES**

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ABSTRACT

Pedestrian is one of the most important factors of an urban space. As one element of the street, pedestrian plays significant role of enhancing and sustaining the quality of an urban space. Climatic conditions at street level are most important for pedestrians and are certainly critical when people do their activity. This study described the pedestrians' behavior during hot climate conditions. The main purpose was to test empirically the relationship between urban shade and people's activities as preferences. It examined the impact of solar exposure (sun, shade) on the time people are willing to reside the outdoor areas. It also explores the influence of different shade pattern to the different people's activities in certain interval time. The aim was to seek which activity has significant relationship to shade in terms of outdoors in commercial areas. People's activities were recorded by using video cameras, which were set on outdoor spaces in five sample spaces and five activities categorization. Computer simulation was used to project the patterns of buildings and trees shade. Simple statistical correlation and regression analysis methods were used to identify relationships between shade and activity. Findings indicated that generally the willingness to utilize an outdoor in daytime was significantly influenced by the presence or the absence of shade. There was significant influence of shade to activity, which indicated by strong negative relationship between shade and chatting/talking activity, and positive relationship to the eating/drinking. Results could be applied to develop and to test, as well as refine the understanding of preferences and constraints that shape outdoor choices in different contexts, thus contributing towards street vitality.

ABSTRAK

Kehadiran pejalan kaki merupakan salah satu elemen yang penting dalam meningkatkan kegunaan sesebuah ruang bandar. Salah satu faktor yang mempengaruhi aktiviti dan kehadiran pejalan kaki di ruang-ruang ini adalah faktor cuaca. Kajian ini melihat kepada pengaruh faktor cuaca kepada aktiviti pejalan kaki dalam keadaan cuaca panas. Tujuan kajian adalah menguji hubungan empirical antara kawasan teduhan kepada pemilihan aktiviti orang ramai. Kajian ini juga dijalankan dengan mengkaji faktor pendedahan cahaya (cahaya matahari/teduhan) kepada masa yang diambil orang ramai untuk berada di luar bangunan. Ia juga dijalankan dengan menegnalpasti pengaruh corak teduhan kepada aktiviti orang ramai. Kajian ini telah dijalankan di kawasan perniagaan di mana terdapat pelbagai aktiviti manusia. Aktiviti orang ramai telah direkod dengan menggunakan kamera video di kawasan-kawasan umum dengan lima sampel ruang dan lima jenis aktiviti telah dirakamkan. Simulasi computer telah digunakan untuk mempamerkan corak teduhan daripada bayang-bayang bangunan atau pokok-pokok. Kaedah regresi dan korelasi telah digunakan untuk menentukan hubungkait antara aktiviti dan teduhan. Hasil kajian menjumpai bahawa terdapat hubungkait yang jelas antara aktiviti luar dengan kehadiran atau ketiadaan kawasan teduhan di kawasan perniagaan. Hubungan negatif daripada analisis terbukti pada hubungkait antara aktiviti berbual dengan kehadiran atau ketiadaan teduhan manakala terdapat hubungan positif pula pada aktiviti makan atau minum di kawasan kajian. Keputusan dapat diaplikasikan bagi menguji dan mengembangkan fokus di kawasan-kawasan lain atau keadaan berbeza. Selain itu, hasil kajian boleh membantu mendalami pemahaman dalam pemilihan rujukan dan batasan yang wujud pada konteks berbeza seterusnya menyumbang kepada kemeriahan sesebuah jalan.

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CHAPTER 1

INTRODUCTION

Topic of this research is about urban shade related to people activities in an outdoor space. The study concentrated on the role of shade from buildings or trees shadow in the context of enhancing the quality of outdoors in commercial area, especially in pedestrian area where people are commuting. The study would be discussed in three sections that were urban block, shadow pattern and people outdoor activities. The case study took place in Orchard road as main corridor for informal activities of Singapore.

1.1 Background of study

Urban growth resulted many changes in the ecology of life order such as on human, animals, plants, and physical environment. Many researchers have studied about these changes in various fields of studies. According to Emmanuel (2005), urban designers, planners, architects, and engineers have not fully understood the

situation of the climate effect. Moreover, issues of global warming arose around the world. Change of climate strongly influence to human being, animal, and even physical environment. One of the effects that rise from the global temperature may alter and threaten the creatures of life (Gore, 2007). Temperature and oxygen has increased for ten years since 1995 to 2005, approximately 20 percent radioactive fold (Intergovernmental Panel on Climate Change, 2008).

Several investigations have achieved some results on how qualities of a place measured from the place itself. In addition, one goal in urban design field in context of tropical climate is to provide shading for human thermal comfort (Emmanuel, 2005). In this study, shading derived from buildings and vegetation shadows that influence the ambient quality in particular places. Agus (2004) addressed that each shadow of the building and vegetation might have different influence on the space relationship quality, positively or negatively. . Moreover, temperature is also a critical factor related to human thermal comfort (Scudo, 2002). Gaitani et al. (2005), stated that human thermal comfort could be defined as reaction of satisfaction or dissatisfaction with environmental terms due to human condition. Meanwhile, it is also difficult to address as it depends on various influencing factors. These are main physical factors, which are (1) ambient air temperature, (2) air velocity, (3) relative humidity, (4) mean radiant temperature.

Microclimate has been put into consideration by architects, planners and also urban designers. However, some designers are still not fully comprehend the concepts of the relationship between human behavior and physical environment in term routine activities (Malavi and Malavasi, 1999).

Many factors such as security and safety, activity, noise, reposition, comfort, and others might influence the quality of facilities. Shadow is one of the elements with significant influence on urban thermal comfort in the tropics. For instance,

shadow is considered vital in order to respond to the tropical climate like Malaysia, Singapore and Indonesia.

Occasionally, many architects, planners and urban designers failed in planning, forming and designing building blocks by locating vegetations roughly based on aesthetical values. They often neglected other factors that might influence the quality of the spaces where the human thermal comfort plays a main role in order to enhancing the outdoor quality.

Pedestrian areas are the main function to connect certain spaces of a town forms. People may walk, even considerably long distances, instead of driving in their air-conditioned petrol powered cars if outdoor condition are comfortable enough for pedestrians. They will also use the outdoors more often, for social encounters, for window-shopping or just for gentle stroll, increasing the numbers of pedestrian will, in turn, attract and promote businesses, and in the long run it adds the city's economical and livability values, as well as meeting basic conditions for environmental, social and economical sustainability. This is one of the most important things to look and assess the image of a town.

Furthermore, according to Kaplan et al. (1998) explained that comfort is fallen in yielding from its green nature. It could be due to the interpreting in natural greenery that is an important factor in enhancing the quality of network on pedestrian links. Therefore, the comfort zone will obtain by increasing much greeneries and providing shades where simultaneously of the existence of trees and buildings can reduce temperature derived from direct solar exposure.

Thus, good condition for walking and for life on foot, along with possibility for staying, for pauses and experiences are the key to attractive and lively public spaces.

1.2 Statement of Problem

Some town designs did not pay much attention to conduct the shadow as shades, especially in network system of pedestrian linkages where places are most people doing their activities. In a network system of pedestrian links, there are nodes or 'pause' area where people having their activities like reading, chatting, or seeing people. According to Emmanuel (2005), shade does relate to climate-conscious urban design that is important in urban areas in tropical countries. He added that the art of artistically applying urban morphology to form shade at public places has received only a little consideration in the tropics.

Ecological sensitive area is the main reason why weather and architecture take into consideration. Certain area could be observed by putting environmental health aspects into consideration (Emmanuel, 2005). It presumed that there are some ways to reduce global warming effects. There are many effective ways where design might contribute to a sustainable environment.

Gehl et al. (2006), studied that the appearance of a town formation is a result of evaluated history of a pathway and sellers, who sold their goods from small-scale stalls as place for people to observe and experience. They have changed in terms of its function, for example, certain places for pedestrians now became roads. However, the main key is how the changes happened among those who came, who has gone and who stayed until present. Hence undeniable, pedestrian is an important element to join various function of spaces neither that is outdoor space and indoor.

Patterns of pedestrian space in multi-purpose development are usually results from the growing structures around it. For example, office buildings, mall buildings, shopping centers, open spaces, parking areas and others. These elements are the key

separators that influence the whole length of the pathway. This can be in the form of barriers (physical obstruction) or gaps (interruption to continuity) like, roadway, intersection, and other (Parker et al., 2008; Bahari, 2008). A standardized network of connection system is not conditional for pedestrian problems in towns, or for security and safety reasons, but also as space link between one activity and others (Emmanuel, 2005).

There are many researches on how shadows and shade can reduce temperature around the place (Agus, 2002, 2003, 2004; Santana, Marcias and Garcia, 2001; Moise and Aynsley, 1991; Scott, Simpson and McPherson, 1999). The relationship between temperature increase and the space's shade is identifiable through the human behavior around the space. It takes a verification to prove scientific relationship between existing shadow level and human activity patterns. Therefore some different approach might be put into consideration in order to improve space's quality in tropical and non-tropical area.

1.3 Research Issue

There are lacks of study in pedestrian links about influences of trees and buildings shade physical factors on human comfort, because it depends on the microclimate of the city where it is located. Influences of shade discussed in many various fields of study, such as medical, architecture, town planning as well as urban design. It has a significant value on influencing human beings. Health and comfort areas are the key consideration. Microclimate factors might significantly influence human behaviors.

Pedestrians are the main area where people commute. Gehl, (2006), addressed that the main function of pedestrian is to provide the links between people and place, and to be able to provide sense of welcoming especially in public space. Thus, it is vital to consider vegetation and buildings shade as variables in order to gain thermal comfort.

Furthermore, Agus (2004) explained in his study that there were differences among shadows resulted from trees and buildings. Shadows of trees give more significant effect than buildings. This study took place in a campus area, where students had specific purposes to remain outdoors. On the other hand, building-shaded areas are relatively hotter rather than tree-shaded areas (Agus, 2002).

Previous findings by Agus (2002) focused on certain variables, based on students' preferences. Questions about its applicability in commercial area, where people and their purposes are various, might arise. Gehl (2006), in his study showed that there are other factors that might influence human spatial preferences in a network system of pedestrian links such as the quality of ground floor, such as forms, types, and other characteristics.

Therefore, this study focused on the relationship between the urban shade and people's activities in pedestrian oriented commercial area in an urban setting.

1.4 Aims and Objectives of Study

Due to the discussion presented, the thesis attempted to deal with the relationship between urban shades to outdoor activities. Urban shades was indicated either by buildings or trees that provided shadow casting to the outdoors through on comprehending urban block geometry and orientation. Furthermore, people activities were categorized in five sedentary activities such as sitting, standing, reading, eating and chatting. The purpose of this category was to find out which activity occurred most, in term of shade influence.

Thus, in order to effectively achieve the primary aim, the following objectives were established:

1. To find and provide scientific evidence on performance of people's activities on outdoors within urban block of commercial area according to the typologies determined by the author. This research intends to acquire information on human preference through outdoors field measurements to justify the design effectiveness in providing shade for comfortable spaces.
2. To identify and define existing outdoor spaces within the pedestrian mall in Orchard road. Consequently, it will help to establish the typologies of the existing outdoors space for shadow pattern assessment related to outdoor location, building block including trees and people activities, in relation to shaded area.
3. To determine, which activity is likely to have strong relationship to shade in order to design effectiveness of an outdoor within commercial area or shopping complex.

1.5 Research Question

The research objectives in this thesis have lead to research questions on relationship between urban shade and people activities. Thus, the research intends to answer questions related to these two issues:

1. How the urban blocks provide shade for outdoors?

The question related to an understanding of urban structures to identify its shadow patterns impact to the outdoor areas where people reside.

2. What and when is the most activity take place?
3. What is the most activity that has significant relationship to the urban shade?

1.6 Scope of Study

Context of the study will be focus on commercial area in Orchard Road in Singapore. The main reason of selecting this area is that the literature reviews mentioned that Singapore has its achievement in reducing temperature (Emmanuel, 2005). Orchard road has successfully provided human comfort in surrounding area compared to others similar places. The study will focus mainly on the linkages and connectivity as a key characteristic of pathway. It will investigate the density of people when they do their activities, the density of shaded area, which will fall onto space and recording the people's behaviors occurred on the sampling area. Therefore, this study will identify any significant relationship between urban shades on human preferences within the urban block.

The following points are the assumption and limitation of this research study:

- i. The studies were limited to daytime only due to urban shades occurred
- ii. This research was limited to the major personal and environmental parameters, which were activity level and building block ratio (W/H) and its typologies. Factors such as body surface area, age, sex, ethnic differences, food and etc, were assumed to be minor parameters
- iii. Due to the limited time of this research, the measurement were limited to one day for pilot survey and one day for observation with the assumption that there were minimal differences of environmental parameters throughout these days and due to the seasonal conditions and rational selection of schedule
- iv. Due to the limited equipment to measuring the existing condition of activity and environment, the technique of data analysis was used randomly from data collection such as time recording for activities, photograph taking and shadow patterns obtained from computer simulation (SketchUP 5)

1.7 Significance of Study

Development will be continuously changing to accommodate people's need, economic demand, politics, and many other purposes in a city. Market is also as a vital element in creating cityscape. Referring to the history of development of town, sales activity could not be separately by the existence of market as community center. Furthermore, development growth pattern in the modern times results in people still using shopping complex as a city center. Meanwhile, to connect one area to other within a city is namely network, pathway, linkages or other similar terms. There are places where people are chatting, entering and leaving, walking along side,

standing alongside, taking a break, standing in doorways, shopping next to, interacting with, looking at displays in, sitting on, sitting next to, looking in and out of (Gehl et al., 2006).

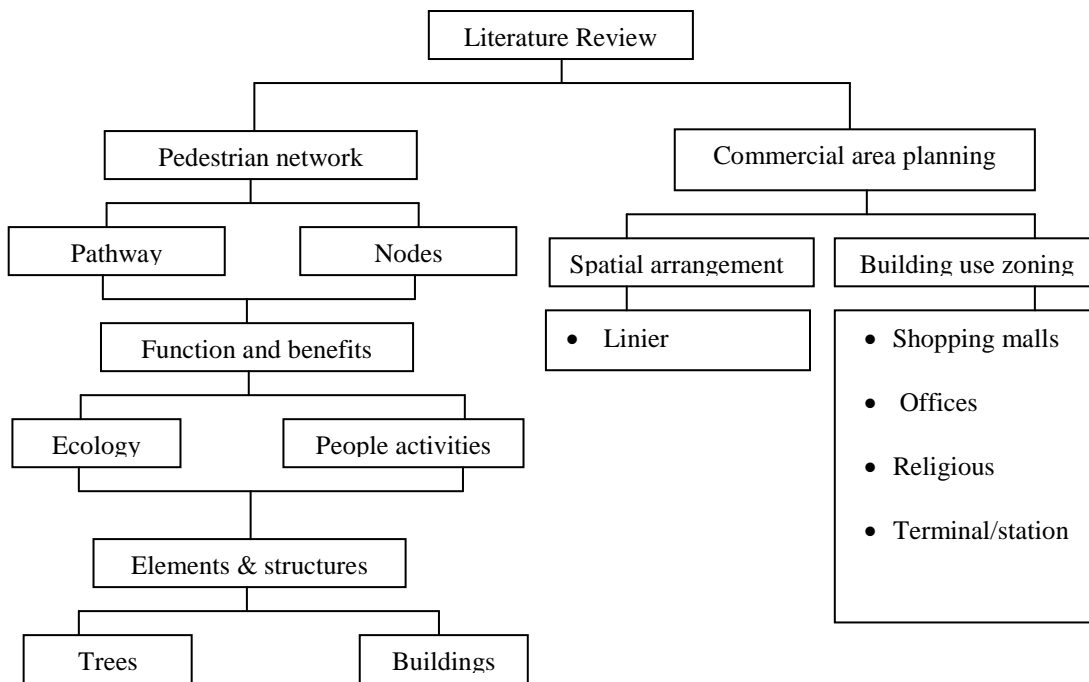
We often disregard that the role of shade is vital in creating comfortable outdoor space. Architects, planners, landscape designer and urban designer also lack of concentration to the role of shade. Shadow can reduce hot-temperatures and balancing the humidity. This is often forgotten by them that only focus on aesthetical values and sometimes only imitates western style causing to forget to the local context especially in area or even tropical states like Malaysia, Indonesia, Singapore, Brazil and others. Thus, providing shade in order to achieve the quality of a place will generate livable and attractive place due to tropical region and it helps to preserve the quality of environment.

1.8 Research Methodology

The methodology of this research addressed two main issues discussed in section 1.4 (research aims and objectives) and 1.5 (research question). To approach these issues, the following tasks have identified:

- A. Research method to identify the shadow pattern and shape throughout its building block
 - i. Literature review to define outdoors, building block form, and earth-sun relationship

- ii. Conduct a field observation to identify the existing pedestrian mall, building block, and consequently the outdoors space
 - iii. Literature reviews on outdoor spaces to determine the critical design parameters involved in shadow pattern and shape assessment
 - iv. Analysis and categorize the typology of outdoors based on chosen parameters
 - v. Assess the outdoor spaces typologies
- B. Research Method in People Activities
- i. Literature review to determine the people activities criteria to be used in outdoors
 - ii. Literature review to determine the people activities assessment method to be used for field measurement in outdoors
 - iii. Conduct a pilot survey to test the pre-assumption procedures in order to get proper method while doing the observation
 - iv. Research method in conducting the measurement is to determine the relationship between urban shade and people activities



STAGE 1

Figure 1.1: Stage 1. Flow chart of research design

1.8.1 Subject or Data Source

To conduct the investigation, the data sources will be developed as follows:

1.8.1.1 Primary Data

The research will gather three types of data from the existing plan including:
 (1) existing land use and building form pattern in the area of Orchard road in

Singapore in relation to pathway distribution, (2) existing pathway and node within the building blocks, which link element of interest. The nodes may represent the destination or transition zones for commercial complex to visit, to pass through and to rest. Some pathway or nodes will be randomly selected as sample study area, which each space is shaded either by trees or by buildings. This existing data will be analyzed by technical drawing including cross-section, elevation, land use pattern and perspective sketches, (3) human preferences on certain area will be defined as the number of people that used the space in certain frequency or time. The frequency of people behavior in each area will be recorded by videotape and camera.

This stage will also involve field observation and behavioral mapping. The existing data gathered on site will identify and verify each of the elements. The variables used for this study is shade (trees and buildings) as independent variable which will be derived from shade pattern of trees and buildings simulated by using computer. The dependent variable is the frequency of people activities.

1.8.1.2 Secondary Data

The secondary data was gained from the reference studies of related matter such as; governmental reports will helps to gain significant information to the study area, literatures (books, journals, research papers, newspapers and magazine articles, etc), local plans and other relevant physical plans and information.

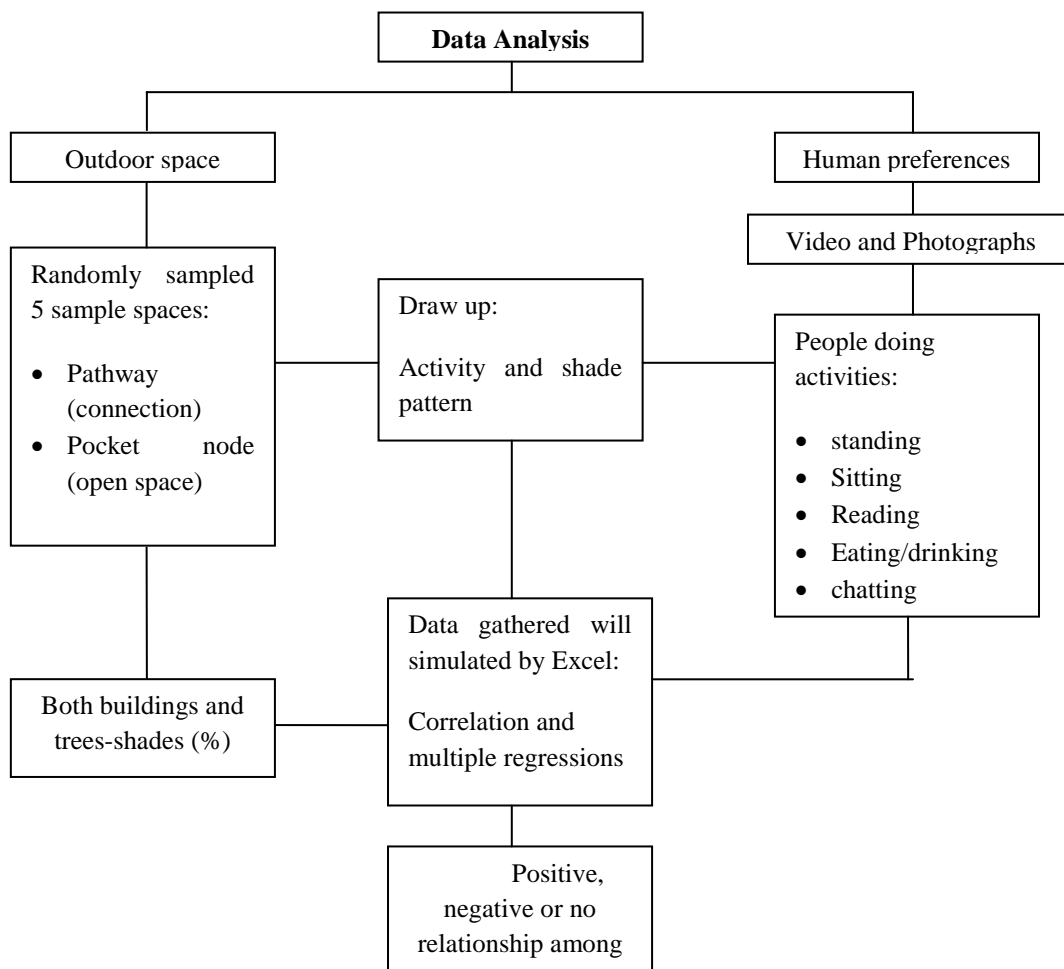


Figure 1.2: Stage 2. Flow chart of Data Analysis

1.8.2 Data Analysis Technique

The data will be analyzed using correlation and multiple regression analysis between independent and dependent variables. Ms Office software (excel 2007) will be utilized as an analyzing tool. It will help the researcher to:

- To identify the density of people who utilized the area on certain sequences of time and divided by the area of study space.
- To identify the proportion of people activities on each samples space.
- To determine does variables have significance relationships to all activities (sitting, standing, reading, eating or drinking, and chatting).

Thus, all data analyzed by using Microsoft Office Excel 2007, derived from data collection (videotape and camera) that will be used as evidence and checklist of those samples space. The data will show the relationship of each variable that exist at those sample spaces. Meanwhile, result of multiple regression analysis with stepwise method will show the model of its relationship between dependent variable (people's activities) and independent variables (building and vegetation shade).

Multiple regression will use for the model as prediction in order the achieve design effectiveness through predicting the shade density related to frequency of people activities. The model would be developed from the correlation analysis that has significant relationship to each variable whether it was positive or negative correlation.

Figure 1.3 below shows how the data will be analyzed in order to achieve the purpose of this research.

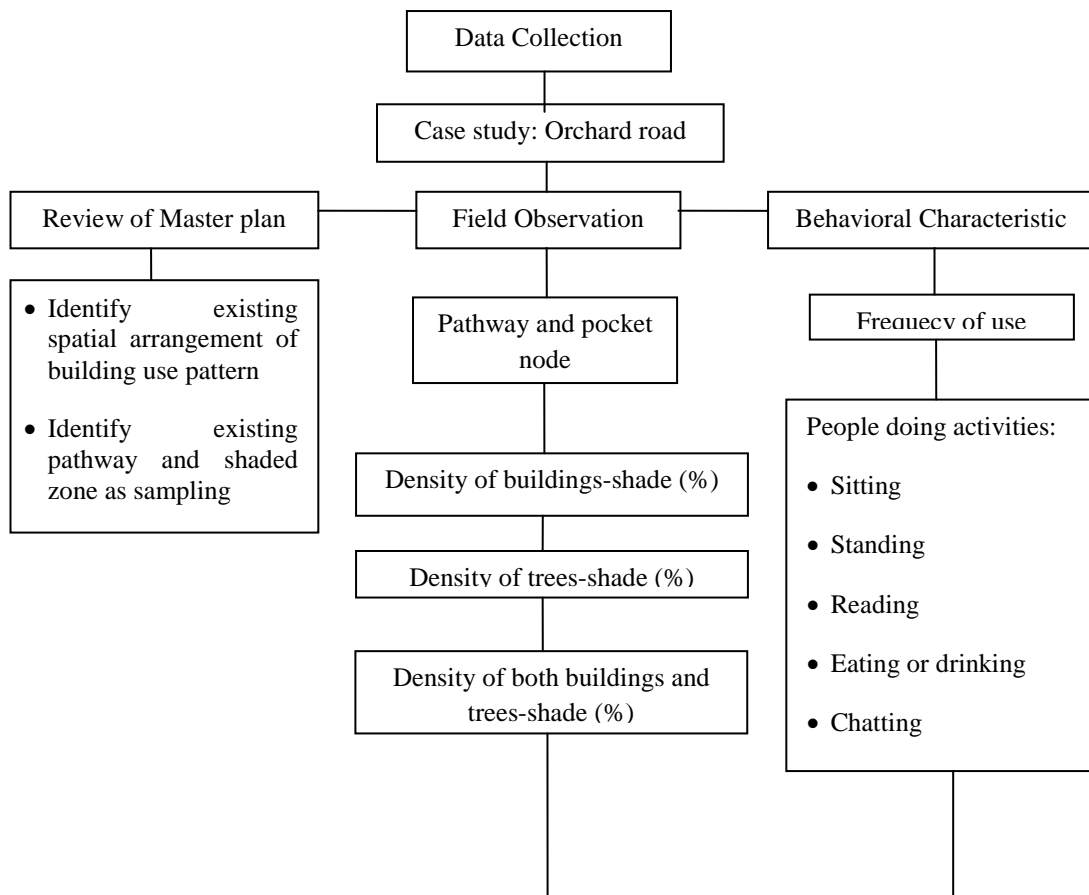


Figure 1.3: Stage 3. Flow chart of Data Collection

1.9 Anticipated Finding

This research anticipates creating model of outdoors, at least at commercial complexes, which provide shading as a vital factor to enhance the quality of environment for human comfort. Furthermore, it would also give positive impacts to

sustain the urban quality by providing urban shade. The criteria of these speculative results could be:

- As a guidance to control, both building blocks forms, heights and its planting design in order to achieve thermal comfort-sensitive design.
- As a guidance to control the utilization of the place in terms of their activities such as shopping streets, gathering place or pause area, pedestrian path and nodes and simultaneously in enhancing the quality of space toward livable and vibrant place.

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