A STUDY ON TRIP GENERATION IN UNIVERSITY MALAYSIA PAHANG, PEKAN

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A STUDY ON TRIP GENERATION IN UNIVERSITY MALAYSIA PAHANG, PEKAN

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ABSTRAK

Pada masa kini, ramai manusia terlibat ke dalam banyak aktiviti dalam kehidupan domestik mereka. Aktiviti-aktiviti ini termasuk pergi ke sekolah dan bekerja, yang telah menjadi rutin harian mereka tanpa mengira waktu pagi atau petang. Aktiviti harian mereka adalah sangat bergantung kepada keadaan dan tahap perkhidmatan trafik dalam sistem pengangkutan yang terdapat di kawasan tersebut. Oleh itu, bilangan kenderaan di jalan raya semakin meningkat dengan pesat setiap tahun kerana peningkatan dalam ekonomi dan pertumbuhan penduduk. Keadaan ini juga berlaku di kawasan kajian iaitu Universiti Malaysia Pahang (UMP), Pekan dimana ia akan memberi kesan kepada masalah trafik seperti masalah tempat letak kereta dan kesesakan lalu lintas. Untuk mengelakkan masalah seperti ini yang sering berlaku di kawasan kajian, kajian penjanaan perjalanan dijalankan. Objektif kajian ini adalah untuk menentukan kelakuan responden, dan kadar penjanaan dari segi waktu puncak bagi perjalanan yang dibuat oleh penduduk UMP Pekan. Semua maklumat yang diperlukan seperti jenis kenderaan yang digunakan, cara perjalanan dan bilangan penduduk dikumpulkan untuk data penjanaan perjalanan. Data ini akan dianalisis dan ditunjukkan menggunakan carta bar dan graf. Perancangan dasar pengangkutan baru dan kejuruteraan dalam hubungan permulaan perjalanan dengan tarikan perjalanan dan penggunaan tanah pada masa hadapan.

ABSTRACT

Nowadays, people are busy engaged themselves into a lot of activities in their domestic life. These activities which are include going to school and work, had become their daily routine regardless the morning or evening. Their daily activities are very dependent on the condition and level of traffic's service in the transportation system that are available in the areas. Therefore, numbers of vehicle on the road are increasing rapidly each year because of improvement in economy and growth of population. This situation also happens in the study area, University Malaysia Pahang, Pekan which it will give impact on traffic problem such as parking problem and traffic congestion. In order to avoid this kind of problems often occurred in the research area, this study on trip generation is conducted. The objective of this study is to determine behavior of trip makers in and out UMP, and trip generation rate in term of population. All the data such as types of vehicle used, modes of travel and number of population are collected for trip generation data. The data will be analyzed and shown by using bar chart and graph. New transportation policy planning and engineering will be developing in a relationship between trip end production or attraction and land use in the future.

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UMP	University Malaysia Pahang
OD	Origin and Destination
CBD	Centre of Business District

CHAPTER 1

INTRODUCTION

1.1 Background of study

Transport or transportation is the movement of people and goods from one place to another. The term is derived from Latin *trans* (“across”) and *portare* (“to carry”). Industries which have the business of providing equipment, actual transport, or goods and services used in transport of goods or people make up a large broad and important sector of most national economies, and are collectively referred to as transport industries.

The interface between transportation investment and economic development has broad ramifications that go beyond transportation’s basic purpose of moving goods and people from one place to another. Whereas there is no doubt that transportation is essential in the operation of market economy, much still needs to be understood about ways in which an efficient transportation system can improve the productivity of the economy.

Before the usage of automobile or any other types of transportation that operate mechanically as the main mean of transportation, most people travelled by foot or riding an animal such as horse. This type of transportation doesn’t need a good road to travel on and people only travel short distance and live back then was cantered on locality in which one lived, work school, shop and all other facilities available locally. But since the emerging of car in the early 1900’s, it has revolutionized the way in which we look at travel and communication. In 1960, each person travelled on average 5600 km, by year 2000 that figure had increase to nearly 11,000 km (David 2002).

The longer distance travelled by people, the higher demand for better and reliable transportation medium such as road etc. the increasing number of population will also

contribute to increasing ownership or vehicle thus pushing the available transportation medium to its limits.

In Malaysia, the car ownership is growing rapidly everywhere and the number are expected to increase even more. The increasing number of vehicle on the road also occur in university campuses. The growing economy of Malaysia increased the need of expert worker such as an engineer and so on. University all around Malaysia is expanding to facilitate more student and facilities.

The growing number of facilities and student will result to problem such as parking problem, congestion, pollution and many more. These are among the important issue for future policies maker to formulate policies, to plan and coordinate developmental aspects of land transport in order to create an efficient, economical and safe transportation system.

In this study, University Malaysia Pahang (UMP) located in Pekan Pahang is selected as study area because it is a relatively new university and still growing in term of facilities and number of students and staff.

1.2 Problem Statement of Study

In the early years of road construction, the automobile had been regarded as a pleasure vehicle rather than an important means of transportation. Consequently, highways consisted of comparatively short sections that were built from the cities into the countryside. There were significant gaps in many important intercity routes. During this period, urban roads were considered to be adequate, particularly in comparison to rural roads which were generally not paved.

After several decades have passed, automobile had been considered a very important form of transportation to human. Numbers of vehicle on the road are increasing rapidly each year because of improvement in economy and growth of population. A proper transportation planning is needed to avoid problem such as congestion, parking problem, air pollution etc.

To do transportation planning, first of all we need to forecast future traffic. Trip generation is among the first step in the conventional four step transportation forecasting

process. The result from the study can be used to make new transportation policy planning and engineering.

1.3 Objectives of Study

The main objectives of this study are:

i. To determine behaviour of trip makers circular inside and outside UMP Pekan.

ii. To determine the trip generation rates by zoning area.

1.4 Scope of Study

To achieve the objective, the scope of study is defined as follows:

i. The study is focus only on University Malaysia Pahang, Pekan campus.

ii. The study area is divided into six (6) zoning.

iii. All data collection is based on questionnaire

iv. To ascertain trip generation from study area.

1.5 Summary

In this chapter, some introduction on trip generation has been given. The problem statement, objectives and scope of study also state in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The importance of transportation in world development is multidimensional. For example, one of basic function of transportation is to link residence with employment and producers of goods with their users. From wider viewpoint, transportation facilities provide the option of works, shopping and recreation and give access to health, education and other amenities.

According to Stolz (2002) to low-income, minority and other disadvantaged population, the location and construction of transportation investments are critical. How transportation planning can be used as a vehicle for community development that meets the needs of low income residents. This fact is true as new transportation facilities attract investor to the area thus creating new job opportunities for the residential nearby.

The need for better transportation facilities is increasing every year. People move to new place in search for new job opportunities and better living surrounding. The increasing of number of house hold of an area due to certain attraction will cause increasing traffic volume and resulting to congestion and other problem related to traffic and transportation problem. The reason that people and goods move from one place to another can be explained by Abler et al, (1971) by the following conditions:

i. Complementarily, the relative attractiveness between two or more destination
ii. The desire to overcome distance, referred to as transferability, measured in term of time and money needed to overcome this distance and the best technology available to achieve this
iii. Intervening opportunities to compete among several locations to satisfy demand and supply.

Build more transportation facilities sometime cannot provide solution to traffic related problem. For example, in big city such as Kuala Lumpur newly opened highways are jammed by traffic as soon as they are opened to traffic. In this case, feedback from the users always resulting to effort to improve the current traffic facilities by the government and basically it will involve trip generation study to make proper traffic and transportation planning. The next section will explain about what is transportation planning, why it is important and what process involved in transportation planning.

2.2 Transportation Planning

The formation of nation transportation system has been evolutionary, nit the result of a grand plan. The system now in place is a product of many individual decision to build or improve its various parts such as bridges, highways, tunnels, harbours, railways station and airports runways. Most of these transportation facilities were selected for construction or improvement because those involved concluded that the project would result in overall improvement. Garber and Hoel (2002)

Among the factors believed to justify a transportation project are improvement in traffic flow and safety, saving energy consumption and travel time, economic growth and increased accessibility. Some transportation project, however, may be selected for other reasons; for example, to stimulate employment in a particular region, to compete with other cities or state for prestige, to attract industry, to respond to pressure from a political constituency, or to gain personal benefits from a particular route location or construction project. In some instances, transportation project is not selected for construction because of opposition from whose who would be adversely affected. Whatever the reason to selecting or rejecting a transportation project, a specific process led to conclusion whether to build it or not.

The process for planning transportation system is rational one that intends to furnish unbiased information about the effect that the proposed transportation project will have one community and its expected users. For example, if noise or air pollution is concern, the process will examine and estimate on how much additional noise or air pollution will occur if the transportation facility is built. Usually, cost is a major factor, and the process will include estimates of construction, maintenance, and operating costs.

The process must be flexible enough to be applicable to any transportation project or system because the kind of problem that transportation engineers work on will vary over time. Transportation has undergone considerable change in emphasis over a 200-year period; such modes as canals, railroads, highways, air, and public transit have each been dominant at one time or another. Thus, the activities of transportation engineers have varied considerably during this period, depending on society's needs and concern. Example of societal concern includes energy conservation, traffic congestion, environmental impact, safety, security, efficiency, productivity, and community preservation.

The transportation planning process is not intended to furnish a decision or give a single result that must be followed, although it can do so in relatively simple situations. Rather, the process is intended to give the appropriate information to those who will be responsible for deciding whether the transportation project should go forward.

The transportation planning process comprises seven basic elements (refer figure 2.1), which are interrelated and not necessarily carried out sequent. The information acquired in one phase of the process may be helpful in some earlier or late phase. Therefore, there is a continuity of effort that finally results in a decision.

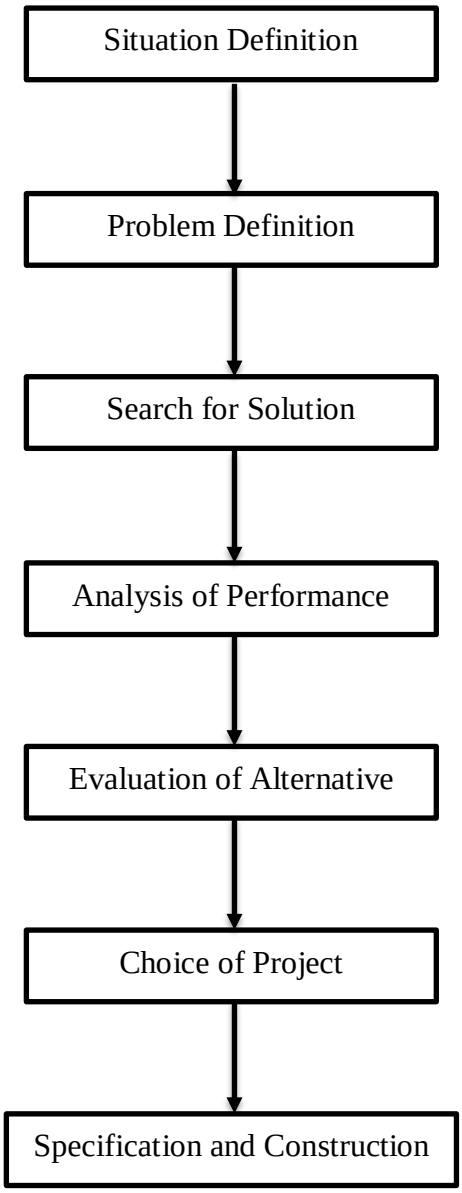

Figure 2.1 Basic Elements in Transportation Planning

In this section, the term transportation planning has been discussed. It is important to plan every future project consequently in order to reduce risk of need to fix any problem that will occur. In the next section, trip will be explained due to it is the most important thing in trip generation modelling process.

2.3 Trip

Banks (2002) in most cases, the trip is considered to be the basic unit of travel behaviour. Trip involve movement form a single origin to a single destination, and are usually describe in term of their origins, destination, purposes, time of occurrence, travel modes, and routes. In some cases, more complex units of travel known as trip chain or trip pattern are studied. There are sets of trips, usually beginning at the traveller's home and proceeding to several destinations in sequence before returning.

There are many kinds of trips. Trip purpose are varies depending on person. Some people made trip from home to work, from home to school, going to shopping form work place and recreation trip. The main point of a trip is that it must have an origin and destination. If a person travel without having a destination, that will be not considered as a trip. The next section will be discussing on trip generation.

2.4 Trip Generation

Trip generation is the first step in the conventional four-step transportation forecasting process (followed by trip distribution, mode choice, and route assignment), widely used for forecasting travel demands. It predicts the number of trips originating in or destined for a particular traffic analysis zone.

There are basically two kinds of trip generation models:

i. Production models
ii. Attraction models

Trip production models estimate the number of home-based trips to and from zones where trip makers reside. Trip attraction models estimate the number of home-based trips to and from each zone at non-home end of the trip. Different production and attraction models are used for each trip purposed. Special generation models are used to estimate non-home-based, truck, taxi, and external trips. Here we pick some of trip generation modelling definition by few authors.

According to Garber and Hoel (2002), trip generation is a process of determining the number of trips that will began or end in each traffic zone within study area. Since the trips are determined without regard to destination, there are referred to as trip ends. Each trip has two ends, and these are described in term of trip purpose, or whether the trip is either produced by traffic zone or attracted to a traffic zone. For example, a home-

to-work trip would be considered to have a trip end produce in home zone and attracted to work zone. Trip generation analysis have two functions as state as follows:

i. To develop a relationship between trip end production or attraction and land use.
ii. To use the relationship developed to estimate the number of trip generated at some future date under a new set of land use conditions.

Cross classification and rate based on activity units will be considered in order to illustrate the methods process. Another method that is commonly used is regression analysis, which has been applied to estimate both production and attraction. This method is used infrequently due to it depends on zonal aggregate data. Trip generation method that used disaggregated analysis unit is preferred.

Kristy and Hall (2003) claim that trip generation is the process by which measure of urban activity are converted into numbers of trips. For example, for a trip generated by a shopping centre is quite different from the number of trips generated by an industrial complex that take up about the same amount of space. Survey of travellers in the study area show the numbers and types made by relating these trips to land use pattern, the analyst is able to forecast the numbers of trip that will be made in the future, given forecast of population and other urban activity.

The study is divided into zone for analysis purposes. After trip generation analysis, the planner will know on how many trips are produced by each zone and how many are attracted by each zone. In addition, the planner will also know the purpose for the trips. The trips are put into several categories, like trips from home to work, or home to shop, or home to school. The categorization is necessary because each trip purpose reflect the behaviour of the trip maker. For examples, school trips and works trips are pretty regular; shopping and recreation trips are less. There are basically two tools for trip generation analysis, multiple linear regression and cross-classification.

Banks (2002) said that trip generation models are intended to predict the total number of trip produced and attracted by a zone. Trips are usually thoughts of as being two-way extrusion originating at the trip maker's home. They are said to be produced by residential development and attracted by economic or other activity. He said that trip is generated from residential; if there are residential, there will be trip generated because obviously people will need to go out from their home in order to find job or make other leisure activity. If there a job opportunity, people will go there. This shows that the trip is generated by residential and attracted to make trip by job availability in certain place near to the residential area or study zone.

2.5 Defining Generated Traffic

General traffic is the additional vehicle travel that results from a road improvement. Generated traffic consists of diverted travel (shifts in time and route) and induced travel (increased total motor vehicle travel). In some situations, highway expansion stimulates sprawl (automobile-dependent, urban fringe land use patterns), further increasing per capita vehicle travel. If some residents would otherwise choose less sprawled housing locations, their additional per capita vehicle travel can be considered to be induced by the road capacity expansion. List of examples in decisions that generate traffic can be seen below:

i. Consumers choose closer destinations when the road are congested and further destinations when traffic flows are smooth and freely.
ii. Travellers shift modes in order to avoid driving in traffic congestion.
iii. Longer trips may seem cost effective when traffic congestion is light, but not in heavy traffic congestion.

Travel time budget research indicates that increased traffic speeds often results in more mobility rather than saving time. People tend to average about 75 minutes of daily travel time regardless of transport conditions (Levinson and Kumar,1997). National data indicates that average commute trip distances and speeds increase as freeway travel increase, but trip time stays constant (Levinson and Kumar,1997). As a result, traffic congestion tends to maintain a self-limiting equilibrium: once congestion becomes a problem, it discourages further growth in peak-period travel. Road improvements that reduce congestion in the short terms attract additional peak-period trips until congestion once again reaches a level that limits further growth. Therefore, the claim about congestion reductions save travel time will be incorrect.

Generated traffic can be considered from two perspectives. Project planners are primarily concerned with the traffic generated on a road segment that is expanded, since this will affect the project's congestion relief. Others may be concerned with changes in total vehicle travel (induced travel) which can be affected to overall benefits and costs. In the short term, most generated traffic consists of trips diverted from other routes, times and modes, called Triple Convergence. Over the long term an increasing portion consists of induced travel.

2.6 Development of Trip Generation Data in Malaysia

In Malaysia, the first documentation relevant to trip generation data is the Trip Generation Study (Pilot Study) conducted by the Highway Planning Unit of Public Works Department Malaysia. Prior to the Trip Generation Study (Pilot Study), there was not widely accepted single source of land-use specific trip generation rates. Generally, the traffic planners will conduct their own trip generation studies. Nevertheless, this information gathered are neither documented nor shared among the professionals. This leads to concern about the validity of the trip generation that was used or the proper documentation of results, it may create problems such as unverified trip rates, application of trip rates based on older or inadequate trip generation rate which may not valid for an application of trip rates that sources are rarely disclose in a traffic study.

The issues above are brought to the establishment of the Trip Generation Study (Pilot Study) conducted by the Highway Planning Unit of Public Works Department Malaysia. A slightly different approach was taken to incorporate in the study since some weaknesses have been noted and experienced in the Institute of Transportation Engineers (ITE) trip generation. The Trip Generation Study (Pilot Study) of Malaysia is trying to address the question of geographical differences, differences in economic and social conditions between regions, vehicle classification and vehicle occupancy counts as cited in the discussion above. The peak period definition was also expended to two-three-hour periods, in recognition of the extended peak hours in Kuala Lumpur region.

Substantial differences should be expected in trip generation rates between countries. Hence, the main objective of the Trip Generation Study (Pilot Study) is to gather a large trip generation database, which would be accepted by the public and even private sectors, for particular use in Malaysia (Highway Planning Unit,1997b).

Trip generation modelling is not a new stuff in Malaysia, but in order to make suitable trip generation data and proper documentation for the future use, the Highway Planning Unit of Public Works Department Malaysia have conducted their own pilot study.

2.7 Conclusion

The objective of this chapter is to study in detail the previous research related to transportation planning, trip, trip generation modelling, defining generated traffic and the development of trip generation data in Malaysia. Based on the journal, previous thesis, website and book, the information can be obtained and can be as a guideline to study the trip generation in University Malaysia Pahang, Pekan campus. The detail about the methodology of this study will be discussed in the following chapter.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, we will discuss the methodology on trip generation. There are some step needs to be done in before the result can be produce. Those steps can be shown in figure 3.1:

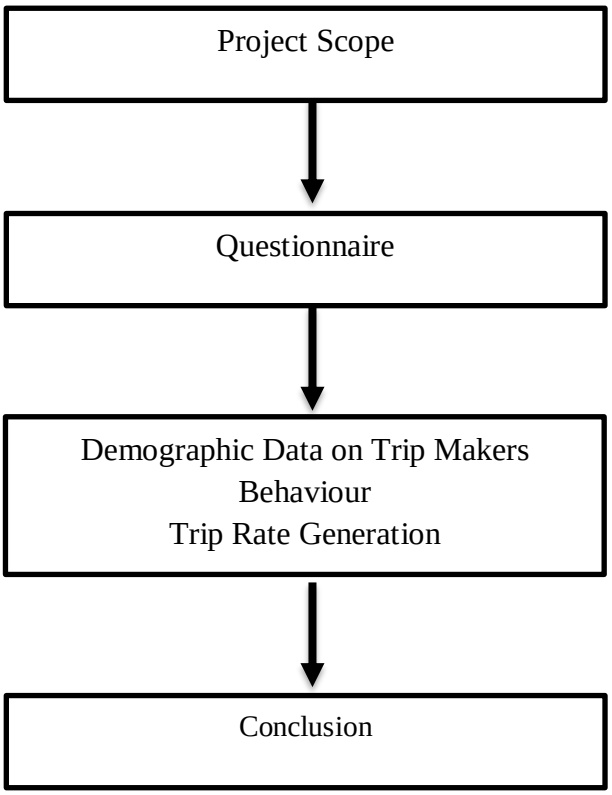

Figure 3.1 Step in building trip generation

3.2 Project Scope

Project scope in this study were focus on:

i. The study is focus only on University Malaysia Pahang, Pekan campus.
ii. The study area is divided into six (6) zoning.
iii. All data collection is based on questionnaire
iv. To ascertain trip generation from study area.

3.3 Data Collection

Data collection is an important aspect in this study. The success of this study is depending on how reliable the data is. In data collection stage, the data has been obtained by doing survey which using questionnaire distribution to the population of land use.

3.3.1 Questionnaire

To achieve the objective of this study, the questionnaire will be use to collect data for this study. In this questionnaire, the origin and distance (OD) will use to collect the information. OD studies the pattern of movement of vehicle and passenger from various zone of origin to various zone of destination. This type of study is done in a specific period of time to determine the behaviour of travel pattern produce by people in and outside the study area. OD study can give us information about the modes of transportation, origin and destination of trips and time when the trip is made.

3.3.2 Zoning

In order to distribute the questionnaire, the selected study area must be divided into several zones. In zoning system, the main purpose of it, is to segregate the study area which is UMP area into a smaller zone. The zone inside the study area will be the basis for analysis of travel movement. Each zone will be named or numbered differently (refer table 3.1 and figure 3.2).

Table 3.1: Description of Zones

Zone	Description
A	The zone could be considered as the 'CBD' of the campus. Its include the UMP library, JHEPA, BPA, etc.
B	Off campus: From outside of UMP
C	Student residential 5
D	Faculty of Electrical & Electronic Engineering
E	Faculty of Manufacturing Engineering
F	Faculty of Mechanical engineering

Figure 3.2: UMP Pekan Campus Location (Google Maps)

3.4 Analysis of Data

The analysis of data in a trip generation study concentrate on the summary of the data and the estimation of parameters. The steps in the process of analysis in this study are as the following:

i. Observe the data collected. Based on that, the raw data are entered into the computer, regarding to certain classifications or characteristics. Then, the data entry process is checked and verified in order to spot for any possible error occurs. This can maintain the accuracy of the entry process.
ii. The peak hour data from all zone are added up to provide trip rate generation.
iii. The trip generated are analysed for each zone.
iv. The graph for behaviour of trip makers, trip rate generation are obtained using Microsoft Excel.

3.4.1 Demographic Data on Trip Makers behaviour

All the demographic data that obtained from the questionnaire such as gender, races, residence, vehicle ownership and occupation were entered into the computer. Then the data entry process is checked and verified in order to spot any possible error occurs.

3.4.2 Trip Generation Rates

The peak hour data from all the respondents are added up to provide total trips and to gather the distribution of hourly trip rates.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In this study, the estimation of trip generation for University Malaysia Pahang are based on trip production and trip attraction. The trip generation analysis was conducted in term of number of vehicle ownership as independent variable. The data were obtained according to their origin zone which is in CBD area (UMP Library, JHEPA, BPA, etc.) is zone A, off campus (from outside of UMP) is zone B, campus residential (KK5) which is zone C, Faculty of Electrical & Electronic Engineering is zone D, Faculty of Manufacturing Engineering is zone E and Faculty of Mechanical Engineering is zone F.

4.2 Survey Results

The data from the questionnaire survey that had been obtain during the data collection period are tabled according to origin zone of the data had been collected. After obtained the data from the questionnaire of 100 respondents, the data were processed and analysed. Table 4.1 shows the demographic data of the respondents in terms of gender, faculty, residence and vehicle ownership.

Table 4.1 Demographic Data of the Respondents

Variable		Number of Respondent
Gender		
	Male	36
	Female	64
Faculty		
	FKM	33
	FKEE	26
	FKP	33
Residence		
	Hostels	65
	Outsiders	35
Vehicle Ownership		
	Motorcycle	13
	Car	30
	Bicycle	3
	No vehicle	54

Based on the table 4.1, the result indicates that majority of the respondents in UMP Pekan have no vehicle ownership. This is due to most of them are more prefer to travel to each zone by sharing their transportation or by public bus. For the least vehicle ownership is by bicycle. This is due to the many of respondents are willing to ride motorcycle or drive a car to travel from origin zone to another zone, instead of riding a bicycle because of the distance from a zone to another are quite far.

4.3 Trip Generation in Term of Trip Attraction and Trip Production

This part of data is calculated based on the trip production and trip attraction by the respondents in the study area from each zone which are zone A, zone B, zone C, zone D, zone E and zone F. Trip generated are considered from their origin zone to another zone as shown in table 4.2.

Table 4.2 Trip Production and Trip Attraction

	TRIP PRODUCTION	TRIP ATTRACTION
ZONE A	1	4
ZONE B	18	15
ZONE C	35	36
ZONE D	9	8
ZONE E	1	3
ZONE F	3	2

Table 4.2 above presented that most of trip production produced by Zone C. This is due to the zone is covered by student's hostel area and most of the respondents in this study are student that live in hostel in this university. Meanwhile, for Zone A and E, trip productions are the lowest due to these areas mostly lack of student and these zones also covered the administration area. Next, most of the respondents are attracted to Zone C as mentioned earlier; the zone is covered by student's hostel. Zone F has lowest trip attraction in this study because this zone is covered the faculty area, which makes the area become least popular in this trip attraction.

4.4 Data Analysis

In this section, suitable analysis method is used to analyses each of the collected data in this study. Data for trip makers behavior and trip generation rate from each zone are tabulated into table and graph. All data is calculated according to their origin zone.

4.4.1 Trip Generation Based on Gender and Vehicle Ownership

The results obtained also were classified into several variables which are group of genders and motorized and non-motorized vehicle ownership as shown in figure 4.1 below.

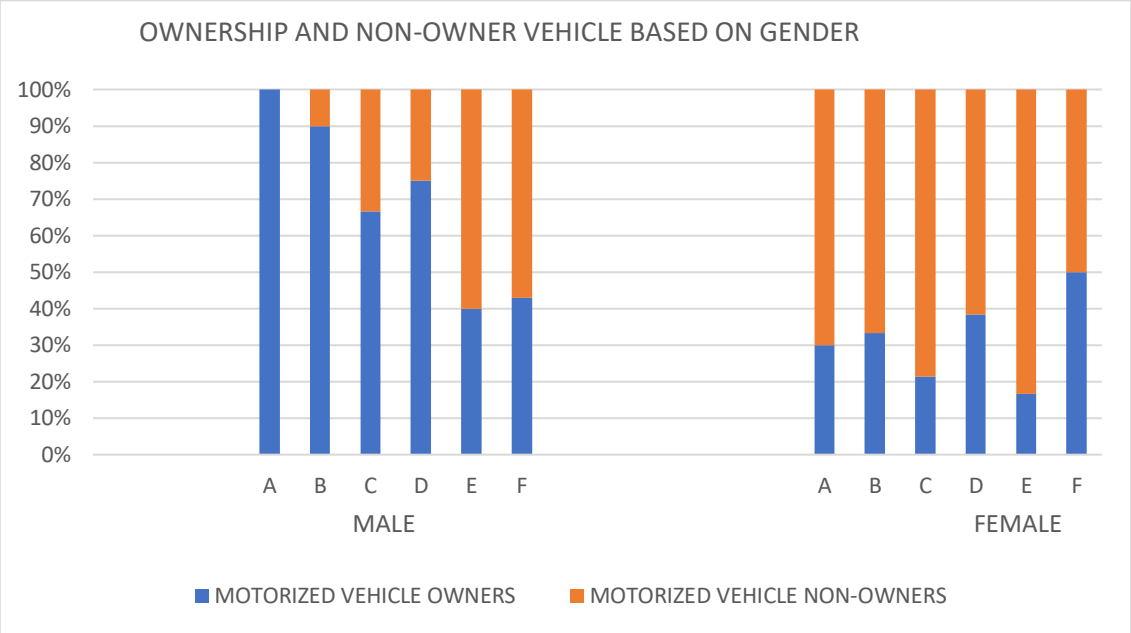

Figure 4.1 Comparison between male and female for motorized vehicle owners and motorized vehicle non-owners

Figure 4.1 above presented the summary of the comparison between motorized vehicle owners and motorized vehicle non-owners based on gender. The result shows that male is conquered the motorized vehicle owners with the highest percentage, which is 100% origin from Zone A. Meanwhile, majority of the female for motorized vehicle non-owners with the highest percentage of 75%, origin from Zone E. The least popular motorized vehicle non-owner for male is only 10%, which is lower compared to female that has percentage of 50%. The nature of motorized vehicle ownership is conquered by male in worldwide. According to World Bank Report, free from these socio-cultural restrictions, men travel much farther than women. This proves that male is greater use of all types of motorized transport in the world

4.4.2 Mode of Transportation

The classification for transportation used by respondents for each zone were shown in figure 4.2.

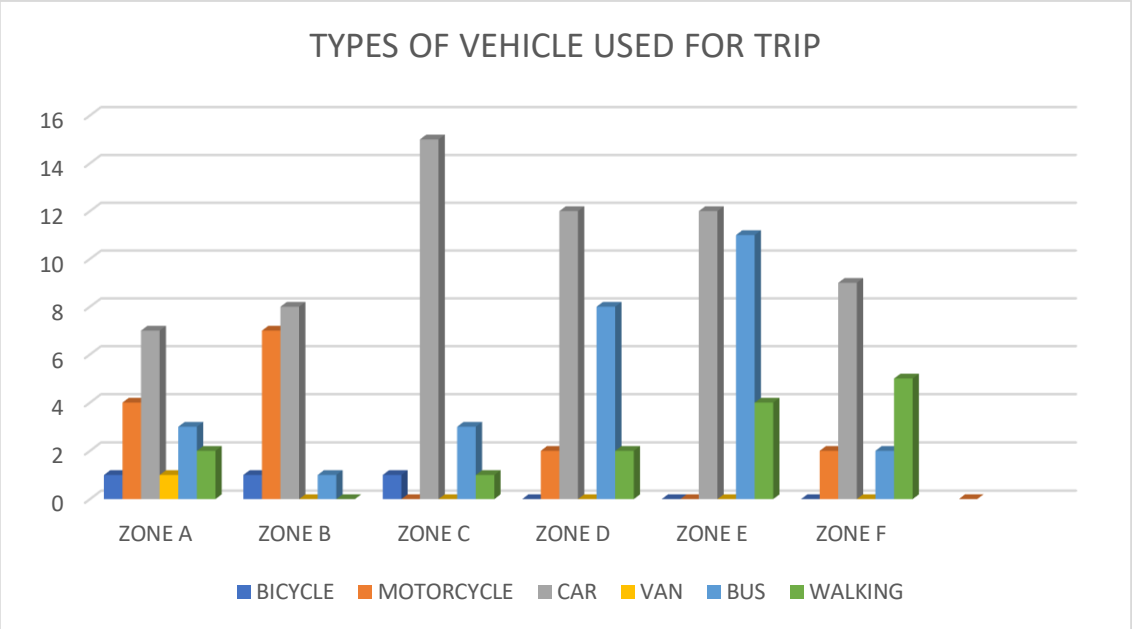

Figure 4.2 Types of vehicle used for trip by each zone

The figure 4.2 above shows the split of mode of transportation used in each zone. It is obvious that car is the highest types of vehicle used for mode of transportation recorded for trip made from each zone. The total trips made by car for all zone are 63 trips, followed by bus with 27 trips and for the least trip is using van. This is due to most of the zones are covered by respondents, which are consisting of students and staff.

For zone A, the highest vehicle used is car which has total of 7 trips generated and meanwhile, type of vehicles that are bicycle and van share the same trips as the type of vehicle is the least popular of types of vehicle used for trip which the total is only 1 trips for both bicycle and van. For Zone B, the highest transports are also car which the total is 8 trips and followed by motorcycle which is 7 trips. Meanwhile, most of the respondents in the zone do not interesting by using van and walking. These are due to no trip are using these modes of transportation. For Zone C, the highest types of vehicle used are same as Zone A and B, which is by car. The total trip generated is 15 trips and also make it as the highest vehicle used compared to all zones. Bicycle and walking share the same mode with 1 trips. Motorcycle and van have no recorded trip from this zone. For Zone D, car made 12 trips compared to others mode of transportation make it highest for this zone. Bicycle and van is also having no recorded trip data for this zone. For Zone E,

car also conquered as the highest mode of transportation which is 12 trips and meanwhile, for bus has only 1 trip different compared to the car. Bicycle, motorcycle and van have no recorded data obtained from this zone. For Zone F, 9 trips are from car and the bicycle and van also have no recorded data obtained from this zone.

The nature of choosing car as most used mode of transportation to make trip to each zone from a zone to another, have giving better, faster and higher freedom in mobility for the respondents in the study area.

4.4.3 Trip Purpose on Weekdays and Weekends

The results for trip purpose are divided into two which are trip purpose on weekdays and trip purpose on weekends because respondents doing different activity for weekdays and weekends as shown in figure 4.3 and figure 4.4.

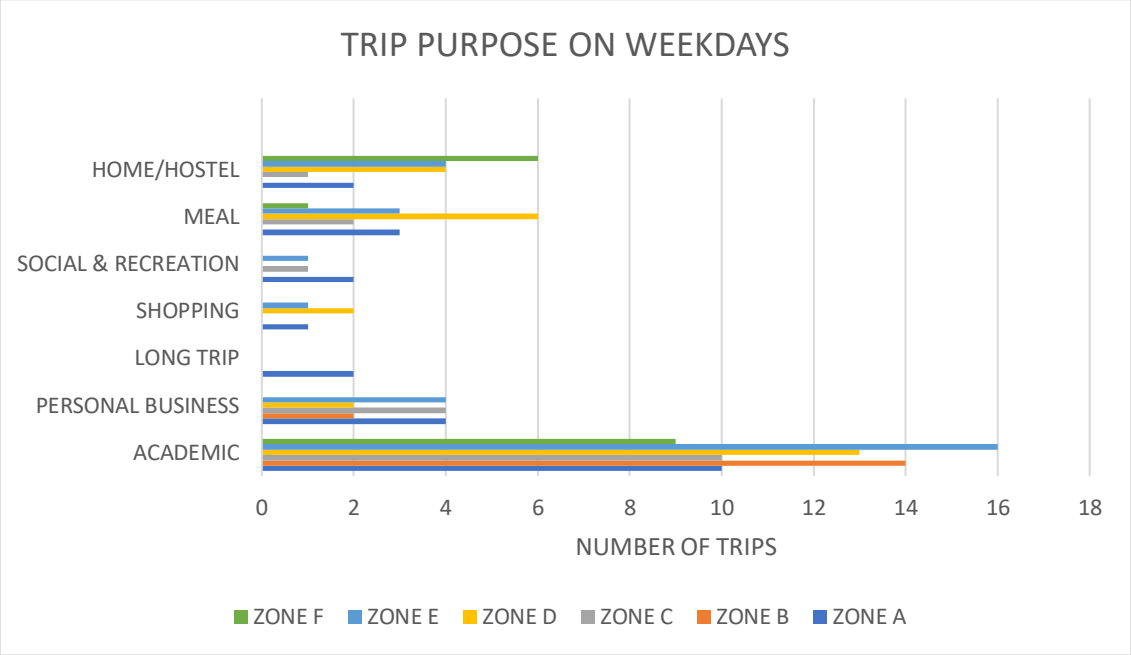

Figure 4.3 Trip purpose made by respondents on weekdays

From the results that had been analyzed in figure 4.3 it is obvious that the trip purposes on weekdays are majority going for academic activity from all zone with total

trip is 72 trips. Zone E made highest number of trips for academic activity which is 16 trips. Long trip seems no recorded from all zone except for zone A which is 2 trips.

For personal business activity, zone A, zone C and zone E made same trips which is 4 trips while zone B and zone D have same 2 trips and make it total is 16 trips for this trip purpose from all zones. For shopping activity on weekdays have 4 trips total from zone A, zone D and zone E. The assumption of respondents going for shopping activity on weekdays is maybe they does not have class on that day. Same goes to shopping activity, respondents also make only 4 trips for social and recreation activity. For meal activity, there seems 15 trips made by respondents and for going to home/hostel have 13 trips made by respondents.

The purposes of trip on weekdays conquered by academic as it is a university and academic activity always on weekdays.

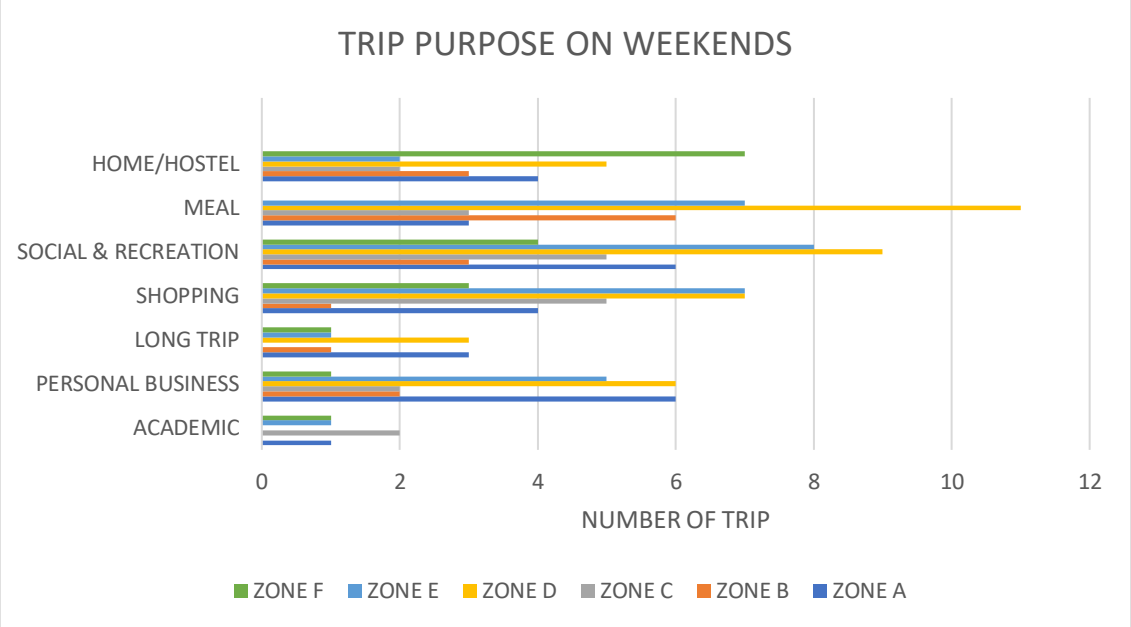

Figure 4.4 Trip purpose made by respondents on weekends

The figure 4.4 above shows that trip purpose on weekend made by respondents in study area. Academic activity is minority in trip purpose made by most of the respondents as it is in weekend. The trip makers are going for other purposes on weekends which are going home/hostel, meal, social and recreation, shopping, long trip and personal business

instead of going for academic activity. The highest trip purpose made by respondents on weekends is social and recreation activity with the total trip is 35 trips. But the highest trip by zone is from Zone D which most of the respondents from this zone are going for meal on weekends.

4.4.4 Trip Begin on Weekdays and Weekends

The results for trip begin also divided into two (2) which are trip begin on weekdays and trip begin on weekends as shown in figure 4.5 and figure 4.6.

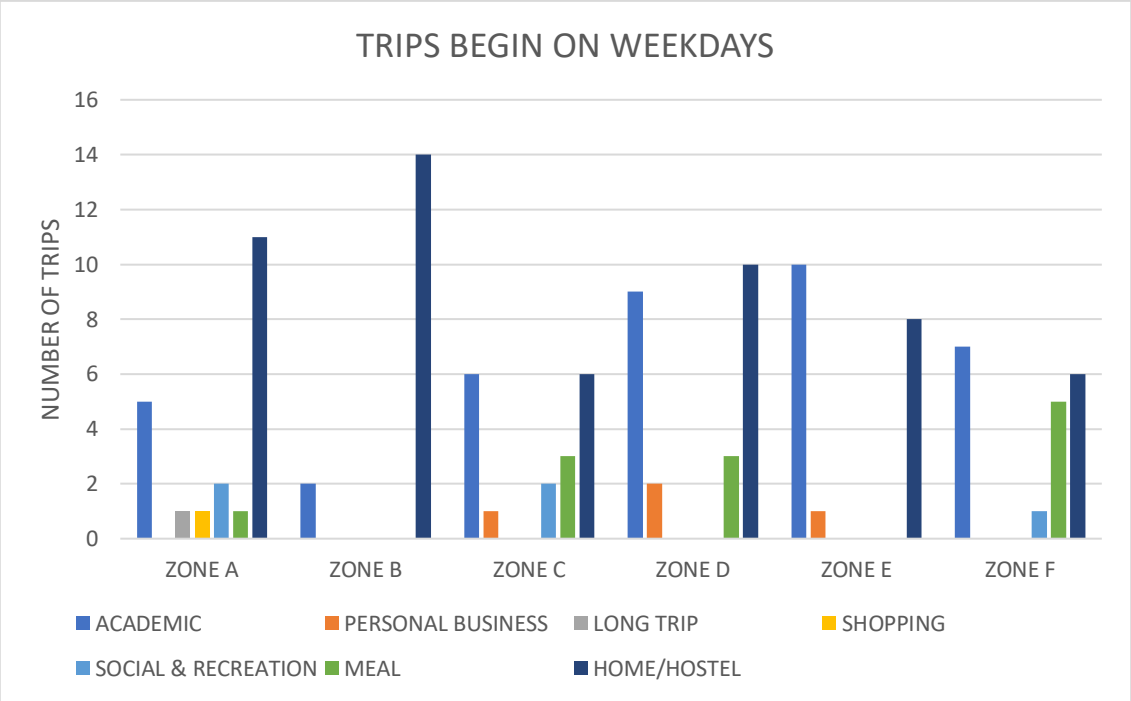

Figure 4.5 Trip begin by respondents on weekdays

The trips begin on weekdays is presented in figure 4.5. The trips majority was beginning from home/hostel and from academic activity. The highest trip made is from zone B which is from home/hostel which is 14 trips. There seems no long trip begin on weekdays except from zone A which made 1 trip. There is only small frequency of trips begin for personal business, long trip, shopping and social and recreation from all zone as shown in the figure.

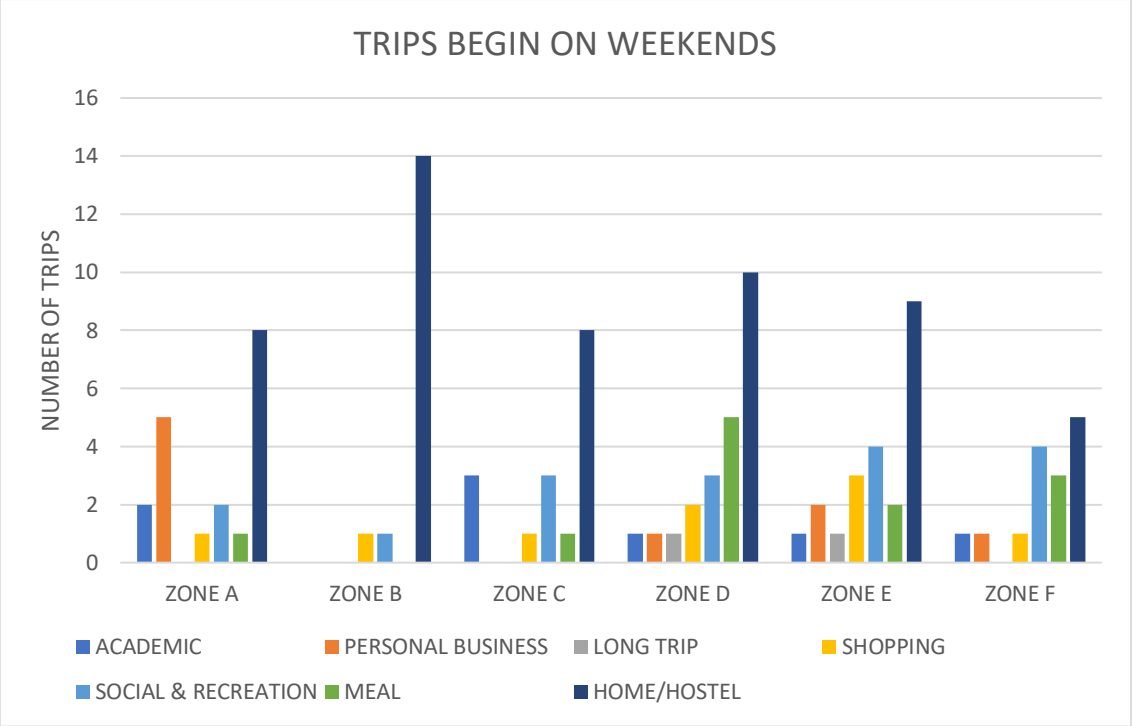

Figure 4.6 Trip begin by respondents on weekends

Figure 4.6 illustrates the trips begin by respondents on weekends. Most of the zones, the trip seems begin from home/hostel but there are also several trip that begin from personal business and meal. For the Zone B, the highest trip begins from home/hostel which is 14 trips, followed by trip begins from shopping. There is no trip begins data recorded from academic activity, personal business, long trip and meal. Trip begin on weekend seem have more activities than weekdays.

4.4.5 Trip End on Weekdays and Weekends

The results for trip end are also divided into two which are trip end on weekdays and trip end on weekends, and it presented in form of graph as shown in figure 4.7 and figure 4.8.

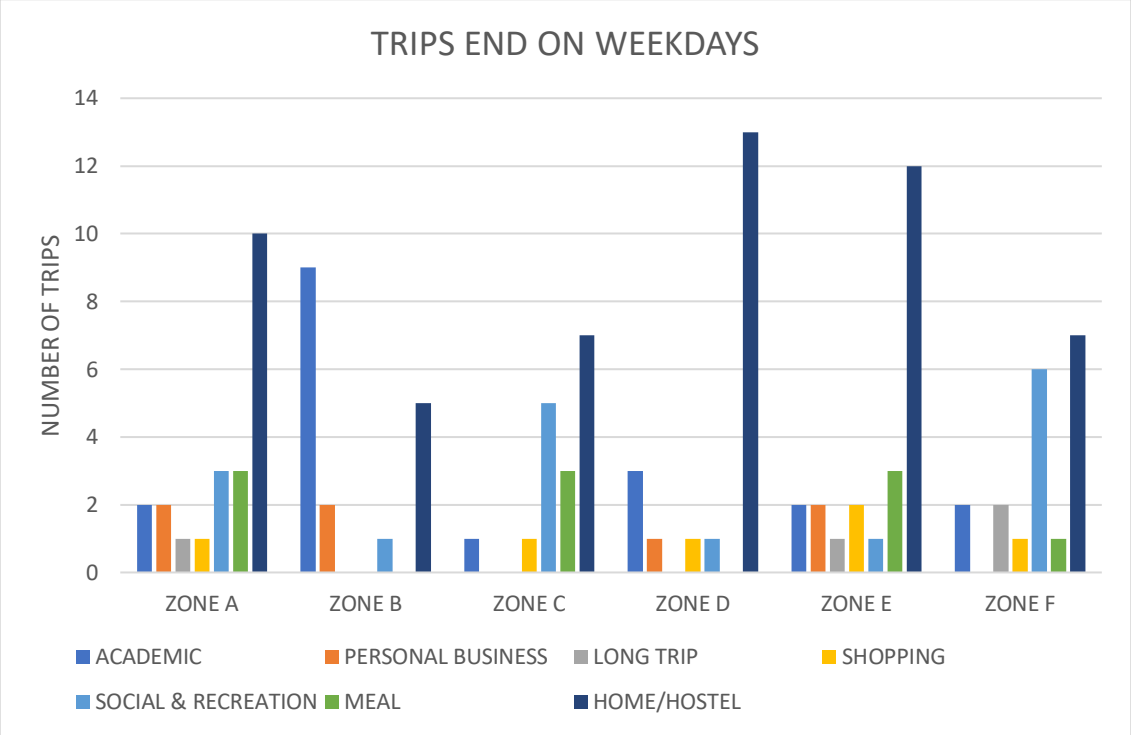

Figure 4.7 Trips end by respondents on weekdays

Figure 4.7 is presented the trips end on weekdays. The highest trips end is going to home/hostel. The highest trip made is from zone D which is 13 trips was end at home/hostel. There seems no long trip begin on weekdays except from zone A which made 1 trip. The figure shows that there are least trips for long journey trip on weekdays as people need to go to work or class on weekdays.

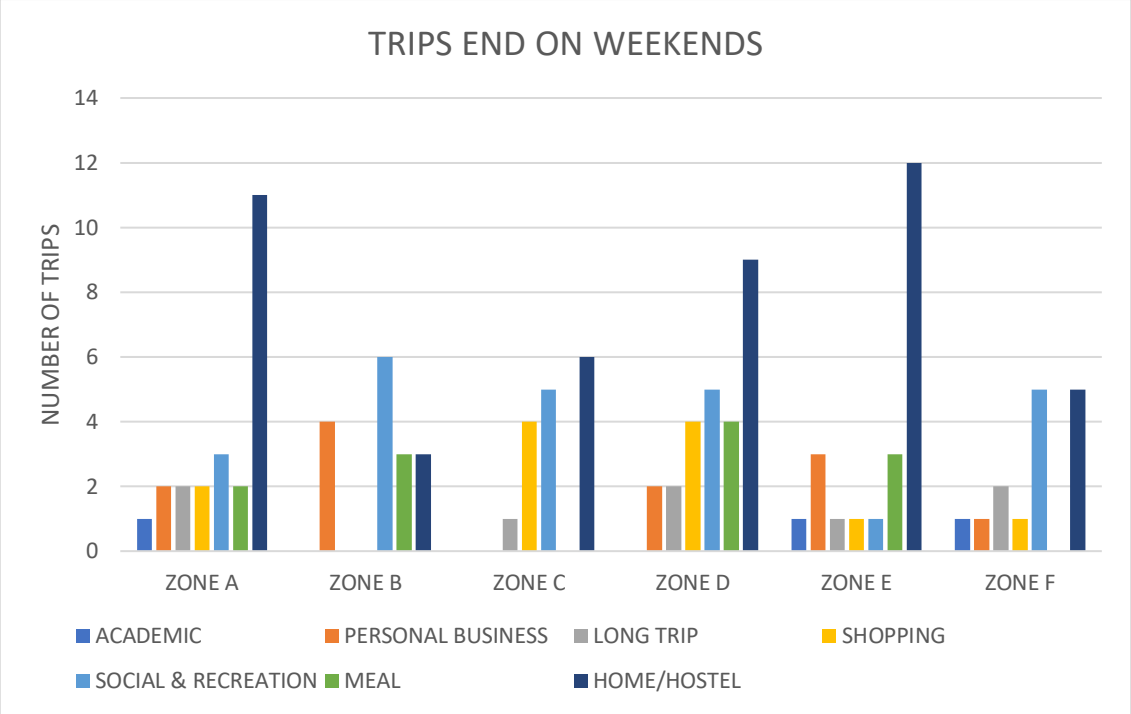

Figure 4.8 Trips end by respondents on weekends

The trips end on weekends is shown in figure 4.8. Compared to weekdays, trip ends on weekends the majority trip ends on weekends are end with home/hostel and followed by meal, social and recreation activity. The highest trip end is made from Zone E which is 12. Most of the respondents in the zone are going to home/hostel as their end trips. Compared to weekdays, the number of trip end from academic activity is lesser than during the weekends.

4.4.6 Trip Generation Rate

Trip generation rates are refer to the intensity of travel due to its development and are also defined in terms of the number of trips in comparison to the "size" of the development (for example number of the respondent) and for a particular time period (for example peak hour of weekday and weekend) as shown in figure 4.9 and figure 4.10.

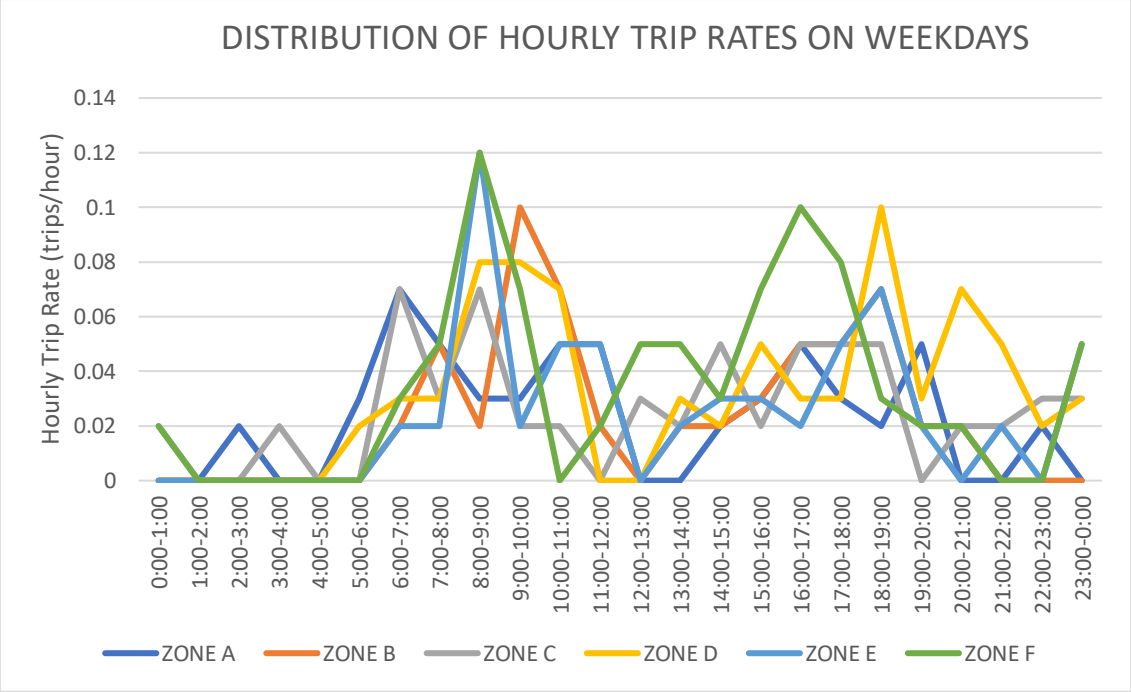

Figure 4.9 The distribution of hourly trip rates on weekdays

The figure 4.9 above illustrates the hourly trip rates on weekdays made by respondents. The majority of the trips are starting from 6.00 a.m. to 11.00 a.m. and last at 4.00 p.m. to 9.00 p.m. on weekdays. The morning peak with an average 0.3 trips/hour are majority reflected to the trips attend by respondents for the academic activity. Meanwhile, the evening peak which average is 0.24 trips/hour reflected the trips made by respondents in the study area which are going back to home/hostel.

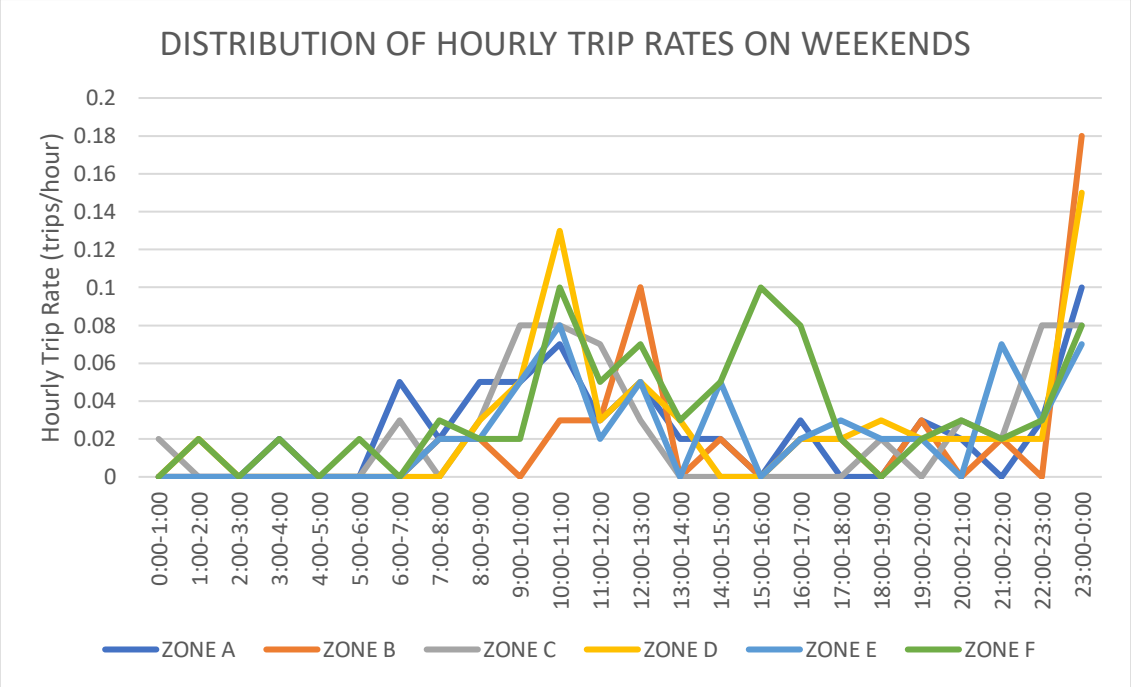

Figure 4.10 The distribution of hourly trip rates on weekends

The figure 4.10 above shows the distribution of hourly trip rates on weekends in each zone. The starting peak hour for weekends are start from 9.00 a.m. and end up at 1.00 p.m. with average 0.33 trips/hour reflected trips for personal business, meal and shopping. Trips begin on the weekends are late compared to weekdays which are most of respondent's intention want to begin their daily activities a bit later on weekends. Meanwhile, trips ends are from 11.00 p.m. to 12.00 a.m. with average of 0.66 trips/hour which reflected trips from social and recreation and meal before going home/hostel.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This study aims to determine the most popular mode of transportation used and also analysed trip generation in in term of population in UMP Pekan. The trip generation is analysed in every hour in a day which is 24 hours.

The trip generation carried out in this study can be viewed as the first step to develop transport models in UMP Pekan. The purpose of this study is to plan a better transportation system in the study area. However, there are some problems occurred during conducting the study which are limitation of time and manpower, knowledge in trip generation are limited as the reference for traffic engineering are also limited.

5.2 Conclusion

The field survey was then conducted in form of origin and destination (OD) traffic counting. The result is represented in term of graph and bar chart based on transportation used in the study area, number of trip made and behaviour of trip makers. The study is to explore the behaviour for trip makers circular inside and outside of university campus and to determine the trip generation rate by zoning area.

The most popular vehicles used in the study area are car and followed by bus. Walking and using a van are the least popular in the study area. Trip purpose made by respondents on weekdays is more formal activity which is going to academic activity compared to weekends, where respondents doing informal activity such as personal

business, social and recreation activity, etc. The highest trip production and trip attraction is a zone C because zone C is residential area where most of respondents are in and out from this zone. The results also show trip generation rate for weekdays and weekends are different in term of peak hour. On weekdays, the morning peak hour is bit early compared to weekends because people doing formal activity such as going to class and work during weekdays. Meanwhile on weekends, respondents start their activity a bit later. Most of the respondent end their trip late on weekends which at 11.00 pm to 12.00 am, compared to weekdays where respondents end at 5.00 pm to 7.00 pm. The highest trip rates generation on weekdays is 0.12 trips/hour which from 8.00 am to 9.00 am, while the highest trip generation rate on weekends is 0.18 trips/hour which from 11.00 pm to 12.00 am. Trip generation rate for weekends is higher compared to weekdays because of their tendency to make their own activity is not limited since it is weekends. New transportation policy planning and engineering will be developing after the behaviour of trip makers has been explores and can develop a relationship between trip end production or attraction and land use in the future.

5.3 Recommendation

There are several recommendations that can be useful in order to enhance the study in the future, which are:

i. Conduct traffic counting at appropriate location whether inside or outside the campus, that are related to the data of origin and destination of trip made.
ii. Conduct pilot study in study area to gain trip generation pattern.
iii. Choose suitable location for zoning.

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APPENDIX A
SAMPLE OF QUESTIONNAIRE

A Study on Trip Generation in UMP Pekan, Pahang.

The objective of this questionnaire are to determine the behaviour of trip makers at UMP Pekan and to get the trip generation rate in order to build trip generation model for trip made by population in the study area.

INSTRUCTIONS: Please answer the following question.

Gender: Male ☐ Female ☐

Race: Malay ☐ Chinese ☐ Indian ☐ Other ☐

Occupation: Student ☐ Lecturer ☐ Staff ☐ Other ☐

Residence: Hostel ☐ Outsider ☐

Faculty: FKM ☐ FKP ☐ FKEE ☐

PART A: To determine the trip rate generation

1) At what time your trip was begin on weekdays?

2) At what time your trip was end on weekdays?

3) At what time your trip was begin on weekends?

4) At what time your trip was end on weekends?

(Each of questions 1–4 has the same options, each with a box:)

0:00-1:00
1:00-2:00
2:00-3:00
3:00-4:00
4:00-5:00
5:00-6:00
6:00-7:00
7:00-8:00
8:00-9:00
9:00-10:00
10:00-11:00
11:00-12:00
12:00-13:00
13:00-14:00
14:00-15:00
15:00-16:00
16:00-17:00
17:00-18:00
18:00-19:00
19:00-20:00
20:00-21:00
21:00-22:00
22:00-23:00
23:00-0:00

PART B: To determine the trip behaviour of trip makers

5) What is your trip purpose on weekdays?

Academic activity
Personal business
Long journey trip
Shopping
Social and recreational activity
Meal
Back to home/ hostel

6) What is your trip purpose on weekends?

Academic activity
Personal business
Long journey trip
Shopping
Social and recreational activity
Meal
Back to home/ hostel

7) Where did your trip was begin on weekdays?

From academic activity
From personal business
From long journey trip
From shopping
From social and recreational activity
From meal
From home/ hostel

8) Where did your trip was end on weekdays?

To academic activity
To personal business
To long journey trip
To shopping
To social and recreational activity
To meal
To home/ hostel

9) Where did your trip was begin on weekends?

From academic activity
From personal business
From long journey trip
From shopping
From social and recreational activity
From meal
From home/ hostel

10) Where did your trip was end on weekends?

To academic activity
To personal business
To long journey trip
To shopping
To social and recreational activity
To meal
To home/ hostel

11) Do you have your own vehicle?

Yes
No

12) If yes, what type of vehicle that you have?

Bicycle ☐ Car ☐ Bus ☐
Motorcycle ☐ Van ☐

13) If no, how you are going on your trip?

Walking
Bus
Car passenger
Motorcycle passenger
Mini van

14) How many people in your vehicle, include driver?

1 person
2 person
3 person
4 person
5 person or more

PART C: To build trip generation model for trip made by population in study area

15) Where did your trip was begin?

From hostel
From Faculty of Mechanical Engineering (FKM)
From Faculty of Electric & Electronic Engineering (FKEE)
From Faculty of Manifacture Engineering (FKP)
From CBD area (JHEPA, BPA, Library)
From outside UMP

16) Where did your trip was end?

To hostel
To Faculty of Mechanical Engineering (FKM)
To Faculty of Electric & Electronic Engineering (FKEE)
To Faculty of Manifacture Engineering (FKP)
To CBD area (JHEPA, BPA, Library)
To outside UMP