

MODELLING OF TRIP GENERATION BASED ON SCHOOL ATTRACTION

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To my beloved mother and father

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ABSTRACT

Trip generation is a very important part in transportation planning and traffic engineering. It used as a model analysis to forecast the population, land use, economic, travels and revenues in area wide. From the trip generation, the other analysis can be carried out which are trip distributions, modal split and trip assignment. This study is an attempt to throw light on determine primary school trip production and attraction rate in Skudai Town. As generally, in Malaysia, trip generation has often been treated lightly with very little research works carried out. Regression analysis using multiple linear regression method was adopted for the modeling process. The data includes three parameters that are considered to determine school trip generations in Skudai Town are accessibility, holding capacity and cost index. The finding of the research shows that the accessibility is the strong factors that affecting trip generation in Skudai Town. This result of trip generation of primary school trip generation in Skudai Town is useful for the further study on trip distribution, mode choice and trip assignment in order to forecast the travel demand for Skudai Town in the future time period

ABSTRAK

Trip generation atau penjaan perjalanan merupakan bahagian penting di dalam kejuruteraan perancangan lalulintas dan pengangkutan. Ia digunakan sebagai model analisis untuk membuat unjuran populasi penduduk, gunatanah, ekonomi, dan perjalanan bagi sesebuah kawasan. Dari peringkat penjaan perjalanan, analisis lain boleh dijalankan iaitu *trip distribution*, *modal choice* dan *trip assignment*. Kajian ini adalah bertujuan untuk menentukan secara umum kadar keluaran perjalanan (*trip production*) dan janaan perjalanan (*trip attraction*) bagi Bandar Skudai. Secara amnya, di Malaysia, kajian mengenai *trip generation* dianggap tidak begitu penting berdasarkan kajian yang amat sedikit dilakukan oleh golongan penyelidik di negara ini. Oleh itu, kajian ini dijalankan untuk mengetahui kadar penjaan semasa bagi sekolah rendah di Bandar Skudai. Analisis Regression menggunakan kaedah Multiple Regression Analysis diaplikasikan dalam menjalankan proses modeling. Data yang digunakan untuk menganalisis termasuk tiga parameter yang mempengaruhi penjaan perjalanan bagi sekolah rendah di Skudai iaitu *accessibility*, *holding capacity* dan *cost index*. Keputusan analisis daripada kajian ini adalah amat berguna untuk kajian lanjutan di dalam bidang *trip distribution*, *modal choice* dan *trip assignment* untuk membuat unjuran permintaan perjalanan dan pengangkutan di masa hadapan.

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LIST OF ABBREVIATIONS

CATS	-	Chicago Area Transportation Study
CBD	-	Central Business District
FHWA	-	Federal Highway Administration
HB	-	Home-based trips
HBS	-	Home-based School
HBW	-	Home-based Work
HBO	-	Home-based Others
MPJBT	-	Johor Bahru Central Municipal Council (<i>Majlis Perbandaran Johor Bahru Tengah</i>)
NHB	-	Non home-based trips
NPP	-	National Physical Plan
O & D Survey	-	Origin and destination survey
PPDJB	-	Johor Bahru Education Office (<i>Pejabat Pelajaran Daerah Johor Bahru</i>)
TAZ	-	Traffic Analysis Zone
UPSR	-	Primary Schooling Achievement Tests (<i>Ujian Pencapaian Sekolah Rendah</i>)

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CHAPTER I

INTRODUCTION

1.1 Background

These days, the transportation planning issues faced by most Asian cities include rapid urbanization and motorization which is leading to sharp increase in travel demand whereas, the supply has largely remained unmatched with demand. So, trip generation is important to the traffic engineer and planner in considering the impact of new development such as office complex, shopping centre and residential development. New development leads a various impact to the people's daily activities. For example the impacts of surrounding roadway network tend to make people moving far from one place to another place. Road length is increasing and road network patterns change according to the accessibility needs of people and desire to reach their destinations. Hence, new development will increase the travel demand with there also increase the vehicles.

Trip generation is obviously most pertinent relative to traffic at specific land use activity. It also plays a role in many phases of transportation planning and traffic engineering related activities. It is the first phase in the travel-forecasting process. It involves the estimation of the total number of trips entering or leaving a parcel of land as a function of the socioeconomic, location, and land-use characteristics of the

parcel. In the reliable sector, urban transportation covers the movement of both people and goods within an urban area. At the individual level, urban transportation can be characterized by a trip. However, at the metropolitan area level, millions of these individual trips define urban transportation (Barber, 1995). A trip is as a journey made by an individual between two different points. Each trip is performed using one or multiple transportation modes for a defined purpose at a given time. Although a trip may involve more than one purpose, it is usually identified by its principal purpose (Hobbs, 1979). Trip generation analysis, as Meyer (1974) puts it, seeks to estimate the volume of trips that will be made by individuals to work, shopping, school, and so forth, but not the flows between points within the whole system. The functioning of metropolitan cities is highly dependent on the movement of people, goods and information (Muller, 1995) and trip generation studies are a vital part of transportation planning, due to the recursive nature of urban transportation modeling procedure (Bruton, 1986; Badoe and Steuart, 1997).

Personal trips are commonly classified based on their main purpose (Barber, 1995); work trips, shopping trips, social trips, recreational trips, school trips, home trips and business trips. Among all trip purposes, work trips are the most numerous, followed by shopping trips (Vickerman and Barmby, 1984), which count approximately for 40% of all trips generated in North American metropolitan areas (Barber, 1995). This study focuses on primary school trip generation in Skudai Town area. In Malaysia, trip generation has often been treated lightly with very little research works carried out. The study is an attempt to throw light on school trip attractions given that primary school trip will be generated as long primary education remain compulsory.

1.2 Problem Statement

Malaysia is on the way to achieving universal primary education for girls and boys. According to the Ministry of Education, Malaysia in 2005 the net enrolment of children in primary schools was 91.7%. Enrolment rate of girls is equal to that of boys. While a literacy rate among the young is largely universal.

Since 1970, Malaysia has invested substantially in creating an environment conducive to primary education for all its children, including those living in rural areas. This includes providing proper infrastructure to ensure access to schools and supporting the needs of the poor through textbook loans, hostels, school health and milk programs as well as a supplementary food scheme. Government efforts have been supported at the family level by parents who perceive education as an opportunity to provide upward mobility and a better life for their children.

Through careful studies of data on pupil's travel behaviour, relationship can be developed to predict how many trips pupils will make, from which zone to which zone. These relationships are the basis for trip generation and must be reviewed and reevaluated, if necessary, in the continuing process of travel demand forecasting. As the first step in the travel demand forecasting, trip generation is very important to ensure that the transportation plan will respond to the area's transportation needs, where the needs that are constantly changing.

1.3 Aim and Objectives

The aim of this study is to determine the trip generation of primary school in the Skudai Town Area. Through the trip generation analysis, we can determine the production of the school trip among the primary school in Skudai Town. Then, the travel demand can be estimated from the analysis. Thus, to achieve the aim, there are several objectives of the study listed:

- i. To determine primary school trip production and attraction rate in Skudai Town.
- ii. To produce mathematical relationships that synthesis trip generation pattern on the basis of observed trips

1.4 Scope of Study

The main focus of the study is on the determination of trip generation production and attraction of twenty one primary schools in Skudai Town. The total area of the primary school in Skudai Town is 47.6 hectare. This study will cover the area of Skudai Town which consists of 37 residential areas. This residential area will be divided manageable zones. Boundry of every residential area was obtained from loacal authority- *Majlis Perbandaran Johor Bahru Tengah* (MPJBT).

i. Trip Production

Trip production is defined as the home end of home-based (HB) trips or as the origin of a non home-based (NHB) trip. For this study, trip productions refer to the zonal trips of the Skudai Town while it consists of several neighbourhood areas.

ii. Trip Attraction

Trip attraction is defined as the non home end of a HB trip or the destination of a NHB trip. For this study, trip attraction refers to the primary schools of the Skudai Town. This meant that, trip attractions equal to the total number of pupils in those primary schools.

iii. Holding Capacity

Holding capacity of the Skudai Town will be determined by using the present population number and percentage of land developed last and present year. In this study, the data of year 2000 will be used in the detailed analysis.

iv. Accessibility of school trips

There are two main factor influences the accessibility of school trips which are number of school and travel time from home to school or vice versa. Data for number of school can be obtained from the PPDJB which is pictured in the land use map using Arc GIS while travel time data from residential zone to school can be measured by using land use map and Google Earth.

v. Cost Index of zone

Average housing price for residential area would be applied to define the cost index for each residential zone as well as for industry and commercial zones. It is difficult to obtain the property value in year 2000. Therefore, property value in this study is obtained from the property market report 2007. It is assumed that, the property value will remain stable and no changes within this period.

1.5 Significance of the Study

Trip generation is a very important part in transportation planning and traffic engineering. It can be used as a model to forecast the population, landuse, economic, travels and revenues in areawide. From trip generation, other relevant analysis which includes trip distributions, modal split and trip assignment can be carried out. The primary school trip generation study is useful when drafting road safety and safer routes to school policies.

1.6 Outline of the Report

In this chapter, background of the study, problem statement, aim and objectives, scope and the significant of the study are discussed. Based on the discussion so far, remainder of the study is organized as follows.

Chapter 2 consists of a literature review related on fundamental of trip generation as a first stage in conventional travel demand forecasting, types of trips, and factors affecting trip generation, trip purposes, and traffic zone analysis. This study also reviews the background of education system in Malaysia which broadly consist a set of five stages. Then, the concepts of regression analysis have been detailed discussed in this chapter.

Chapter 3 contains concept of regression analysis, the modeling methodology and study data. Data collection and survey are explained in detail. Data of trip attraction and production are gathered to be analyzed. The data for parameters of accessibility, holding capacity and cost index are obtained from previous research studies are also discussed in this chapter.

In Chapter 4, the empirical results are presented and analyzed. Trip production and attraction for the Skudai Town are presented in a form of tables and figures. The equation of multiple regression models is represented and applied.

Chapter 5 concludes the study and outlines areas for further research.