AN INVESTIGATION ON LEADING CHARACTERISTICS OF RAPIDKUANTAN BUS PASSENGERS USING CORRESPONDENCE ANALYSIS

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for the award of the degree of
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Dedicated to my beloved family, teachers and friends

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I can no other answer make, but, thanks, and thanks.
- William Shakespeare -

ABSTRACT

Kuantan facing huge transformation in their bus transportation system when most of the bus companies discontinue their operations because profitability issue and of the number of bus passengers has declined. The efforts to solve this problem have failed since Kuantan did not have detail information on bus and passengers characteristics. RapidKuantan was introduced in early 2013 and a study needs to be conduct to avoid the same issues. The travel data collected by previous study were not able to describe the leading characteristics of routes covered without the application of more rigours such as correspondence analysis. Researchers often use continuous data analysis (quantitative analysis) to perform the analysis. Some studies can be misleading in determining the correct method of analysing. This study shows how the analysis can be done for categorical travel data (qualitative analysis) using correspondence analysis which is a dimension reduction technique similar to factor analysis but extends factor analysis in handling of categorical data/variables. The leading characteristics for can be identified from correspondence analysis. The questionnaire survey was done for the selected routes in Kuantan and Pekan for one month. The questionnaire form was distributed at the bus stop and on the bus involving 1340 respondents. The study area was divided into four zones and different characteristics were determined for each zone. It can be summarised that the leading characteristics for bus passengers in Zone A (Pekan) were secondary student who from/to home, the bus passenger for Zone B (Gambang) were University student which were from/to shopping with time of return between 11 am to 1 pm, for zone C (Sungai Lembing) the bus passengers were from/to work and business with income less than RM2000 while passengers from zone D (Teluk Cempedak) mostly were from/to school and using bus once a while during weekend. At the end of this study, the strategies to improve bus ridership for each zone were proposed based on Transportation Handbook and Traffic Impact Assessment (TIA) method. This study would like to recommend future research to separate the inbound and outbound passengers when conducting data collection and analysis.

ABSTRAK

Kuantan mengalami perubahan yang amat besar dalam sistem pengangkutan basnya apabila kebanyakan syarikat pengangkutan bas memberhentikan operasi mereka disebabkan isu keuntungan dan bilangan pengguna bas yang berkurangan. Usaha-usaha untuk mengatasi masalah ni gagal kerana Kuantan tidak mempunyai maklumat lengkap mengenai ciri-ciri bas dan pengguna bas. RapidKuantan diperkenalkan pada awal tahun 2013 dan satu kajian perlu dilaksanakan untuk mengelakkan isu yang sama berulang. Maklumat perjalanan yang telah dikumpulkan dalam kajian sebelum ini tidak boleh menggambarkan ciri-ciri utama tanpa penggunaan aplikasi seperti analisa hubungan. Penyelidik selalunya menggunakan kajian data berterusan (kuantitatif analisis) untuk menjalankan analisis. Terdapat kajian yang tersilap dalam memilih kaedah analisis yang betul untuk menganalisis data. Kajian ini menunjukkan bagaimana analisis boleh dijalankan ke atas data perjalanan jenis kategori (kualitatif analisis) menggunakan analisa hubungan yang mana menyerupai analisis faktor tetapi sesuai digunakan untuk data jenis kategori. Ciri-ciri utama boleh dikenalpasti menggunakan analisa hubungan. Satu kajian soal selidik telah dilakukan di hentian bas dan di dalam bas melibatkan 1340 responden. Kawasan kajian dibahagikan kepada empat zon dan ciri-ciri utama yang berlainan telah dikenalpasti untuk setiap zon. Secara rumusannya, ciri-ciri utama untuk pengguna bas di Zon A (Pekan) adalah pelajar sekolah menengah yang dari/ke rumah, pengguna bas di Zon B (Gambang) adalah pelajar Universiti yang dari/ke tempat membeli belah dengan masa pulang di antara 11 pagi ke 1 petang, untuk Zon C (Sungai Lembing) pengguna bas adalah dari/ke tempat kerja dengan pendapatan kurang dari RM2000 sementara itu pengguna dari Zon D (Teluk Cempedak) kebanyakkannya dari/ke sekolah menggunakan bas sekali sekala dihujung minggu. Di akhir kajian ini, langkah-langkah untuk meningkatkan bilangan pengguna bas dicadangkan berdasarkan buku pengangkutan dan kaedah penilaian kesan trafik (TIA). Kajian ini ingin mencadangkan agar penyelidik di masa akan datang mengasingkan pengguna bas berdasarkan laluan masuk dan laluan keluar semasa mengumpulkan data dan menjalankan analisis.

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LIST OF SYMBOLS

n	number of counts or frequency

LIST OF ABBREVIATIONS

BGRC	Bukit Gambang Resort City
CA	Correspondence analysis
COO	Chief Operation Officer
ECER	East Coast Economic Region
ICAM	International College of Automotive
IKIP	Institut Kemajuan Ikhtisas Pahang
IKM	Institut Kemahiran MARA
MRSM	Maktab Rendah Sains MARA
OD	Origin Destination
PRIDE	Prasarana Integrated Development Sdn. Bhd.
PRIME	Prasarana Integrated Management & Engineering Services Sdn. Bhd.
SBUs	Strategic business units
SDN. BHD.	Sendirian Berhad
SMK	Sekolah Menengah Kebangsaan
SPSS	Statistical Package for Social Sciences
UiTM	Universiti Teknologi MARA
UMP	Universiti Malaysia Pahang

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Kuantan is one of the gateways to the East Coast, so it is important for it to have a reliable and systematic public transport system. This study will focus on the bus transportation system since Kuantan has had a major revolution in bus transport in the last six years. Although Kuantan's population has increased, however, the number of bus users and bus modal share has declined since commuters tend to choose private vehicles over public transportation (Harun, 2013). As a consequence, traffic congestion continues to increase despite the improve services by RapidKuantan.

In early 2013, Kuantan faced a major transformation in its public transport system where the majority of existing buses stopped operating and were replaced by new buses called RapidKuantan. Figure 1.1 illustrates the situation before the government introduced RapidKuantan.

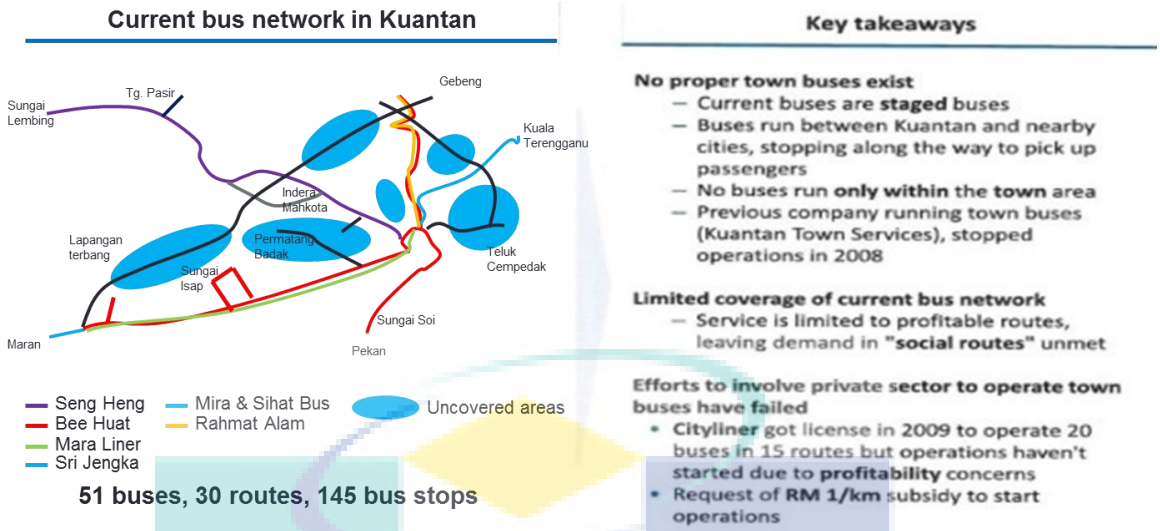


Figure 1.1: Bus companies scenario before RapidKuantan

Source: East Coast Economic Region (ECER) transportation study

Before 2008, eight bus companies operated in Kuantan Town, which were: Seng Heng Bus Sdn. Bhd., Koperasi Serbaguna Felda Bukit Kuantan Bhd., Rahmat Alam Enterprise Sdn. Bhd., Bee Huat Omnibus Co. Sdn. Bhd., Sihat Bas Sdn. Bhd., Sri Jengka Sdn. Bhd., Mara Liner and Kuantan Town Service Co. Sdn. Bhd. Since 2008, Kuantan Town Service Co. Sdn. Bhd., the biggest bus company in Kuantan, stopped operations because revenues decreased while operational costs increased as shown in Figure 1.2. Although, Bee Huat Omnibus Co. Sdn. Bhd. to take over the routes, however the imbalanced between the revenue and operating cost were still not resolved.

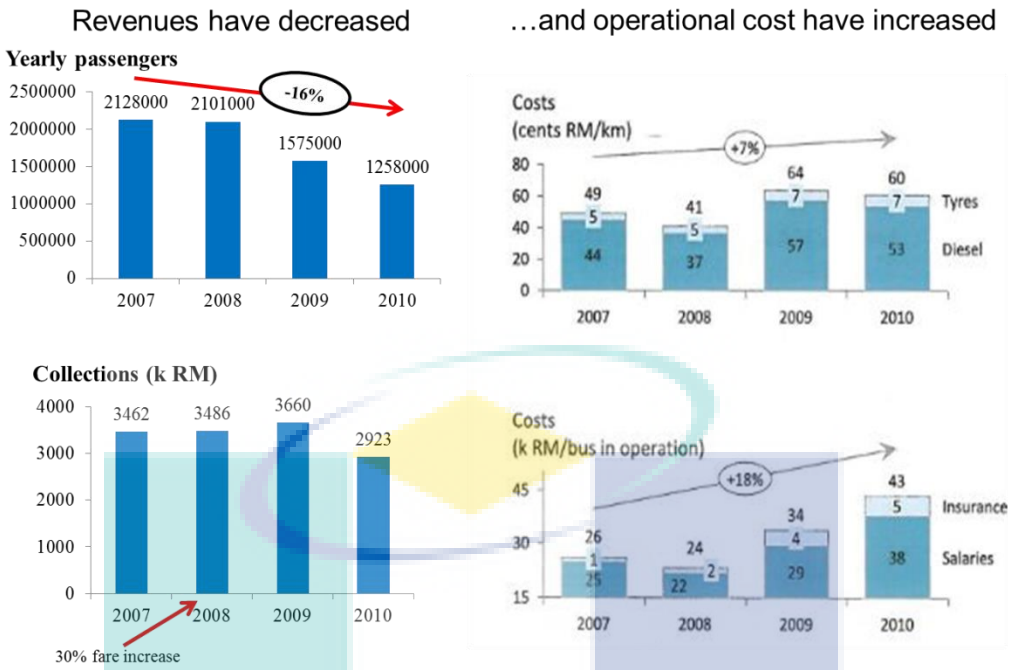


Figure 1.2: Bus companies in Kuantan have faced an increase in operating costs and total number of buses in operation has decreased by 40 % in last 4 years

Source: East Coast Economic Region (ECER) transportation study

On 31 December, 2012, Prime Minister Y.A.B. Dato' Sri Najib Tun Razak launched RapidKuantan buses as a solution to the problem. In the beginning, RapidKuantan serviced only three routes as presented in Figure 1.3. Later, due to high demand from the public as reported by Harun (2013), the number of buses and routes was increased as shown in Figure 1.4. Huge losses and stiff competition forced Bee Huat Omnibus to cease operations (NikMin, 2012b). Consequently, Rapid Bus Sdn. Bhd had to extend service to other routes (NikMin, 2012a) without knowing the trip maker characteristics of the routes. Zulkiple et al. (2014) conduct an analysis to describe the demographics and travel behaviour of affected bus routes without due attention to determine trip maker characteristics of the routes using factor analysis or regression analysis. Regression analysis was out of the context because to run regression, the dependent variable and at least one of the independent variable must be quantitative data (numerical/continuous). Factor analysis was also discovered not suitable for analysing the categorical data (Shariff, 2014).

Many studies on bus transportation involved determination of trip maker characteristics using factor analysis or regression analysis and this was valid for continuous data case. In case it involved with categorical data, factor analysis or regression analysis cannot be performed in principle.

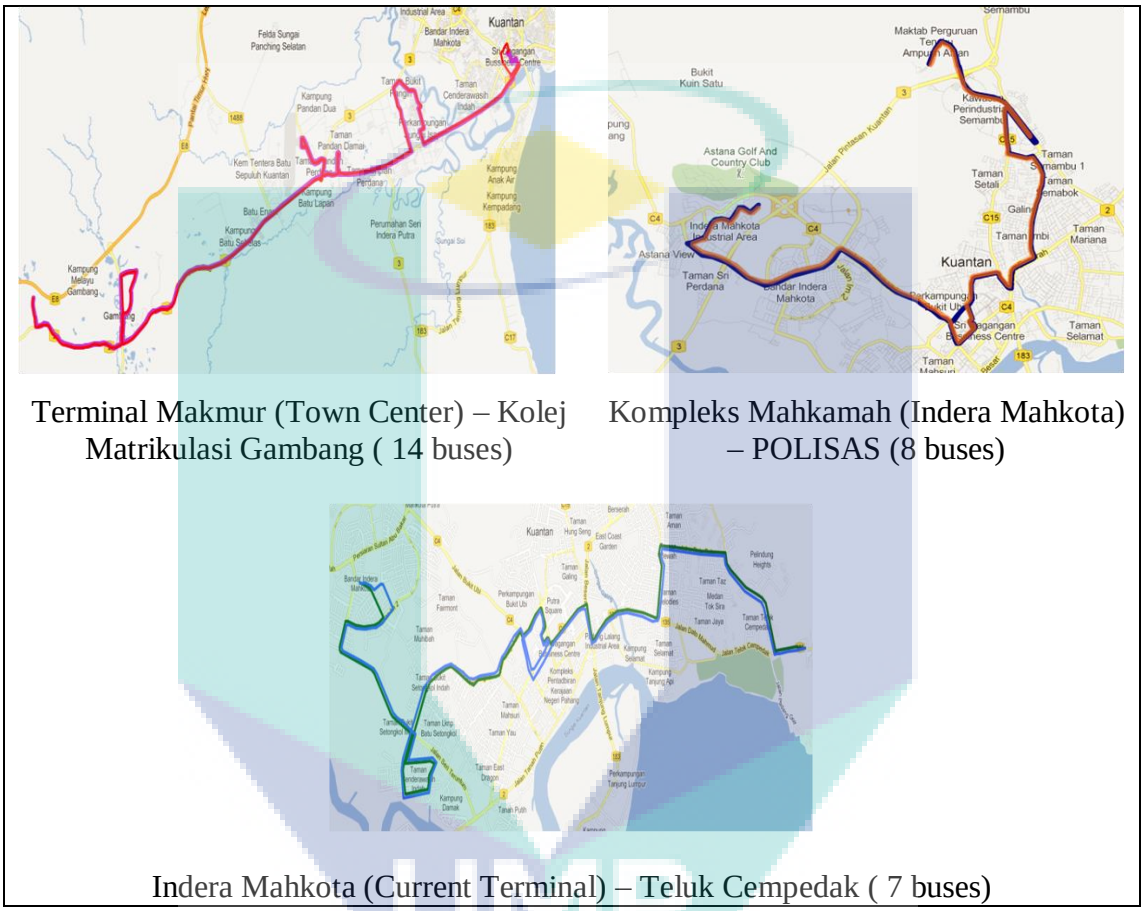
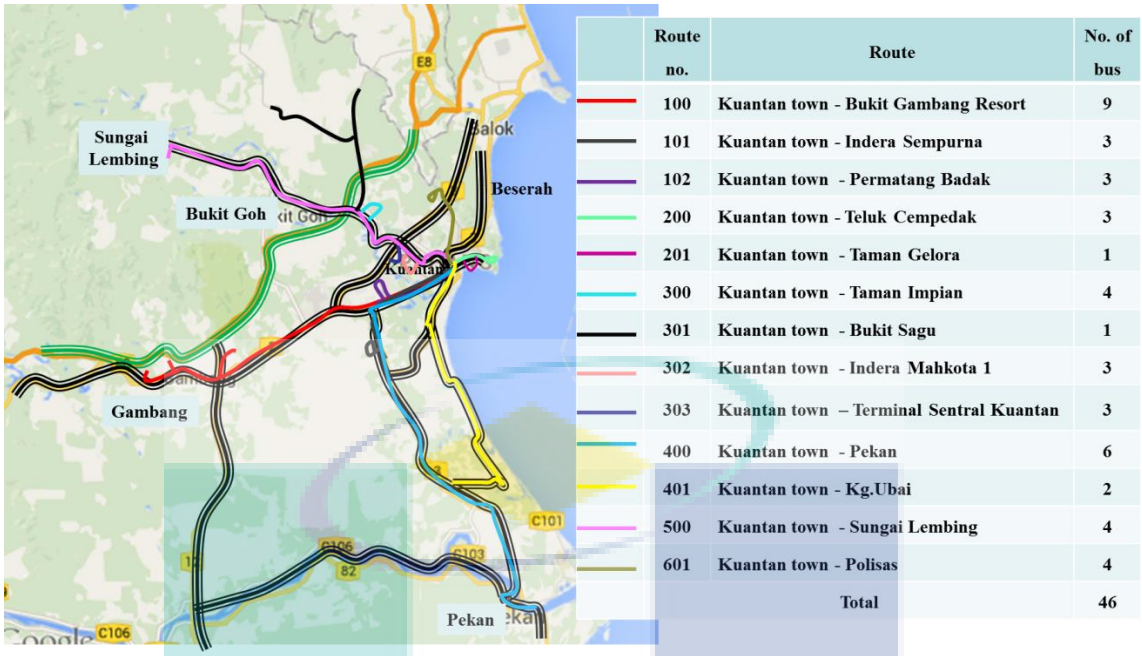


Figure 1.3: Basic routes for RapidKuantan buses in Kuantan town



	Route no.	Route	No. of bus
	100	Kuantan town - Bukit Gambang Resort	9
	101	Kuantan town - Indera Sempurna	3
	102	Kuantan town - Permatang Badak	3
	200	Kuantan town - Teluk Cempedak	3
	201	Kuantan town - Taman Gelora	1
	300	Kuantan town - Taman Impian	4
	301	Kuantan town - Bukit Sagu	1
	302	Kuantan town - Indera Mahkota 1	3
	303	Kuantan town – Terminal Sentral Kuantan	3
	400	Kuantan town - Pekan	6
	401	Kuantan town - Kg.Ubai	2
	500	Kuantan town - Sungai Lembing	4
	601	Kuantan town - Polisas	4
		Total	46

Figure 1.4: The number of buses was increased along with the routes due to higher demand

Knapp (1990) treated the five Likert Scales as ordinal data. So were Vigderhous (1977); Jakobsson (2004); Jamieson (2004); Kuzon et al. (1996).

Likert scales can indeed be analysed effectively as continuous data as discovered by Brown (2011); Baggaley & Hull (1983); Maurer & Pierce (1998); Vickers (1999); Allen & Seaman (1997) with certain hideous conditions.

1.2 PROBLEM STATEMENT

RapidKuantan was introduced in early 2013 by the government when most of bus companies in Kuantan discontinue their operation which cause certain area disconnected. The efforts to improve bus transportation system in Kuantan in this six years failed because lack of bus passengers information and there was limited study conducted. There were 2840 data collected in the previous study of RapidKuantan buses, unfortunately the travel data collected were not be able to characterized the leading characteristics namely bus trip characteristics, bus passenger characteristics and transportation system characteristics of routes covered by the local bus company (RapidKuantan) without the application of more rigours such as correspondence analysis. Since Kuantan town does not have a National Household survey and a database for their bus transportation system, the data collected by a previous study were important to improve the bus transportation system as well as to avoid more failure in improving Kuantan bus transportation system. The actual leading characteristics need to be defined so that the best strategies can be performed to increase bus ridership. This study found the best way to analysis all the samples using correspondence analysis.

1.3 OBJECTIVES OF THE RESEARCH

The objectives of this study were:

i. To determine the leading characteristics between sub domain (trip characteristics, trip maker characteristics and the transportation system characteristics) for each zone using correspondence analysis.

ii. To recommend strategies to increase the bus ridership pattern through origin and destination survey.

1.4 LIMITATION AND SCOPE OF STUDY

There were 13 routes provided by RapidKuantan. This case study selects two routes from the certain area to represent the zone. Zones were created based on basic demographic and land use within a study area. Zone A was represented by route Pekan and Indera Sempurna because both of the routes used the same link of route compared to route Kg. Ubai. Zone B involved both routes which were Bukit Gambang and Permatang Badak. Zone C excluded the route of Bukit Sagu since the link was too far from Sungai Lembing meanwhile route Indera Mahkota 1 were choose compared to route Taman Impian because there were numerous types of bus passengers and attraction area (school, residential area, government building and hospital) in Indera Mahkota compared to Taman Impian. Lastly, for zone D, it involved all the routes which were Teluk Cempedak and Taman Gelora.

The detailed information of the selected routes listed in Table 1.1 and illustrated in Figure 1.5. Route Kuantan Town to POLISAS was excluded from this study to avoid bias in calculating bus passenger (representation of college students) while route Kuantan town to Terminal Sentral Kuantan excluded due to captive users category.

The domains were trip characteristics, trip maker characteristics and transportation system characteristics. Each of the domains has the sub domain that will be listed in chapter 3.

Table 1.1: Summary of sample size and zone used

Bus no	Route	Sample size taken by Zulkiple. A,. et al. (2014)	Sample size used in this study (2015)	Zone No	Total sample
400	Kuantan Town - Pekan	329	329	Zone A	520
101	Kuantan Town - Indera Sempurna	321	191		
401	Kuantan Town - Kg. Ubai	145	-		
100	Kuantan Town - Bukit Gambang Resort	472	157	Zone B	370
102	Kuantan Town - Permatang Badak	301	213		
500	Kuantan Town - Sungai Lembing	114	114	Zone C	290
302	Kuantan Town - Indera Mahkota 1	176	176		
300	Kuantan Town - Taman Impian	179	-		
301	Kuantan Town - Bukit Sagu	270	-		
200	Kuantan Town - Teluk Cempedak	326	106	Zone D	160
201	Kuantan Town - Taman Gelora	54	54		
601	Kuantan Town - POLISAS	153	-		-
303	Kuantan Town - Terminal Sentral	-	-		-
	TOTAL	**2840**	**1340**		**1340**

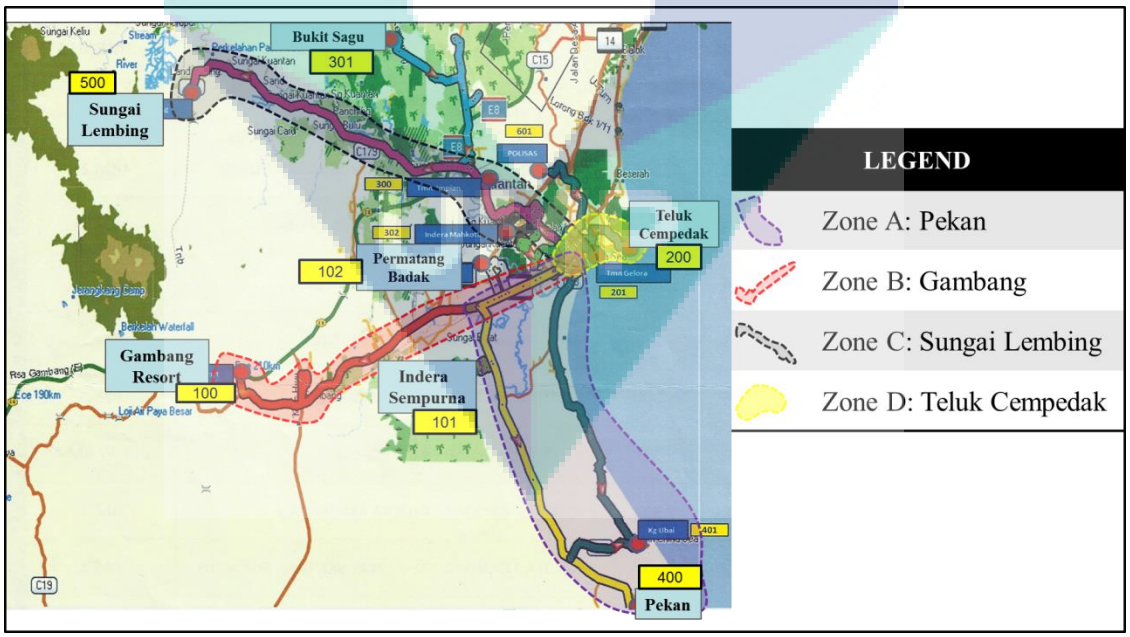


Figure 1.5: The location for each zone

1.5 OVERVIEW OF THE THESIS

Chapter 1 explains the historical background of bus transportation in Kuantan and why this study focuses on RapidKuantan buses only. From this thesis, researchers can understand the method to manage with categorical data as explained in Chapters 2 and 3. Chapter 2 examined the relevant literature, while Chapter 3 described the research approach. The study about RapidKuantan buses can give an overview of the bus transport system in Kuantan. Chapter 4 will list all the result from the correspondence analysis based on research questions in Table 1.2. The leading characteristics and proposed strategies were listed in chapter 5. All the conclusions and recommendations to improve this study were in Chapter 6.

Table 1.2: Summary table for the objectives and method used in this research

No	OBJECTIVES OF THE RESEARCH	METHOD	RESEARCH QUESTIONS
1	To determine the leading characteristics between sub domain (trip characteristics, trip maker characteristics and the transportation system characteristics) for each zone using correspondence analysis.	Row profile tables	1. What are the similarities and differences among the zones with respect to each domain?
		Column profile tables	2. What are the similarities and differences among the domains with respect to the zones?
		Weighted chi-squared distance	3. What is the relationship between the zones and the domain?
		Perceptual maps	4. Can these relationships be presented graphically in a join low dimensional space?
2	To recommend strategies to increase the bus ridership pattern through origin and destination survey.	Proposed based on Handbook of Transportation Engineering (Kurtz, 2014), Traffic Impact Assessment (TIA) study by Zulkiple et al. (2014) and Guide to Sustainable Transportation Performance Measures provided by U.S. Environmental Protection Agency.	Based on leading characteristics discovered in objective number 1.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter elaborated more on RapidKuantan buses, factors affecting mode choice that will contribute to the leading characteristics, data types, level of measurement and correspondence analysis. It is important to conduct a study on RapidKuantan buses since there were limited studies for this bus system as such inefficiencies in the city bus service will force people to use privately-owned vehicles, which will result in congestion, accidents and vehicular pollution (Argarwal & Singh, 2010).

2.2 PRASARANA GROUP

Prasarana Negara Berhad (Prasarana Group) was established in 1998 by the Ministry of Finance to supervise, transform, implement and accelerate public transport infrastructure projects in Malaysia. Prasarana Group implemented a corporate restructuring at the beginning of 2013, forming four new subsidiaries or strategic business units (SBUs) which were: Rapid Rail Sdn. Bhd., Rapid Bus Sdn. Bhd., Prasarana Integrated Management & Engineering Services Sdn. Bhd. (PRIME) and Prasarana Integrated Development Sdn. Bhd. (PRIDE)(Prasaranagroup, 2012). RapidKuantan was under Rapid Bus Sdn. Bhd as illustrated in Figure 2.1.

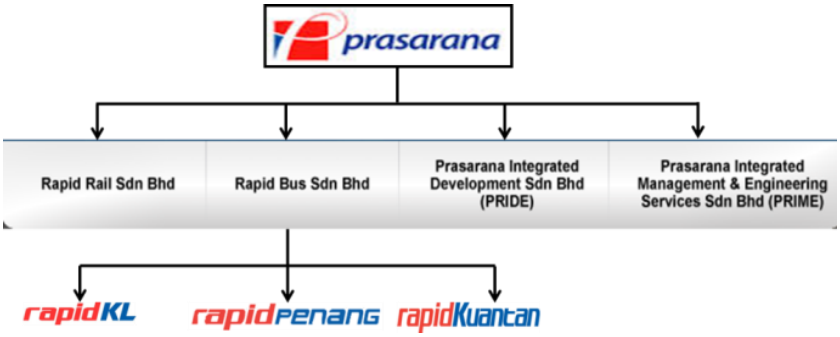


Figure 2.1: Flow chart for Prasarana Group

2.2.1 RapidKuantan Bus

RapidKuantan charges RM4 for Route 100 between Kuantan Town and Bukit Gambang Resort, Route 301 between Kuantan Town and Bukit Sagu, Route 400 between Kuantan Town and Pekan, Route 401 between Kuantan Town and Kampung Ubai, and Route 500 between Kuantan Town and Sungai Lembing. Meanwhile other routes only cost RM2 for each trip. Passengers with MyRapid concession cards will also enjoy a 50 percent discount on the fares. The concession cards were only for primary and secondary school students, the physically-challenged and senior citizens or those above 60 years old.

Figure 2.2: A RapidKuantan bus in front of Terminal Sentral Kuantan

With a mission of providing world class services for the public, RapidKuantan made huge investments in developing public infrastructure, namely upgrading of Hentian Bandar Kuantan, installation of bus poles and information triangles, and refurbishment of existing bus stop shelters for the convenience of passengers.

2.3 MODE CHOICE/ LEADING CHARACTERISTICS FOR TRANSPORTATION SYSTEM

Past studies have summarised details of trip makers and trip characteristics but only for holiday travel purposes. They also include environmental impact, transport mode shift, finance, political and marketing strategies (Bohler et al., 2005). Mode choice for transportation was different based on travel patterns. Trip purpose and mode of travel can be determined using home interviews (for internal travel), roadside interviews at cordon stations (for external-internal and through trips) and on-board survey on transit vehicles (Kurtz, 2004). Chapter 3 will discuss more about the methods used. Figure 2.3 lists the factors affecting mode choice that can be leading characteristics in this study according to the Handbook of Transportation Engineering.

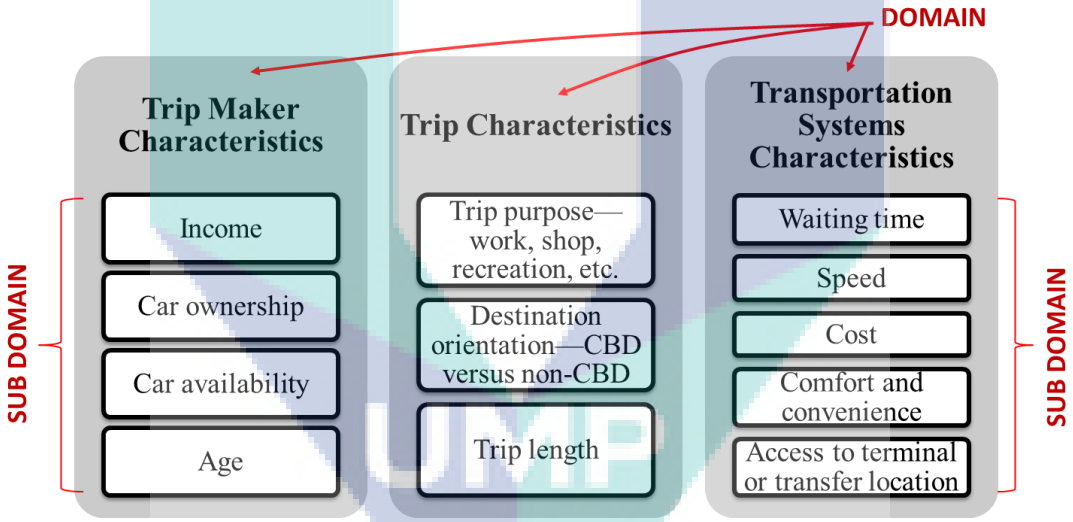


Figure 2.3: Factors affecting mode choice

Source: Kurtz, (2004)

2.4 STATISTICAL ANALYSIS

All the data will be analysed using the Statistical Package for Social Sciences (SPSS). SPSS is software that provides a powerful statistical analysis and data management system in a graphical environment, using descriptive menus and simple dialog boxes (IBM, 2012). Hongyan and Sixu proved that SPSS is not only useful for social science and mathematics but can also be used in transportation engineering (Hongyan & Sixu, 2013). Before running an analysis, it is important to identify the type of data and level of measurement used in the study.

2.4.1 Type of Data

According to Shariff (2014) and Agresti (2002), if a researcher has used categorical data it means the researcher is doing qualitative analysis. Choosing the suitable analysing method is important to make sure the result is correct. The type of data needs to be clear to avoid mistakes in the analysis process. Generally, data can be divided into two categories, that is, categorical and numerical. The categorical data pertains to categories such as gender, which would consist of a male group and a female group. On the other hand, numerical data are divided into discrete and continuous data. Discrete data, for example, is data that can be measured in numbers such as shoe sizes and number of children. Age and height are examples of continuous data. Continuous data can theoretically take on any value, within a range defined by the measuring instrument. Continuous data often include decimals or fractions of numbers. Figure 2.4 simplifies types of data.

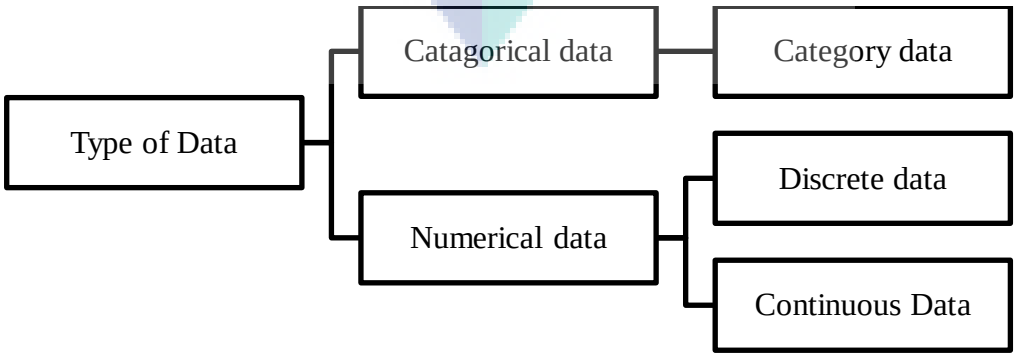


Figure 2.4: Types of dataset

2.4.2 Level of Measurement

Breakwell (2006) and Shariff (2014) explained that the level of measurement is critical in determining the appropriate multivariate technique to use. The nominal and ordinal scales are included in qualitative data, while interval and ratio scales are used in quantitative data (continuous data). The qualitative data is also identified as categorical data and non-metric data. Besides this, the quantitative data is also recognized as continuous data and metric data. Figure 2.5 categorises the data classification and level of measurement.

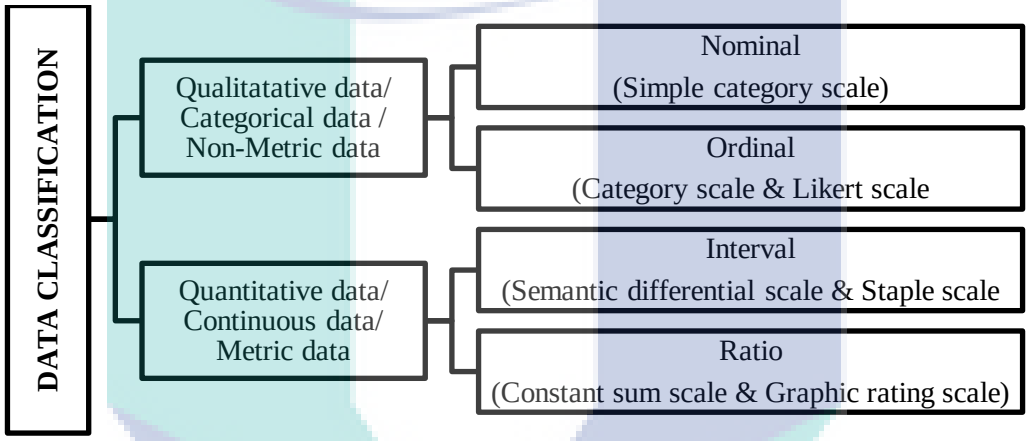


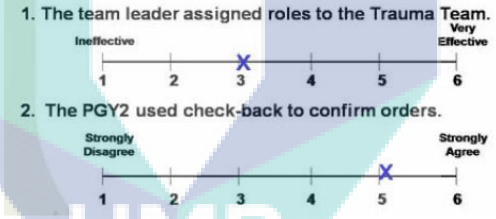
Figure 2.5: The data classification and level of measurement

Source: Shariff (2014)

The nominal scale has no direction or order. It is geared towards grouping. In this scale, the numbers or letters assigned to an object serve only as labels for identification or classification, the size of numbers is not related to the amount of the characteristic being measured. For example, age, gender, type of vehicle, student type and employment status. The ordinal scale otherwise has an order and ranking. For example, student marks, time of leaving and time of return. In terms of rating scale, it can be divided into two categories, the itemised rating scale and the graphic rating scale. The itemised rating scale includes simple category rating scale, category scale, Likert scale (summated rating scale), semantic differential scale, staple scale and constant sum scale. Table 2.1 summarises the itemised rating scale.

Table 2.1: The rating scale

Rating Scale	Example	Characteristics
Simple Category Scale A category scale with only two response categories both of which are labelled	Please rate car model A on each of the following dimensions: poor excellent a) Durability [ ] [ ] b) Fuel consumption [ ] [ ]	Nominal
Category Scale A rating scale which the response option provided for a closed-ended question are labelled with specific verbal descriptions	Please rate car model A on each of the following dimensions: Poor Fair Good Very Good Excellent a)Durability [ ] [ ] [ ] [ ] [ ] b)Fuel consumption [ ] [ ] [ ] [ ] [ ]	Ordinal
The Likert Scale A multiple item rating scale in which the degree of an attribute possessed by an object is determined by asking respondents to agree or disagree with a series of positive and/or negative statements describing the object.	Attitude toward buying from the Internet Totally disagree / Disagree / Neutral / Agree / Totally agree a) Shopping takes much longer on the Internet [ ] [ ] [ ] [ ] [ ] b) It is a good thing that Saudi consumers have the opportunity to buy products through the [ ] [ ] [ ] [ ] [ ] c) Buying products over the Internet is not a sensible thing to do [ ] [ ] [ ] [ ] [ ]	Ordinal
Semantic Differential Scale A rating scale in which bipolar adjectives are placed at both ends (and poles) of the scale, and response option are expressed as semantic space. It is often used to construct an image profile	Please rate car model A on each of the following dimensions: Durable ---:-X-:---:---:---:---:--- Not durable Low fuel consumption ---:---:---:---:---:-X-:--- High fuel consumption Poor Excellent Durability : 1 2 3 4 5 6 7 Poor Excellent Fuel consumption : 1 2 3 4 5 6 7	Interval

Stapel Scale A simplified version of semantic differential scale in which a single adjective or descriptive phrase is used instead of bipolar adjectives. The scale measures both the direction and intensity of the attribute simultaneously.	Please rate car model A on each of the following dimensions: Model A -3 -2 -1 Durable Car 1 2 3 -3 -2 -1 Good Fuel Consumption 1 2 3	Interval
Constant Sum Scale A rating scale in which respondents divide a constant sum among different attributes of an object (usually to indicate the relative importance of each attribute)	Divide 100 points among the following dimensions to indicate their level of importance to you when you purchase a car: Durability _____ Fuel Consumption _____ **Total** **100**	Ratio
Graphic Rating Scale Also known as continuous rating scale. It is a rating scale in which respondent rate on an object graphic continuum, usually straight line. The respondents rate object by placing a mark at the appropriate position on the line that runs from one extreme of the criterion variable to another		Ratio

Source: Shariff (2014)

Based on Denzin &Lincoln (1994), if data types are interval and ratio, the suitable method of testing is parametric tests. The nominal and ordinal data only can be tested using nonparametric tests. Parametric tests are based on assumptions about the distribution of the underlying population from which the samples are taken. The most common parametric assumption is that the data are approximately normally distributed. On the other hand, nonparametric tests do not rely on assumptions about the shape or parameters of the underlying population distribution. If the data deviates strongly from the assumptions of the parametric procedure, using the parametric procedure could lead to incorrect conclusions, so in this case it is prudent to use nonparametric procedures.

The advantages of using nonparametric tests are they can be used with all scales (note that interval and ratio can be transformed to nominal and ordinal data), they are easy to compute because this method was developed before computers were extensively used; they make fewer assumptions and do not involve the population parameters. The results can be as precise as the parametric procedures. The disadvantages of nonparametric tests are they require a larger sample size than corresponding parametric tests in order to achieve the same power, while also being difficult to calculate manually for larger samples (Lozano, 2006).

2.4.3 Correspondence Analysis (CA)

Correspondence analysis (CA) is a geometric approach to descriptive data analysis and was developed by French linguist and data analyst Jean-Paul Benzecri and his colleagues in the 1960s. This method was widely used in marketing, refer Bendixen (1996) as well as for psychology and ecology research, refer Doey and Kurta (2011). The objective of CA is to identify the relationship between two categorical variables. CA is a dimension reduction technique similar to factor analysis, but extends factor analysis on two counts:

i. Handling of categorical variables, particularly those measured in the nominal scale
ii. Developing perceptual maps of extracted components

The objective of correspondence analysis is to convert a table of numerical information into a graphical display as well as simplify the interpretation of the information.

While factor analysis captures linear relationships (Russell, 2002), CA captures non linearity between the variables represented in contingency tables (cross table). Examples of tables for data are given in Table 2.2. Correspondence tables or contingency tables in Figure 2.3 below consider variables X_1 and X_2 from Table 2.2.

Table 2.2: The example of data table

i	X_1	X_2	…	X_p
1	X_{C1}	X_{C2}	…	X_{Cp}
2	…	…	…	
…	…	…	…	
N				

Table 2.3: The example of contingency table or cross table

	Category 1	Category 2	…	Category k
X_1	n_{11}	n_{12}	…	n_{1k}
X_2	n_{21}	n_{22}	…	n_{2k}
…	…	…	…	…
X_3	n_{31}	n_{32}	…	n_{3k}
				n

n_{ij} = number of counts or frequency

From both tables above the total frequency can be expressed in equation below. The n_{ij} were the represented the Ith row and the Jth column.

$$n = \sum_{i}^{k} \sum_{j}^{k} n_{ij}$$

2.5 SUMMARY

The type of data analysis depends on the type of data used. Choosing the wrong analysis method will produce inaccurate results. Correspondence analysis handles the nominal and ordinal data precisely and creates perceptual maps to show how the variables related. From the result of the correspondence analysis, the shortest distance between the variables will be the leading characteristics compare to the other variables. The exact strategies can be proposed based on the leading characteristics which will help bus operator and local authorities to increase the bus ridership.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This study used the qualitative method as stated in chapter 2. Qualitative research has been discussed by many researchers. For example, in early 1990, Corbin and Strauss explained methods that can be used in qualitative research; Walker and Myrick (2006) improvised on the study by Corbin and Strauss (1990), Denzin and Lincoln (1994) said that qualitative research was multi-method in focus, involving an explanatory, real-life approach to its subject matter. The qualitative researchers study things in their natural surroundings, trying to make sense of, or interpret phenomena in terms of the meanings people bring to them; and Anthony et al. (2007) have provided sample designs for researchers.

Gephart (2004) from University of Alberta in his journal explained the benefit of qualitative research and the mistakes that researchers always make in qualitative research. Carrying out qualitative research was challenging since it is time consuming and also difficult because researchers must really understand the nature of the study and there are no algorithms to produce it. However, qualitative research was also the best way to describe the nature of the study area as well as express real situations. In this study, the site investigation was important to make sure researcher clearly understand the past and current situation in Kuantan bus transportation system. The questionnaire must be related to the local situation. Overall methodology used in this study was demonstrated in Figure 3.1.

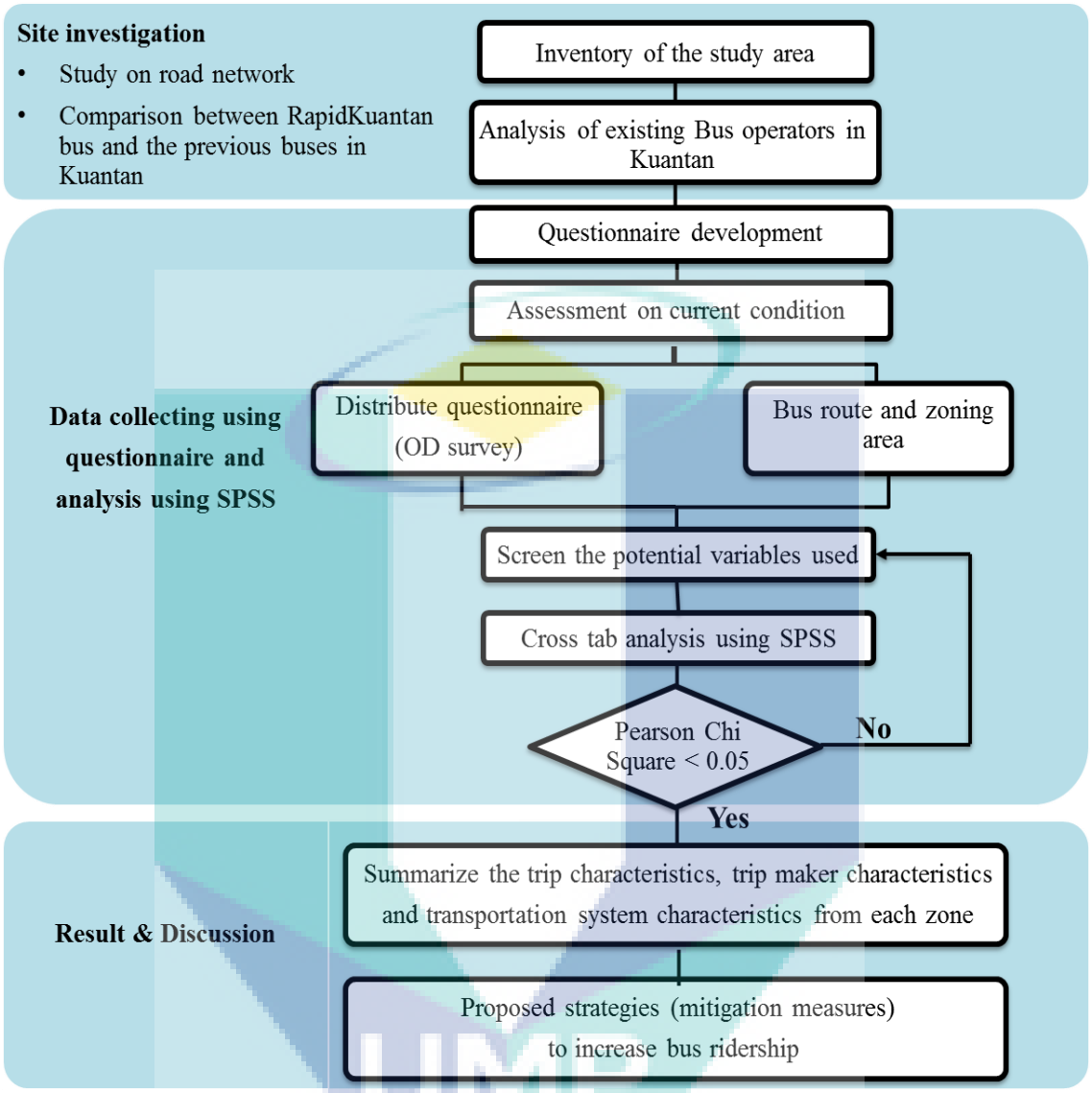


Figure 3.1: The methodology for this study.

3.2 DEVELOPMENT OF INSTRUMENT AND PILOT STUDY

Kuantan and Pekan, Pahang lacked information related to travel surveys. Since the authorities do not have a National Household Travel Survey for Kuantan and Pekan, the questionnaire method was selected to collect all the data. The survey was done from 25 November 2013 to 25 December 2013, involving 1340 respondents (sample). The respondents were chosen randomly at the bus stop and on the RapidKuantan bus. A simple random sample is a sampling design where each sample of size n has an equal chance of being selected. The questionnaire was constructed based on method that has been approved by previous study. The data collection involved RapidKuantan bus passengers. Before running the data collection for all zones, a pilot study was conducted to test the questionnaire set. The development of instrument will be explained in Section 3.2.1 while pilot study will be explained in Section 3.2.2.

In 2013, the total population in Kuantan was 353,182 for Kuantan and 28,524 for Pekan. Tables 3.1 and Table 3.2 shows the total population for Kuantan and Pekan from 2010 to 2013. Population data provided by were multiplied by 1.5 annual population growth rates for Pahang (Goverment of Statistics, 2012). The annual population growth rate for all states in Malaysia is listed in Figure 3.2 while Figure 3.3 illustrated the administrative district and mukim boundary for Kuantan and Pekan.

Table 3.1: Total population by mukim in Kuantan

Mukim		Total population by year			
		2010	**2011**	**2012**	**2013**
1	Beserah	19485	19777	20074	20375
2	Kuala Kuantan	337754	342820	347963	353182
3	Penor	7720	7836	7953	8073
4	Sungai Karang	54838	55661	56495	57343
5	Ulu Kuantan	7102	7209	7317	7426
6	Ulu Lepar	16897	17150	17408	17669
TOTAL		**443796**	**450453**	**457210**	**464068**

Source: Government of Statistics, Malaysia (2010)

Table 3.2: Total population for mukim in Pekan

Mukim		Total population by year			
		2010	**2011**	**2012**	**2013**
1	Bebar	16905	17159	17416	17677
2	Ganchong	1780	1807	1834	1861
3	Kuala Pahang	7936	8055	8176	8299
4	Langgar	6302	6397	6492	6590
5	Lepar	6007	6097	6189	6281
6	Pahang Tua	11859	12037	12217	12401
7	Pekan	27288	27697	28113	28534
8	Penyor	23874	24232	24596	24965
9	Pulau Manis	2064	2095	2126	2158
10	Pulau Rusa	677	687	697	708
11	Temai	895	908	922	936
	TOTAL	105587	107171	108778	110410

Source: Government of Statistics, Malaysia (2010)

Negeri *State*	**Luas kawasan (kilometer persegi)** *Area (square kilometres)*	**Penduduk** *Population* **('000)**	**Kadar pertumbuhan penduduk tahunan** *Annual population growth rate (%)*
	2011	2012[p]	2012
Malaysia	**330,290**	**29,336.8**	**1.3**
Johor	19,016	3,439.6	1.1
Kedah	9,425	1,996.8	1.2
Kelantan	15,105	1,640.4	1.5
Melaka	1,652	842.5	1.1
Negeri Sembilan	6,657	1,056.3	1.3
Pahang	35,965	1,548.4	1.5
Perak	21,022	2,416.7	0.8
Perlis	795	239.4	0.8
Pulau Pinang	1,031	1,611.1	1.1
Sabah	73,902	3,371.7	1.7
Sarawak	124,450	2,545.8	1.2
Selangor	7,930	5,650.8	1.3
Terengganu	12,956	1,092.9	1.8
W. P. Kuala Lumpur	243	1,713.4	1.1
W. P. Labuan	92	91.6	1.9
W. P. Putrajaya	49	79.4	3.9

Figure 3.2: The annual population growth rate for all state in Malaysia

Source: Government of Statistics, Malaysia (2012)

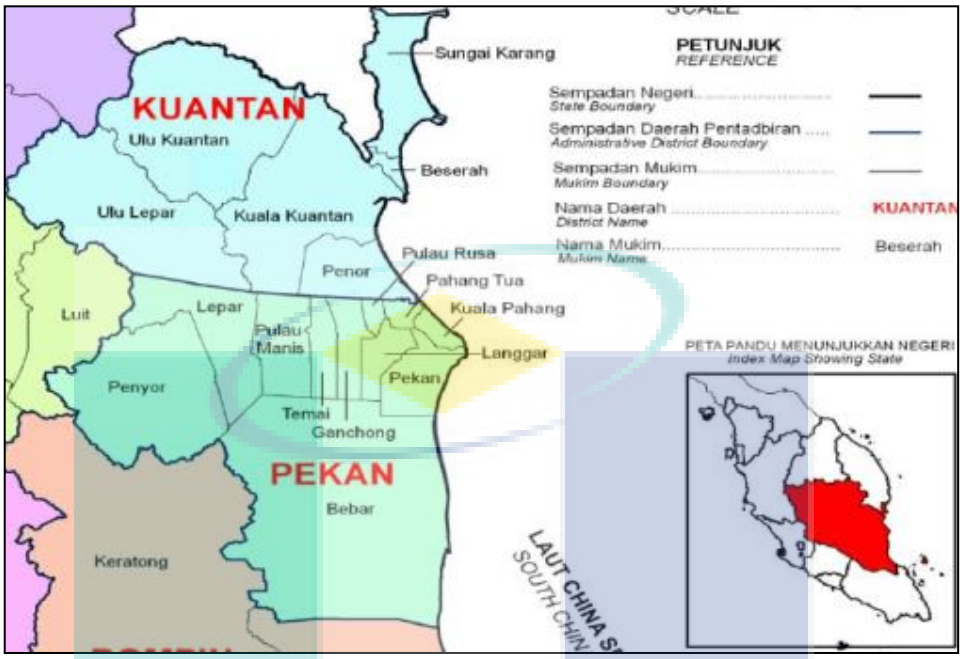


Figure 3.3: Administrative district and mukim boundary for Kuantan and Pekan

Source: Government of Statistics, Malaysia (2010)

According to Krejcie and Morgan (1970), the sample size depends on the population size. Based on Table 3.1, the total population for Kuantan was 353,182 and by referring to the details of the sample size provided by Krejcie and Morgan (1970) in Table 3.3, the sample size should have been 384. The actual samples taken from Kuantan were 820 samples. Table 3.2 stated that there were 28,534 peoples in Pekan so the sample size could not be less than 379. The actual samples taken in Pekan were 520 samples. Total sample size taken was 1,340 samples equal to 19.6% from total ridership. The detailed sample sizes for each route were listed in Table 3.4.

Table 3.3: The sample size based on the population size

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384
N is population size					
S is sample size					

Source: Krejcie and Morgan (1970)

Table 3.4: Number of respondents (sample size) taken

Zone No	Route	Bus no	Distance (km)	Ridership per day	Ridership by zone	Sample size
Zone A	Kuantan Town – Pekan	400	50.8	1370	2176	520
	Kuantan Town - Indera Sempurna	101	23.5	564		
	Kuantan Town - Kg. Ubai	401	35.2	242		
Zone B	Kuantan Town - Bkt Gambang Resort	100	46	1742	2197	370
	Kuantan Town - Permatang Badak	102	20.5	455		
Zone C	Kuantan Town - Sg. Lembing	500	49.2	528	1881	290
	Kuantan Town - Indera Mahkota 1	302	12.6	429		
	Kuantan Town - Taman Impian	300	19.9	805		
	Kuantan Town - Bukit Sagu	301	39.6	119		
Zone D	Kuantan Town - Teluk Cempedak	200	8.2	523	569	160
	Kuantan Town - Taman Gelora	201	9.5	46		
			TOTAL	**6822**	**6822**	**1340**

3.2.1 Development of Instrument

The challenge while doing the surveys will be to balance the need for increasingly detailed, accurate and timely data on daily travel patterns with the need to minimise respondent burden and protect personal privacy. So that, before distributing the questionnaire for the bus users, the respondents will be informed about their personal privacy protection and the objective of this survey to make sure they volunteer in providing accurate data. There are three manuals that describe the different steps involved in performing on-board surveys as described by Schaller (2005), Tierney et al. (1996), Baltes (2002). These manuals provide general procedural guidelines for conducting an on-board survey and address the managerial issues associated with each step. Also, the manuals provide qualitative opinions about which techniques might be most effective and which factors must be considered when designing a questionnaire and conducting a survey.

An on-board survey is one of the most common survey methods utilised for transit units like buses, subways, monorail, light rail cars and commuter transit. Transit agencies use on-board surveys to collect data regarding customer trip characteristics, travel behaviour, demographic characteristics and customer trips towards services. Survey results are used for travel modelling, long-range and area-wide planning, route planning and scheduling, service design, marketing and customer communication (Schaller, 2005). This methodology has been proved to be a very successful survey technique as reported by Transit Research Program Synthesis (Schaller, 2005) where the on-board survey obtained better information (accuracy, reliability, detail) from respondents in Adelaide in the early 1990s (Crouch et al. 1992)

The questionnaire form used in this study was depicted in Figure 3.4 and also in appendix B. The questionnaire was constructed based on categorical data. All the questions construct based on factor affecting mode of choice mention earlier in Figure 2.3. The summaries of variables in Table 3.5 detailed the questions from the questionnaire form. The types of improvements in the summaries of variables number 28, 29 and 30 (question number 17 in questionnaire form) were suggested based on local condition and Traffic Impact Assessment guideline (Zulkiple, 2014).

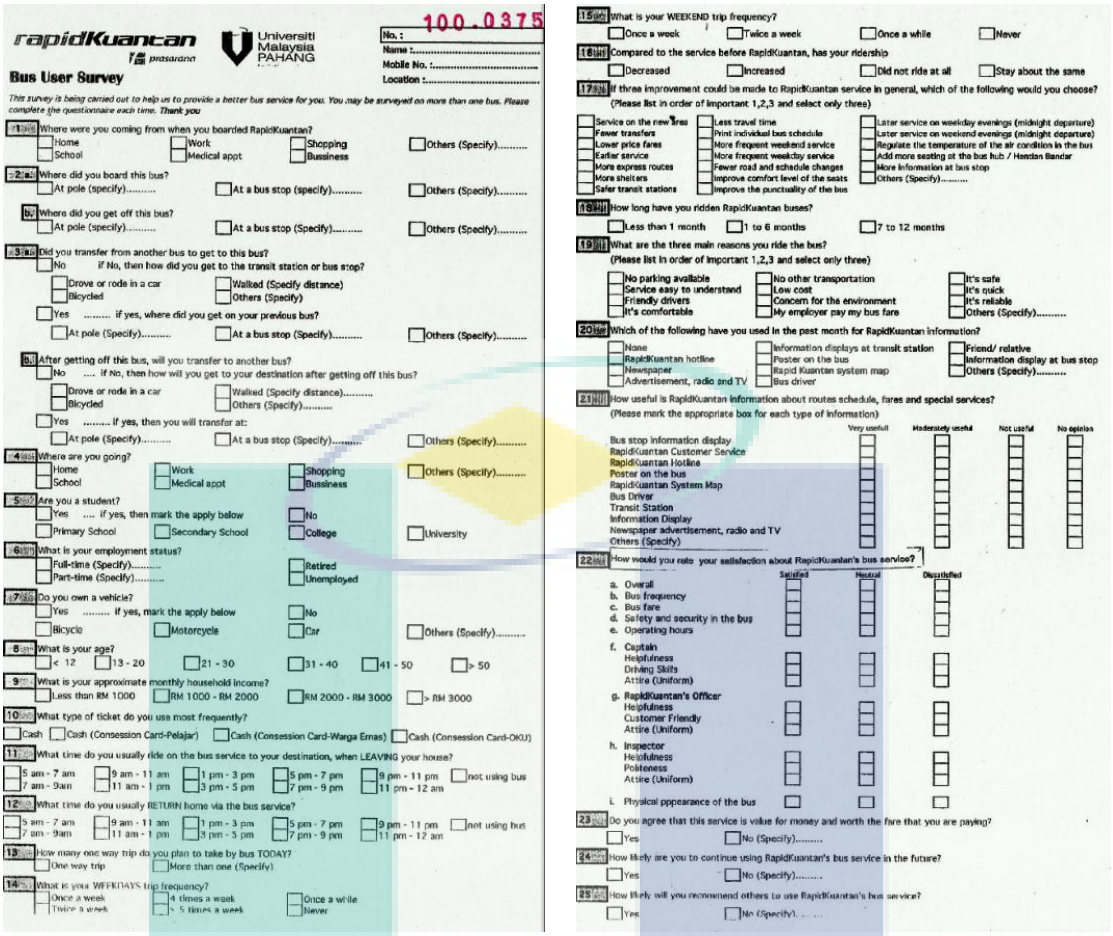


Figure 3.4: The questionnaire form for RapidKuantan bus passengers

3.2.2 Pilot Study

A feasibility study or pilot study was done to test and improve the quality of the questionnaire and data collection method. A study was run a route 401, between Kuantan town and Kg. Ubai. This route was chosen due to it have an average distance compare to other 13 routes which was 35.2 KM. It involved 144 bus passengers. Figure 3.5 showed the route for Kg. Ubai while Figure 3.6, Figure 3.7, Figure 3.8 and Figure 3.9 displayed some results obtained from this pilot study. The time taken to explain the research project to the bus passengers was about 3 to 5 minutes. The study procedures for data collection encountered some initial problems, with the research assistants unsure how to guide and assist the subjects due to a lack of familiarity with the questions but this difficulty was overcome after 3 or 4 respondents.

Respondent spends an average of 15-20 minutes to complete the questionnaire. From this pilot study some improvement and comments have been taken such as:

i. There were some typographical errors noted on the items and the boxes were placed too close together which made it difficult to identify which one the respondent had ticked. Reformatting was done to overcome this problem.

ii. This pilot study found that respondents encountered no difficulty to understand the questionnaire even though in the English language since there was a translator.

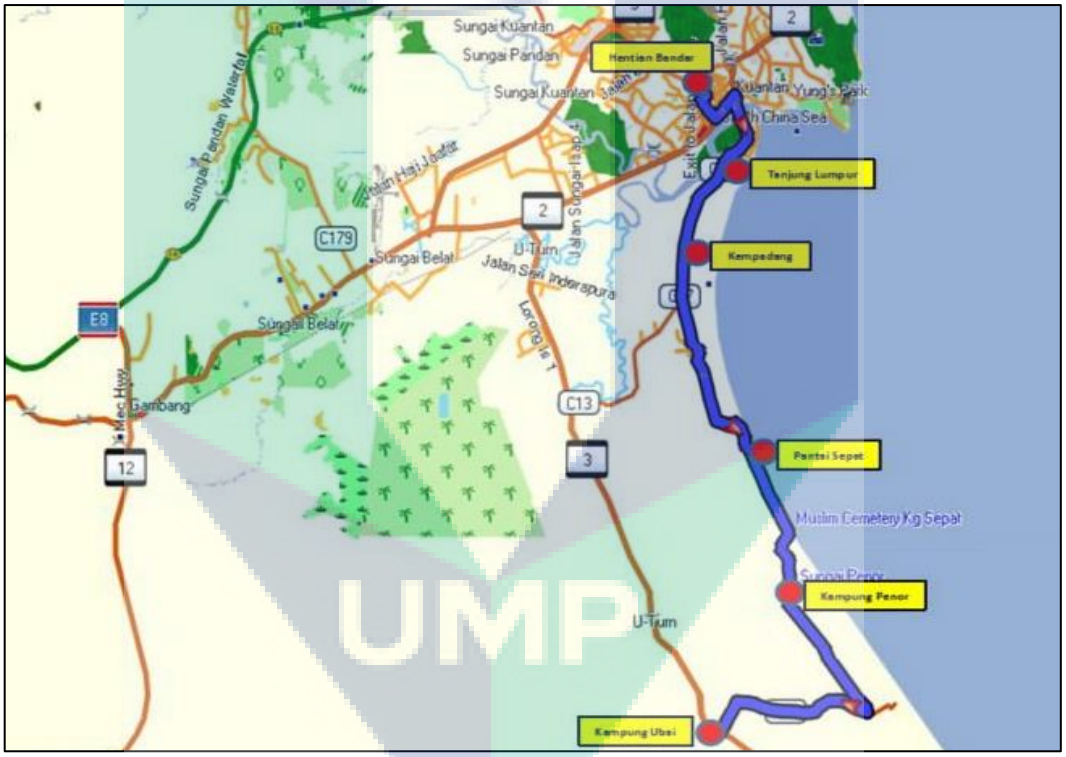


Figure 3.5: Route for Kg. Ubai (between Kuantan Town and Kg. Ubai)

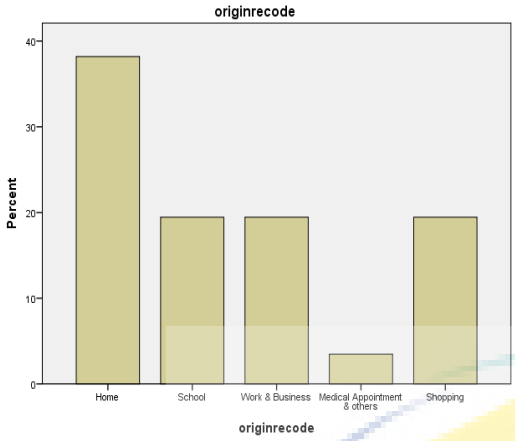


Figure 3.6: The percentages for origin place by Kg. Ubai bus passenger

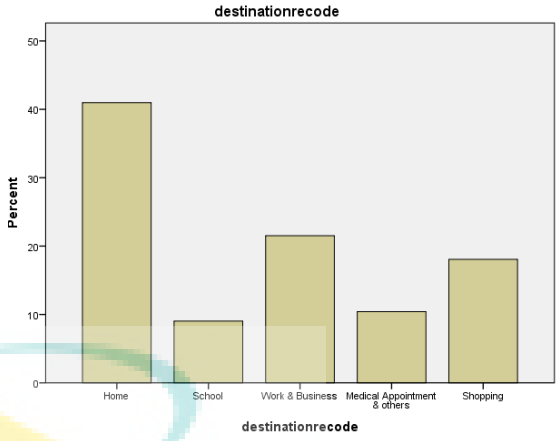


Figure 3.7: The percentages for destination taken by Kg. Ubai bus passenger

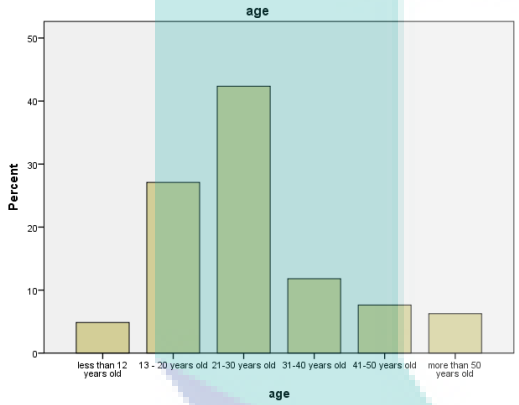


Figure 3.8: The percentages for age of Kg. Ubai bus passenger

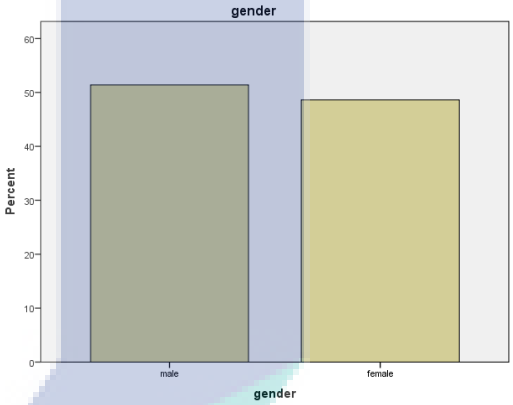


Figure 3.9: The percentages for Kg. Ubai bus passenger's gender

3.3 DATA ANALYSIS

All the data was analysed using Statistical Package for the Social Sciences (SPSS) version 20 as shown is Figure 3.10.

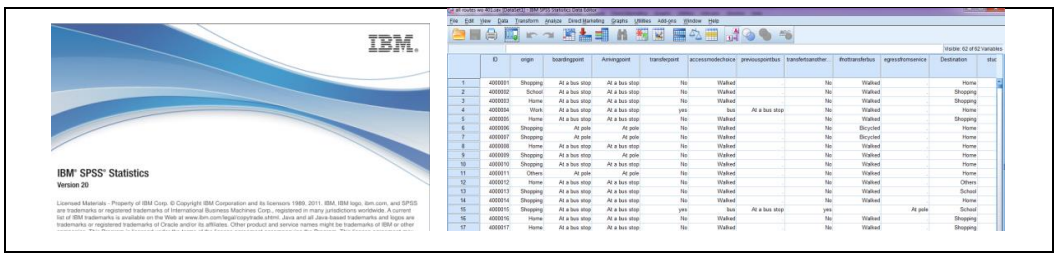


Figure 3.10: Statistical Package for the Social Sciences (SPSS) version 20

Table 3.5: Summary of variables used

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
1	ID	Number of questionnaire	None	Nominal
2	Zone	The zone for bus user/ passengers	1 = Pekan 2 = Gambang 3 = Sungai Lembing 4 = Teluk Cempedak	Nominal
3	Origin	The point where respondent start to travel	1= Home 2= School 3= Work & Business 4= Medical Appointment & Others 5= Shopping	Nominal
4	Boarding point	Where the respondent board the bus	1 = At pole 2 = At Bus Stop 3 = Others	Nominal
5	Arriving point	Where the respondent get off the bus	1 = At pole 2 = At Bus Stop 3 = Others	Nominal
6	Do transfer from	Either the respondent transfer from another bus or not	1 = No 2 = Yes	Nominal
7	Access mode choice	Mode used for travel from the origin to their destination	1= Drove or rode in car 2= Bicycled 3= Walked 4= Others 5= Bus	Nominal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
8	Previous point	Where the respondent transfer from another bus to another bus	1 = At pole 2 = At Bus Stop 3 = Others	Nominal
9	Transfer to another bus	Did the respondent transfer to another bus	1 = No 2 = Yes	Nominal
10	Egress mode choice	How the respondent get to their destination after getting off this bus	1= Drove or rode in car 2= Bicycled 3= Walked 4= Others 5 = Bus	Nominal
11	Yes transfer	Where the respondent transfer to another bus	1 = At pole 2 = At Bus Stop 3 = Others	Nominal
12	Destination	The point when respondent reach or end their travel	1= Home 2= School 3= Work & Business 4= Medical Appointment & Others 5= Shopping	Nominal
13	Student's status	The respondent's status either they are student or working	1= Yes 2= No	Nominal
14	Student's type	Level of student education	1 = Primary School 2 = Secondary School 3 = Collage 4 = University	Ordinal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
15	Employment status	Type of employment	1 = Full time 2 = Part time 3 = Retired 4 = Unemployed	Nominal
16	Vehicle Ownership	Did the respondent have their own vehicle or not	1= Yes 2= No	Nominal
17	Type of vehicle	Type of vehicle	1 = Bicycle 2 = Motorcycle 3 = Car 4 = Others	Nominal
18	Age	The age of the respondent	1= Less than 12 years old 2= 13 to 20 years old 3= 21 to 30 years old 4= 31 to 40 years old 5= 41 to 50 years old 6= More than 50 years old	Ordinal
19	Gender	Respondent's gender	1= Male 2= Female	Nominal
20	Income	The approximate respondent's monthly household income	1= Less than RM 1000 2= RM 1000 to RM 2000 3= RM 2000 to RM 3000 4= More than RM 3000	Ordinal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
21	Type of ticket	Type of bus ticket respondent used	1 = Cash 1 = Cash(Concession Card-Pelajar) 1 = Cash(Concession Card-Warga Emas) 1 = Cash (Concession Card-OKU)	Nominal
22	Time LEAVING home	Respondent's time leaving their house and start travel	1= Between 5 am to 7 am 2= Between 7 am to 9 am 3= Between 9 am to 11 am 4= Between 11 am to 1 pm 5= Between 1 pm to 3 pm 6= Between 3 pm to 5 pm 7= Between 5 pm to 7 pm 8= Between 7 pm to 9 pm 9= Between 9 pm to 11pm 10= Between 11 pm to 12 am 11= Not using bus	Ordinal
23	Time RETURN home	Respondent's time return to their house	1= Between 5 am to 7 am 2= Between 7 am to 9 am 3= Between 9 am to 11 am 4= Between 11 am to 1 pm 5= Between 1 pm to 3 pm 6= Between 3 pm to 5 pm 7= Between 5 pm to 7 pm 8= Between 7 pm to 9 pm	Ordinal

			9= Between 9 pm to 11pm 10= Between 11 pm to 12 am 11= Not using bus	
24	Total trip	How many one way trip the respondent take for today	1 = One way Trip 2 = Two way trip	Nominal
25	Weekday trip frequency	Trip frequency during weekdays	1 = Once a week 2 = Twice a week 3 = 4 times a week 4 = 5 times a week 5 = Once a while 6 = Never	Nominal
26	Weekend trip frequency	Trip frequency during weekend	1 = Once a week 2 = Twice a week 3 = Once a while 4 = Never	Nominal
27	Compared service before	The comparison of the ridership between before and after RapidKuantan start operate	1 = Decreased 2 = Increased 3 = Did not ride at all 4 = Stay about the same	Nominal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
28	Improvement 1	The improvement that RapidKuantan should do	1 = Services on the new area 2 = Fewer transfer 3 = lower fare price 4 = Earlier service 5 = More express road 6 = More Shelter 7 = Safer transit station 8 = Less travel time 9 = Print individual bus schedule 10 = More frequent weekend service 11 = More frequent weekday service 12 = Fewer road and schedule changes 13 = Improve comport level of the seats 14 = Improve the punctuality of the bus 15 = Later service on weekday evening (midnight) 16 = Later service on weekend evening (midnight) 17 = Regulate the temperature of air condition in the bus 18 = Add more seating at the hub/ Kuantan town 19 = More information display at the bus stop 20 = Others	Nominal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
29	Improvement 2	The improvement that RapidKuantan should do	1 = Services on the new area 2 = Fewer transfer 3 = lower fare price 4 = Earlier service 5 = More express road 6 = More Shelter 7 = Safer transit station 8 = Less travel time 9 = Print individual bus schedule 10 = More frequent weekend service 11 = More frequent weekday service 12 = Fewer road and schedule changes 13 = Improve comport level of the seats 14 = Improve the punctuality of the bus 15 = Later service on weekday evening (midnight) 16 = Later service on weekend evening (midnight) 17 = Regulate the temperature of air condition in the bus 18 = Add more seating at the hub/ Kuantan town 19 = More information display at the bus stop 20 = Others	Nominal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
30	Improvement 3	The improvement that RapidKuantan should do	1 = Services on the new area 2 = Fewer transfer 3 = lower fare price 4 = Earlier service 5 = More express road 6 = More Shelter 7 = Safer transit station 8 = Less travel time 9 = Print individual bus schedule 10 = More frequent weekend service 11 = More frequent weekday service 12 = Fewer road and schedule changes 13 = Improve comport level of the seats 14 = Improve the punctuality of the bus 15 = Later service on weekday evening (midnight) 16 = Later service on weekend evening (midnight) 17 = Regulate the temperature of air condition in the bus 18 = Add more seating at the hub/ Kuantan town 19 = More information display at the bus stop 20 = Others	Nominal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
31	Riding period	How long the respondent ridden RapidKuantan buses	1 = Less than 1 month 2 = 1 to 6 months 3 = 7 to 12 months	Ordinal
32	Reason riding bus 1	The reason why the respondent ride the bus	1 = No parking available 2 = Service easy to understand 3 = Friendly drivers 4 = It's comfortable 5 = No other transportation 6 = Low Cost 7 = Concern for the environment 8 = My employer pay my bus fare 9 = It's safe 10 = It's quick 11 = It's reliable 12 = Others	Nominal
33	Reason riding bus 2	The reason why the respondent ride the bus	1 = No parking available 2 = Service easy to understand 3 = Friendly drivers 4 = It's comfortable 5 = No other transportation 6 = Low Cost 7 = Concern for the environment 8 = My employer pay my bus fare 9 = It's safe	Nominal

			10 = It's quick 11 = It's reliable 12 = Others	
34	Reason riding bus 3	The reason why the respondent ride the bus	1 = No parking available 2 = Service easy to understand 3 = Friendly drivers 4 = It's comfortable 5 = No other transportation 6 = Low Cost 7 = Concern for the environment 8 = My employer pay my bus fare 9 = It's safe 10 = It's quick 11 = It's reliable 12 = Others	Nominal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
35	Type of passengers	Type of passengers (choice or captive passengers)	1 = Choice passengers 2 = Captive passengers	Nominal
36	Get info	Where the respondent get the information about RapidKuantan	1 = None 2 = RapidKuantan Hotline 3 = Newspaper 4 = Advertisement, radio and TV 5 = Information display at transit station 6 = Poster on the bus 7 = RapidKuantan system map 8 = Bus driver 9 = Friend/Relative 10 = Information display at the bus stop 11 = Others	Nominal
37	Useful- Bus stop information display	How useful information at Bus stop information display	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal
38	Useful- RapidKuantan customer services	How useful information at RapidKuantan customer services	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
39	Useful- RapidKuantan hotline	How useful information at RapidKuantan hotline	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal
40	Useful- Poster on the bus	How useful information at Poster on the bus	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal
41	Useful- RapidKuantan system map	How useful information at RapidKuantan system map	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal
42	Useful- Bus driver	How useful information at Bus driver	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal
43	Useful- Transit station	How useful information at Transit station	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal
44	Useful- information display	How useful information at information display	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
45	Useful- Newspaper advertisement, radio and TV	How useful information at Newspaper advertisement, radio and TV	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal
46	Useful- Others	How useful information other (specify)	1 = Very useful 2 = Moderately useful 3 = Not useful 4 = No opinion	Ordinal
47	Overall Satisfaction	The respondent rating about RapidKuantan overall services	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
48	Satisfaction- bus frequency	The respondent rating about RapidKuantan bus frequency	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
49	Satisfaction- bus fare	The respondent rating about RapidKuantan bus fare	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
50	Satisfaction – safety and security	The respondent rating about RapidKuantan safety and security in the bus	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
51	Satisfaction -operating hours	The respondent rating about RapidKuantan operating hours	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
52	Satisfaction- captain helpfulness	The respondent rating about RapidKuantan captain's helpfulness	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
53	Satisfaction- captain driving skill	The respondent rating about RapidKuantan captain's driving skills	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
54	Satisfaction- captain attire	The respondent rating about RapidKuantan captain's attire (uniform)	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
55	Satisfaction- officer helpfulness	The respondent rating about RapidKuantan's officer helpfulness	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
56	Satisfaction- officer friendly	The respondent rating about RapidKuantan's officer customer friendly	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
57	Satisfaction- officer attire	The respondent rating about RapidKuantan's officer attire (uniform)	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
58	Satisfaction- inspector help	The respondent rating about RapidKuantan's inspector helpfulness	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
59	Satisfaction- inspector polite	The respondent rating about RapidKuantan's inspector politeness	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal

Table 3.5: Summary of variables used (continue)

NO.	SUB DOMAIN	DESCRIPTION	VALUE	MEASURE TYPE IN SPSS
60	Satisfaction- inspector attire	The respondent rating about RapidKuantan's inspector attire (uniform)	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
61	Satisfaction- bus appearance	The respondent rating about RapidKuantan's bus appearance	1 = Satisfied 2 = Moderate 3 = Dissatisfied	Ordinal
62	Value for money	Is the bus service provide by RapidKuantan is worth for money that respondent pay	1= Yes 2= No	Nominal
63	Continue using bus	The respondent willingness to continue using RapidKuantan in the future	1= Yes 2= No	Nominal
64	Recommendation	Either the respondent recommend RapidKuantan bus to another people or not	1= Yes 2= No	Nominal

3.3.1 Descriptive statistics

Descriptive statistics were important to summarize and to indicate the pattern of the survey. It recaps essential features of the data such as central tendency, variability and distribution. Since this study using qualitative and nonparametric test, the descriptive statistics were done to see the distribution of the samples only.

3.3.2 Chi Square Test and Cross tab (Contingency Table)

Categorical data may be displayed in contingency tables and the chi-square statistic to compares the observed count in each table cell to the count which would be expected under the assumption of no association between the row and column classifications. If the value in Chi Square test is less than 0.005, the variables are significant and can be test using Correspondence Analysis. Chi Square Test was commonly used with Cross tab. Noted that cross tab also known as contingency tables.

3.3.3 Correspondence Analysis

Correspondence analysis (CA) can only be performed if the Pearson Chi Square Test value between the variables is significant (less than .005). Correspondence Analysis is an interdependence technique that has become increasingly popular for dimensional reduction and perceptual mapping. Using perceptual maps, the relationship between the variables can be illustrated, as seen, for example, in Figure 3.11.

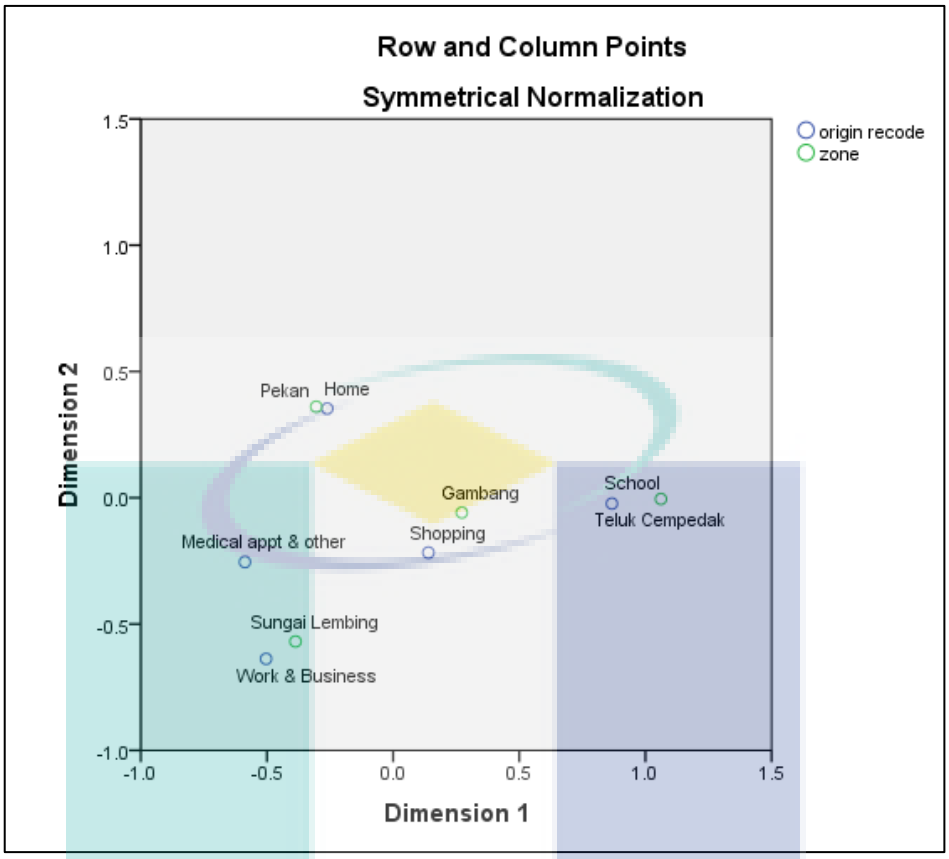


Figure 3.11: The example of result (perceptual map) in correspondence analysis

From earlier explanations, conclusions about correspondence analysis can be drawn as shown in Figure 3.12. From the correspondence table, it can measure the association between variables as well as create the perceptual map.

Figure 3.12: Review on correspondence analysis

3.4 THE LEADING CHARACTERISTICS FOR EACH ZONE

From the perceptual maps that will be illustrate in chapter 4, the leading characteristics can be defined by the distance between the variables. The shortest distance means most influential and will become the leading characteristics and longest distance means least influential.

3.5 THE STRATEGIES TO INCREASE THE BUS RIDERSHIP PATTERN BY ZONES

The improvement strategies for this study were proposed based on Handbook of Transportation Engineering (Kurtz, 2014), Sustainable Framework Model (SUSTIA FWM) For Traffic Impact Assessment in Malaysia (Zulkiple et al. 2014) and Guide to Sustainable Transportation Performance Measures provided by U.S. Environmental Protection Agency.

3.6 SUMMARY

The strategies to improve the bus transportation system in Kuantan for these six years (from 2007 until 2013) by the local authorities have failed since there was limited study on this system. Early 2013, Prasarana Group provided RapidKuantan buses in Kuantan and in order to retain the quality of the bus service an overall study need to be done. The origin destination survey was the best way to collect the data. The questionnaire was constructed based on previous studies, Handbook of Transportation Engineering and Traffic Impact Assessment guidelines. The questionnaire forms were distributed at the bus stop and on the bus. The questionnaire used in this study was constructed based on the factor that affecting mode choice listed in Handbook of Transportation Engineering. Some questions were added based on the current situation. The variables used were detailed from the questionnaire form to get the accurate result from the correspondence analysis. In correspondence analysis, the shortest distance means most influential and longest distance means least influential characteristics.

CHAPTER 4

CORRESPONDENCE ANALYSIS

4.1 INTRODUCTION

This chapter was divided according to the objectives of this study. The descriptive analyses for each variable (sub domain) were attached in the appendix C. This chapter presented the trip characteristics, trip maker characteristics and transportation system characteristics for each zone. Section 4.2 presented the relationship between trip characteristics and zones, section 4.3 elaborated on the relationship between trip maker characteristics and zones and section 4.4 described the association between transportation systems and zones.

Based on questionnaire form, all variables involved were categories as listed in Table 4.1 but not all the variables were run with correspondence analysis. The dichotomous variables cannot be tested using correspondence analysis. Also, some variables in the questionnaire were not listed and analysed in this chapter that have the level of significance more than .05 during chi square test, meaning there was no relationship between these variables and the zone.

Table 4.1: The categories of variables used

NO.	VARIABLES (SUB DOMAIN)	CATEGORY OF VARIABLES
1	Origin	Trip characteristics
2	Destination	
3	Access mode choice	
4	Egress mode choice	
5	Student's status*	Trip maker characteristics
6	Student's type	
7	Employment status	
8	Vehicle Ownership*	
9	Type of vehicle	
10	Age	
11	Gender^	
12	Income	
13	Time leaving home	
14	Time return home	
15	Total trip frequency^	
16	Weekdays trip frequency	
17	Weekend trip frequency	
18	Overall Satisfaction (Comfort & convenience)	Transportation trip characteristics
19	Satisfaction - bus frequency (involving waiting time)	
20	Satisfaction - bus fare (cost)	
21	Satisfaction - safety and security	
22	Satisfaction - operating hours	
23	Satisfaction - captain helpfulness	
24	Satisfaction - captain driving skill	
25	Satisfaction - captain attire (uniform)	
26	Satisfaction - officer helpfulness	
27	Satisfaction - officer friendly	
28	Satisfaction - officer attire(uniform)	
29	Satisfaction - inspector helpfulness	
30	Satisfaction - inspector politeness	
31	Satisfaction - inspector attire (uniform)	
32	Satisfaction - bus appearance	

**Dichotomous variable*
^ Not significant

4.2 THE RELATIONSHIP OF TRIP CHARACTERISTICS FOR EACH ZONE

This section lists all the results involved in the trip characteristics for each zone. The variables (sub domain) selected for trip characteristics were origin, destination, access mode choice and egress mode choice.

4.2.1 Correspondence analysis between zone and origin

Table 4.2 shows that the passengers started their trip from home more than from other places. This might be because this group was the largest group. Other passengers were those returning from shopping and school. There were fewer passengers that returning from work and business as well as medical appointment and other activities.

Table 4.2: Correspondence table of the zone and the origin

Origin	Zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Home	264	140	110	49	563
School	74	84	39	61	258
Work & Business	68	43	64	12	187
Medical appt & others	17	9	12	2	40
Shopping	97	94	65	36	292
Active Margin	520	370	290	160	1340

From Table 4.3, it is clear that there was a statistical significance between the zone and the origin at .000, less than .05 level of significance, justifying the assumption that the two variables are apparently related. The proportion of inertia value accounted for dimension 1 = 0.750 means that the dimension 1 explains the association of the variables is 75%, for dimension 2 the association of the variables is 22% and for dimension 3 the association of the variables is 2.8% only.

Table 4.3: Summary table of the zone and the origin

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.223	.050			.750	.750	.028	.052
2	.121	.015			.222	.972	.029	
3	.043	.002			.028	1.000		
Total		.067	89.153	.000[a]	1.000	1.000		

a. 12 degrees of freedom

From Tables 4.2 and 4.3, the perceptual map can be illustrated as in Figure 4.1. The association of the zone and the origin shows that passengers from Pekan tended to start their trip from home, whereas passengers from zone Gambang started their trips from shopping and leisure activities including from Bukit Gambang Resort City (BGRC). There are also many institutions and schools in zone Teluk Cempedak such as UiTM Taman Gelora, IKIP, International School, MRSM and SMK Ehsan, from where passengers started their trips.

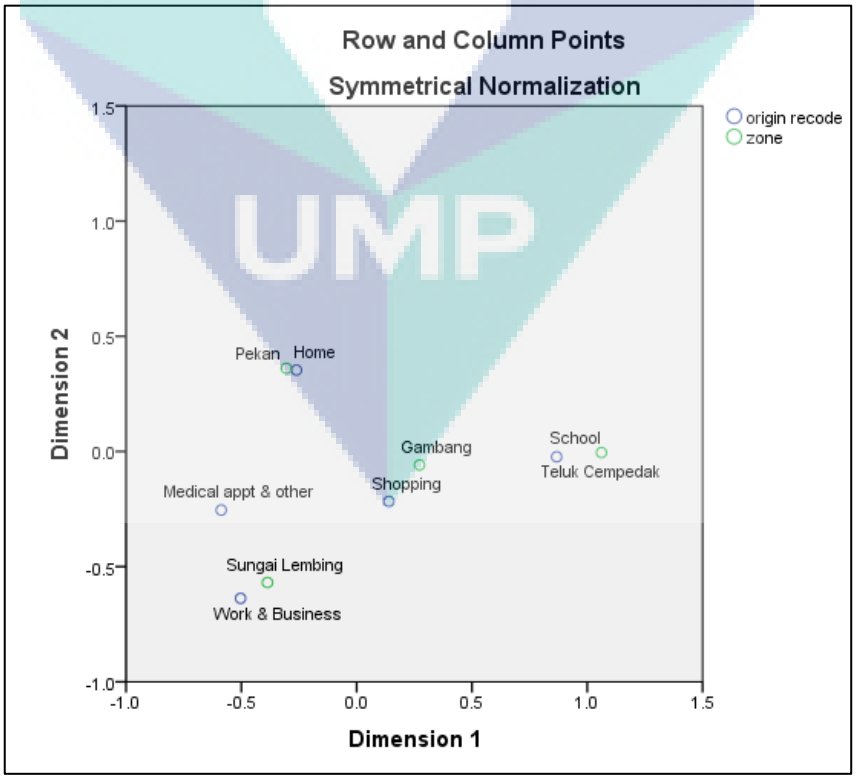


Figure 4.1: The perceptual map for zone and the origin

4.2.2 Correspondence analysis between zone and destination

Table 4.4 shows that most passengers used the bus went home and shopping. This might be because these passengers did not rely on buses for important activities, especially those that involved time accuracy. For important activities, they would not be willing to take the risk of the delays during their journey.

Table 4.4: Correspondence table of the zone and destination

Destination	Zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Home	226	130	110	38	504
School	44	24	23	24	115
Work & Business	70	34	62	15	181
Medical appt & others	11	4	20	2	37
Shopping	162	170	74	77	483
Active Margin	513	362	289	156	1320

Referring to Table 4.5, there is statistical significance between the zone and the destination at .000, less than .05 level of significant, showing that the two variables are related. The proportion of inertia value accounted for dimension 1 is 73.3%, for dimension 2 the association of the variables is 19.3% and for dimension 3 the association of the variables is 7.3% only.

Table 4.5: The summary of the zone and the destination

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.231	.053			.733	.733	.027	.129
2	.119	.014			.193	.927	.027	
3	.073	.005			.073	1.000		
Total		.073	96.298	.000[a]	1.000	1.000		

a. 12 degrees of freedom

The perceptual map as demonstrated in Figure 4.2 show that the destination for zone Pekan was home, for zone Gambang it was shopping and leisure activity and passengers for zone Teluk Cempedak were more likely to go to school. All these activities related to the trip maker characteristics from these areas.

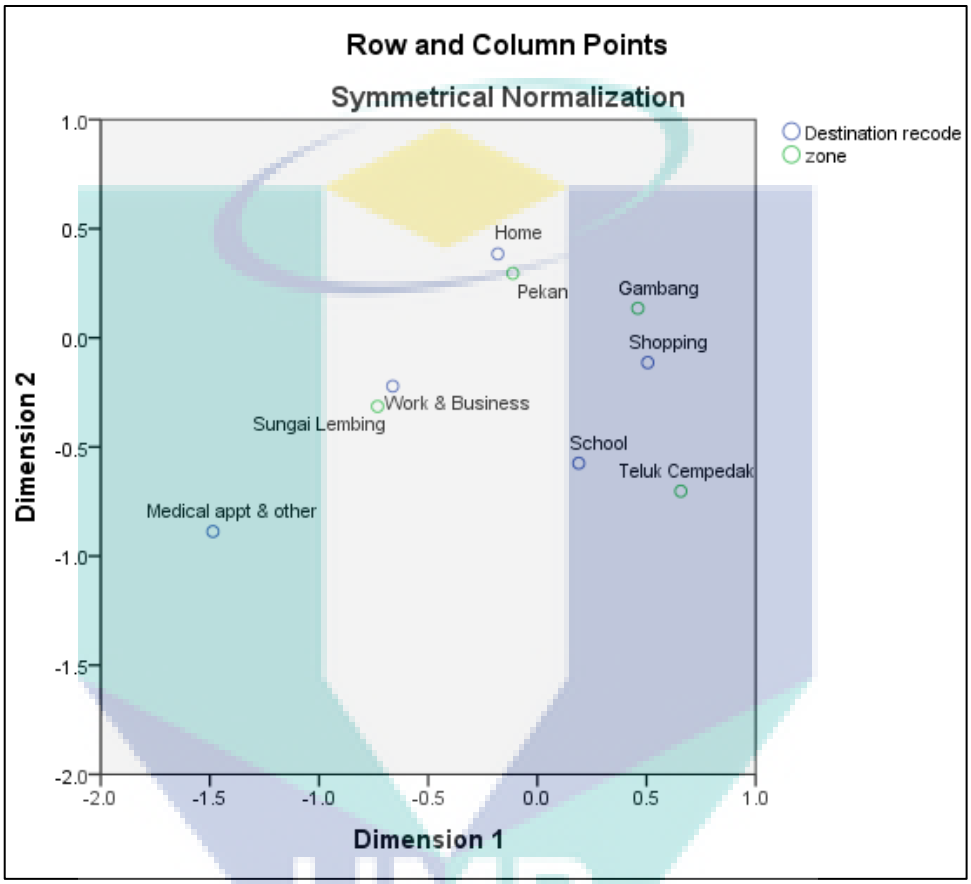


Figure 4.2: The perceptual map for the zone and destination

4.2.3 Correspondence analysis between zone and access mode choice

Access mode choice was the passenger's mode choice when they started their trip from home before they use the buses. From Table 4.6, it can be concluded that most passengers walked to the bus pole or bus station. Only 150 passengers transferred from other buses to the buses where the survey was made. The others' mode included motorcycles and taxis.

Table 4.6: Correspondence table between zone and access mode choice

Access mode choice	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Drove or rode in a car	55	16	30	11	112
Bicycled	6	3	6	1	16
Walked	394	304	223	138	1059
Others	2	0	1	0	3
bus	63	47	30	10	150
Active Margin	520	370	290	160	1340

The summary table in Table 4.7 expressed that both these variables were related based on the fact that the significant value was .020, less than .05 level of significant. The proportion of inertia value accounted for dimension 1 was 70.9%, for dimension 2 the association of the variables was 23% and for dimension 3 the association of the variables was 6.1%.

Table 4.7: The summary table for zone and the access mode choice

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.113	.013			.709	.709	.023	-.033
2	.064	.004			.230	.939	.023	
3	.033	.001			.061	1.000		
Total		.018	23.996	.020[a]	1.000	1.000		

a. 12 degrees of freedom

Based on Figure 4.3, passengers from zone Gambang and Pekan tend to transfer from the bus because the distance from these two zones to the town was longer than the others and there are many bus poles and stops along the route.

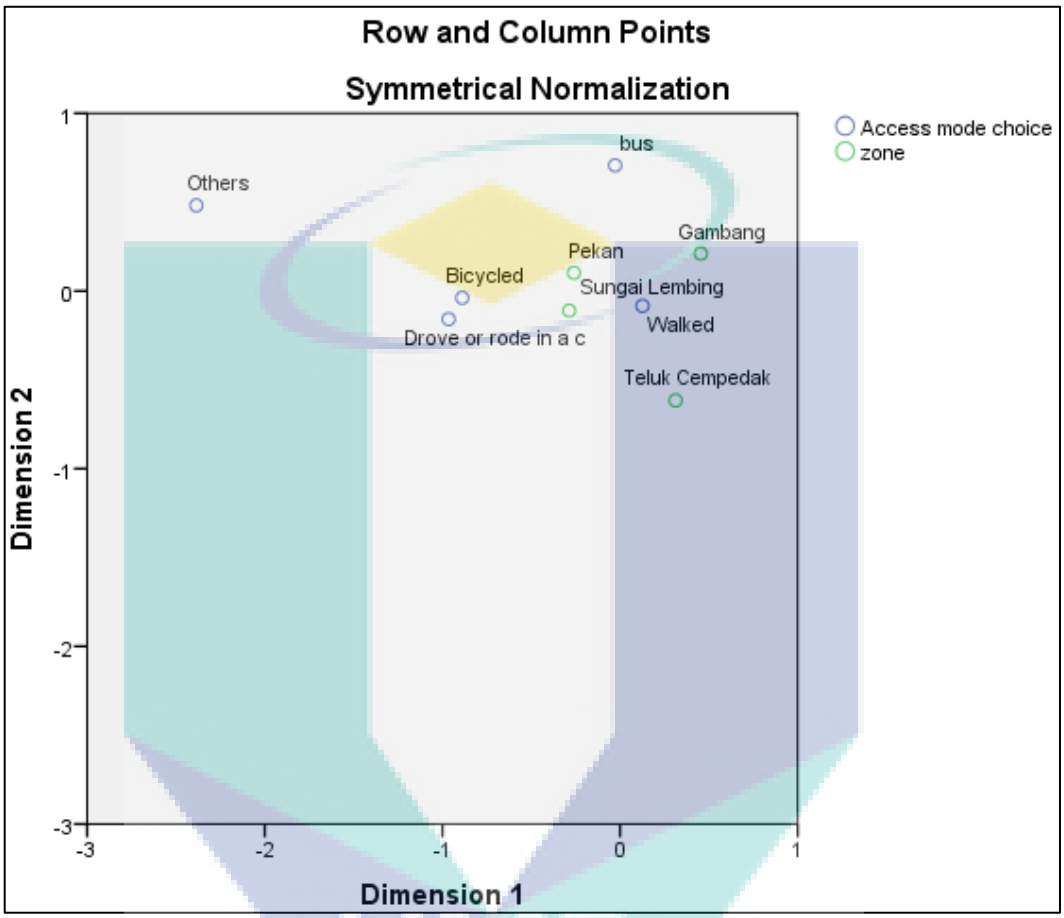


Figure 4.3: The perceptual map for the relationship between zone and access mode choice

4.2.4 Correspondence analysis between zone and egress mode choice

Most passengers walked after getting off the bus to reach their destination. Generally, passengers choose to use bus to reach their destination if their destinations close with the bus stop and bus pole. If not they will transferred to another bus or used a car to reach their destination.

Table 4.8: Correspondence table between zone and egress from bus service mode choice

Egress from bus service	Zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Drove or rode in a car	44	12	31	10	97
Bicycled	6	0	1	0	7
Walked	417	309	223	139	1088
Others	1	0	1	0	2
Bus	52	49	32	11	144
Active Margin	520	370	288	160	1338

Table 4.9 described there was a relationship between zone and the egress mode choice because of the significant value was .004, less than .05 level of significant. The proportion of inertia value accounted for dimension 1 was 70.8%, for dimension 2 the association of the variables was 15.4% and for dimension 3 the association of the variables was 13.9%.

Table 4.9: Summary table for the relationship between zone and egress from bus service mode choice

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.124	.015			.708	.708	.021	.084
2	.058	.003			.154	.861	.025	
3	.055	.003			.139	1.000		
Total		.022	28.997	.004[a]	1.000	1.000		

a. 12 degrees of freedom

Figure 4.4 summarized that passengers from zone Pekan, Gambang and Teluk Cempedak choose to walk when they getting of the bus to reach the destination. In zone Sungai Lembing they choose to transfer bus and drove or rode in a car.

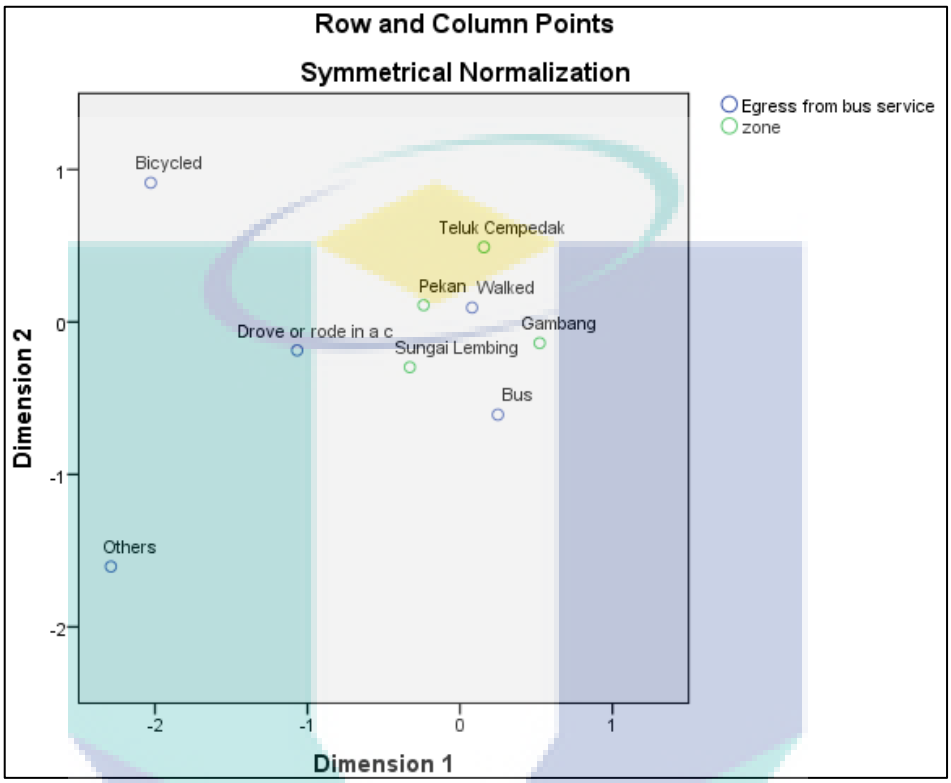


Figure 4.4: The perceptual map zone and egress from bus service mode choice

4.3 THE RELATIONSHIP OF TRIP MAKER CHARACTERISTICS FOR EACH ZONE

This section detailed all the results involved the trip maker characteristics for each zone. The variables for trip maker characteristics were student's type, employment status, type of vehicle, age, income, time of leaving from home, time of return to home, weekday and weekend trip frequency.

4.3.1 Correspondence analysis between zone and student types

Since, at 63.8%, a majority of the passengers were students (refer to the frequency analysis in the appendix) the correspondence analysis between zone and student type was done to determine the type of student based on the zone. Table 4.10 details student types from each zone. Students from primary school were fewer among the passengers since they were too young to ride the bus alone and parents themselves took them to school.

Table 4.10: The correspondence table for student types for each zone

Student's type	Zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Primary school	11	6	9	1	27
Secondary school	128	55	56	40	279
College	70	70	37	39	216
University	83	118	32	44	277
Active Margin	292	249	134	124	799

Table 4.11 verified that there was a relationship between the zone and student's type since the level of significant was .000 less than .05. The proportion of inertia value accounted for dimension 1 was 87.4%, for dimension 2 the association of the variables was 8.8% and for dimension 3 the association of the variables was 3.8%.

Table 4.11: Summary table between the zone and student types

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.233	.054			.874	.874	.034	.026
2	.074	.005			.088	.962	.035	
3	.049	.002			.038	1.000		
Total		.062	49.579	.000[a]	1.000	1.000		

a. 9 degrees of freedom

Figure 4.5 proves that the majority of passengers from Gambang were students from Universiti Malaysia Pahang (UMP); as mentioned by the Chief Operation Officer (COO) of RapidKuantan, Mr Zainurul Hakim Mohamad that UMP's students contributed more ridership compared with passengers from other places.

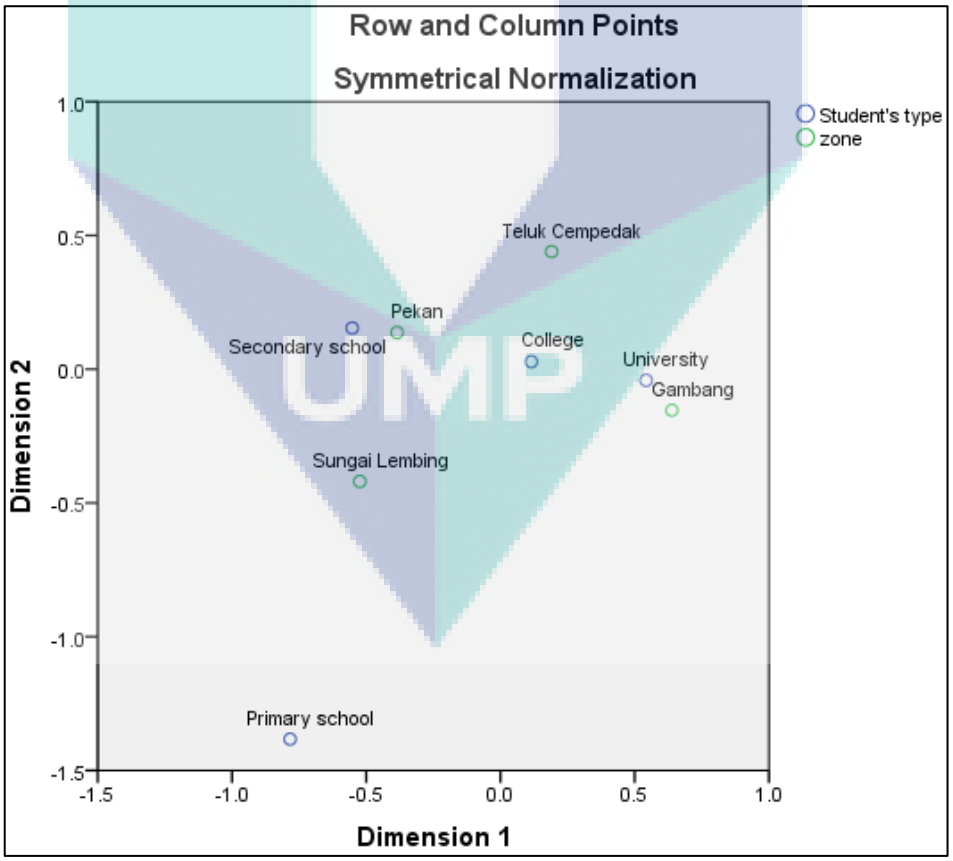


Figure 4.5: The perceptual map for student types and zone

4.3.2 Correspondence analysis between zone and employment status

As stated in Table 4.12, the majority of passengers of RapidKuantan buses were unemployed passengers or students. There were fewer passengers from among retired workers, probably due to health issues.

Table 4.12: The correspondence table for employment status from each zone

Employment status	Zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Full time	166	70	109	26	371
Part time	41	31	20	9	101
Retired	15	6	16	1	38
Unemployed	285	248	133	115	781
Active Margin	507	355	278	151	1291

From Table 4.13, there was statistically significance between the zone and the employment's status at .000, less than .05 level of significant, justifying the assumption that the two variables were apparently related. The proportion of inertia value accounted for dimension 1 = 0.957 was mean that the dimension 1 explained the association of the variables was 95.7%, for dimension 2 the association of the variables was 2.4% and for dimension 3 the association of the variables was 1.9% only.

Table 4.13: The summary table for the relationship between the employment status and the zone

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.218	.047			.957	.957	.026	.124
2	.035	.001			.024	.981	.029	
3	.030	.001			.019	1.000		
Total		.049	63.883	.000[a]	1.000	1.000		

a. 9 degrees of freedom

Figure 4.6 verified that the majority of the passengers from Gambang and Teluk Cempedak majorities were unemployed as mentioned earlier, since the passengers from these two zones were mainly students. Many passengers from Sungai Lembing were full time workers while those from Pekan were part time workers.

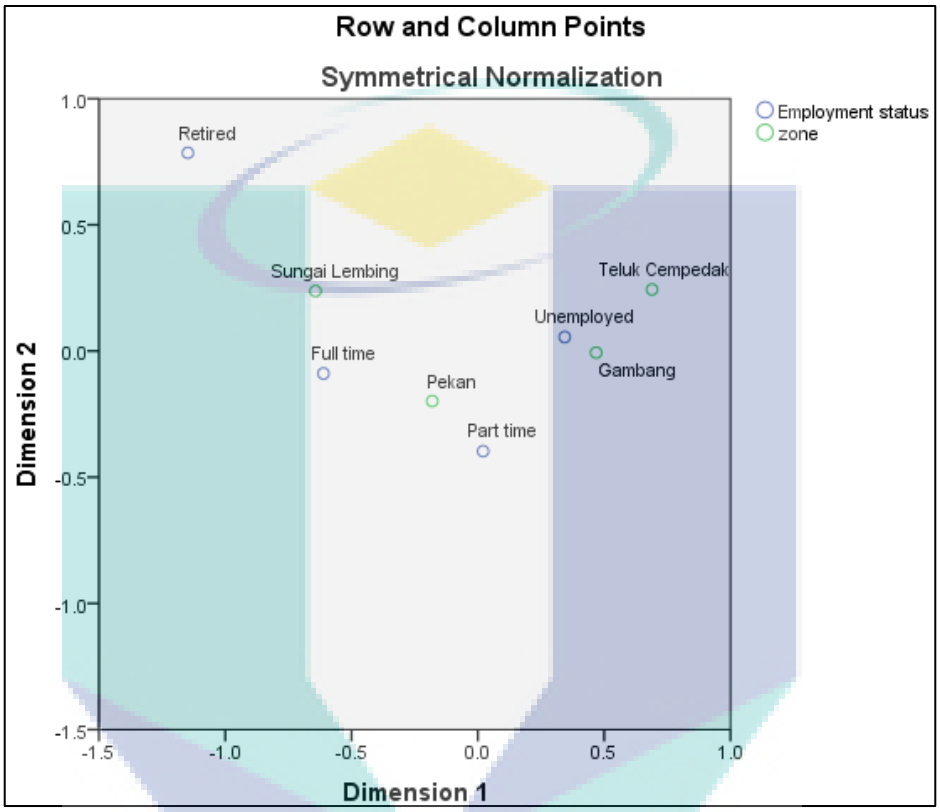


Figure 4.6: The perceptual map for employment status and zone

4.3.3 Correspondence analysis between zone and type of vehicle

Since most passengers were students, analysis shown only 485 passengers from the total of 1340 respondent that have the vehicle as stated in Table 4.14. The type of vehicle that most passengers have was motorcycle.

Table 4.14: Correspondence table for type of vehicle for each zone

Type of vehicle	Zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Bicycle	43	5	9	1	58
Motorcycle	113	55	85	28	281
Car	55	44	30	13	142
Others	2	1	1	0	4
Active Margin	213	105	125	42	485

Referring to Table 4.15, there was statistically significance between type of vehicle and the zone at .000, less than .05 level of significant, showed that the two variables were related. The proportion of inertia value accounted for dimension 1 was 74.9%, for dimension 2 the association of the variables was 24.4% and for dimension 3 the association of the variables was 0.7%.

Table 4.15: Summary table for correspondence analysis between type of vehicle and zone

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.231	.053			.749	.749	.041	.066
2	.132	.017			.244	.993	.046	
3	.023	.001			.007	1.000		
Total		.071	34.590	.000[a]	1.000	1.000		

a. 9 degrees of freedom

Figure 4.7 illustrated the type of vehicle owned by passengers in each zone. From zone Gambang, most of the passengers have cars, while passengers from Teluk Cempedak and Sungai Lembing tend to have motorcycles as their vehicle.

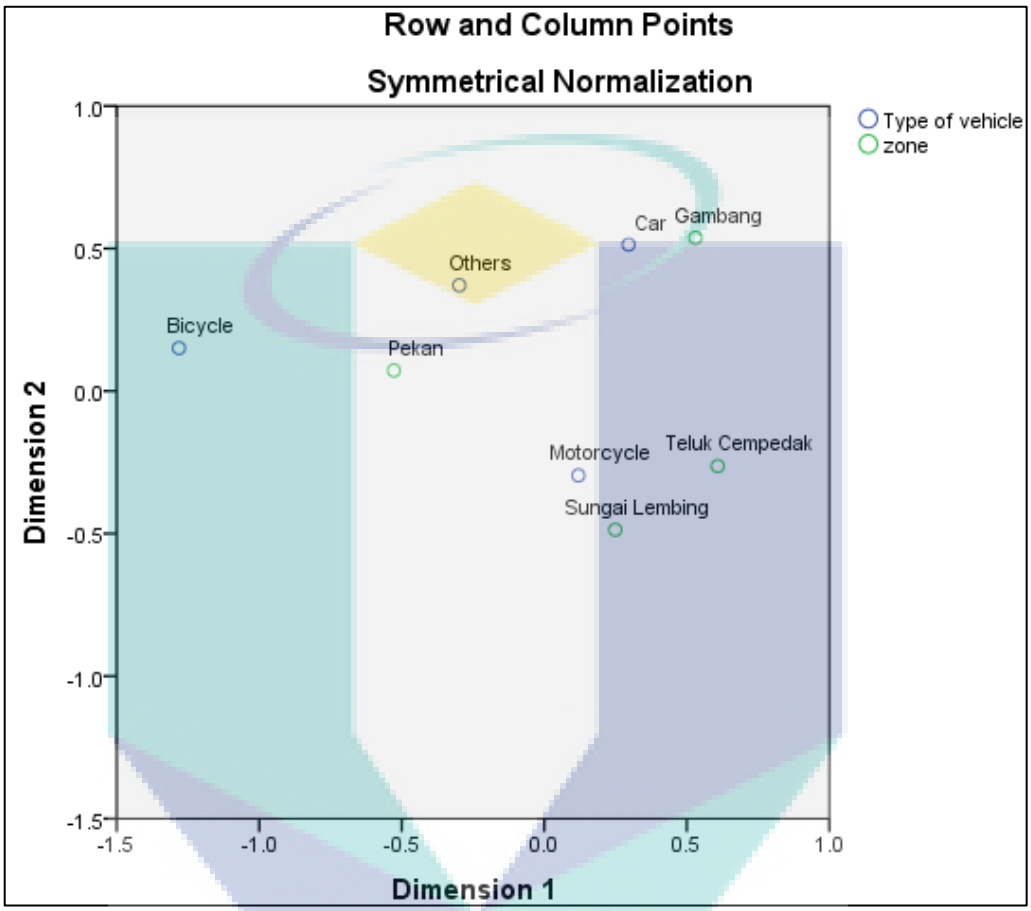


Figure 4.7: The perceptual map for the type of vehicle and the zone

4.3.4 Correspondence analysis between zone and age

Table 4.16 summarized the passengers age for each zone. It can be concluded that most passengers were between 13 to 30 years old. Fewer passengers less than 12 years old due to they too young and need more attention from their parents.

Table 4.16: Correspondence table for zone and age

Age	Zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Less than 12 years old	14	1	8	0	23
13 - 20 years old	242	157	112	69	580
21-30 years old	138	169	92	51	450
31-40 years old	54	19	30	4	107
41-50 years old	36	9	27	2	74
More than 50 years old	34	9	17	1	61
Active Margin	518	364	286	127	1295

From Table 4.17, it is clear that there was statistical significance between zone and age at .000, less than .05 level of significant, justifying the assumption that the two variables were apparently related. The proportion of inertia value accounted for dimension 1 = 0.873 mean that the dimension 1 explained the association of the variables was 87.3%, for dimension 2 the association of the variables was 11.1% and for dimension 3 the association of the variables was 1.5% only.

Table 4.17: Summary table between zone and age

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.241	.058			.873	.873	.023	-.021
2	.086	.007			.111	.985	.028	
3	.032	.001			.015	1.000		
Total		.067	86.324	.000[a]	1.000	1.000		

a. 15 degrees of freedom

Figure 4.8 illustrated that most passengers from zone Gambang were 21 to 30 years old, passengers from zone Teluk Cempedak were 13 until 20 years old. Passengers from zone Pekan were between 13 to 20 years old and more than 50 years old. Passengers from Sungai Lembing in other hand have all ranges of age.

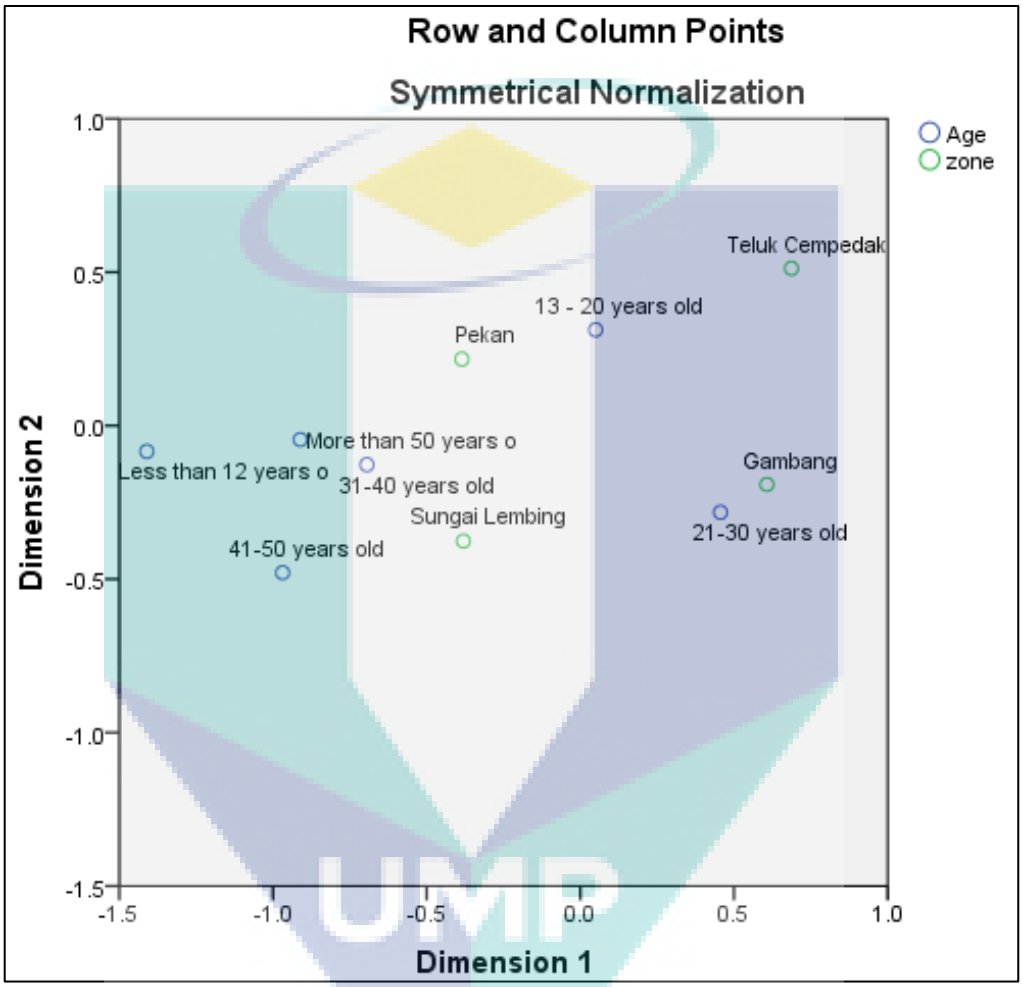


Figure 4.8: Perceptual map between age and zone

4.3.5 Correspondence analysis between zone and income

Based on Table 4.18, most passengers have less than RM1000 as their income. Note that student normally do not have an income if they did not do part time job. 427 passengers have an income in range of RM1000 to RM2000. It can be concluded that most passengers have a monthly household income less than RM2000.

Table 4.18: Correspondence table between zone and income

Correspondence Table

Income	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Less than RM1000	281	225	159	58	723
RM1000 - RM2000	157	100	102	68	427
RM2000 - RM3000	33	28	14	14	89
More than RM3000	13	8	3	3	27
Active Margin	484	361	278	143	1266

From Table 4.19, there was statistically significance between the zone and the income at .001, less than .05 level of significant, justifying the assumption that the two variables were apparently related. The proportion of inertia value accounted for dimension 1 = 0.800 mean that the dimension 1 explained the association of the variables was 80%, for dimension 2 the association of the variables was 17% and for dimension 3 the association of the variables was 3.1% only.

Table 4.19: Summary table between zone and income

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.131	.017			.800	.800	.028	-.031
2	.060	.004			.170	.969	.025	
3	.026	.001			.031	1.000		
Total		.021	27.187	.001[a]	1.000	1.000		

a. 9 degrees of freedom

Figure 4.9 proved that most passengers from zone Pekan and Gambang were students and their monthly income less than RM1000. Passengers from Sungai Lembing and Teluk Cempedak have an income in range of RM1000 to RM2000. Fewer passengers have an income more than RM3000.

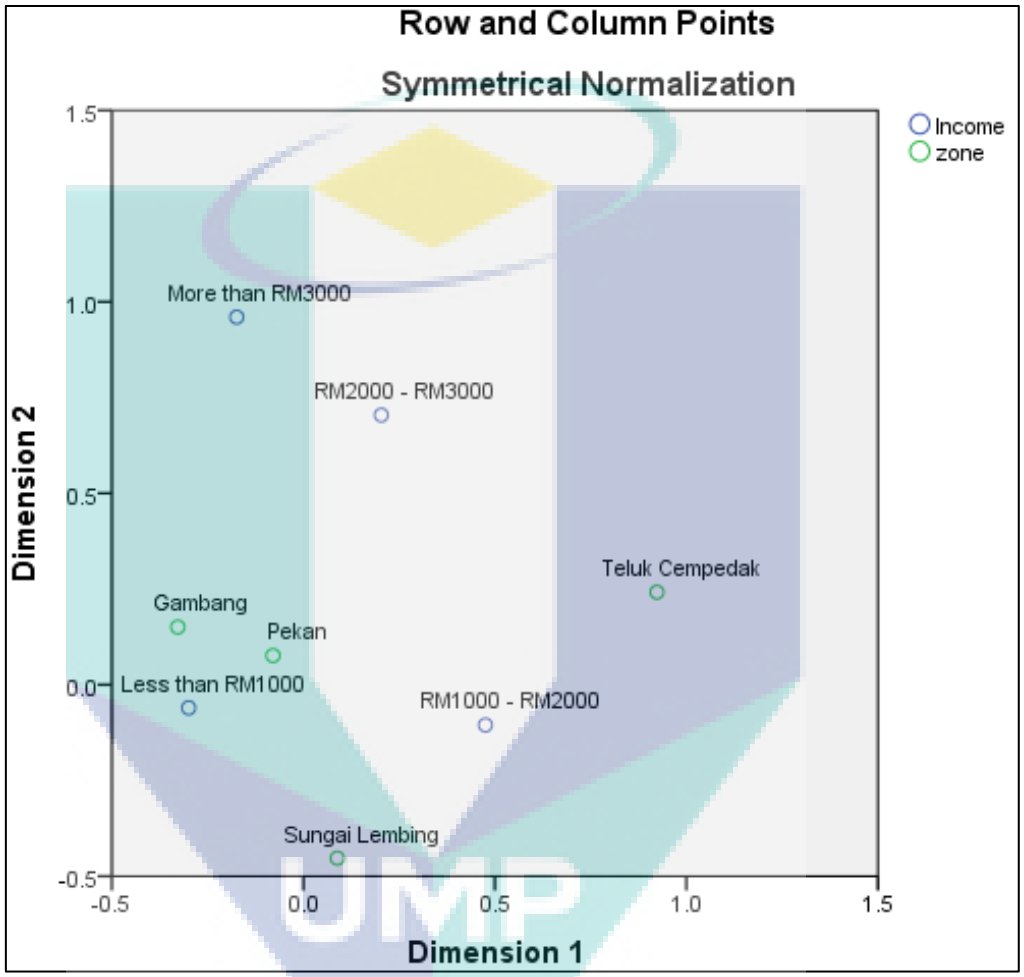


Figure 4.9: The perceptual map for passenger's income and zone

4.3.6 Correspondence analysis between zone and time of leaving from home

Table 4.20 listed the relationship between times of leaving from home from each zone. Most passengers leaving from home between 9.00am to 11.00am followed by 1.00pm until 3.00pm.

Table 4.20: Correspondence table between zone and time of leaving from home

Time of leaving from home	Zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
5.00am - 7.00am	50	23	35	3	111
7.00am - 9.00am	42	41	19	23	125
9.00am - 11.00am	218	158	148	76	600
11.00am - 1.00pm	41	20	26	26	113
1.00pm - 3.00pm	93	71	38	19	221
3.00pm - 5.00pm	26	21	13	7	67
5.00pm - 7.00pm	19	5	3	5	32
7.00pm - 9.00pm	4	0	1	0	5
9.00pm - 11.00pm	7	1	2	1	11
11.00pm - 12.00pm	0	0	1	0	1
Not using bus	13	12	4	0	29
Active Margin	513	352	290	160	1315

Table 4.21 proved that there was a relationship between zone and time of leaving from home because of the significant value was .000, less than .05 level of significant. The proportion of inertia value accounted for dimension 1 was 45.8%, for dimension 2 the association of the variables was 33.1% and for dimension 3 the association of the variables was 21.2%.

Table 4.21: The summary table between zone and time of leaving from home

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.163	.026			.458	.458	.025	-.001
2	.138	.019			.331	.788	.026	
3	.111	.012			.212	1.000		
Total		.058	76.121	.000[a]	1.000	1.000		

a. 30 degrees of freedom

Figure 4.10 demonstrated the relationship between the times of passengers leaving their home for each zone. Passengers from Sungai Lembing choose to begin their trip at 5.00 am to 7.00 am, 11.00am until 1.00pm and 7.00pm to 9.00pm. Passengers from Pekan begin their trip at 9.00am to 11.00am, 3.00pm- 5.00pm and 9.00pm to 11.00pm. Passengers from Teluk Cempedak tend to start their journey at 9.00am to 11.00am and 5.00pm to 7.00pm. Passengers from Gambang start using bus at 7.00am to 9.00am and 1.00pm to 5.00pm.

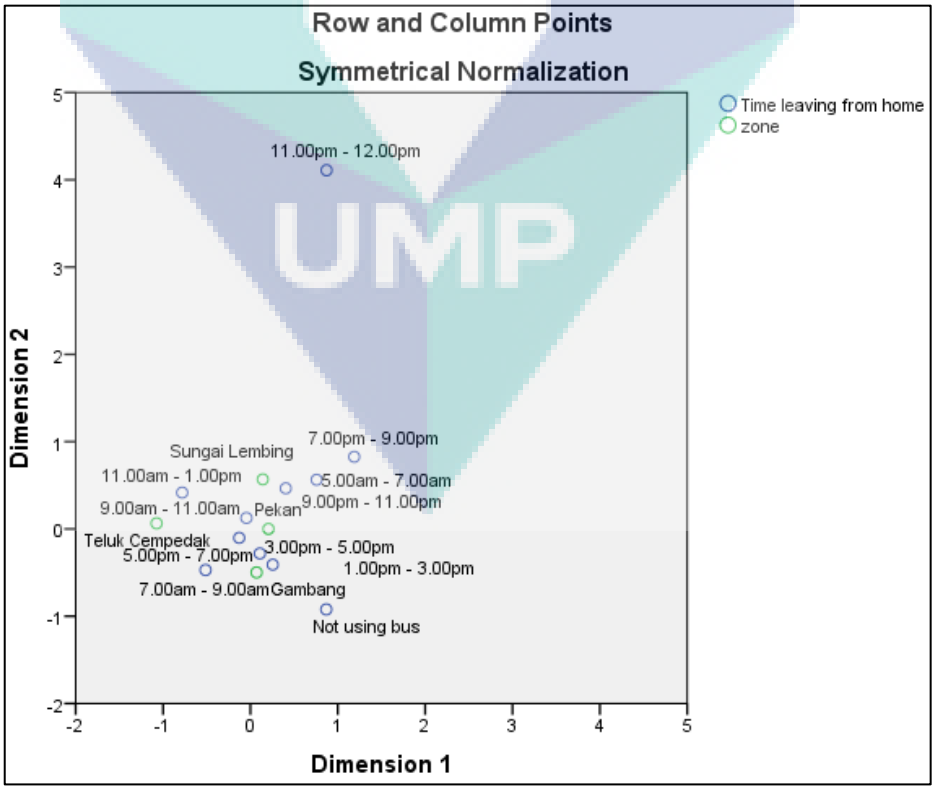


Figure 4.10: The perceptual map for time of passengers leaving their home for each zone

4.3.7 Correspondence analysis between zone and time of return to home

From Table 4.22, fewer passengers return to their home between 5.00am to 1.00pm. The most passengers return to their home between 3.00pm to 9.00pm.

Table 4.22: Correspondence table between zone and time of return to home

Time of return to home	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
5.00am - 7.00am	0	0	0	0	0
7.00am - 9.00am	1	0	1	0	2
9.00am - 11.00am	3	1	0	0	4
11.00am - 1.00pm	2	4	2	1	9
1.00pm - 3.00pm	38	24	33	6	101
3.00pm - 5.00pm	116	77	74	19	286
5.00pm - 7.00pm	168	93	104	70	435
7.00pm - 9.00pm	89	81	52	42	264
9.00pm - 11.00pm	59	38	13	16	126
11.00pm - 12.00pm	24	14	6	4	48
Not using bus	12	18	5	2	37
Active Margin	512	350	290	160	1312

From Table 4.23, there was statistically significance between the zone and time of return to home at .000, less than .05 level of significant, justifying the assumption that the two variables were apparently related. The proportion of inertia value accounted for dimension 1 = 0.438 mean that the dimension 1 explained the association of the variables was 43.8%, for dimension 2 the association of the variables was 37.3% and for dimension 3 the association of the variables was 18.9% only.

Table 4.23: Summary table between zone and time of return to home

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.149	.022			.438	.438	.026	.004
2	.137	.019			.373	.811	.024	
3	.098	.010			.189	1.000		
Total		.050	66.168	.000[a]	1.000	1.000		

a. 30 degrees of freedom

As illustrated in Figure 4.11, passengers from Teluk Cempedak tend to return to their home at 5.00pm to 7.00pm. Passengers from Sungai Lembing start ride to their home at 7.00pm to 9.00pm and 1.00pm to 3.00pm. Passengers from Pekan begin their trip at 9.00pm to 11.00pm and 1.00pm to 3.00pm. Lastly, passengers from zone Gambang mostly start the trip to home at 11.00am to 1.00pm, 11.00pm to 12.00pm and 3.00pm to 5.00pm.

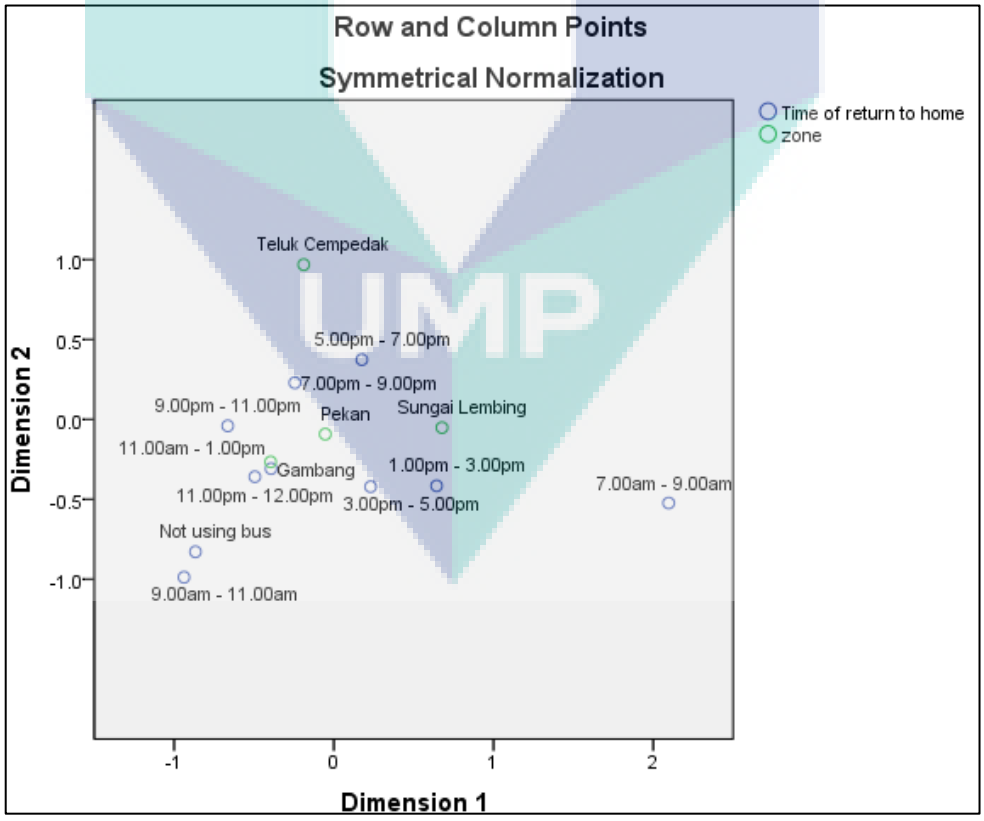


Figure 4.11: The perceptual map for time of return to home and zone

4.3.8 Correspondence analysis between zone and weekday trip frequency

As stated in Table 4.24, there were 397 passengers use bus once a while for weekday trip frequency, meanwhile 368 passengers use bus for once a week. Moderate passengers use the bus twice a week, 4 times a week and more than 5 times a week. There were 50 passengers that did not use bus during weekday.

Table 4.24: Correspondence table between zone and weekday trip frequency

Weekday trip frequency	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Once a week	118	112	84	54	368
Twice a week	28	50	71	22	171
4 times a week	118	30	29	4	181
more than 5 times a week	40	42	62	16	160
once a while	193	109	31	64	397
Never	17	21	12	0	50
Active Margin	514	364	289	160	1327

From Table 4.25, there was statistically significance between the zone and weekday trip frequency at .000, less than .05 level of significant, justifying the assumption that the two variables were apparently related. The proportion of inertia value accounted for dimension 1 = 0.740 mean that the dimension 1 explained the association of the variables was 74%, for dimension 2 the association of the variables was 21.5% and for dimension 3 the association of the variables was 4.4% only.

Table 4.25: The summary table between zone and weekday trip frequency

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.342	.117			.740	.740	.025	-.003
2	.184	.034			.215	.956	.021	
3	.084	.007			.044	1.000		
Total		.158	209.399	.000[a]	1.000	1.000		

a. 15 degrees of freedom

Figure 4.12 demonstrated the weekday trip frequency for each zone. Passengers from zone Gambang used the bus once a week, passengers from zone Pekan and Teluk Cempedak use bus once a while during the weekday. Lastly, passengers from Sungai Lembing use bus more than 5 times a week. It was significant with most passengers from Sungai Lembing use bus to work and business matter as illustrated in Figure 4.2.

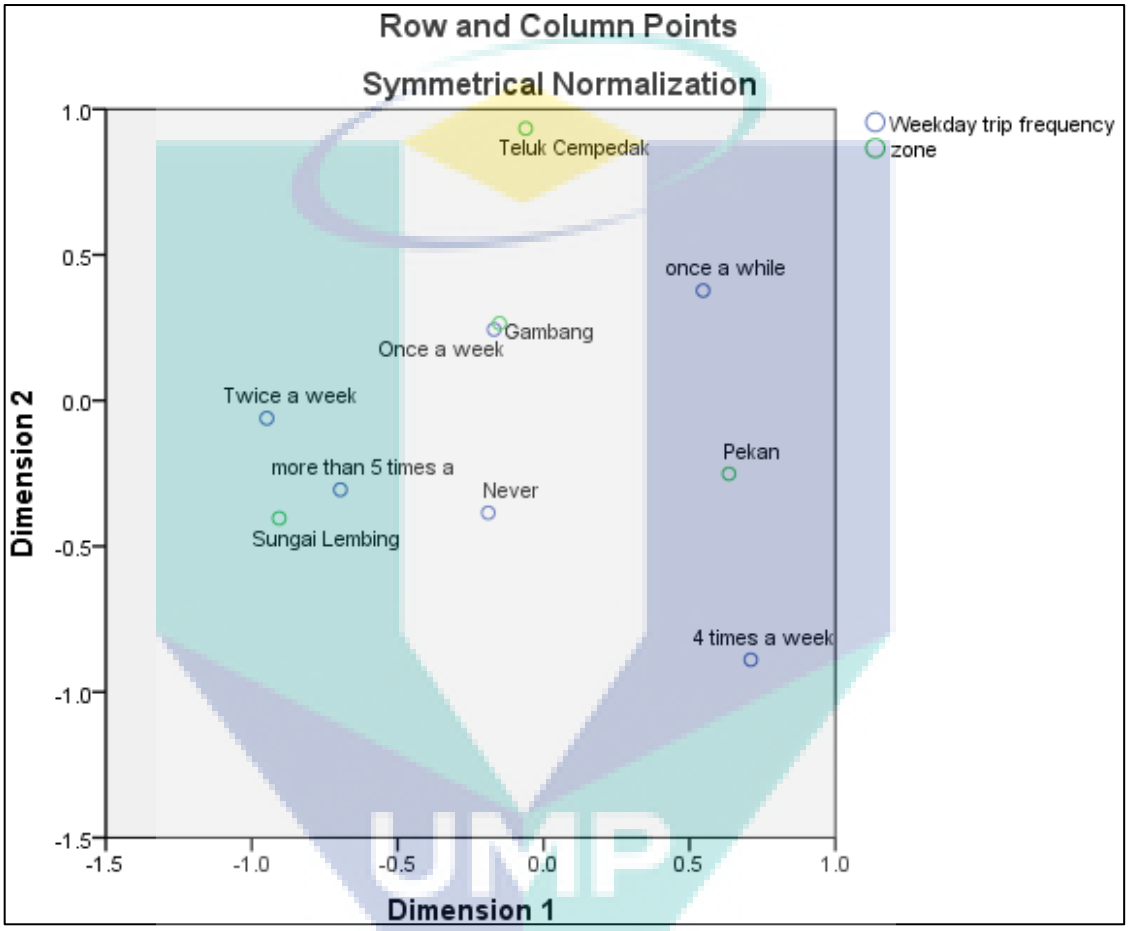


Figure 4.12: The perceptual map for weekday trip frequency and zone

4.3.9 Correspondence analysis between zone and weekend trip frequency

Table 4.26 proved that most of the passengers use bus once a week and once a while. There were also passengers who did not use the bus during weekend. The totals of number passengers that respond to this question were 1314 passengers.

Table 4.26: Correspondence table between zone and weekend trip frequency

Weekend trip frequency	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Once a week	145	130	110	36	421
Twice a week	94	63	89	23	269
Once a while	231	143	57	92	523
Never	49	15	34	3	101
Active Margin	519	351	290	154	1314

The summary in Table 4.27 expressed that these both variables were related based on the significant value was .000, less than .05 level of significant. The proportion of inertia value accounted for dimension 1 was 84.2%, for dimension 2 the association of the variables was 13.4% and for dimension 3 the association of the variables was 2.4%.

Table 4.27: The summary table between zone and weekend trip frequency

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.253	.064			.842	.842	.025	-.049
2	.101	.010			.134	.976	.026	
3	.043	.002			.024	1.000		
Total		.076	99.877	.000[a]	1.000	1.000		

a. 9 degrees of freedom

Figure 4.13 explained the weekend trip frequency for each zone. Passengers from zone Gambang tend to ride bus once a week, passengers from zone Teluk Cempedak and Pekan use bus once a while. Meanwhile, passengers from Sungai Lembing use bus twice a week during weekend.

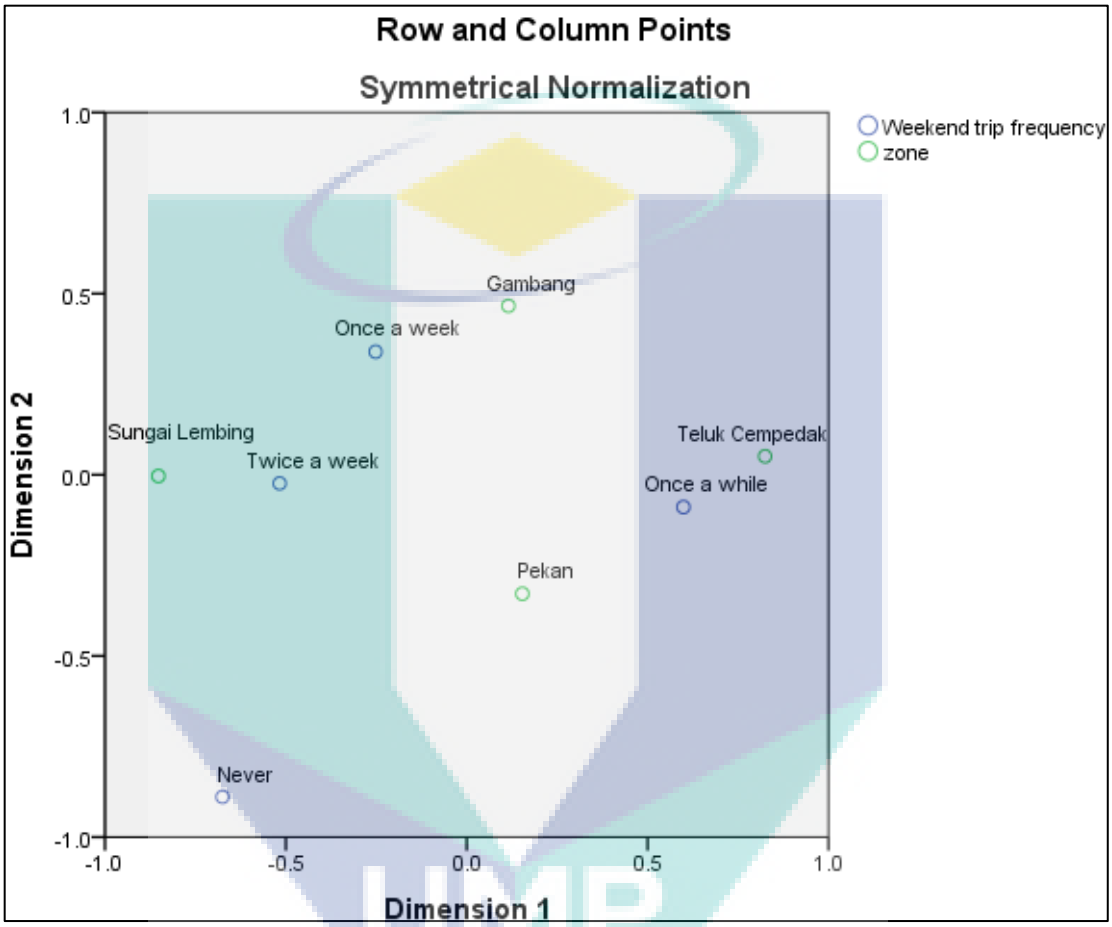


Figure 4.13: The perceptual map for weekend trip frequency and zone

4.4 THE RELATIONSHIP OF TRANSPORTATION SYSTEM CHARACTERISTICS FOR EACH ZONE

This section summarized the results regarding the transportation system characteristics for each zone. The variables involved were from the passenger's level of satisfaction based on category Likert Scale. All the variables in this section have the Pearson chi square value less than .05 level of significant, justifying the assumption that the two variables were apparently related. The variables for transportation system characteristics were the overall satisfaction on comfort and convenience with Pearson Chi Square value equal to 0.03, bus frequency (involving waiting time): 0.029, bus fare (cost): 0.002, safety and security: 0.000, operating hours: 0.002, captain helpfulness: 0.003, captain driving skill: 0.002, captain attire (uniform): 0.013, officer helpfulness: 0.001, officer friendly: 0.000, officer attire (uniform): 0.042, inspector helpfulness: 0.007, inspector politeness: 0.007, inspector attire (uniform): 0.006, and lastly the bus appearance: 0.000. The correspondence and summary table for this section were attached in the appendix D.

Correspondence analysis between zone and overall satisfaction, bus frequency, bus fare as well as safety and security showed that the passengers from zone Pekan were satisfied with all these aspects, passengers from zone Gambang and Sungai Lembing gave a moderate assessment while passengers from zone Teluk Cempedak were in between moderate and satisfied. Even though the distance between Pekan and Kuantan town was the longest compared to other zone, people from zone Pekan believed to use the RapidKuantan bus as their main transportation. Bus frequency depends on total number of bus, distance and bus driver/captain. Noted that, bus fare for RapidKuantan bus were RM4 for long distance and RM2 for short distance. The perceptual maps for each aspect were showed in Figure 4.14, Figure 4.15, Figure 4.16 and Figure 4.17.

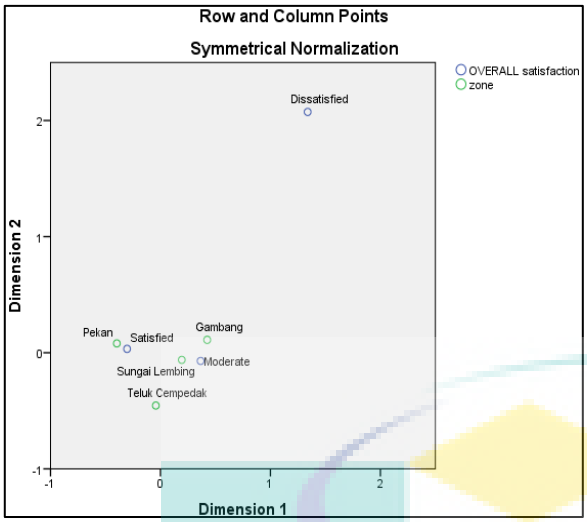


Figure 4.14: The perceptual map for overall satisfaction and zone

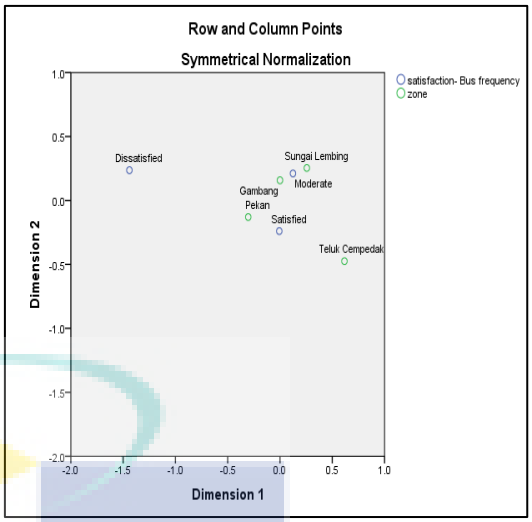


Figure 4.15: The perceptual map for bus frequency and zone

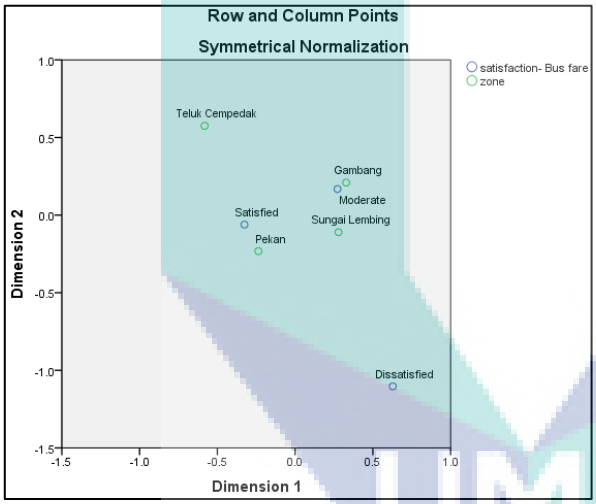


Figure 4.16: The perceptual map for bus fare and zone

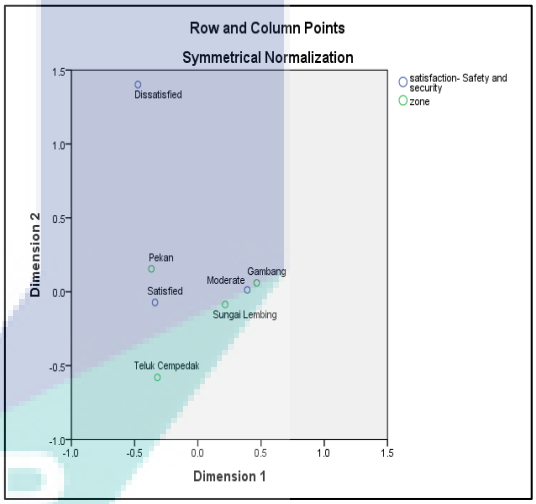


Figure 4.17: The perceptual map for safety and security and zone

The correspondence analysis for operating hours, captain helpfulness, captain driving skill and captain attire (uniform) presented a different satisfaction level from passengers in zone Sungai Lembing. Passengers from zone Sungai Lembing were in between moderate and satisfied as well as passengers from Teluk Cempedak. Passengers from Pekan and Gambang still gave the same evaluation while passengers from zone Gambang gave moderate evaluation and passengers from Pekan were satisfied with all the aspects. The perceptual maps were presented in Figure 4.18, Figure 4.19, Figure 4.20 and Figure 4.21.

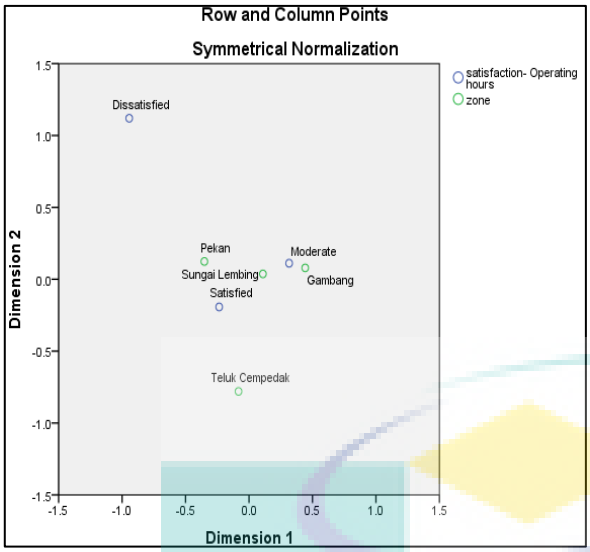


Figure 4.18: The perceptual map for operating hours and zone

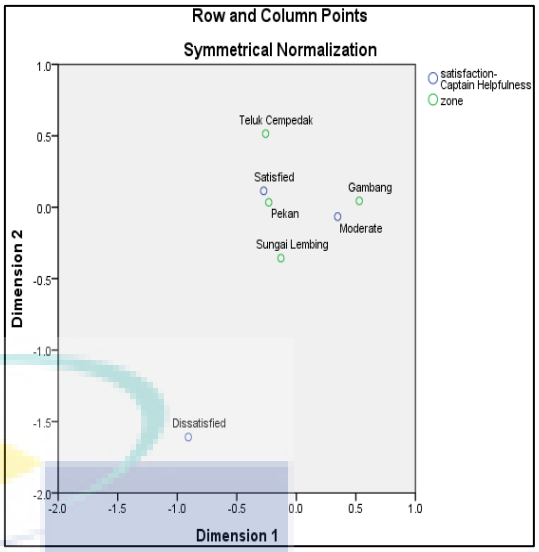


Figure 4.19: The perceptual map for captain helpfulness and zone

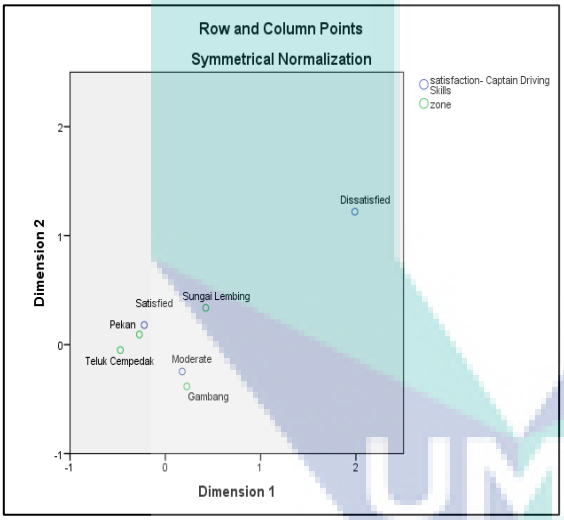


Figure 4.20: The perceptual map for captain driving skill and zone

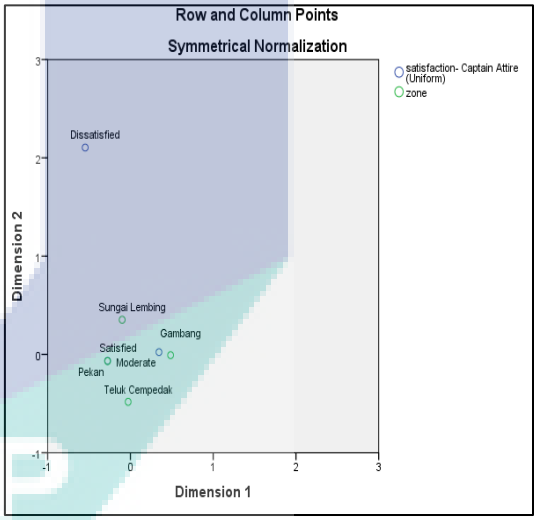


Figure 4.21: The perceptual map captain attire and zone

Correspondence analysis for officer helpfulness, officer friendly, officer attire (uniform) and inspector helpfulness for each zone also displayed differences of opinion from zone Sungai Lembing and Teluk Cempedak. Passengers from Sungai Lembing and Teluk Cempedak were satisfied in these aspects as well as passengers from zone Pekan. Passengers from zone Gambang gave moderate evaluation on these aspects just like other aspects. The perceptual maps for these relationships were displayed in Figure 4.22, Figure 4.23, Figure 4.24, and Figure 4.25.

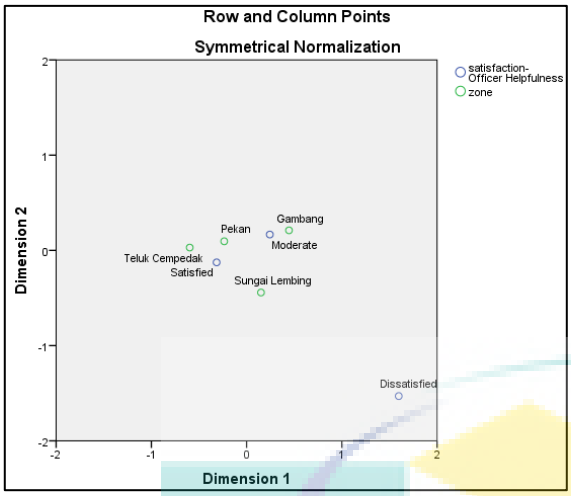


Figure 4.22: The perceptual map for officer helpfulness and zone

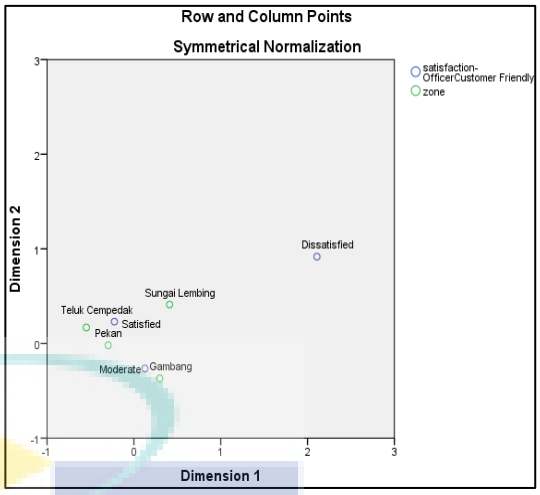


Figure 4.23: The perceptual map for officer friendly and zone

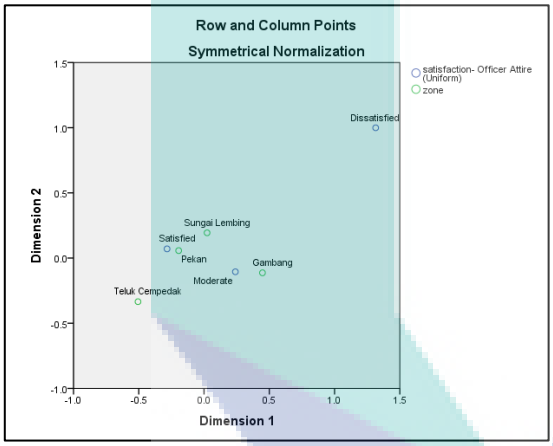


Figure 4.24: The perceptual map for officer attire and zone

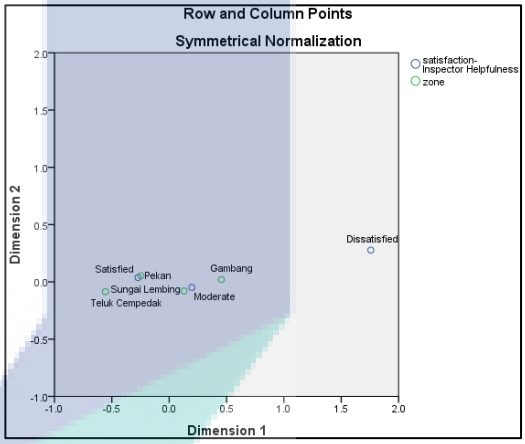


Figure 4.25: The perceptual map for inspector helpfulness and zone

In terms of inspector helpfulness and inspector attire, the passengers from Sungai Lembing gave a moderate evaluation, and it was the same with passengers from zone Gambang while passengers from Pekan and Teluk Cempedak still satisfied in these aspects as demonstrated in Figure 4.26 and Figure 4.27.

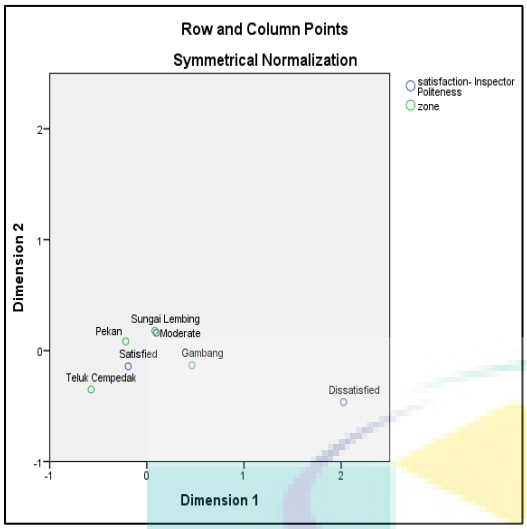


Figure 4.26: The perceptual map for inspector politeness and zone

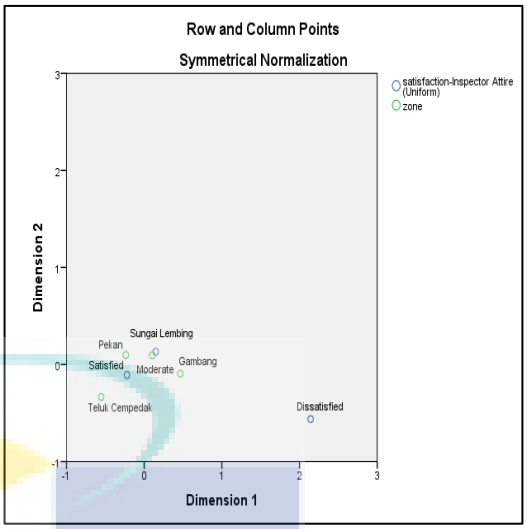


Figure 4.27: The perceptual map between inspector attire and zone

The relationship between bus appearance and zones revealed that all passengers from all zones except for zone Pekan, which gave a moderate evaluation of bus appearance. Passengers from zone Pekan on the other hand were satisfied with the bus appearance as illustrated in Figure 4.28.

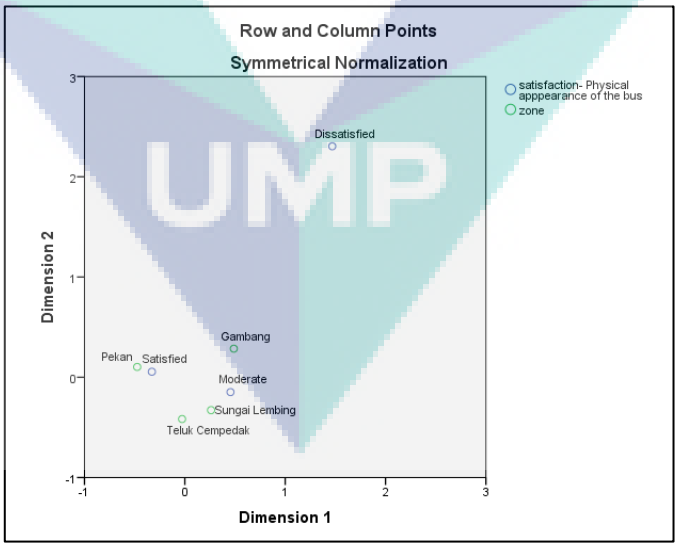


Figure 4.28: The perceptual map for bus appearance and zone

4.5 SUMMARY

Chapter 4 listed all the results from the correspondence analysis. Based on the perceptual maps, the distance between the sub domain and zone will be measured. The shortest distance means most influential and longest distance means least influential. The shortest distance between the subdomain and the zone will become the leading characteristics. The leading characteristics from this analysis will be summarized in chapter 5. Noted that there were some variables/subdomain that not been analysed in this study due to their Chi Square value was more than 0.05 and it was not significant. It also means that there were no relationship between the subdomain and zone.

CHAPTER 5

RESULTS AND DISCUSSION

5.1 INTRODUCTION

From the OD Survey, 42.5% were choice passengers and 57.5% were captive passengers. It was classified based on Question 19, the main reason of passengers to take the bus. Figure 5.1 categorized the type of passengers based on Figure 5.2, the reason of passengers chooses to ride the bus. Most passengers use bus because there was no other transportation and for the low cost. But on the other hand, there were passengers who wanted reduction in the bus fare as stated in Figure 5.3.

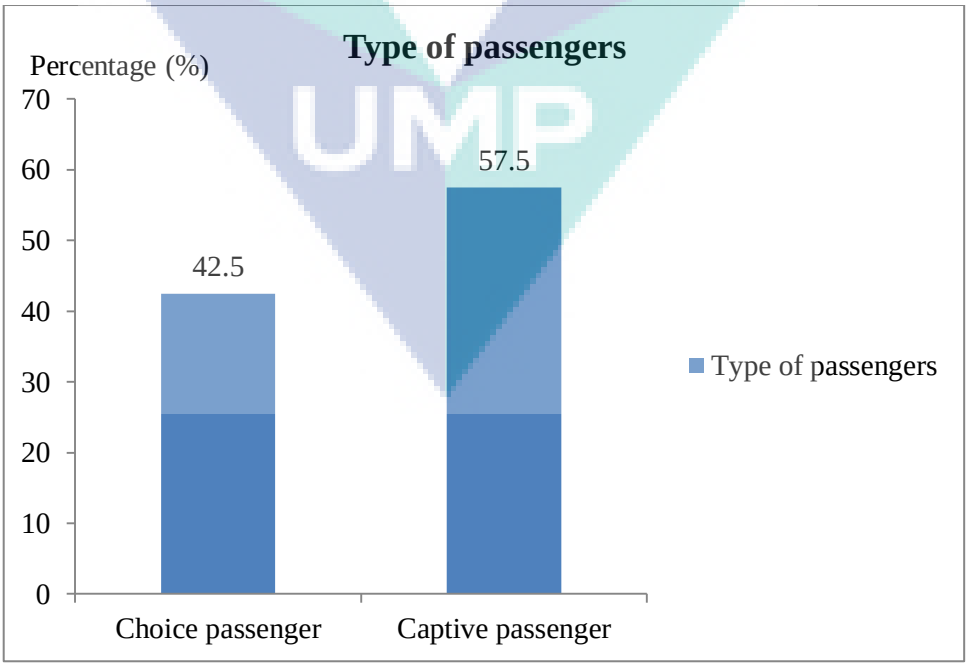


Figure 5.1: The type of passengers in RapidKuantan bus

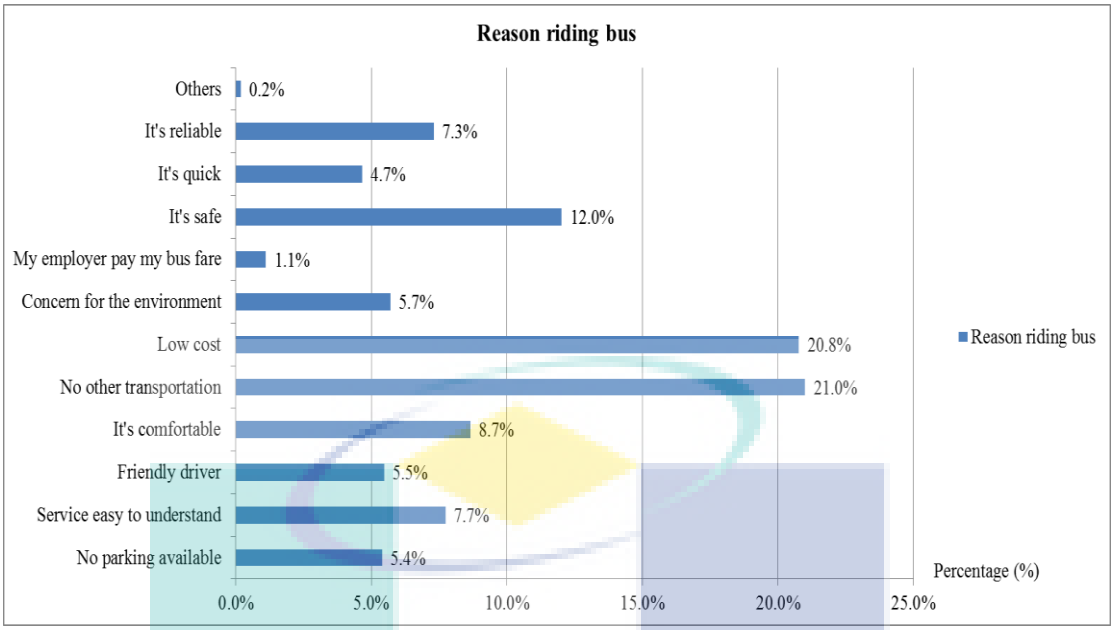


Figure 5.2: The reason of riding RapidKuantan bus from passengers view

Improvements illustrated in Figure 5.3 were chosen by RapidKuantan bus passengers. Most passengers want lower bus fares, less travel time and improved the bus punctuality. The other suggestions were to improve the facilities for buses and bus passengers. The detail strategies based on leading characteristics from correspondence analysis were listed in section 5.2

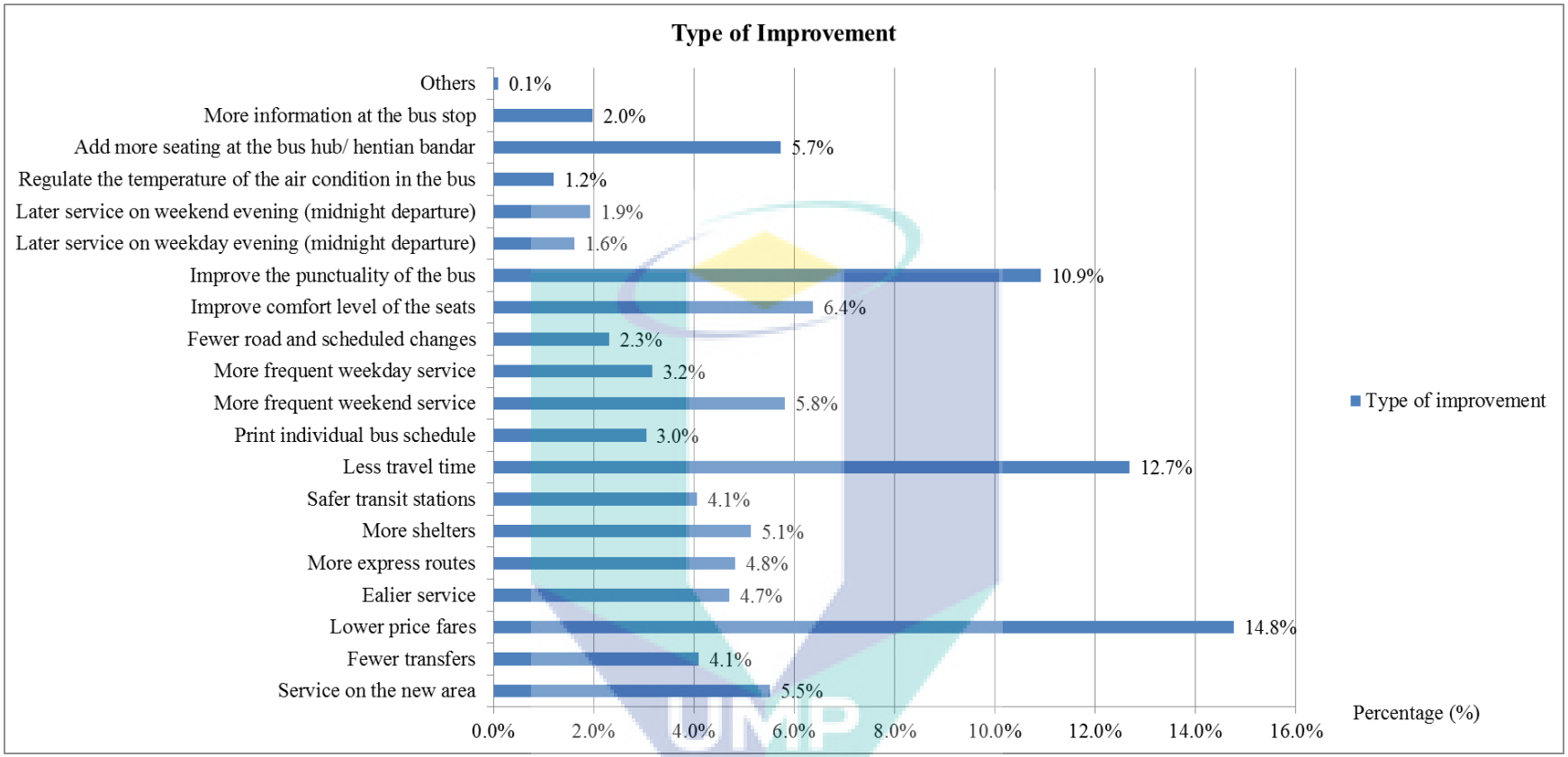


Figure 5.3: The improvement on RapidKuantan bus suggested by the passengers

5.2 THE LEADING CHARACTERISTICS FOR EACH ZONE

This section summarized all the leading characteristics for each zone. Table 5.1 listed leading characteristics for Zone A, Table 5.2 itemized leading characteristics for Zone B, Table 5.3 listed leading characteristics for Zone C and Table 5.4 listed leading characteristics for Zone D.

Table 5.1: The leading characteristics for zone A

SCALE FOR ZONE A (PEKAN - KUANTAN)

Scale	Legend
2cm = 0.5	Shortest means most influential
	Longest means least influential

Sub Domain	Characteristics	Scale	1	2	3	4	5	6	7	8	9
Trip Characteristics											
Origin	Home	1									
Destination	Home	1									
Access mode	Walked	5									
Egress mode	Walked	3									
Trip Maker Characteristics											
Student types	Secondary School	2									
Employment status	Part time	3									
Types of vehicle	Others	4									
Age	13 -20 years old	5									
Income	< RM 1000	3									
Time Leaving	9-11am	3									
Time return	7-9pm	4									
Weekday trip frequency	once a while	6									
Weekend trip frequency	once a while	3									
Transportation System Characteristics											
Overall satisfaction	Satisfied	1									
Bus frequency	Satisfied	3									
Bus fare	Satisfied	2									
Safety & security	Satisfied	2									
Operating hours	Satisfied	3									
Captain helpfulness	Satisfied	1									
Captain driving skill	Satisfied	1									
Captain attire	Satisfied	0									
Officer helpfulness	Satisfied	4									
Officer customer friendly	Satisfied	3									
Officer attire	Satisfied	1									
Inspector helpfulness	Satisfied	0									
Inspector politeness	Satisfied	2									
Inspector attire	Satisfied	2									
Physical appearance of bus	Satisfied	2									

Table 5.2: The leading characteristics for zone B

SCALE FOR ZONE B (GAMBANG - KUANTAN)

Scale	Legend
2cm = 0.5	Shortest means most influential
	Longest means least influential

Sub Domain	Characteristics	Scale	1	2	3	4	5	6	7	8	9
Trip Characteristics											
Origin	Shopping	2									
Destination	Shopping	2									
Access mode	Walked	6									
Egress mode	Walked	5									
Trip Maker Characteristics											
Student types	University	2									
Employment status	Unemployed	2									
Types of vehicle	Car	3									
Age	21-30 years old	2									
Income	< RM1000	2									
Time Leaving	1-3pm	2									
Time return	11am-1pm	1									
Weekday trip frequency	once a week	0									
Weekend trip frequency	once a week	4									
Transportation System Characteristics											
Overall satisfaction	Moderate	2									
Bus frequency	Moderate	1									
Bus fare	Moderate	1									
Safety & security	Moderate	1									
Operating hours	Moderate	1									
Captain helpfulness	Moderate	2									
Captain driving skill	Moderate	2									
Captain attire	Moderate	2									
Officer helpfulness	Moderate	2									
Officer customer friendly	Moderate	2									
Officer attire	Moderate	2									
Inspector helpfulness	Moderate	3									
Inspector politeness	Moderate	5									
Inspector attire	Moderate	4									
Physical appearance of bus	Moderate	5									

Table 5.3: The leading characteristics for zone C

SCALE FOR ZONE C (SUNGAI LEMBING - KUANTAN)

Scale	Legend
2cm = 0.5	Shortest means most influential
	Longest means least influential

Sub Domain	Characteristics	Scale	1	2	3	4	5	6	7	8	9
Trip Characteristics											
Origin	Work & Business	2									
	others	4									
Destination	Work & Business	1									
	others	9									
Access mode	Walked	2									
Egress mode	Walked	6									
Trip Maker Characteristics											
Student types	Secondary school	5									
Employment status	Full time	4									
Types of vehicle	Motorcycle	3									
Age	31- 40 years old	4									
Income	RM 0- RM 2000	3									
Time Leaving	9-11pm	3									
Time return	1-3pm	4									
Weekday trip frequency	>5 times	3									
Weekend trip frequency	twice a week	3									
Transportation System Characteristics											
Overall satisfaction	Moderate	2									
Bus frequency	Moderate	1									
Bus fare	Moderate	3									
Safety & security	Moderate	2									
Operating hours	Moderate	2									
Captain helpfulness	Satisfied	5									
Captain driving skill	Satisfied	7									
Captain attire	Satisfied	6									
Officer helpfulness	Satisfied	6									
Officer customer friendly	Satisfied	5									
Officer attire	Satisfied	3									
Inspector helpfulness	Moderate	1									
Inspector politeness	Moderate	1									
Inspector attire	Moderate	1									
Physical appearance of bus	Moderate	3									

Table 5.4: The leading characteristics for zone D

SCALE FOR ZONE D (TELUK CEMPEDAK - KUANTAN)

Scale	Legend
2cm = 0.5	Shortest means most influential
	Longest means least influential

Sub Domain	Characteristics	Scale	1	2	3	4	5	6	7	8	9
Trip Characteristics											
Origin	School	2									
Destination	School	5									
Access mode	Walked	5									
Egress mode	Walked	4									
Trip Maker Characteristics											
Student types	Collage	5									
Employment status	Unemployed	4									
Types of vehicle	Motorcycle	5									
Age	13-20 years old	7									
Income	RM 1000 - RM 2000	6									
Time Leaving	11am-1pm	5									
Time return	5-7pm	5									
Weekday trip frequency	once a while	8									
Weekend trip frequency	once a while	3									
Transportation System Characteristics											
Overall satisfaction	Moderate	6									
Bus frequency	Satisfied	7									
Bus fare	Satisfied	7									
Safety & security	Satisfied	5									
Operating hours	Satisfied	6									
Captain helpfulness	Satisfied	4									
Captain driving skill	Satisfied	3									
Captain attire	Satisfied	5									
Officer helpfulness	Satisfied	3									
Officer customer friendly	Satisfied	3									
Officer attire	Satisfied	5									
Inspector helpfulness	Satisfied	3									
Inspector politeness	Satisfied	4									
Inspector attire	Satisfied	4									
Physical appearance of bus	Moderate	6									

5.3 THE STRATEGIES TO INCREASE THE BUS RIDERSHIP PATTERN BY ZONES

This section proposed strategies for each zone from based on the leading characteristics in Section 5.2. Table 5.5 listed proposed strategies for Zone A, Table 5.6 itemized proposed strategies for Zone B, Table 5.7 listed proposed strategies for Zone C and Table 5.8 listed proposed strategies for Zone D.

Table 5.5: The proposed strategies for zone A

DOMAIN	SUB-DOMAIN	CHARACTERISTICS	PROPOSED STRATEGIES
TRIP CHARACTERISTICS	Origin	Home trips	At least there are a number of pick up and drop off points in residential.
	Destination	Home trips	
	Access and egress mode	Bicycled	Upgrade or provide convenient access such as paved pedestrian and cycle paths (if possible with cover) and provide adequate number of bus stop with cover.
		Walked	
		Bus	
TRIP MAKER CHARACTERISTICS	Student's type	Secondary School	Cater more for demand from secondary schools and colleges.
		Collage	
	Employment status	Full time	Cater more for demand to attraction zones such as offices, factories and shopping complex; night and day.
		Part time	
	Vehicle ownership	Bicycle	Service to focus at zone with high dependency on travel mode other than motorcycles and cars.
		Others (van, lorry)	
	Age	13 to 20 years old	Service to focus at zone with high young population and low income group
	Income	Less than RM 1000	
	Time leaving home	Between 9 am to 11 am	Higher bus frequency during these hours
		Between 3 pm to 7 pm	
		Between 9 pm to 11pm	
	Time return home	Between 11 am to 1 pm	
		Between 7 pm to 11 pm	
	Weekday trip frequency	4 times a week	These trip maker characteristics cannot be one of the leading characteristics
		Once a while	
	Weekend trip frequency	Once a while	

Table 5.5: The proposed strategies for zone A (continue)

TRANSPORTATION SYSTEM CHARACTERISTICS	Overall Satisfaction	Satisfied	Maintain service as status quo.
	Satisfaction- bus frequency	Satisfied	
	Satisfaction- bus fare	Satisfied	
	Satisfaction – safety and security	Satisfied	
	Satisfaction – operating hours	Satisfied	
	Satisfaction- captain helpfulness	Satisfied	
	Satisfaction- officer helpfulness	Satisfied	
	Satisfaction- inspector	Satisfied	
	Satisfaction- bus appearance	Satisfied	

Table 5.6: The proposed strategies for zone B

DOMAIN	SUB-DOMAIN	CHARACTERISTICS	PROPOSED STRATEGIES
TRIP CHARACTERISTICS	Origin	Shopping	At least there are a number of pick up and drop off points in shopping area
	Destination	Shopping	
	Access Mode	Walked	Upgrade or provide convenient access such as paved pedestrian (if possible with cover) and provide adequate number of bus stop with cover.
		Bus	
	Egress Mode	Walked	
		Bus	
TRIP MAKER CHARACTERISTICS	Student's type	Collage	Cater more for demand from collages and university students
		University	
	Employment status	Unemployed	
	Type of vehicle	Car	Service to focus at zone with high dependency on travel mode other than cars.
	Age	21 to 30 years old	Service to focus at zone with high young population and low income group
	Income	Less than RM 1000	
	Time leaving home	Between 7 am to 9 am	Higher bus frequency during these hours
		Between 1 pm to 3 pm	
		Between 3 pm to 5 pm	
	Time return home	Between 11 am to 1 pm	
		Between 11 pm to 12 am	
	Weekday trip frequency	Once a week	These trip maker characteristics cannot be one of the leading characteristics
	Weekend trip frequency	Once a week	
TRANSPORTATION SYSTEM CHARACTERISTICS	Overall Satisfaction	Moderate	Can be improved to be satisfied
	Satisfaction- bus frequency	Moderate	
	Satisfaction- bus fare	Moderate	
	Satisfaction – safety and security	Moderate	
	Satisfaction – operating hours	Moderate	
	Satisfaction- captain helpfulness	Moderate	
	Satisfaction- officer helpfulness	Moderate	
	Satisfaction- inspector	Moderate	
	Satisfaction- bus appearance	Moderate	

Table 5.7: The proposed strategies for zone C

DOMAIN	SUB-DOMAIN	CHARACTERISTICS	PROPOSED STRATEGIES
TRIP CHARACTERISTICS	Origin	Work & Business	At least there are a number of pick up and drop off points in residential, hospitals, clinics and shopping complex
	Destination	Work & Business	
	Access mode choice	Drove or rode in car	Upgrade or provide convenient access such as paved pedestrian (if possible with cover) and provide adequate number of bus stop with cover.
		Bicycled	
		Walked	
	Egress mode choice	Drove or rode in car	
		Walked	
		Bus	
TRIP MAKER CHARACTERISTICS	Student's type	Secondary School	Cater more for demand from secondary school students
	Employment status	Full Time	Cater more for demand from school, office and factory
	Type of vehicle	Motorcycle	Service to focus at zone with high dependency on travel mode other than motorcycles
	Age	Less than 12 years old	Service to focus at zone with high young population and low income group
		31 to 40 years old	
		41 to 50 years old	
		More than 50 years old	
	Income	Less than RM 2000	
	Time leaving home	Between 5 am to 7 am	Higher bus frequency during these hours
		Between 9 am to 11 am	
		Between 7 pm to 9 pm	
		Between 9 pm to 11pm	
	Time return home	Between 1 pm to 3 pm	
	Weekday trip frequency	More than 5 times a week	These trip maker characteristics cannot be one of the leading characteristics
	Weekend trip frequency	Twice a week	

Table 5.7: The proposed strategies for zone C (continue)

TRANSPORTATION SYSTEM CHARACTERISTICS	Overall Satisfaction	Moderate	Can be improved to be satisfied
	Satisfaction- bus frequency	Moderate	
	Satisfaction- bus fare	Moderate	
	Satisfaction – safety and security	Moderate	
	Satisfaction – operating hours	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- captain helpfulness	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- captain driving skill	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- captain attire	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- officer helpfulness	Satisfied	Maintain service as status quo
	Satisfaction- officer friendly	Satisfied	
	Satisfaction- officer attire	Satisfied	
	Satisfaction- inspector help	Satisfied	
	Satisfaction- inspector polite	Moderate	Can be improved to be satisfied
	Satisfaction- inspector attire	Moderate	
	Satisfaction- bus appearance	Moderate	

Table 5.8: The proposed strategies for zone D

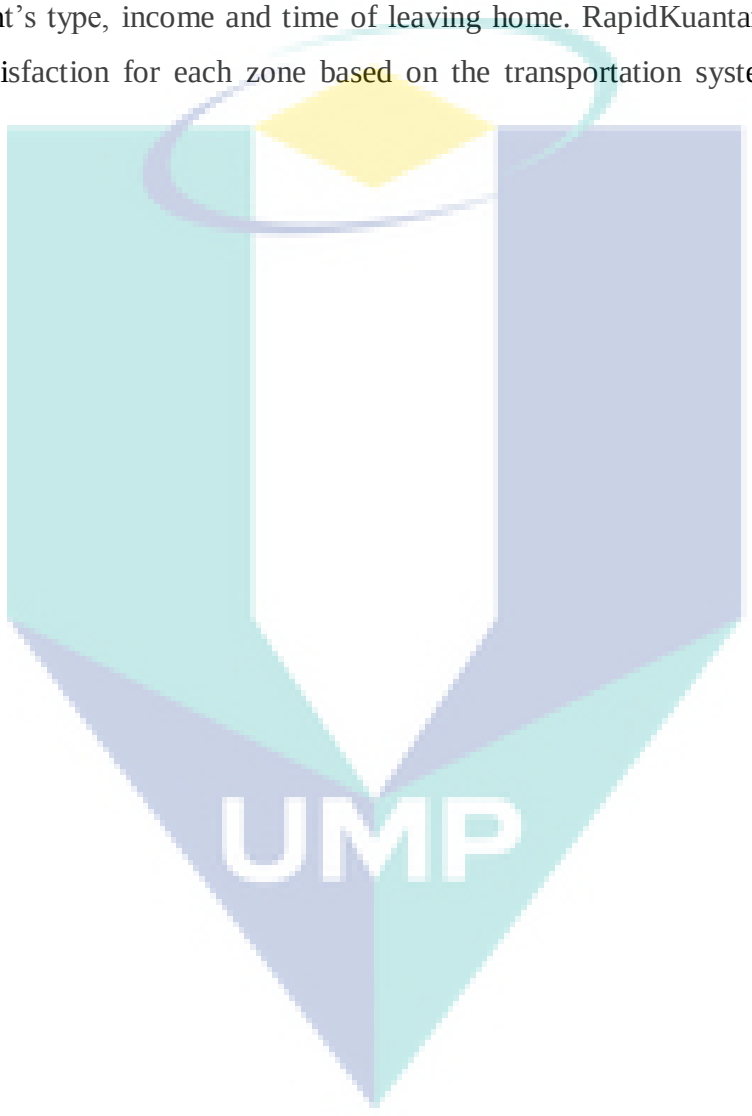
DOMAIN	SUB-DOMAIN	CHARACTERISTICS	PROPOSED STRATEGIES
TRIP CHARACTERISTICS	Origin	School	At least there are a number of pick up and drop off points in residential and school area
	Destination	School	
	Access mode choice	Walked	Upgrade or provide convenient access such as paved pedestrian (if possible with cover) and provide adequate number of bus stop with cover.
	Egress mode choice	Walked	
TRIP MAKER CHARACTERISTICS	Student's type	Collage	Cater more for demand from collages and university students
		University	
	Employment status	Unemployed	
	Type of vehicle	Motorcycle	Service to focus at zone with high dependency on travel mode other than motorcycles
	Age	13 to 20 years old	Service to focus at zone with high young population and low income group
	Income	RM 1000 to RM 2000	
	Time leaving home	Between 9 am to 11 am	Higher bus frequency during these hours
		Between 11 am to 1 pm	
		Between 3 pm to 5 pm	
		Between 5 pm to 7 pm	
	Time return home	Between 5 pm to 7 pm	
	Weekday trip frequency	Once a week	These trip maker characteristics cannot be one of the leading characteristics
		Once a while	
	Weekend trip frequency	Once a while	

Table 5.8: The proposed strategies for zone D (continue)

TRANSPORTATION SYSTEM CHARACTERISTICS	Overall Satisfaction	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- bus frequency	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- bus fare	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction – safety and security	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction – operating hours	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- captain helpfulness	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- captain driving skill	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- captain attire	Satisfied	Maintain service as status quo
		Moderate	Can be improved to be satisfied
	Satisfaction- officer helpfulness	Satisfied	Maintain service as status quo
	Satisfaction- officer friendly	Satisfied	
	Satisfaction- officer attire	Satisfied	
	Satisfaction- inspector help	Satisfied	
	Satisfaction- inspector polite	Satisfied	
	Satisfaction- inspector attire	Satisfied	
	Satisfaction- bus appearance	Moderate	Can be improved to be satisfied

5.4 SUMMARY

This chapter listed the leading characteristics and the improvement that should be taken by RapidKuantan and local authorities. In term of trip characteristics, most of the leading characteristics were origin and destination compared to access and egress mode while in term of trip maker characteristics, the most influential of sub domain were student's type, income and time of leaving home. RapidKuantan can identify the level of satisfaction for each zone based on the transportation system characteristics evaluation.



CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

Based on the first objective of this study, the leading characteristics for zone A (Pekan) were the passengers from/to home with most of them were secondary students. Most passengers from Pekan satisfied with the transportation system characteristics. The leading characteristics for zone B (Gambang) were from/to shopping and leisure activity with time of return between 11am to 1pm. Most of passengers from zone Gambang were University students. The leading characteristics for zone C (Sungai Lembing) were the passengers from/to work and business with income less than RM2000. Passengers from zone D (Teluk Cempedak) mostly were from/to school and using bus once a while during weekend.

Consequent to determination of leading characteristics for RapidKuantan bus passengers, the appropriate strategies were proposed as to match the leading characteristics in order to reap highest benefit to both passengers and bus operator.

6.1.1 Proposed strategies for Zone A

Based on result listed in Table 5.1 and Table 5.5, the proposed strategies for leading characteristics in zone A were increased pick up and drop off points in residential and cater more for demand from secondary schools and colleges. Figure 6.1 illustrated the location main residential areas that have been identified in zone A and Figure 6.2 highlights the secondary schools and colleges in Zone A.

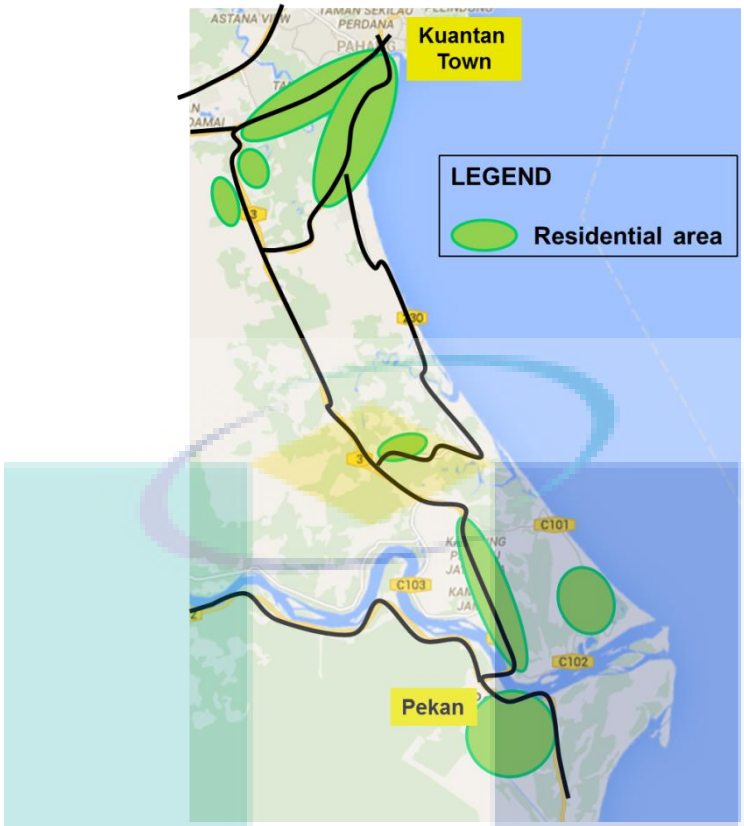


Figure 6.1: Residential area in zone A

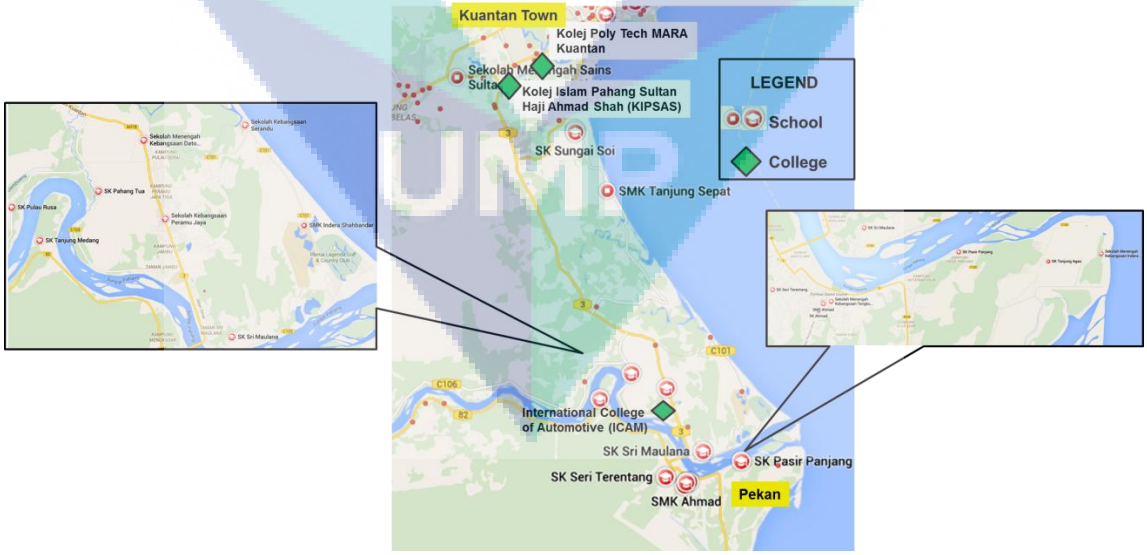


Figure 6.2: The secondary schools and colleges area in Zone A

6.1.2 Proposed strategies for Zone B

Refer to Table 5.2 and Table 5.6, it can be concluded that the proposed strategies for leading characteristics in zone B were increase the pick up and drop off points in main hospital, clinic and shopping complex. Figure 6.3 shows the location of the main attraction in zone B. Besides that, the result from this study also suggested that RapidKuantan should increase bus frequency between 11am until 1pm.

Figure 6.3: Location of the main attraction in zone B

6.1.3 Proposed strategies for Zone C

Previously in Table 5.3 and Table 5.7, the proposed strategies for leading characteristics in zone C were to increase pick up and drop off points in residential, hospitals, clinics and shopping complex area due to the majorities of bus passengers in zone C using buses for work and business. Figure 6.4 demonstrated the main attraction and destination in zone C. RapidKuantan should provide services that focus the low income group which was less than RM2000.

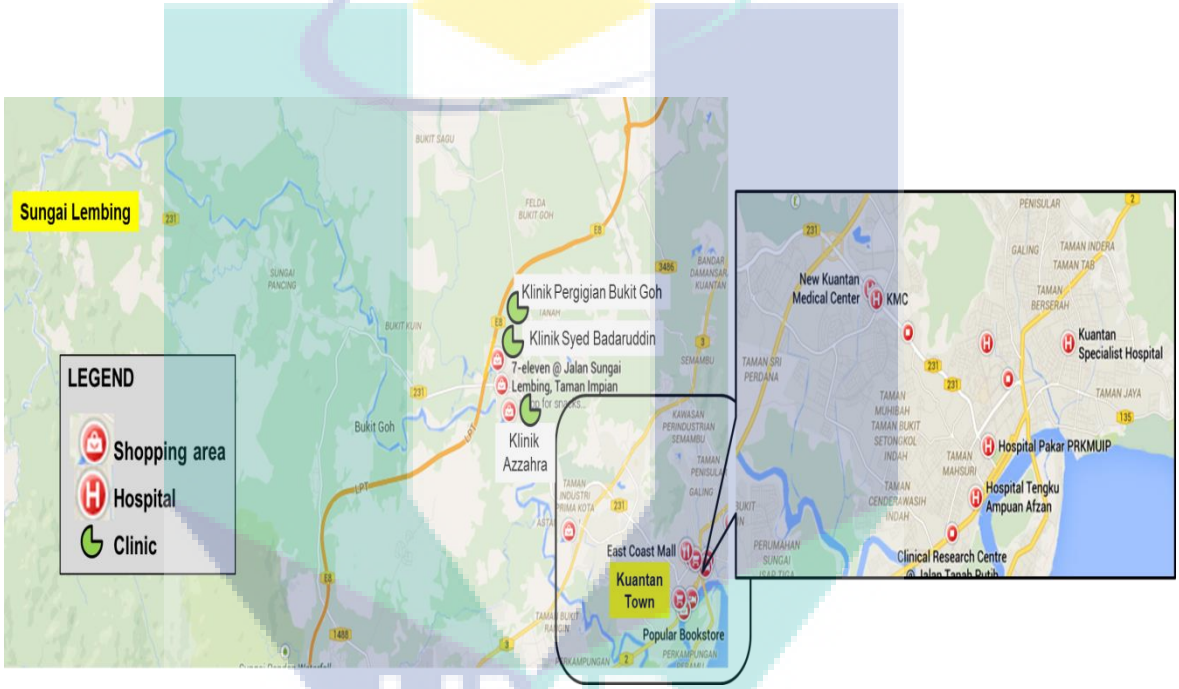


Figure 6.4: The location of main attraction and destination in zone C

6.1.4 Proposed strategies for Zone D

Based on result listed in Table 5.4 and Table 5.8, the proposed strategies for leading characteristics in zone D were increase the number of pick up and drop off points in residential and school area and cater more for demand from collages and university students. The main location was illustrated in Figure 6.5.

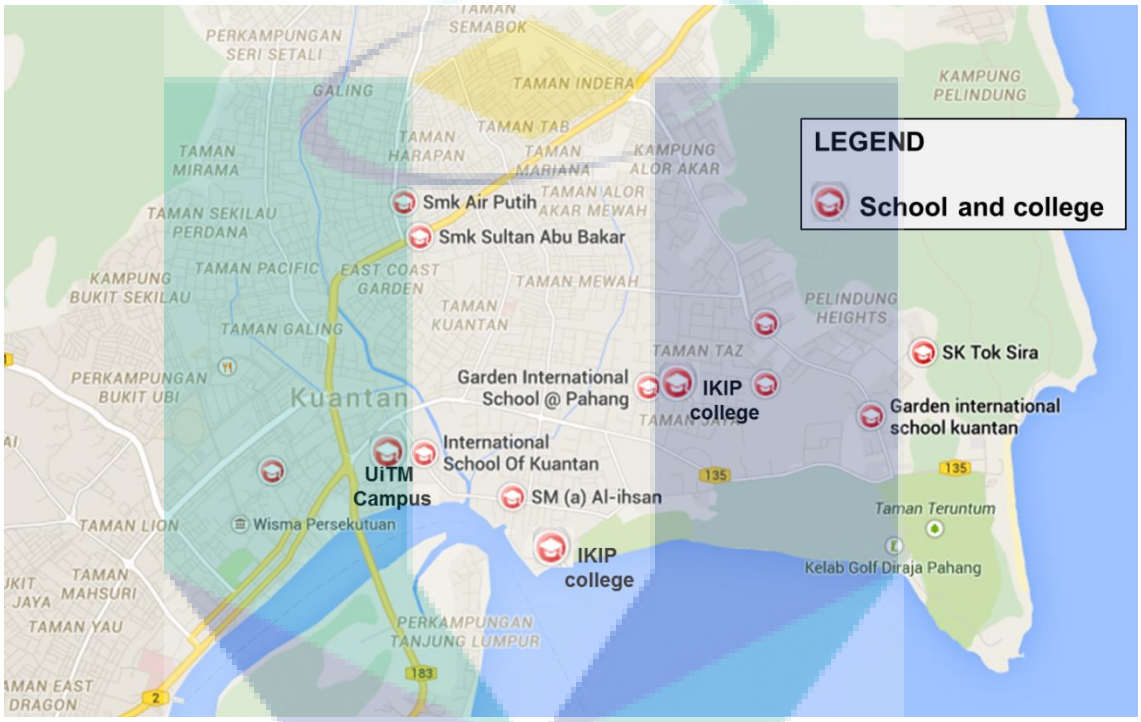


Figure 6.5: The location for school and college in zone D

6.2 RECOMMENDATIONS FOR FUTURE RESEARCH

For future research, it is suggested that data analysis should be conducted in two stages namely inbound and outbound. Inbound passengers is the bus passengers from the Kuantan town to outside town area while outbound passenger is bus passengers from outside town area go to Kuantan town area. The inbound and outbound data collection and analysis will clarify more on the origin and destination taken by bus passengers. The future study can focus on the study of origin and destination for inbound and outbound RapidKuantan bus passengers.

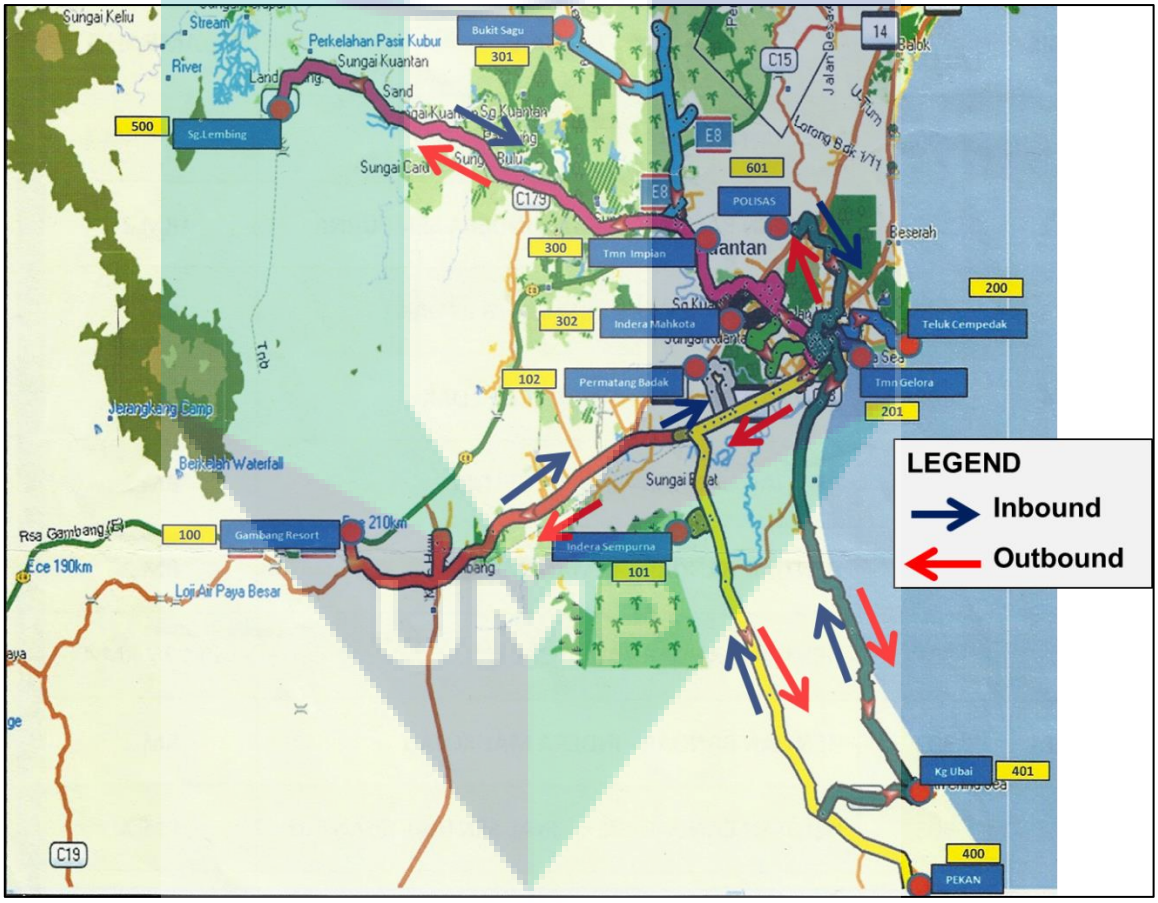


Figure 6.6: Location for inbound and outbound routes

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APPENDIX A

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APPENDIX B

QUESTIONNAIRE FORM

rapidKuantan by prasarana

Universiti Malaysia PAHANG

No. : 10200261

Name :.....

Mobile No. :.....

Location :.....

Bus User Survey

This survey is being carried out to help us to provide a better bus service for you. You may be surveyed on more than one bus. Please complete the questionnaire each time. ***Thank you***

1 Where were you coming from when you boarded RapidKuantan?
☐ Home ☐ Work ☐ Shopping ☐ Others (Specify).....
☐ School ☐ Medical appt ☐ Bussiness

2 a. Where did you board this bus?
☐ At pole (specify)..... ☐ At a bus stop (specify)..... ☐ Others (Specify).....

b. Where did you get off this bus?
☐ At pole (specify)..... ☐ At a bus stop (Specify)..... ☐ Others (Specify).....

3 a. Did you transfer from another bus to get to this bus?
☐ No if No, then how did you get to the transit station or bus stop?
☐ Drove or rode in a car ☐ Walked (Specify distance)
☐ Bicycled ☐ Others (Specify)
☐ Yes ..... if yes, where did you get on your previous bus?
☐ At pole (Specify)..... ☐ At a bus stop (Specify)..... ☐ Others (Specify).....

b. After getting off this bus, will you transfer to another bus?
☐ No .... if No, then how will you get to your destination after getting off this bus?
☐ Drove or rode in a car ☐ Walked (Specify distance).....
☐ Bicycled ☐ Others (Specify).....
☐ Yes ..... if yes, then you will transfer at:
☐ At pole (Specify)..... ☐ At a bus stop (Specify)..... ☐ Others (Specify).....

4 Where are you going?
☐ Home ☐ Work ☐ Shopping ☐ Others (Specify).....
☐ School ☐ Medical appt ☐ Bussiness

5 Are you a student?
☐ Yes .... if yes, then mark the apply below ☐ No
☐ Primary School ☐ Secondary School ☐ College ☐ University

6 What is your employment status?
☐ Full-time (Specify)..... ☐ Retired
☐ Part-time (Specify)..... ☐ Unemployed

7 Do you own a vehicle?
☐ Yes ..... if yes, mark the apply below ☐ No
☐ Bicycle ☐ Motorcycle ☐ Car ☐ Others (Specify).....

8 What is your age?
☐ < 12 ☐ 13 - 20 ☐ 21 - 30 ☐ 31 - 40 ☐ 41 - 50 ☐ > 50

9 What is your approximate monthly household income?
☐ Less than RM 1000 ☐ RM 1000 - RM 2000 ☐ RM 2000 - RM 3000 ☐ > RM 3000

10 What type of ticket do you use most frequently?
☐ Cash ☐ Cash (Consession Card-Pelajar) ☐ Cash (Consession Card-Warga Emas) ☐ Cash (Consession Card-OKU)

11 What time do you usually ride on the bus service to your destination, when LEAVING your house?
☐ 5 am - 7 am ☐ 9 am - 11 am ☐ 1 pm - 3 pm ☐ 5 pm - 7 pm ☐ 9 pm - 11 pm ☐ not using bus
☐ 7 am - 9am ☐ 11 am - 1 pm ☐ 3 pm - 5 pm ☐ 7 pm - 9 pm ☐ 11 pm - 12 am

12 What time do you usually RETURN home via the bus service?
☐ 5 am - 7 am ☐ 9 am - 11 am ☐ 1 pm - 3 pm ☐ 5 pm - 7 pm ☐ 9 pm - 11 pm ☐ not using bus
☐ 7 am - 9am ☐ 11 am - 1 pm ☐ 3 pm - 5 pm ☐ 7 pm - 9 pm ☐ 11 pm - 12 am

13 How many one way trip do you plan to take by bus TODAY?
☐ One way trip ☐ More than one (Specify)

14 What is your WEEKDAYS trip frequency?
☐ Once a week ☐ 4 times a week ☐ Once a while
☐ Twice a week ☐ > 5 times a week ☐ Never

15 What is your WEEKEND trip frequency?
☐ Once a week ☐ Twice a week ☐ Once a while ☐ Never

16 Compared to the service before RapidKuantan, has your ridership
☐ Decreased ☐ Increased ☐ Did not ride at all ☐ Stay about the same

17 If three improvement could be made to RapidKuantan service in general, which of the following would you choose?
(Please list in order of important 1,2,3 and select only three)

☐ Service on the new area
☐ Fewer transfers
☐ Lower price fares
☐ Earlier service
☐ More express routes
☐ More shelters
☐ Safer transit stations
☐ Less travel time
☐ Print individual bus schedule
☐ More frequent weekend service
☐ More frequent weekday service
☐ Fewer road and schedule changes
☐ Improve comfort level of the seats
☐ Improve the punctuality of the bus
☐ Later service on weekday evenings (midnight departure)
☐ Later service on weekend evenings (midnight departure)
☐ Regulate the temperature of the air condition in the bus
☐ Add more seating at the bus hub / Hentian Bandar
☐ More information at bus stop
☐ Others (Specify).....

18 How long have you ridden RapidKuantan buses?
☐ Less than 1 month ☐ 1 to 6 months ☐ 7 to 12 months

19 What are the three main reasons you ride the bus?
(Please list in order of important 1,2,3 and select only three)
☐ No parking available
☐ Service easy to understand
☐ Friendly drivers
☐ It's comfortable
☐ No other transportation
☐ Low cost
☐ Concern for the environment
☐ My employer pay my bus fare
☐ It's safe
☐ It's quick
☐ It's reliable
☐ Others (Specify).....

20 Which of the following have you used in the past month for RapidKuantan information?
☐ None
☐ RapidKuantan hotline
☐ Newspaper
☐ Advertisement, radio and TV
☐ Information displays at transit station
☐ Poster on the bus
☐ Rapid Kuantan system map
☐ Bus driver
☐ Friend/ relative
☐ Information display at bus stop
☐ Others (Specify).....

21 How useful is RapidKuantan information about routes schedule, fares and special services?
(Please mark the appropriate box for each type of information)

	Very usefull	Moderately useful	Not useful	No opinion
Bus stop information display	☐	☐	☐	☐
RapidKuantan Customer Service	☐	☐	☐	☐
RapidKuantan Hotline	☐	☐	☐	☐
Poster on the bus	☐	☐	☐	☐
RapidKuantan System Map	☐	☐	☐	☐
Bus Driver	☐	☐	☐	☐
Transit Station	☐	☐	☐	☐
Information Display	☐	☐	☐	☐
Newspaper advertisement, radio and TV	☐	☐	☐	☐
Others (Specify)	☐	☐	☐	☐

22 How would your satiffaction about RapidKuantan's bus service?

	Satisfied	Neutral	Dissatisfied
a. Overall	☐	☐	☐
b. Bus frequency	☐	☐	☐
c. Bus fare	☐	☐	☐
d. Safety and security in the bus	☐	☐	☐
e. Operating hours	☐	☐	☐
f. **Captain**			
Helpfulness	☐	☐	☐
Driving Skills	☐	☐	☐
Attire (Uniform)	☐	☐	☐
g. **RapidKuantan's Officer**			
Helpfulness	☐	☐	☐
Customer Friendly	☐	☐	☐
Attire (Uniform)	☐	☐	☐
h. **Inspector**			
Helpfulness	☐	☐	☐
Politeness	☐	☐	☐
Attire (Uniform)	☐	☐	☐
i. Physical pppearance of the bus	☐	☐	☐

23 Do you agree that this service is value for money and worth the fare that you are paying?
☐ Yes ☐ No (Specify).....

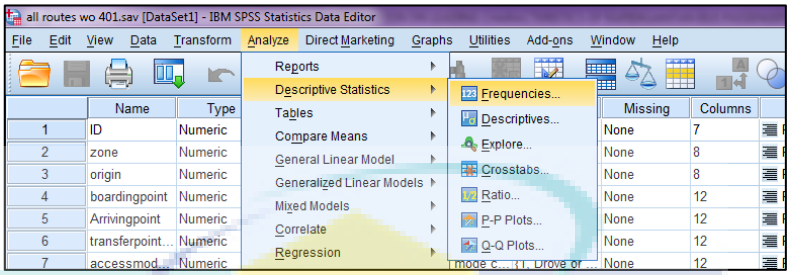
24 How likely are you to continue using RapidKuantan's bus service in the future?
☐ Yes ☐ No (Specify).....

25 How likely will you recommend others to use RapidKuantan's bus service?
☐ Yes ☐ No (Specify).....

APPENDIX C

DESCRIPTIVE ANALYSIS

To perform descriptive statistics test, click analyse – descriptive statistics – frequency



Zone

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pekan	520	28.9	38.8	38.8
	Gambang	370	20.5	27.6	66.4
	Sungai Lembing	290	16.1	21.6	88.1
	Teluk Cempedak	160	8.9	11.9	100.0
	Total	1340	74.4	100.0	
Missing	System	462	25.6		
Total		1802	100.0		

origin recode

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Home	563	31.2	42.0	42.0
	School	258	14.3	19.3	61.3
	Work & Business	187	10.4	14.0	75.2
	Medical appt & others	40	2.2	3.0	78.2
	Shopping	292	16.2	21.8	100.0
	Total	1340	74.4	100.0	
Missing	System	462	25.6		
Total		1802	100.0		

Destination recode

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Home	504	28.0	38.2	38.2
	School	115	6.4	8.7	46.9
	Work & Business	181	10.0	13.7	60.6
	Medical appt & others	37	2.1	2.8	63.4
	Shopping	483	26.8	36.6	100.0
	Total	1320	73.3	100.0	
Missing	System	482	26.7		
Total		1802	100.0		

Access mode choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Drove or rode in a car	112	6.2	8.4	8.4
	Bicycled	16	.9	1.2	9.6
	Walked	1059	58.8	79.0	88.6
	Others	3	.2	.2	88.8
	bus	150	8.3	11.2	100.0
	Total	1340	74.4	100.0	
Missing	System	462	25.6		
Total		1802	100.0		

Egress from bus service

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Drove or rode in a car	97	5.4	7.2	7.2
	Bicycled	7	.4	.5	7.8
	Walked	1088	60.4	81.3	89.1
	Others	2	.1	.1	89.2
	Bus	144	8.0	10.8	100.0
	Total	1338	74.3	100.0	
Missing	System	464	25.7		
Total		1802	100.0		

Student's type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary school	27	1.5	3.4	3.4
	Secondary school	279	15.5	34.9	38.3
	College	216	12.0	27.0	65.3
	University	277	15.4	34.7	100.0
	Total	799	44.3	100.0	
Missing	System	1003	55.7		
Total		1802	100.0		

Employment status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full time	371	20.6	28.7	28.7
	Part time	101	5.6	7.8	36.6
	Retired	38	2.1	2.9	39.5
	Unemployed	781	43.3	60.5	100.0
	Total	1291	71.6	100.0	
Missing	System	511	28.4		
Total		1802	100.0		

Type of vehicle

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bicycle	58	3.2	12.0	12.0
	Motorcycle	281	15.6	57.9	69.9
	Car	142	7.9	29.3	99.2
	Others	4	.2	.8	100.0
	Total	485	26.9	100.0	
Missing	System	1317	73.1		
Total		1802	100.0		

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 12 years old	23	1.3	1.8	1.8
	13 - 20 years old	580	32.2	44.8	46.6
	21-30 years old	450	25.0	34.7	81.3
	31-40 years old	107	5.9	8.3	89.6
	41-50 years old	74	4.1	5.7	95.3
	More than 50 years old	61	3.4	4.7	100.0
	Total	1295	71.9	100.0	
Missing	System	507	28.1		
Total		1802	100.0		

Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than RM1000	723	40.1	57.1	57.1
	RM1000 - RM2000	427	23.7	33.7	90.8
	RM2000 - RM3000	89	4.9	7.0	97.9
	More than RM3000	27	1.5	2.1	100.0
	Total	1266	70.3	100.0	
Missing	System	536	29.7		
Total		1802	100.0		

Time leaving from home

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5.00am - 7.00am	111	6.2	8.4	8.4
	7.00am - 9.00am	125	6.9	9.5	17.9
	9.00am - 11.00am	600	33.3	45.6	63.6
	11.00am - 1.00pm	113	6.3	8.6	72.2
	1.00pm - 3.00pm	221	12.3	16.8	89.0
	3.00pm - 5.00pm	67	3.7	5.1	94.1
	5.00pm - 7.00pm	32	1.8	2.4	96.5

	7.00pm - 9.00pm	5	.3	.4	96.9
	9.00pm - 11.00pm	11	.6	.8	97.7
	11.00pm - 12.00pm	1	.1	.1	97.8
	Not using bus	29	1.6	2.2	100.0
	Total	1315	73.0	100.0	
Missing	System	487	27.0		
Total		1802	100.0		

Time of return to home

		Frequency	Percent	Valid Percent	Cumulative Percent
	7.00am - 9.00am	2	.1	.2	.2
	9.00am - 11.00am	4	.2	.3	.5
	11.00am - 1.00pm	9	.5	.7	1.1
	1.00pm - 3.00pm	101	5.6	7.7	8.8
	3.00pm - 5.00pm	286	15.9	21.8	30.6
Valid	5.00pm - 7.00pm	435	24.1	33.2	63.8
	7.00pm - 9.00pm	264	14.7	20.1	83.9
	9.00pm - 11.00pm	126	7.0	9.6	93.5
	11.00pm - 12.00pm	48	2.7	3.7	97.2
	Not using bus	37	2.1	2.8	100.0
	Total	1312	72.8	100.0	
Missing	System	490	27.2		
Total		1802	100.0		

Weekday trip frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
	Once a week	368	20.4	27.7	27.7
	Twice a week	171	9.5	12.9	40.6
	4 times a week	181	10.0	13.6	54.3
Valid	more than 5 times a week	160	8.9	12.1	66.3
	once a while	397	22.0	29.9	96.2
	Never	50	2.8	3.8	100.0
	Total	1327	73.6	100.0	
Missing	System	475	26.4		
Total		1802	100.0		

Weekend trip frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
	Once a week	421	23.4	32.0	32.0
	Twice a week	269	14.9	20.5	52.5
Valid	Once a while	523	29.0	39.8	92.3
	Never	101	5.6	7.7	100.0
	Total	1314	72.9	100.0	
Missing	System	488	27.1		
Total		1802	100.0		

OVERALL satisfaction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	728	40.4	55.4	55.4
	Moderate	577	32.0	43.9	99.4
	Dissatisfied	8	.4	.6	100.0
	Total	1313	72.9	100.0	
Missing	System	489	27.1		
Total		1802	100.0		

satisfaction- Bus frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	613	34.0	47.1	47.1
	Moderate	637	35.3	48.9	96.0
	Dissatisfied	52	2.9	4.0	100.0
	Total	1302	72.3	100.0	
Missing	System	500	27.7		
Total		1802	100.0		

satisfaction- Bus fare

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	629	34.9	48.2	48.2
	Moderate	617	34.2	47.3	95.5
	Dissatisfied	59	3.3	4.5	100.0
	Total	1305	72.4	100.0	
Missing	System	497	27.6		
Total		1802	100.0		

satisfaction- Safety and security

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	666	37.0	51.0	51.0
	Moderate	611	33.9	46.8	97.8
	Dissatisfied	29	1.6	2.2	100.0
	Total	1306	72.5	100.0	
Missing	System	496	27.5		
Total		1802	100.0		

satisfaction- Operating hours

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	638	35.4	48.9	48.9
	Moderate	620	34.4	47.5	96.3
	Dissatisfied	48	2.7	3.7	100.0
	Total	1306	72.5	100.0	
Missing	System	496	27.5		
Total		1802	100.0		

satisfaction- Captain Helpfulness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	680	37.7	52.2	52.2
	Moderate	599	33.2	46.0	98.2
	Dissatisfied	24	1.3	1.8	100.0
	Total	1303	72.3	100.0	
Missing	System	499	27.7		
Total		1802	100.0		

satisfaction- Captain Driving Skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	681	37.8	52.1	52.1
	Moderate	605	33.6	46.3	98.3
	Dissatisfied	22	1.2	1.7	100.0
	Total	1308	72.6	100.0	
Missing	System	494	27.4		
Total		1802	100.0		

satisfaction- Captain Attire (Uniform)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	702	39.0	53.9	53.9
	Moderate	586	32.5	45.0	98.8
	Dissatisfied	15	.8	1.2	100.0
	Total	1303	72.3	100.0	
Missing	System	499	27.7		
Total		1802	100.0		

satisfaction- Officer Helpfulness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	617	34.2	47.5	47.5
	Moderate	660	36.6	50.8	98.4
	Dissatisfied	21	1.2	1.6	100.0
	Total	1298	72.0	100.0	
Missing	System	504	28.0		
Total		1802	100.0		

satisfaction- OfficerCustomer Friendly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	627	34.8	48.2	48.2
	Moderate	647	35.9	49.7	97.8
	Dissatisfied	28	1.6	2.2	100.0
	Total	1302	72.3	100.0	
Missing	System	500	27.7		
Total		1802	100.0		

satisfaction- Officer Attire (Uniform)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	642	35.6	49.3	49.3
	Moderate	638	35.4	49.0	98.3
	Dissatisfied	22	1.2	1.7	100.0
	Total	1302	72.3	100.0	
Missing	System	500	27.7		
Total		1802	100.0		

satisfaction- Inspector Helpfulness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	634	35.2	48.8	48.8
	Moderate	640	35.5	49.2	98.0
	Dissatisfied	26	1.4	2.0	100.0
	Total	1300	72.1	100.0	
Missing	System	502	27.9		
Total		1802	100.0		

satisfaction- Inspector Politeness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	632	35.1	48.5	48.5
	Moderate	641	35.6	49.2	97.8
	Dissatisfied	29	1.6	2.2	100.0
	Total	1302	72.3	100.0	
Missing	System	500	27.7		
Total		1802	100.0		

satisfaction-Inspector Attire (Uniform)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	644	35.7	49.6	49.6
	Moderate	632	35.1	48.7	98.2
	Dissatisfied	23	1.3	1.8	100.0
	Total	1299	72.1	100.0	
Missing	System	503	27.9		
Total		1802	100.0		

satisfaction- Physical apppearance of the bus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	756	42.0	59.5	59.5
	Moderate	501	27.8	39.4	98.9
	Dissatisfied	14	.8	1.1	100.0
	Total	1271	70.5	100.0	
Missing	System	531	29.5		
Total		1802	100.0		

Value for money

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1215	67.4	92.5	92.5
	no	98	5.4	7.5	100.0
	Total	1313	72.9	100.0	
Missing	System	489	27.1		
Total		1802	100.0		

Continue using bus

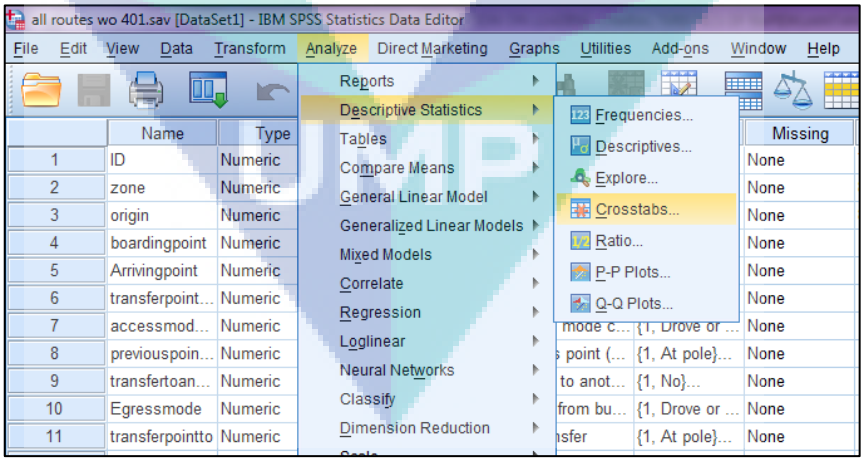
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1277	70.9	97.6	97.6
	no	32	1.8	2.4	100.0
	Total	1309	72.6	100.0	
Missing	System	493	27.4		
Total		1802	100.0		

Recommendation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1242	68.9	94.7	94.7
	no	70	3.9	5.3	100.0
	Total	1312	72.8	100.0	
Missing	System	490	27.2		
Total		1802	100.0		

NOTES

Cross tab was important to determine if two variables were related or not. To run cross tab, click analyse – descriptive statistics – cross tab.



APPENDIX D

CORRESPONDENCE ANALYSIS FOR TRANSPORTATION SYSTEM CHARACTERISTICS

OVERALL SATISFACTION AND ZONE

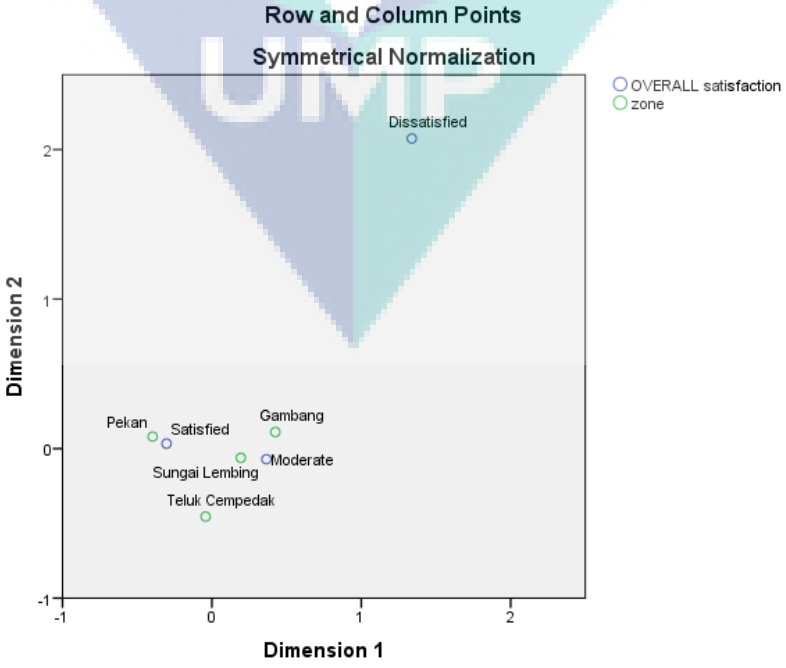
Correspondence Table

Overall satisfaction	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	322	177	151	78	728
Moderate	193	184	137	63	577
Dissatisfied	2	4	2	0	8
Active Margin	517	365	290	141	1313

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.121	.015			.945	.945	.027	.037
2	.029	.001			.055	1.000	.015	
Total		.015	20.219	.003[a]	1.000	1.000		

a. 6 degrees of freedom



BUS FREQUENCY AND ZONE

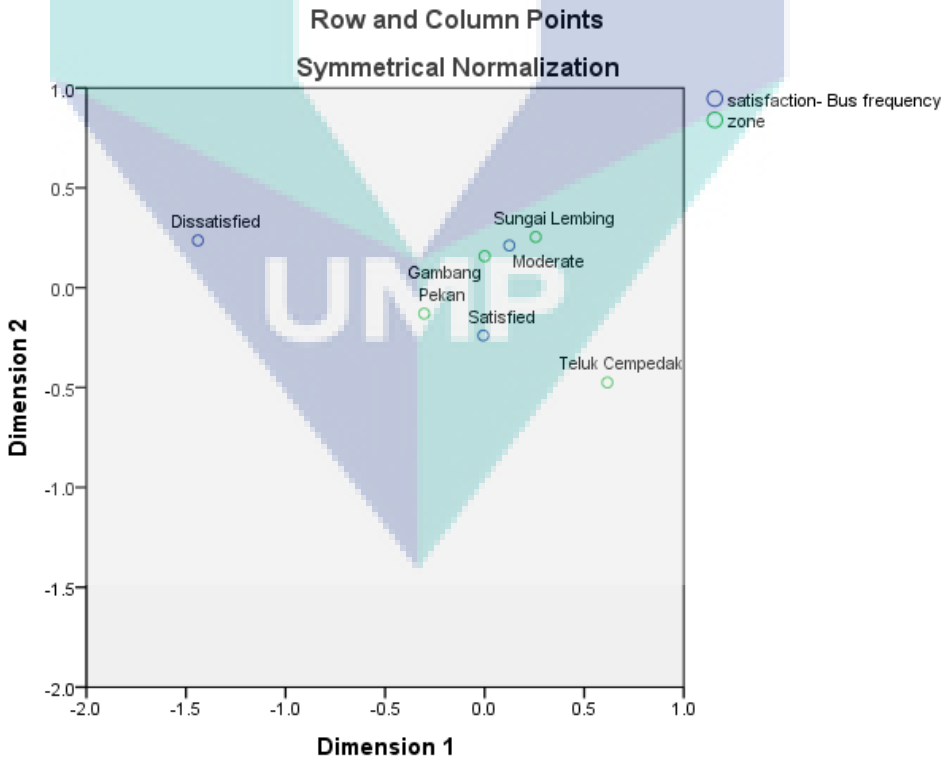
Correspondence Table

satisfaction- Bus frequency	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	251	164	128	70	613
Moderate	236	183	154	64	637
Dissatisfied	29	15	8	0	52
Active Margin	516	362	290	134	1302

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.090	.008			.758	.758	.021	-.136
2	.051	.003			.242	1.000	.028	
Total		.011	14.038	.029[a]	1.000	1.000		

a. 6 degrees of freedom



BUS FARE AND ZONE

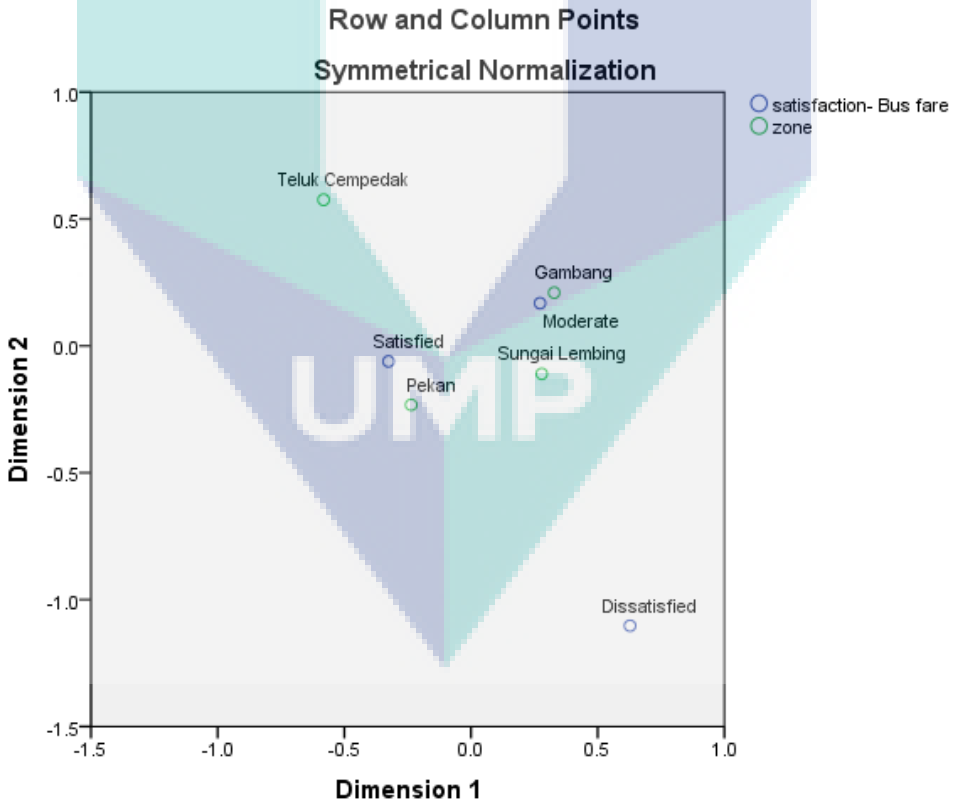
Correspondence Table

satisfaction- Bus fare	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	273	154	128	74	629
Moderate	220	193	145	59	617
Dissatisfied	26	16	17	0	59
Active Margin	519	363	290	133	1305

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.104	.011			.687	.687	.027	-.229
2	.070	.005			.313	1.000	.021	
Total		.016	20.550	.002[a]	1.000	1.000		

a. 6 degrees of freedom



SAFETY AND SECURITY AND ZONE

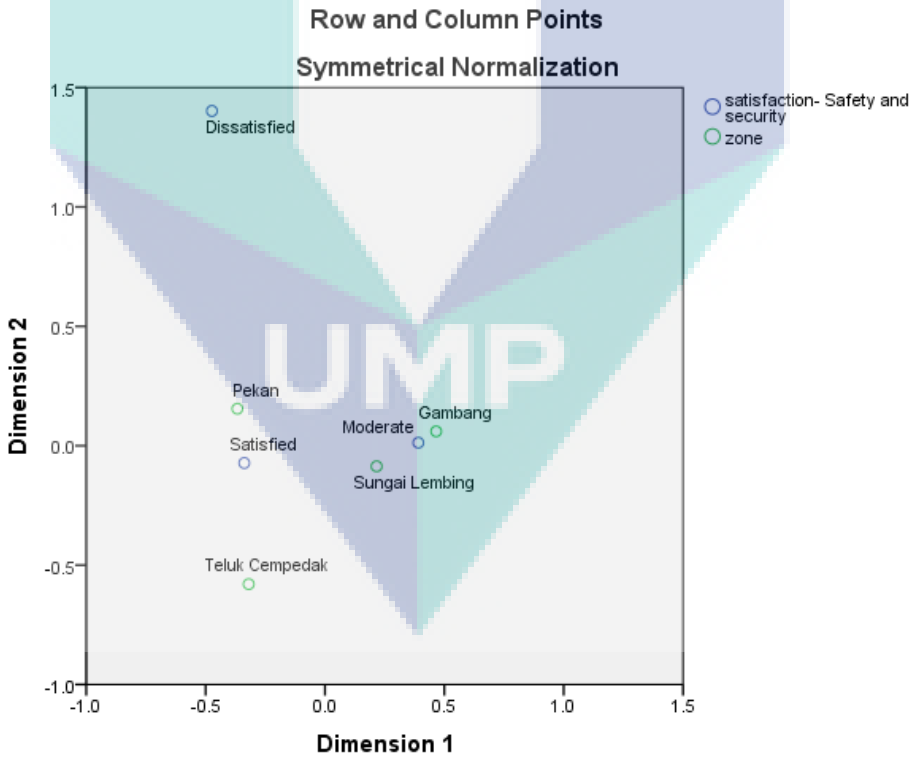
Correspondence Table

satisfaction- Safety and security	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	294	156	138	78	666
Moderate	208	202	147	54	611
Dissatisfied	16	7	5	1	29
Active Margin	518	365	290	133	1306

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.135	.018			.894	.894	.027	.057
2	.046	.002			.106	1.000	.020	
Total		.020	26.574	.000[a]	1.000	1.000		

a. 6 degrees of freedom



OPERATING HOURS AND ZONE

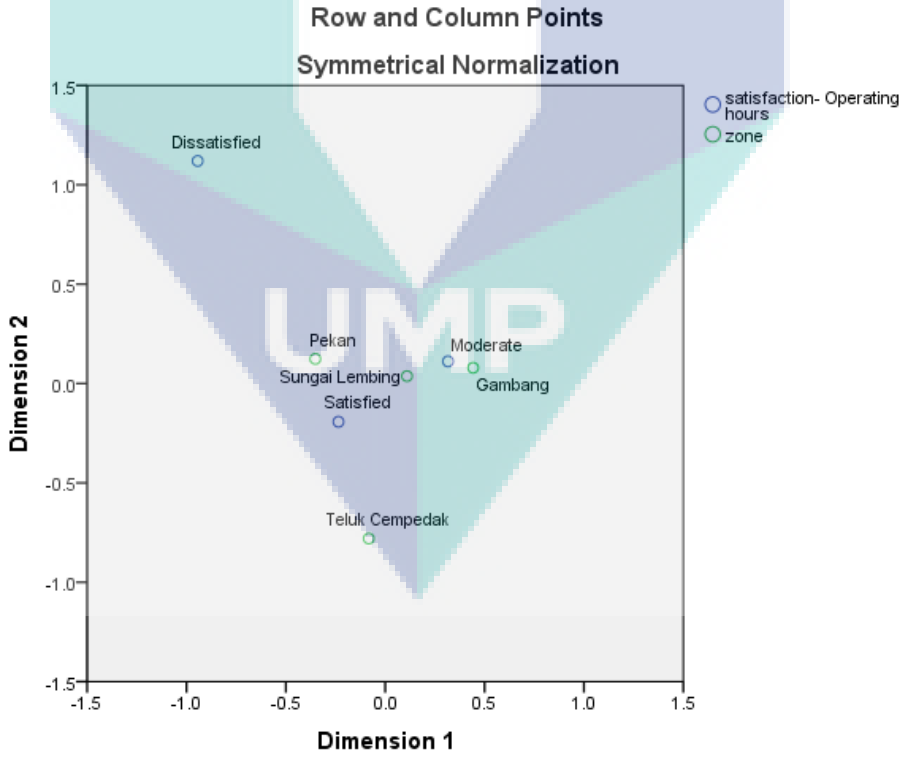
Correspondence Table

satisfaction- Operating hours	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	268	157	137	76	638
Moderate	222	199	143	56	620
Dissatisfied	28	9	10	1	48
Active Margin	518	365	290	133	1306

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.107	.011			.700	.700	.027	.082
2	.070	.005			.300	1.000	.020	
Total		.016	21.417	.002[a]	1.000	1.000		

a. 6 degrees of freedom



CAPTAIN HELFULNESS AND ZONE

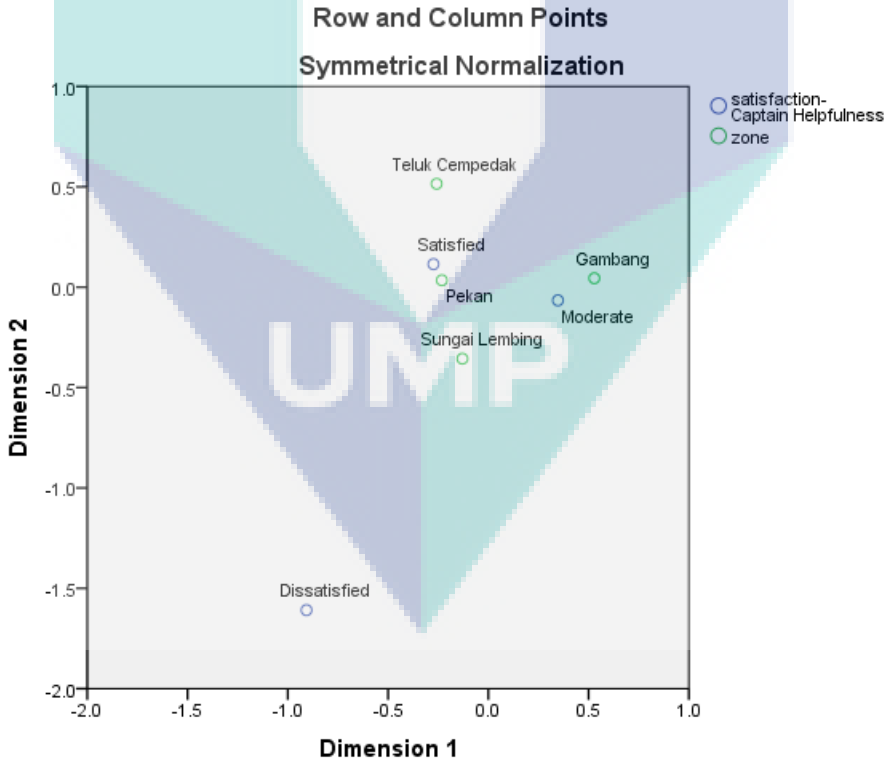
Correspondence Table

satisfaction-Captain Helpfulness	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	288	163	150	79	680
Moderate	218	197	130	54	599
Dissatisfied	11	3	9	1	24
Active Margin	517	363	289	134	1303

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.110	.012			.790	.790	.027	.023
2	.057	.003			.210	1.000	.027	
Total		.015	19.838	.003[a]	1.000	1.000		

a. 6 degrees of freedom



CAPTAIN DRIVING SKILLS AND ZONE

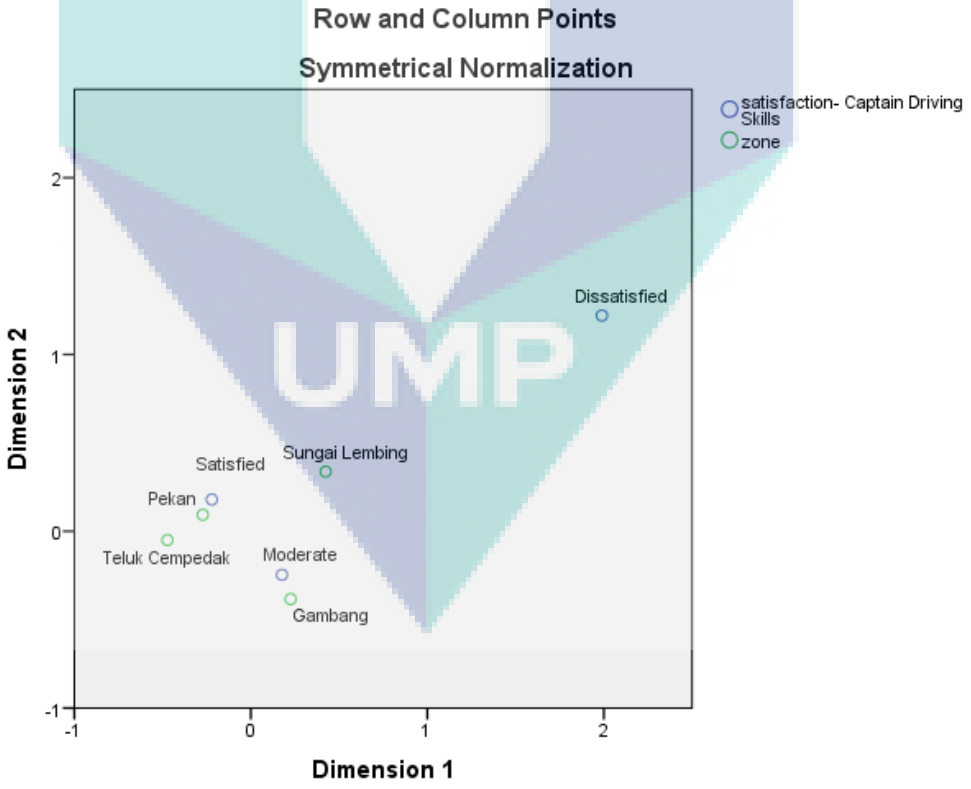
Correspondence Table

satisfaction- Captain Driving Skills	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	291	167	146	77	681
Moderate	223	191	133	58	605
Dissatisfied	5	6	11	0	22
Active Margin	519	364	290	135	1308

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.106	.011			.698	.698	.026	.160
2	.070	.005			.302	1.000	.029	
Total		.016	21.212	.002[a]	1.000	1.000		

a. 6 degrees of freedom



CAPTAIN ATTIRE (UNIFORM) AND ZONE

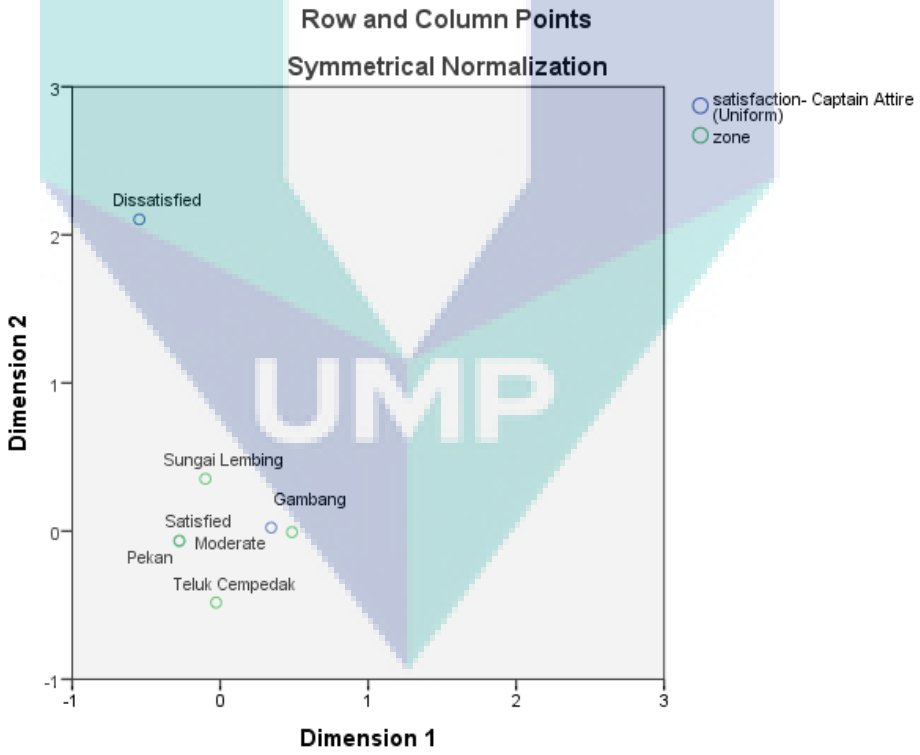
Correspondence Table

satisfaction- Captain Attire (Uniform)	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	301	169	157	75	702
Moderate	210	190	127	59	586
Dissatisfied	6	3	6	0	15
Active Margin	517	362	290	134	1303

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.098	.010			.770	.770	.028	.011
2	.053	.003			.230	1.000	.025	
Total		.012	16.230	.013[a]	1.000	1.000		

a. 6 degrees of freedom



OFFICER HELPFULNESS AND ZONE

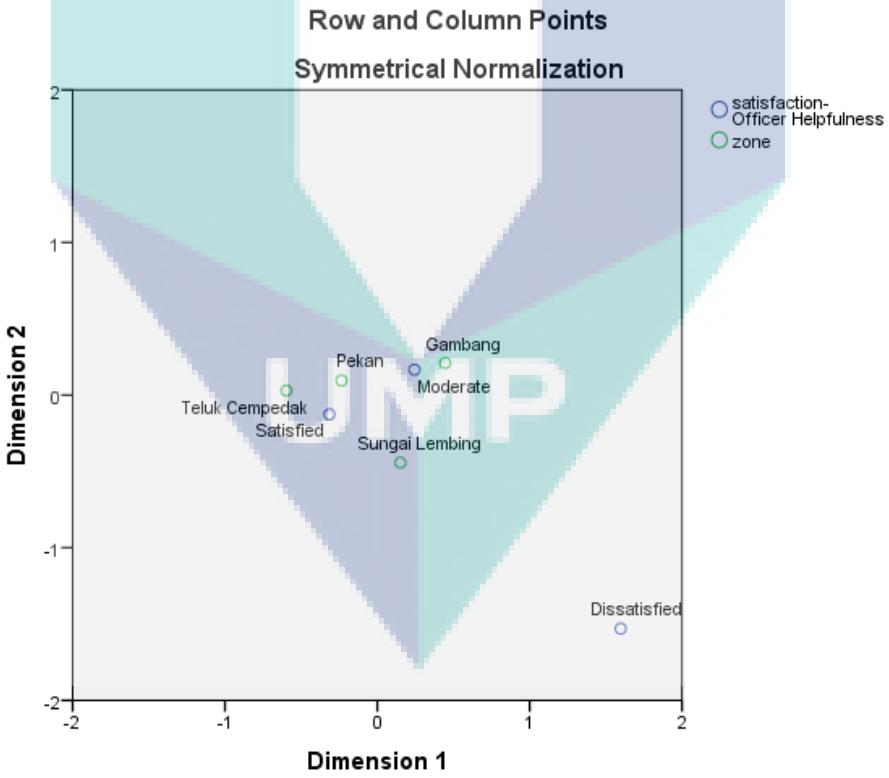
Correspondence Table

satisfaction-Officer Helpfulness	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	261	141	139	76	617
Moderate	252	207	142	59	660
Dissatisfied	4	8	9	0	21
Active Margin	517	356	290	135	1298

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.119	.014			.798	.798	.025	-.082
2	.060	.004			.202	1.000	.033	
Total		.018	22.868	.001[a]	1.000	1.000		

a. 6 degrees of freedom



OFFICER CUSTOMER FRIENDLY AND ZONE

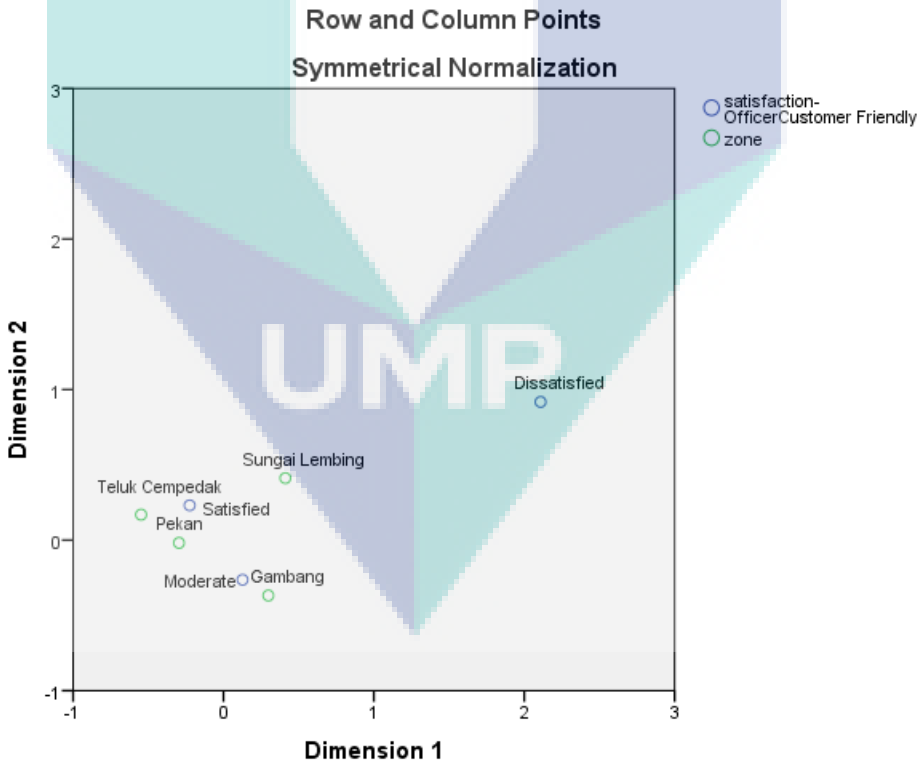
Correspondence Table

satisfaction-OfficerCustomer Friendly	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	265	147	140	75	627
Moderate	249	203	136	59	647
Dissatisfied	4	10	14	0	28
Active Margin	518	360	290	134	1302

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.128	.016			.728	.728	.023	.147
2	.078	.006			.272	1.000	.030	
Total		.023	29.303	.000[a]	1.000	1.000		

a. 6 degrees of freedom



OFFICER ATTIRE (UNIFORM) AND ZONE

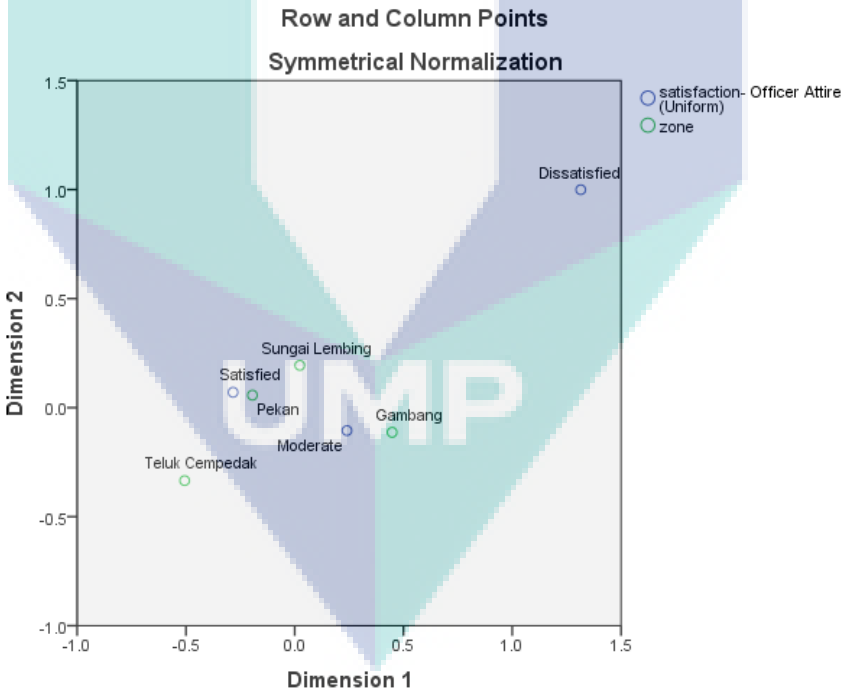
Correspondence Table

satisfaction- Officer Attire (Uniform)	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	270	154	144	74	642
Moderate	240	198	140	60	638
Dissatisfied	7	9	6	0	22
Active Margin	517	361	290	134	1302

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.097	.009			.939	.939	.027	-.281
2	.025	.001			.061	1.000	.024	
Total		.010	13.061	.042[a]	1.000	1.000		

a. 6 degrees of freedom



INSPECTOR HELPFULNESS AND ZONE

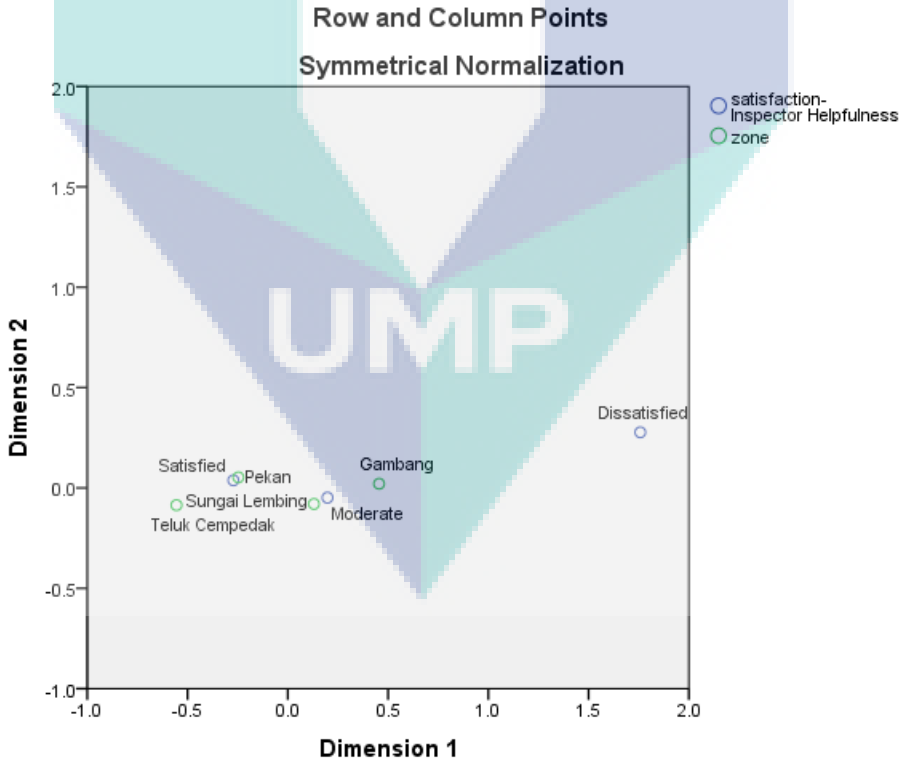
Correspondence Table

satisfaction-Inspector Helpfulness	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	269	154	136	75	634
Moderate	241	193	147	59	640
Dissatisfied	6	13	7	0	26
Active Margin	516	360	290	134	1300

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.117	.014			.999	.999	.026	-.037
2	.003	.000			.001	1.000	.026	
Total		.014	17.821	.007[a]	1.000	1.000		

a. 6 degrees of freedom



INSPECTOR POLITENESS AND ZONE

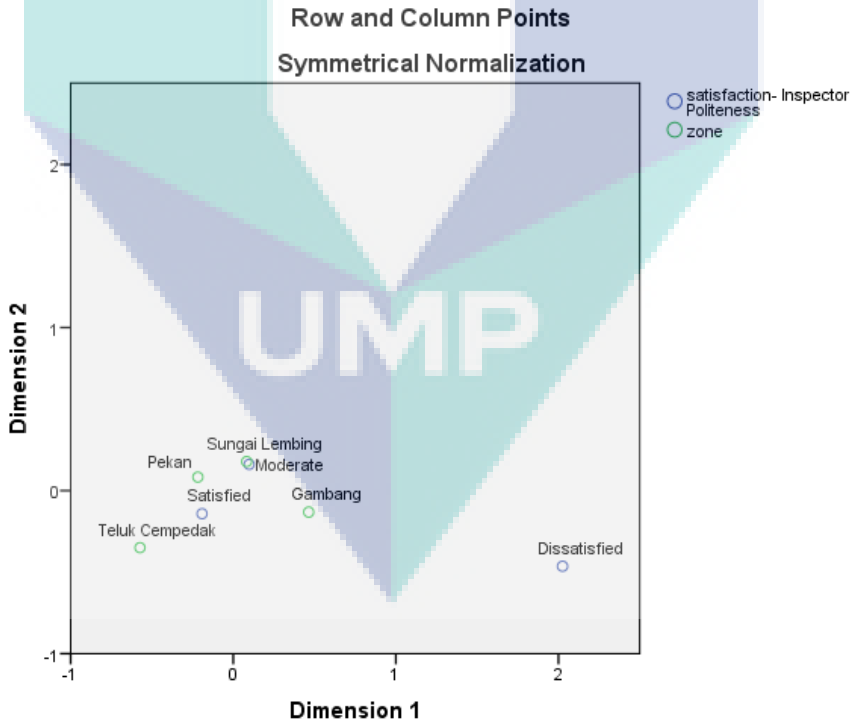
Correspondence Table

satisfaction- Inspector Politeness	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	259	162	135	76	632
Moderate	253	181	148	59	641
Dissatisfied	6	16	7	0	29
Active Margin	518	359	290	135	1302

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.114	.013			.946	.946	.025	.252
2	.027	.001			.054	1.000	.027	
Total		.014	17.869	.007[a]	1.000	1.000		

a. 6 degrees of freedom



INSPECTOR ATTIRE AND ZONE

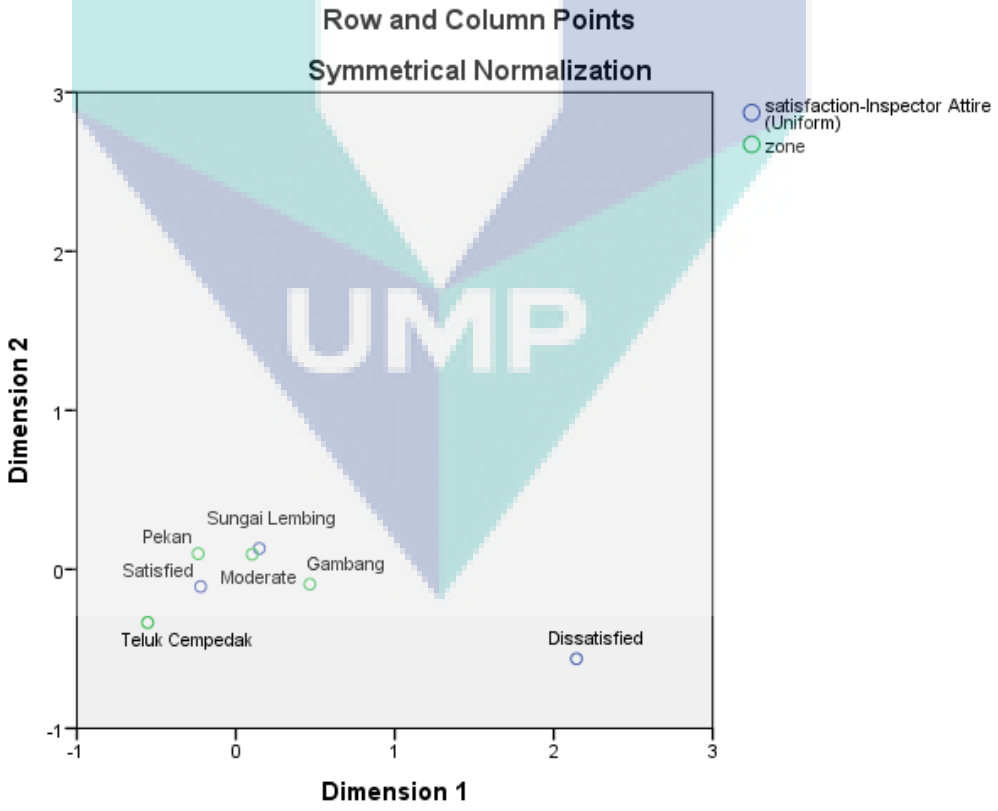
Correspondence Table

satisfaction-Inspector Attire (Uniform)	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	267	161	139	77	644
Moderate	246	184	145	57	632
Dissatisfied	4	13	6	0	23
Active Margin	517	358	290	134	1299

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.116	.014			.972	.972	.025	.275
2	.020	.000			.028	1.000	.025	
Total		.014	18.051	.006[a]	1.000	1.000		

a. 6 degrees of freedom



PHYSICAL APPEARANCE OF THE BUS AND ZONE

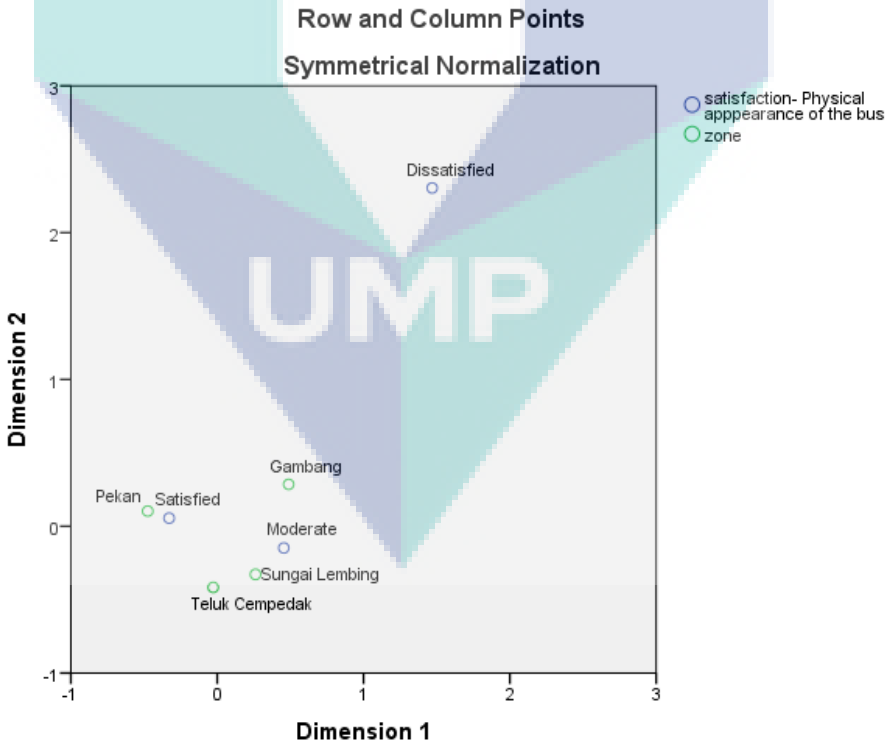
Correspondence Table

satisfaction- Physical appearance of the bus	zone				
	Pekan	Gambang	Sungai Lembing	Teluk Cempedak	Active Margin
Satisfied	349	175	154	78	756
Moderate	153	160	133	55	501
Dissatisfied	3	9	2	0	14
Active Margin	505	344	289	133	1271

Summary

Dimension	Singular Value	Inertia	Chi Square	Sig.	Proportion of Inertia		Confidence Singular Value	
					Accounted for	Cumulative	Standard Deviation	Correlation 2
1	.170	.029			.859	.859	.027	.121
2	.069	.005			.141	1.000	.025	
Total		.034	42.660	.000[a]	1.000	1.000		

a. 6 degrees of freedom



APPENDIX E

SCALE FOR LEADING CHARACTERISTICS

Scala
2cm = 0.5

Sub Domain	Charateristics	Measured	Converted	Plotted	Scale 1 2 3 4 5 6 7 8 9
TC					
Origin	Pekan Home	0.2	0.1	1	
	Gambang Shopping	0.9	0.2	2	
	SL Work & B	0.6	0.2	2	
	SL others	1.5	0.4	4	
	TC School	0.8	0.2	2	
Destination	Pekan Home	0.4	0.1	1	
	Gambang Shopping	0.8	0.2	2	
	SL Work & B	0.5	0.1	1	
	SL others	3.2	0.9	9	
	TC School	1.6	0.5	5	
Access mode	Pekan Walk	1.2	0.5	5	
	Gambang Walk	1.5	0.6	6	
	SL Walk	0.4	0.2	2	
	TC Walk	1.3	0.5	5	
Egress mode	Pekan Walk	0.8	0.3	3	
	Gambang Walk	1.3	0.5	5	
	SL Walk	1.4	0.6	6	
	TC Walk	1	0.4	4	
TMC					
Student types	Pekan Sec.School	0.75	0.2	2	
	Gambang Uni	0.6	0.2	2	
	SL Sec.school	2.1	0.5	5	
	TC Collage	1.8	0.5	5	
Employment status	Pekan Part time	1.15	0.3	3	
	Gambang Unemployed	0.6	0.2	2	
	SL Full time	1.4	0.4	4	
	TC Unemployed	1.6	0.4	4	
Types of vehicle	Pekan Others	1.5	0.4	4	
	Gambang Car	1	0.3	3	
	SL Motorcycle	1	0.3	3	
	TC Motorcycle	2	0.5	5	
Age	Pekan 13 -20	1.8	0.5	5	
	Gambang 21-30	0.75	0.2	2	
	SL 31- 40	1.65	0.4	4	
	TC 13-20	2.7	0.7	7	
Income	Pekan <1000	1.3	0.3	3	
	Gambang <1000	1.1	0.2	2	
	SL 0-2000	1.65	0.3	3	
	TC 1000-2000	2.85	0.6	6	
Time Leaving	Pekan 9-11am	0.4	0.3	3	
	Gambang 1-3pm	0.3	0.2	2	
	SL 9-11pm	0.45	0.3	3	
	TC 11am-1pm	0.7	0.5	5	
Time return	Pekan 7-9pm	1	0.4	4	
	Gambang 11am-1pm	0.15	0.1	1	
	SL 1-3pm	1	0.4	4	
	TC 5-7pm	1.25	0.5	5	
Weekday trip frequency	Pekan once a while	2.5	0.6	6	
	Gambang once a week	0.15	0.0	0	
	SL >5 times	1	0.3	3	
	TC once a while	3.35	0.8	8	
Weekeend trip frequency	Pekan once a while	1.35	0.3	3	
	Gambang once a week	2	0.4	4	
	SL twice a week	1.7	0.3	3	
	TC once a while	1.3	0.3	3	

TSC				
Overall satisfaction	Pekan satisfied	0.35	0.1	1
	Gambang moderate	0.6	0.2	2
	SL moderate	0.5	0.2	2
	TC moderate	1.7	0.6	6
Bus frequency	Pekan satisfied	1.1	0.3	3
	Gambang moderate	0.5	0.1	1
	SL moderate	0.5	0.1	1
	TC satisfied	2.25	0.7	7
Bus fare	Pekan satisfied	0.8	0.2	2
	Gambang moderate	0.3	0.1	1
	SL moderate	1.15	0.3	3
	TC satisfied	2.8	0.7	7
Safety & security	Pekan satisfied	0.9	0.2	2
	Gambang moderate	0.4	0.1	1
	SL moderate	0.85	0.2	2
	TC satisfied	2.1	0.5	5
Operating hours	Pekan satisfied	1.15	0.3	3
	Gambang moderate	0.5	0.1	1
	SL moderate	0.8	0.2	2
	TC satisfied	2	0.6	6
Captain helpfulness	Pekan satisfied	0.35	0.1	1
	Gambang moderate	0.75	0.2	2
	SL satisfied	1.7	0.5	5
	TC satisfied	1.35	0.4	4
Captain driving skill	Pekan satisfied	0.3	0.1	1
	Gambang moderate	0.5	0.2	2
	SL satisfied	1.9	0.7	7
	TC satisfied	1	0.3	3
Captain attire	Pekan satisfied	0	0.0	0
	Gambang moderate	0.4	0.2	2
	SL satisfied	1.4	0.6	6
	TC satisfied	1.25	0.5	5
Officer helpfulness	Pekan satisfied	1.1	0.4	4
	Gambang moderate	0.5	0.2	2
	SL satisfied	1.5	0.6	6
	TC satisfied	0.8	0.3	3
Officer customer friendly	Pekan satisfied	0.65	0.3	3
	Gambang moderate	0.5	0.2	2
	SL satisfied	1.2	0.5	5
	TC satisfied	0.8	0.3	3
Officer attire	Pekan satisfied	0.4	0.1	1
	Gambang moderate	0.85	0.2	2
	SL satisfied	1.3	0.3	3
	TC satisfied	1.85	0.5	5
Inspector helpfulness	Pekan satisfied	0.15	0.0	0
	Gambang moderate	0.9	0.3	3
	SL moderate	0.3	0.1	1
	TC satisfied	1	0.3	3
Inspector politeness	Pekan satisfied	0.7	0.2	2
	Gambang moderate	1.35	0.5	5
	SL moderate	0.15	0.1	1
	TC satisfied	1.3	0.4	4
Inspector attire	Pekan satisfied	0.5	0.2	2
	Gambang moderate	1	0.4	4
	SL moderate	0.2	0.1	1
	TC satisfied	1	0.4	4
Physical appearance of bus	Pekan satisfied	0.4	0.2	2
	Gambang moderate	1.15	0.5	5
	SL moderate	0.7	0.3	3
	TC moderate	1.4	0.6	6