

**PUBLIC EXPECTATION ON THE IMPLEMENTATION OF BUS RAPID
TRANSIT AT ISKANDAR MALAYSIA, JOHOR**

MATHIVANAN A/L MUTHUSAMY

**A project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Science (Urban and Regional Planning)**

**Faculty of Built Environment and Surveying
Universiti Teknologi Malaysia**

JANUARY 2020

DEDICATION

Every challenging work needs self-efforts as well as guidance of elders especially those who very close to our heart. Hence, this thesis is dedicated to my parents, family, friends whose affection, love, encouragement and prays of day and night make me able to get such success and honour along with all hard working and respected lecturers.

ACKNOWLEDGEMENT

First and foremost, I am thanking God for giving me strength and ability to further my studies in this competitive world and showing me right path to me.

Throughout in preparing this thesis, I was in contact with many people, researchers, academicians, and practitioners. They have contributed towards my understanding and thoughts. In particular, I have to thank my parents for their love support in my life. Not forget to my siblings and Darrshni A/P Tanabbal, who have supported me in financial and morally in order for me to complete this research successfully.

I wish to express my sincere appreciation to my main thesis supervisor, Professor Dr. Gobi Krishna Sinniah and thesis examiner, Professor Dr. Zuhra Junaida Binti Ir. Mohamad for encouragement, continuous guidance, critics and friendship. I am also very thankful to all my lecturers for their guidance, advices and motivation. Without their continued support and interest, this thesis would not have been the same as presented here.

I am also indebted to University of Technology Malaysia (UTM) for giving me opportunity to further my master study. In addition, I would like thank Iskandar Regional Development Authority (IRDA) for offering me an interview session with the relevant officials to collect the required information regarding my research project.

Last but not least, my fellow postgraduate student should also be recognised for their support. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space.

ABSTRACT

Iskandar Malaysia is situated in Johor has encountered a lightening urban expansion after its formation in 2006 which also known as Southern Development Corridor. Iskandar region is undergoing critical urban sprawl and high vehicle dependency due to urbanization. Public transportation is one important solution for this problem. Public transport operators and authorities are forced to place emphasis on the monitoring and improvements of the services provided in an attempt to address the increasing rate of car ownership and climate change. This study focuses on **commuters' satisfaction using public bus services and expectation towards upcoming Bus Rapid Transit service in Iskandar Malaysia (IMBRT)**. Furthermore, this research also studied the implementation challenges of IMBRT as preliminary studies and provide recommendation for further enhancement of the BRT services prior implementation. Using self-rate questionnaire to investigate 263 respondents' satisfaction and expectation of commuters. Statistical Package for Social Science (SPSS) was used to analyzed data in a descriptive, cross-tabulation and factor analysis. One main finding, reported that respondents are mostly not satisfied with most of the quality attributes of public buses. This indicates that the quality of Iskandar Malaysia **public bus transport service, especially in Johor Bahru is below the commuters' expectation**. Frequency analysis suggests that from 22 independent variables, commuters only satisfy with fare collection and fare payment system and feeling neutral for air-conditioning services and not satisfied with other service attributes. **Frequency analysis also done to study the commuters' expectation towards future BRT services in Iskandar Malaysia**. The factor analysis is conducted to reduce numbers of factor that correlated to customer satisfaction to simplify the decision maker to make an improvement, instead looking on specific items. From twenty-one single service quality attributes that were observed to investigate customer satisfaction in public bus transport, the factor analysis suggests simplifying them into nine factors. Cross-Tabulation analysis was also carried separately from the Johor Bahru city to identify the public bus usage with three independent factors which are: Gender, Employment and Residential area. From the cross-tabulation of gender (Pearson $\chi^2 = 4.832$; $df=1$; $p=0.028 < 0.05$) and residential area (Pearson $\chi^2 = 7.94$; $df= 2$; $p= 0.019 < 0.05$) with public bus usage are showing the relationship between variable is significant using Pearson χ^2 results and relationship with employment status (Pearson $\chi^2 = 2.246$; $df= 6$; $p=0.896 > 0.05$) and public bus usage has shown no significant between these two variables. In addition, under preliminary studies, IMBRT implementation challenges were also being discussed by conducting interview the IRDA officer and found the major possible challenges to be addressed. To summarize, overall aim of this research is to make public transportation mainly Bus Rapid Transit in Iskandar Malaysia (IMBRT) to be implemented in a way more attractive, satisfied, and marketable mode of transport by addressing all those expectations from users and highlighting the implementing challenges in order to provide a highly efficient transport service in Iskandar Malaysia by addressing those challenges.

ABSTRAK

Iskandar Malaysia terletak di Johor telah mengalami urbanisasi yang sangat ketara selepas pembentukannya pada tahun 2006 yang juga dikenali sebagai Pembangunan Wilayah Ekonomi Selatan Johor. Wilayah Iskandar sedang menjalani pemintasan bandar yang serius dan kebergantungan tinggi kepada kenderaan akibat urbanisasi. Pengangkutan awam adalah salah satu penyelesaian penting untuk masalah ini. Pihak berkuasa dan operator pengangkutan awam terpaksa memberi penekanan kepada pemantauan dan penambahbaikan perkhidmatan yang disediakan dalam usaha untuk menangani kadar pemilikan kereta yang tinggi dan perubahan cuaca. Kajian ini memberi tumpuan kepada tahap kepuasan pengguna menggunakan perkhidmatan bas awam dan harapan terhadap perkhidmatan Transit Aliran Bas yang akan dikenalkan di Iskandar Malaysia (IMBRT). Selain itu, kajian awal juga mengkaji cabaran-cabaran pelaksanaan IMBRT dan memberi cadangan untuk meningkatkan lagi pelaksanaan perkhidmatan BRT sebelum pelaksanaan. Kaedah soal selidik digunakan untuk menyoal tahap kepuasan dan harapan bakal penumpang daripada 263 responden. *Statistical Package For Social Science (SPSS)* telah digunakan untuk menganalisis data secara deskriptif dengan cara '*Frequency Analysis*', '*Factor Analysis*' dan '*Cross-Tabulation*'. Hasil kajian melaporkan bahawa kebanyakan responden tidak berpuas hati dengan kualiti perkhidmatan bas awam. Ini menunjukkan bahawa kualiti perkhidmatan bas di Iskandar Malaysia, terutamanya di Johor Bahru berada di bawah jangkaan. '*Frequency Analysis*' menunjukkan bahawa dari 22 atribut, pengguna hanya berpuas hati dengan kadar tambang dan sistem pembayaran tambang dan merasa neutral dengan sistem penyaman udara dan tidak berpuas hati dengan atribut perkhidmatan lain. Analisis kekerapan juga dilakukan untuk mengkaji harapan pengguna terhadap bakal perkhidmatan BRT Iskandar Malaysia. '*Factor Analysis*' dijalankan untuk mengurangkan bilangan faktor yang dikaitkan dengan tahap kepuasan pelanggan untuk mempermudah membuat keputusan untuk penambahbaikan secara keseluruhan. Dari dua puluh satu atribut yang mengkaji tahap kepuasan terhadap kualiti perkhidmatan, '*Factor Analysis*' mengurangkan faktor menjadi sembilan faktor. '*Cross-Tabulation*' juga dibuat untuk membandingkan penggunaan bas awam dengan tiga faktor iaitu: Perbezaan jantina, jenis pekerjaan dan kawasan kediaman. Dari analisis '*Cross-Tabulation*', hubungan antara jantina (Pearson $\chi^2 = 4.832$; $df=1$; $p=0.028 < 0.05$) dan kawasan kediaman (Pearson $\chi^2 = 7.94$; $df= 2$; $p= 0.019 < 0.05$) dengan penggunaan bas awam menunjukkan hubungan signifikan dengan menggunakan keputusan Pearson- χ^2 dan hubungan status pekerjaan (Pearson $\chi^2 = 2.246$; $df= 6$; $p=0.896 > 0.05$) dengan penggunaan bas awam tidak menunjukkan signifikasi antara dua pemboleh ubah tersebut. Di samping itu, sebagai kajian awal, sesi temu bual diadakan dengan pihak IRDA untuk mengetahui cabaran-cabaran pelaksanaan IMBRT dan cara-cara penyelesaian kepada cabaran tersebut. Kesimpulannya, matlamat keseluruhan kajian ini adalah untuk menjadikan pengangkutan awam terutamanya Transit Aliran Bas di Iskandar Malaysia (IMBRT) untuk dilaksanakan dengan cara yang lebih menarik, meningkatkan tahap kepuasan dan kebolehpasaran dengan cara memenuhi semua harapan dari pengguna dan menyediakan perkhidmatan pengangkutan yang sangat efisien di Iskandar Malaysia dengan menangani cabaran semasa pelaksanaan.

TABLE OF CONTENTS

	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xi
	LIST OF FIGURES	xiii
	LIST OF ABBREVIATIONS	xiv
	LIST OF SYMBOLS	xv
	LIST OF APPENDICES	xvi
CHAPTER 1	INTRODUCTION	1
	1.1 Research Background	1
	1.2 Problem Statement	3
	1.3 Research Aim	6
	1.4 Research Objective	6
	1.5 Research Question	7
	1.6 Scope of Study	7
	1.7 Research Gap	8
	1.8 Significant of study	9
	1.9 Background of the Study Area	10
	1.9.1 Iskandar Malaysia	11
	1.10 Research Limitation	12
	1.11 Thesis Outline	12
CHAPTER 2	LITERATURE REVIEW	15
	2.1 Introduction	15

2.1.1	Traffic Congestion at Main roads in Iskandar Region	16
2.2	Definition and Features of BRT	19
2.2.1	Definition of BRT	19
2.2.2	Features of BRT	20
2.2.3	BRT Success Factors	22
2.3	Review of BRT Systems in Model Cities	25
2.3.1	Curtiba (Brazil)	25
2.3.1	Jakarta (Indonesia)	26
2.3.2	Beijing (China)	27
2.3.3	Brisbane (Australia)	28
2.4	Bus Rapid Transit (BRT) Service in Iskandar Malaysia	29
2.5	Challenges on Implementing BRT	30
2.5.1	Institutional and Legislative Framework	31
2.5.2	Management of Competing Modes	31
2.5.3	Adequate funding and coordination	32
2.6	Public Expectations on Bus Rapid Transit Services	32
2.6.1	Commuters' Expectation	32
2.6.2	Customer Satisfaction	33
2.6.3	Attraction	37
2.6.3.1	Tangible and Intangible Service Characteristic	38
2.6.4	Commuters Loyalty	39
2.7	Role of Gender and Public Transportation Use	40
2.8	Chapter Summary	41
CHAPTER 3	RESEARCH METHODOLOGY	43
3.1	Introduction	43
3.2	Research Design	43
3.3	Research Process	44
3.4	Respondent	47
3.4.1	Calculation of Sampling	47
3.5	Data Collection	48

3.5.1	Questionnaire	49
3.5.2	The Framework of Questionnaire Design	50
3.5.3	Conceptual Model Framework for Research Objective	51
3.6	Data Analysis	53
3.6.1	Literature Review	53
3.6.2	Analysis Using Statistical Tools	53
3.6.3	Exploratory Factor Analysis (EFA)	54
3.6.3.1	Suitability of data for factor Analysis	54
3.6.3.2	Kaiser Meyer Olkin (KMO)	54
3.6.3.3	Bartlett test of Sphericity	55
3.6.3.4	Interpretations of Factor Loading	55
3.6.4	Cross Tabulation Analysis	55
3.6.4.1	Pearson Chi-Square Analysis	56
3.7	Chapter Summary	56
CHAPTER 4	RESULTS AND ANALYSIS	59
4.1	Introduction	59
4.2	Demographic Background	59
4.3	Descriptive Analysis: Frequency Analysis	60
4.3.1	Transportation Access and Public Transportation Usage	61
4.3.2	Commuters' Opinion on Current Public Bus Services	67
4.3.3	Public Expectation on Upcoming BRT Services in Iskandar Region	71
4.4	Descriptive Analysis: Cross-Tabulation & Chi-Square Tests	77
4.4.1	Gender Difference & Public Bus Usage	77
4.4.2	Employment Type & Public Bus Usage	79
4.4.3	Residential Area & Public Bus Usage	82
4.5	Factor Analysis	83
4.6	Discussion	88

4.7	Recommendation for enhancement on Future Iskandar Malaysia Bus Rapid Transit (IMBRT)	92
4.7.1	Ensure that feeder bus and BRT services less costly than current bus services	92
4.7.2	BRT Operational performance	93
4.7.3	BRT Quality Services	93
4.7.4	Social and Demographic Matters	94
4.7.5	Quality BRT infrastructure	95
4.7.6	Social Factors	95
4.7.7	Environmental Quality	96
4.8	Chapter Summary	96
CHAPTER 5	CONCLUSION AND RECOMMENDATIONS	99
5.1	Introductions	99
5.2	Recapitulation of Research	99
5.2.1	Preliminary Study	99
5.2.2	Research Objective One	103
5.2.3	Research Objective Two	103
5.2.4	Research Objective Three	103
5.3	Recommendation for Further Research	104
5.4	Implication of the Study	105
5.5	Limitation of the Study	105
5.6	Contributions of the Findings	106
5.7	Conclusion	107
REFERENCES		109

LIST OF TABLES

TABLE NO.	TITLE	PAGE
Table 1.1	Iskandar Malaysia and Klang Valley (GKL/KV) current and expected public transport modal share (IRDA, 2014 & EPU, 2015)	2
Table 1.2	Details of Respondents Interview	5
Table 1.3	Research Gap between this research and similar research	8
Table 1.4	Five Flagship zones in Iskandar Malaysia	11
Table 2.1	Iskandar Malaysia and Klang Valley (GKL/KV) current and expected public transport modal share (IRDA, 2014 & EPU, 2015)	18
Table 2.2	Main criteria affecting the quality of services provided by public transport	37
Table 3.1	Populations sampling calculation	48
Table 3.2	Likert Scale	50
Table 3.3	Framework of Designing Questionnaire	50
Table 4.1	Respondent Demographic Profile	60
Table 4.2	Mode of transportation	61
Table 4.3	Main reason behind using transportation	62
Table 4.4	Main Reason for not using Public Bus Service	63
Table 4.5	Experience using current bus services	64
Table 4.6	Satisfaction using Public Bus	64
Table 4.7	Important factor for Bus services	65
Table 4.8	Modal Shift form Private Vehicle to Public Transportation	66
Table 4.9	Knowledge Testing on IMBRT	66
Table 4.10	Commuters Satisfaction Using Public Bus Service	69
Table 4.11	Public Expectation on Upcoming BRT Services	71
Table 4.12	Preferable BRT Service Span in a day	75
Table 4.13	BRT Operating Speed	75
Table 4.14	Proposal on Peak Hour Passenger Management	76

Table 4.15	BRT as Sustainable Transportation	77
Table 4.16	SPSS Cross Tabulation- Gender & Public Bus Usage	78
Table 4.17	Chi-Square Test - Gender & Public Bus Usage	79
Table 4.18	SPSS Cross Tabulation -Employment Type & Public Bus Usage	80
Table 4.19	Chi-Square Test - Employment Type & Public Bus Usage	81
Table 4.20	SPSS Cross Tabulation -Residential Area & Public Bus Usage	82
Table 4.21	Chi-Square Test - Residential Area & Public Bus Usage	83
Table 4.22	Initial KMO & Bartlett test of Sphericity	84
Table 4.23	Initial The Total Variance Explained	85
Table 4.24	Initial Rotated Component Matrix	85
Table 4.25	Final Rotated Factor Matrix	87
Table 4.26	Name of new factors with variance	88

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
Figure 1.1	Map of Malaysia (Vector Shock, 2017)	10
Figure 1.2	Map of Districts of Johor (RSN Johor 2030 (Kajian Semula), 2016)	10
Figure 2.1	GHG emissions for transportation sector (Iskandar Malaysia Greenhouse Gas Inventory 2015)	17
Figure 2.2	BRT Success Factors (Nasrin, 2015)	24
Figure 2.3	Modal Split of Curitiba (BRTDATA.ORG, 2017)	26
Figure 2.4	Iskandar Malaysia Bus Rapid Transit main alignment (IMBRT,2019)	30
Figure 3.1	Research Process	46
Figure 3.2	Conceptual Model Framework for Research Objective 1	52
Figure 3.3	Conceptual Model Framework for Research Objective 2	52
Figure 4.1	Pubic Bus Usage	62
Figure 4.2	Public Bus Frequency Data	63
Figure 4.3	Expectation on BRT On-Time Performance	72
Figure 4.4	Expectation on travelling time using BRT	73
Figure 4.5	BRT Fare Expectation	73
Figure 4.6	BRT Fare Collection Method	74

LIST OF ABBREVIATIONS

IMBRT	-	Iskandar Malaysia Bus Rapid Transit
IRDA	-	Iskandar Regional Development Authority
BRT	-	Bus Rapid Transit
JKR	-	Public Work Department
MIROS	-	Malaysia Institute of Road Safety Research
JPJ	-	Road Transport Department Malaysia
PDRM	-	Royal Police of Malaysia
EFA	-	Exploratory factor analysis
SPSS	-	Statistical Package for the Social Sciences
KMO	-	Kaiser Meyer Olkin
BRT	-	Bus Rapid Transit

LIST OF SYMBOLS

n	-	Sample Size
E	-	Margin of error
N	-	Population size
r	-	Fraction of response that interested in
$Z (c/100)$	-	Critical value for the confidence level c

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A:	Questionnair Form	119
Appendix B:	Iskandar Malaysia Bus Rapid Transit Phase 1 Route Map	125
Appendix C:	Iskandar Malaysia Complete Bus Rapid Transit Route Map	126
Appendix D:	Iskandar Malaysia Bus Rapid Transit Station and Terminal Facilities	127

CHAPTER 1

INTRODUCTION

1.1 Research Background

Increasing travel demand and preferences in using private vehicle is causing rapid motorization in many counties around the world. Most people are now highly dependent on private motorize travel (Ellaway et al. 2003). This phenomenon was caused because of attractiveness of car and people love to drive (Beirão & Sarsfield Cabral 2007). An increased private motorization has resulted in an increased traffic congestion which in turn result in longer travel times for many people (Beirão & Sarsfield Cabral 2007; Asri & Hidayat 2005). Various studies have shown that commuting can cause considerable stress, whether by public transport or private car (Tse et al. 2000; Bhat and Sardesai 2006; Wener et al. 2005). This stress can spill over **into commuters' work and home life (Wener et al. 2005), as well as affect the overall quality of life of commuters (Costal et al. 1988).** Elevated stress levels can contribute to serious health problems such as cardiovascular disease and suppressed immune functioning (Wener et al. 2005).

In addition to congestion, private motorization is also affecting the safety of vulnerable road users (Kodukula 2009), high consumption of non-renewable resource (Aßmann & Sieber 2005), and causes serious threat to the quality of human environments (Goodwin 1996; Greene & Wegener 1997). In order to prevent more problems caused by this increase in motorization it is highly recommended by many researchers as well as public decision makers to provide an attractive public transport service as an alternative transport mode in many cities.

Public transportation has undoubtedly play a vital role in commuting passengers to work or to places that they desire, and more importantly, to reduce traffic congestion. The public transport company in Malaysia was first introduced by the

British, in 1935 by setting up a company called the General Transport Company. However, public transport was not the trend back then, since walking and cycling were mostly favored by the people (Klang Valley Regional Planning and Development Study, 1973). Customer Expectations and its Relationship Towards Public Transport in Klang Valley.

Iskandar Malaysia is situated in Johor has encountered a lightening urban expansion after its formation in 2006 which also known as Southern Development Corridor in another name. Iskandar Malaysia populace recorded between 2006 and 2010 higher compared to the projected rate with an annual growth rate of 3.8 percent and starting of 2012, recorded population about 1.74 million. Iskandar region is undergoing critical urban sprawl and high vehicle dependency due to urbanization. Likewise, land use for transportation encompasses highest percentage in the category of built up area in 2013 (IRDA 2014). As this region is highly dependent on private vehicle, the public transport modal share is relatively low. According to Iskandar Regional Development Authority (IRDA) (2010), the public transport modal share of Iskandar Malaysia was 10 percent in 2012. Current and expected public transport modal share in Iskandar Malaysia and Greater Kuala Lumpur/Klang Valley (GKL/KV) were showing in Table 1.1 below.

Table 1.1 Iskandar Malaysia and Klang Valley (GKL/KV) current and expected public transport modal share (IRDA, 2014 & EPU, 2015)

	Iskandar Malaysia	GKL/KV
Current public transport modal share	10% (as of 2012) (IRDA, 2014)	17.1% (as of 2014) (EPU, 2015)
Expected public transport modal share	40% (by 2025) (IRDA, 2014)	40% (by 2020) (EPU, 2015)

In order to solve the issue of unsustainable transportation in Iskandar Malaysia, one of the solutions highlighted in ‘CDP II 2014-2025’ is Transit Oriented Development (TOD). According to IRDA (2014), TOD is to encourage and enhance Bus Rapid Transit (BRT) system in Iskandar Malaysia and they are to be applied concurrently. BRT system is also incorporated with ‘Low Carbon Society Action Plan

2025' by Ho et al. (2015). As of 2013, a total cost of RM36.5 million was invested to develop BRT system as stated in 'Iskandar Malaysia Annual Report 2013' (IRDA, 2014).

Prior going for further discussion, BRT can be characterized as a high-quality bus-based transit system that delivers quick, cozy, and cost-effective urban mobility through the provision of separated right-of-way infrastructure, rapid and frequent operations, and excellence in marketing and customer service (Wright and Hook, 2007). Bus Rapid Transit (BRT) has been classified as one of the most financially savvy instruments for urban communities to develop a public transport system that can cover a complete network and deliver a quick with high-quality service which will help solve the current transportation related problem. Curitiba, Brazil is the first country to implement BRT in 1974 where now BRT turned into a worldwide application in the twenty-first century. In Europe, BRT is generally provided a higher quality and execution of transport with an effective budget. However, the use of BRT system is considered new and growing in some Asian countries like Malaysia (Omar, Lamin and Osman, 2017).

In Iskandar Region, Bus rapid transit (BRT) will be the backbone of public transport in Iskandar Malaysia. Its targets by 2025 (IMBRT Report);

- 1) Increase in public transport coverage from 39% to 90%.
- 2) Increase in public transport modal share from 15% to 40%.

1.2 Problem Statement

Rapid motorization is derived from car and private motorize preference in choosing travel mode in fulfill customer travel demand. According to several studies that the writer summarize in previous report (Budiono 2009b), preference of using car because public transport still could not compete with the attractiveness of private car

or motorcycle, such as low flexibility, no direct access, longer travel time, and unsafe when traveling with public transport.

Inefficient public transportation services will reduce their efficiency and eventually lead to high private vehicle dependency. The masterplan reported that only 8% of Johoreans use public transportation, with a satisfaction level of 45%. (Transportation Masterplan 2015-2045) due to the reduction of efficiency in public transportation system which showing a serious scenario where less public transport ridership in Johor.

According to Comprehensive Development Plan 2 (CDP2) of Iskandar Region, auto-vehicle ownership is expected to rise from 500 cars in 2014 to more than 800 cars in 2025 for count of 1,000 populations. Furthermore, person trips targeted that will increase to 6.9 mil (2.3 trips/person). Private person trip is estimated to be about 4.65 mil with 3.1 mil cars or 1.5 car occupancy rate. All these situations will cause major roads in the Johor Bahru will be heavily occupied by cars especially during peak hour.

Less public transport ridership and high auto-vehicle dependency will eventually lead to congestion in Iskandar Malaysia areas. Jobs opportunities are very concentrated in Johor Bahru City Centre. People will travel to Johor Bahru City Centre every single day at the same time to Johor Bahru City Centre to go to work. This condition gave a really bad congestion not only in Johor Bahru City Centre, but also to the main roads to Johor Bahru City Centre especially to Jalan Skudai. This is because it not only connects the suburb area to JBCC, but also the neighbouring districts which are Pontian and Pasir Gudang.

Therefore, public transportation which is mainly Bus Rapid Transit (BRT) is an exciting public transportation system which will help alleviate the current burden off the roads. But however, until now the implementation of BRT has not taken place yet. Hence, this research aims to investigate the main challenges on implementing BRT in Iskandar Malaysia and to study the public satisfaction and expectation towards BRT services and the improvement needed prior the BRT implementation.

Therefore, in order to study the challenges on implementing bus rapid transit in Iskandar, a preliminary study was conducted with the relevant authority which is responsible for Iskandar Malaysia Bus Rapid Transit design and implementation process. The interview has been conducted to have clear view of the Iskandar Malaysia Bus Rapid Transit (IMBRT) history, current progress of IMBRT and possible challenges faced during planning and implementation of this IMBRT. This interview session was conducted with the Iskandar Regional Development Authority (IRDA) who is the main government agency responsible for the Iskandar Malaysia Bus Rapid Transit (IMBRT). Mr.Rudyanto Azhar, the director of IMBRT has agreed to be interviewed at 9.30 am on 27 November 2019 (Wednesday) at IRDA main office located in G-01, Block 8, Danga Bay, Jalan Skudai,80200 Johor Bahru, Malaysia. The interview conducted helped in preliminary study of this research. Table 1.2 is displaying the information related to the interview session conducted for ease of reference.

Table 1.2 Details of Respondents Interview

Aspects	Details
Name of the Agency	Iskandar Regional Development Authority (IRDA)
Name of the Officer	Mr.Rudyanto Azhar
Position of the officer	Director of IMBRT
Location of the interview session	Main office located in G-01, Block 8, Danga Bay, Jalan Skudai,80200 Johor Bahru, Malaysia
Date of interview conducted	27 November 2019 (Wednesday)
Time of the interview conducted	9.30 am
Total respondents involved in interview session	1

1.3 Research Aim

Aim of this research is to investigate the possible key challenges which causing delays in implementing the BRT in Iskandar Region and also to know how the public expectation towards BRT services to be like and public satisfaction using current public bus services and this research can be used as reference for other development of BRT in other states of Malaysia and to ensure that this service is meeting the passenger demand. As IRDA has invested RM36.5 million for enhancing the public transport network and established a Transport Blueprint as an output up to Iskandar Malaysia ten years (IRDA, 2015), the usage of public transportation still remains questionable.

1.4 Research Objective

This research objective is can be classified into three parts. First, identification of the **commuters' satisfaction using current public bus services**. Secondly, to determine the public expectation towards upcoming of BRT services. The last objective is, by obtaining the identified challenges and public satisfaction and expectation, recommendation will be proposed to enhance further the BRT services in the designing stage prior implementation. Hence, the research objectives of this study are listed below:

The objectives of this research are:

(1) **To determine the commuters' satisfaction** towards current public bus services in Johor.

(2) To identify the public expectations towards upcoming Bus Rapid Transit in Johor.

(3) To recommend for further enhancement in BRT design and implementation stages prior implementation based on findings from Objective 1 and Objective 2 and also preliminary studies conducted.

1.5 Research Question

The research questions for this study are shown below:

- (1) **What will be commuters' satisfaction towards current bus services?**
- (2) **What will be the public expectation towards future BRT services?**
- (3) **What are the suggestions or further modifications required to encourage usage of BRT and improve BRT service prior implementation?**

1.6 Scope of Study

The scope for this research are listed as follow:

- 1) This research is confined in Iskandar Area which is Johor Bahru.
- 2) This research investigates the challenges in BRT implementation.
- 3) This research also gathers information on public expectation on BRT services.
- 4) This research is limited to challenges mentioned by relevant officials without touching any sensitive areas or matters.
- 5) The target group of people of this research are the public people, bus users and government officers.
- 6) From the findings, it will attempt to outline the challenges and public expectation and also the way to address the mentioned challenges and encourage public to commute public transportation

1.7 Research Gap

There has been a number of studies conducted on BRT services which mainly focuses on Malaysia's first Bus Rapid Transit (BRT) Sunway Line in Klang Valley bases on various dimensions namely accessibility, perceives accessibility, sustainability etc.

In the context of Iskandar Region, there is even fewer studies found on BRT public transportation as it has not yet implemented and doesn't draw other scholar attention. From table 1.3, it can be seen that previous studies.

So, there is a gap in studying the challenges on implementing BRT services and public expectation which will enable the Iskandar BRT services will serve with high efficiency and quality.

Table 1.3 Research Gap between this research and similar research

Previous research on Bus Rapid Transit Services			Research gap
Author	Study area	Objectives	
(Rohani <i>et al.</i> , 2013)	Malaysia	<ul style="list-style-type: none"> ▪ Review the type of bus service, quality of service in the bus operation that influence the passenger decision and also the role of bus provider and bus driver 	There is a gap in studying major challenges faced in implementing Bus Rapid Transit in Iskandar Region, Johor and there is no recommendation on how to improve the current BRT
(Ming and Fong, 2016)	Malaysia (Sunway BRT Line)	<ul style="list-style-type: none"> ▪ The manner in which the project was awarded ▪ The design and costing of the Sunway BRT line ▪ The efficacy of the route alignment, the bus lanes and station accessibility. ▪ The ticketing system, ridership and fare structure of the Sunway BRT line 	
(Mukhopadhyay, 2017)	Malaysia (Sunway BRT, Klang Valley)	<ul style="list-style-type: none"> ▪ To investigate the potential of BRT systems as a tool of decarbonization, compared to other modes of public transport. ▪ To focus on decarbonization, the study also explores the co-benefits of 	

	and BRT Iskandar	promoting a Bus Rapid Transit system as a mode of public transport in Malaysia	services in Malaysia based on public expectation
(Bannister, 2017)	ETekwini, Durban, South Africa	<ul style="list-style-type: none"> ▪ Outlines the process that the eThekwini Municipality went through in adopting a BRT system. ▪ Provides some lessons, both for policy-making and implementation 	
(Lindau <i>et al.</i> , 2014)	-	▪ Barriers to introducing BRT based on implementing and improving these systems in cities of emerging countries.	

1.8 Significant of study

BRT is a very new concept to a developing country such as Malaysia. The success of a BRT project lies in its acceptance by stakeholders, particularly its potential users. Potential uptake of BRT by commuters would be expected to be the greatest when users receive the maximum benefit. According to Levinson et al (2003) the most important principles of BRT implementation are translating BRT plans into the **operating system, and identifying the respective urban area's own specific needs,** opportunities and constraints. This research addresses the possible challenges on BRT implementation and commuter satisfaction using public bus services and expectation on BRT services. Eventually the investigation from this research will help other megacities with similar characteristics in developing countries by indicating the needs, opportunities and constraints those cities may face during BRT implementation and operation.

Some other studies have considered various transport-related issues and customer expectation with respect to Klang Valley (Rohani, Wijeyesekera, & Karim, 2013; Helmi, Mi Tianghao, 2018; Azizan *et al.*, 2016; Kamaruddin *et al.*, 2012). Unfortunately, no research was found that specifically addresses the implementation **challenges and public expectation on BRT's attributes for Iskandar region.**

1.9 Background of the Study Area

Johor covers an area of more than 1.9 million hectares which is about 14% of the size of Peninsular Malaysia. Johor is the third largest state in Malaysia after Pahang and Perak. Originally, Johor consist of 8 districts until it was revised in 2007 that involved Johor Bahru and Muar. Johor Bahru was divided into two; Johor Bahru and Kulai, while Muar was divided into two; Muar and Tangkak. This mean that Johor now has 10 districts all together. These 10 districts are administered by 16 local council including a newly formed, PBT Pengerang.

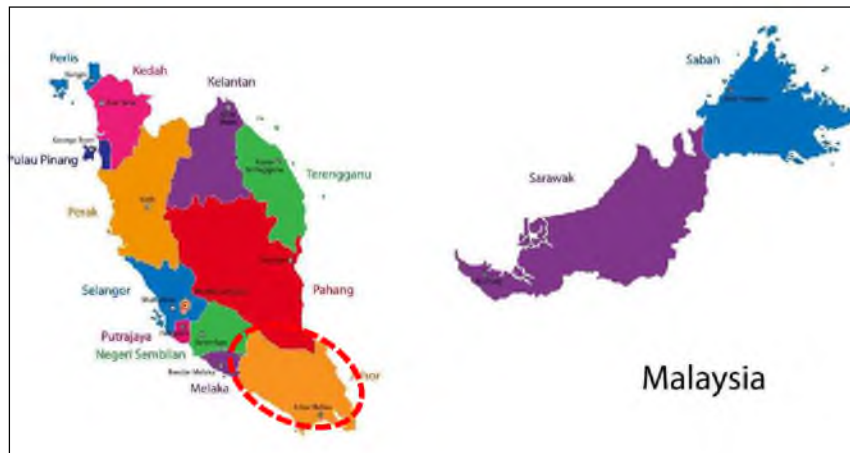


Figure 1.1 Map of Malaysia (Vector Shock, 2017)



Figure 1.2 Map of Districts of Johor (RSN Johor 2030 (Kajian Semula), 2016)

1.9.1 Iskandar Malaysia

Iskandar Malaysia covers an area of roughly 2216.3 km², that is, approximately three times the size of Singapore and two times of Hong Kong Island. IM ranks as the second most significant conurbation in Malaysia, which is expected to rival other cities in East Asia, e.g., Singapore and Hong Kong (Yunos and Johar, 2015).

In 2006, IM was established mainly to attract more focused economic and infrastructure investments under the administration of Iskandar Regional Development Authority (IRDA). It involves five local government authorities with five unique Flagship Zones designated as key points for development in IM (see Table 1.4). These zones are planned to strengthen the existing economic cluster and develop the targeted growth sectors the region involves five local government authorities with five distinctive Flagship Zones designated as key focal points for development in Iskandar Malaysia. These flagship zones have been envisaged to strengthen existing economic cluster as to diversify and develop targeted growth sectors in the future.

Table 1.4 Five Flagship zones in Iskandar Malaysia

Flagship Zone	Area covered	Development
A	Johor Bahru City Centre	New financial district, central business district, waterfront city of Danga Bay, mixed development in Tebrau Plentong and Malaysia/Singapore Causeway
B	Nusajaya	New Johor state administrative centre, Medini Iskandar Malaysia, a medical hub, an "educity", a resort for international tourism and an industrial logistic cluster and residence
C	Western Gate Development	Port of Tanjung Pelepas (PTP), providing a second transportation link for Malaysia/Singapore, a free trade zone, the RAMSAR World Heritage Park and the Tanjung Piai.
D	Eastern Gate Development	Pasir Gudang Port and industrial zone, Tanjung Langsat Port, the Tanjung Langsat Technology Park and the Kim- Kim regional distribution centre
E	Senai-Skudai	Senai International Airport, hubs for cargo and knowledge, a multimodal centre and the MSC Cyberport city.

1.10 Research Limitation

Because the research has been done based on people expectation, the questionnaire survey and interview have been conducted with the related government officials and public people. Then the limitation for this research are listed as below:

1. The data has been gathered from questionnaire survey with public bus user and interview with government officials. The unwillingness of them to participate and cooperate is the problem for this research, because of unwillingness, they might respond to the question without thinking quickly and incorrectly. In addition, because of safety issue, it is hard to convince the female for the interview and questionnaire survey especially the old one.
2. During questionnaire answering session, some of the bus user felt insecure to answer the questionnaire truly as they scared in future they might have any problem due to this survey.
3. Every state and area are differing in size and other characteristics from Iskandar Region, Johor Bahru. And this research has been done based on the expectation of bus user and public people of Johor Bahru in Iskandar Region. Thus this research may not be applicable in other area in Iskandar Region.

1.11 Thesis Outline

The structure of the research is organized into five chapters, including introduction, literature review, Research Methodology, Data Analysis and Finding, and conclusion and recommendation.

REFERENCES

- Abrahamse, W., Steg, L., Gifford, R., & Vlek, C. (2009). Factors Influencing Car Use for Commuting and the Intention to Reduce it: A Question of Self-Interest or Morality. *Transportation Research Part F*, 12 (2009): 317-324.
- Adetunji, M. A. (2013). Gender Travel Behaviour and Women Mobility Constraints in Ilesha, Nigeria *International Journal for Traffic and Transport Engineering*, 3(2), 220-229.
- Arias, C., Castro, A., Martins, W. C., Custodio, P., Diaz, J. C., Fjellstorm, K., . . . Zimmerman, S. L. (2007, June, 2007). *Bus Rapid Transit Planning Guide*. 3rd Retrieved from <https://www.itdp.org/wp-content/uploads/2014/07/52.-Bus-Rapid-Transit-Guide-PartIntro-2007-09.pdf>
- Asri, D.U. & Hidayat, B. (2005). Current Transport Issues in Jakarta and Its Impact on environment. *Proceedings of the Eastern Asia Society for Transportation Studies*, 5, 1792-1798.
- Aßmann, D. & Sieber, N. (2005). Transport in Developing Countries: Renewable Energy versus Energy Reduction? *Transport Reviews*, 25 (6), 719-738.
- Astrop, A. (1996). Urban Travel Behavior and Constraints of Low-Income Households and Females in Pune, India. In *Proceedings from the Second National Conference on Women's Travel Issues, Baltimore*.
- Azizan, M. A., Ibrahim, F. A., Ismail, R., Ishak, N., Syafiq, M., Khadir, A., Mansor, A. F., Muiz, S., Abd, S., Mustaqqim, M., Rahim, A., Shaari, M. S. And Azmi, S. (2016) '**Implementation Of Systematic Public Transportation In Malaysia : Development Of Bus Rapid Transit**', 4(2), Pp. 2–4.
- Baltes, M. R. (2003). The importance customers place on specific service elements of bus rapid transit. *Journal of Public Transportation* 6(4): 1–19
- Bannister, S. (2017) '**Implementing Bus Rapid Transit In Ethekwini : Challenges , Lessons And Opportunities**', *Skills At Work: Theory And Practice Journal*, 8(1), Pp. 59–74.
- Bartlett, M. S. (1954). A note on the multiplying factors for various chi square approximation. *Journal of Royal Statistical Society*, 16(Series B), 296-8.

- Beirão, G. & Sarsfield Cabral, J.A. (2007). Understanding attitudes towards public transport and private car: A qualitative study. *Transport Policy*, 14 (6), 478-489.
- Beirão, G., and J. S. Cabral. Market Segmentation Analysis Using Attitudes Toward Transportation: Exploring the Differences Between Men and Women. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 2067, Transportation Research Board of the National Academies, Washington, D.C., 2008, pp. 56–64.
- Bhat, C.R., and R. Sardesai. 2006. The impact of stop-making and travel time reliability on commute mode choice. *Transportation Research Part B: Methodological*40(9): 709-730.
- Bocarejo J. P., J. M. Velasquez, C. A. Diaz, L. E. Tafur. Impact of BRT Systems on Road Safety: Lessons from Bogota. *Transportation Research Board Annual Meeting*, Washington DC, 2012
- Borhan, M. N., Hakimi Ibrahim, A. N., Syamsunur, D. And Rahmat, R. A. (2019) **‘Why Public Bus Is A Less Attractive Mode Of Transport: A Case Study Of Putrajaya, Malaysia’**, *Periodica Polytechnica Transportation Engineering*, 47(1), Pp. 82–90.
- BRTDATA.ORG (2017). Curitiba, Brazil - Rede Integrada De Transporte. Global BRT Data.
- Budiono, O. A. (2009) **‘CUSTOMER SATISFACTION IN PUBLIC BUS TRANSPORT’**.
- Cain, A. And Flynn, J. (2015) **‘Examining The Ridership Attraction Potential Of Bus Rapid Transit: A Quantitative Analysis Of Image And Perception’**, *Journal Of Public Transportation*, 16(4), Pp. 63–82.
- Cantwell, M., Caulfield, B. And O’Mahony, M. (2009) **‘Examining The Factors That Impact Public Transport Commuting Satisfaction’**, *Journal Of Public Transportation*, 12(2), Pp. 1–21.
- Catell, R. R. (1966). The scree test for number of factors, *Multivariate Behavioral Research*, 1, 245-276
- Cattell, R.B. (1973). *Factor analysis*. Westport, CT: Greenwood Press.
- Cervero, R., 2013. *Bus Rapid Transit (BRT). An efficient and competitive mode of public transport*. IURD Working Paper 2013-1. Institute of Urban and Regional Development. University of California (2013). USA

- Child, D. (2006). *The essentials of factor analysis*. (3rd ed.). New York, NY: Continuum International Publishing
- Cooper Marcus, C. and Francis, C. (1998) *People Places: Design Guidelines for Urban Open Space*. 2nd edn. Toronto: John Wiley & Sons, Inc.
- Costal, G., L. Pickup, and V. DiMartino. 1988. Commuting – a further stress factor for working people: Evidence from the European Community. *International Archives of Occupational and Environmental Health* 60(5).
- Costello, A.B., & Osborne, J.W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation*, 10(7), 1-9.
- DataStar (2008) 'DataStar', *What Every Researcher Should Know About Statistical Significance* (October 2008).**
- DeCoster, J. (1998). Overview of factor analysis. Retrieved March 22, 2012 from <http://www.stat-help.com/notes.html>
- Diaz, R. B., & Hinebaugh, D. (2009, February,2009). Characteristics of Bus Rapid Transit for Decision Making. Retrieved from http://www.nbrti.org/docs/pdf/Characteristics_BRT_Decision-Making.pdf
- Dobbie, F., McConville, S., & Ormston, R. (2010). Understanding Why Some People Do Not Use Buses. In Dobbie F., McConville S., and Ormston R. (Ed.). *Transport Research Series 28-34*. Scotland.
- Doors Are Closing (2015). Trans Iskandar Bus Service BET3. [cited 26 September 2017. Available from <http://landtransportguru.net/jbbusbet3/>.
- Dublin Bus. 2006. Dublin bus network review. Dublin Bus, Ireland.
- Economic Planning Unit (EPU) (2015). *The Eleventh Malaysian Plan 2016-2020*.
- Ellaway, A., Macintyre, S., Hiscocl, R. & Kearns, A. (2003). In the driving seat: Psychosocial benefits from private motor vehicle transport compared to public transport.
- Field, A. (2000). *Discovering Statistics using SPSS for Windows*. London – Thousand Oaks – New Delhi: Sage publications.
- G. Tabachnick and L. S. Fidell, *Using Multivariate Statistics*. Fourth Edition. Allyn and Bacon, Boston, 2001.
- Gilbert, A. (2008). Bus rapid transit: Is transmilenio a miracle cure? *Transport Reviews*, 28(4), 439e467
- Gillham, B. (2000). *The Research Interview*. New York: Continuum.

- Global BRT Data (2012). Database of Bus Rapid Transit systems around the world. Accessed August to December, 2012 from: <http://brtdata.org/#/location>
- Goličnik, B. and Ward Thompson, C. (2010) ‘Emerging relationships between design and use of urban park spaces’,** *Landscape and Urban Planning*, 94(1), pp. 38–53. doi: 10.1016/j.landurbplan.2009.07.016.
- Goodwin, P. (1996). Simple Arithmetic. *Transport Policy*, 3, 79-80.
- Gordon, P., A. Kumar, and H. W. Richardson. Gender Differences in Metropolitan Travel Behaviour. *Regional Studies*, Vol. 23, No. 6, 1989, pp. 499–510.
- Gorsuch, R.L. (1983). *Factor analysis* (2nd ed.). Hillside, NJ: Lawrence Erlbaum Associates.
- Greene, D.L. & Wegener, M. (1997). Sustainable transport. *Journal of Transport Geography*, 5 (3), 177-190.
- Hanson, S., and I. Johnston. Gender Differences in Work-Trip Length: Explanations and Implications. *Urban Geography*, Vol. 6, No. 3, 1985, pp. 193–219.
- He, S. Y. & Thøgersen, J. (2017). The Impact of Attitudes and Perceptions on Travel Mode Choice and Car Ownership in a Chinese Megacity: The Case of Guangzhou. *Research in Transportation Economics*. 62: 57-67.
- He, S. Y. & Thøgersen, J. (2017). The Impact of Attitudes and Perceptions on Travel Mode Choice and Car Ownership in a Chinese Megacity: The Case of Guangzhou. *Research in Transportation Economics*. 62: 57-67.
- Hess, D.B., B.D. Taylor and A.C. Yoh, 2005. Light Rail Lite or Cost-Effective Improvements to Bus Service?? Evaluating Costs of Implementing Bus Rapid Transit, pp: 22-30.
- Hidalgo, D. Bus Rapid Transit in Bogotá and its potential in Bangkok. A report presented at “**Building a New City: Sustainable Transport in Bangkok**” in the SUTP project of GTZ and UN-ESCAP, Bangkok, Thailand, Jan 30. (2004).
- Hidalgo, D., & Graftieux, P. (2008). Bus rapid transit systems in latin America and Asia: Results and difficulties in 11 cities. *Transportation Research Record*, 2072, 77e88.
- Ho, C.S., Chau L.W., Teh B.T., Matsuoka Y., Gomi K., Rohayu A., Nadzirah J., Nur Hu, X., Zhao, L., & Wang, W. (2015). Impact of Perceptions of Bus Service Performance on Mode Choice Preference. *Advances in Mechanical Engineering*. 2015: 1-11.

- Hutcheson, G. D., and Sofroniou, N. (1999). *The Multivariate Social Scientist: an introduction to generalized linear models*. Sage Publications.
- Iskandar Regional Development Authority (IRDA) (2010). *Transportation Blueprint 2010- 2030 for Iskandar Malaysia (Public Version)*.
- Iskandar Regional Development Authority (IRDA) (2014). *10 Year Progress Report*.
- Iskandar Regional Development Authority (IRDA) (2014). *Comprehensive Plan Development ii Iskandar Malaysia 2014-2025*.
- Iskandar Regional Development Authority (IRDA). *Transportation Blueprint 2010-2030 for Iskandar Malaysia (Public Version) (2010)*. Retrieved From the IRDA website <http://iskandarmalaysia.com.my>
- Janet Choi, Joseph F. Coughlin and Lisa D'Ambrosio (2013), "Travel Time and Subjective Well-Being," *Transportation Research Record 2357*, TRB (www.trb.org), pp. 100-108; at <http://tinyurl.com/lxl8nkd>.
- J. C. Coakes and C. Ong, *SPSS Version 18.0 for Windows Analysis Without Anguish*. 1st Edition. Dougall Street, Milton: John Wiley & Sons Australia, Ltd, 2011.
- Jarzab, T. J., Lightbody, J., & Maeda, E. (2002). Characteristics of Bus Rapid Transit Projects: An Overview. *Journal of Public Transportation*, 5(2), 31-45.
- Johor Public Transport Masterplan (2015-2045)
- Kaiser, H. (1970). A second generation Little Jiffy. *Psychometrika*, 35, 401-15.
- Kaiser, H. (1974). An index of factorial simplicity. *Psychometrika*, 39, 31-6.
- Kamaruddin, R., Osman, I., Anizaliana, C. And Pei, C. (2012) 'Public Transport Services In Klang Valley : Customer Expectations And Its Public Transport Services In Klang Valley : Customer Expectations And Its Relationship Using SEM', *Procedia - Social And Behavioral Sciences*. Elsevier B.V., 36(December), Pp. 431-438.
- Kittelson & Associates INC, Herbert S. Levinson Transportation Consultants, & DMJM+HARRIS. (2007). *Bus Rapid Transit Practitioner's Guide*. Retrieved from http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_118.pdf
- Kodukula, S. (2009). Non-motorised transport in developing countries. [Online] Available from: http://www.sutp.org/index.php?option=com_content&task=view&id=107&Itemid=48&lang=uk [2009-February 21st].
- Kumar, C. R. (2008). *Research Methodology*. India: APH Publishing.

- Law, R. **Beyond “Women and Transport”**: Towards New Geographies of Gender and Daily Mobility. *Progress in Human Geography*, Vol. 23, No. 4, 1999, pp. 567–588.
- Leland, K. & Bailey, K., 1995, *Customer service*, IDG worldwide, Foster City.
- Levinson, H. S., Zimmerman, S., Clinger, J., Rutherford, S., Smith, R. L., Cracknell, J. A., & Soberman, R. (2003). Volume 1: Case Studies in Bus Rapid Transit. Retrieved from http://www.nbri.org/docs/pdf/tcrp_rpt_90v1.pdf
- Lindau, L. A., Hidalgo, D. and de Almeida Lobo, A. (2014) **‘Barriers to planning and implementing Bus Rapid Transit systems’**, *Research in Transportation Economics*. Elsevier Ltd, 48, pp. 9–15. doi: 10.1016/j.retrec.2014.09.026.
- Loo L.Y.L, Corcoran J., Mateo-Babiano D., Zahnow R. (2015). **Transport mode choice in South East Asia: Investigating the relationship between transport users’ perception and travel behaviour in Johor Bahru, Malaysia**. *Journal of Transport Geography* 46 (2015) 99–111.
- Loo, L. Y. L., Corcoran, J., Mateo-Babiano, D. & Zahnow, R. (2015). **Transport Mode Choice in South East Asia: Investigating the Relationship Between Transport Users’ Perception and Travel Behaviour in Johor Bahru, Malaysia**. *Journal of Transport Geography*. 46 (2015): 99-111.
- Malaysia Automotive Robotics and IoT Institute, 2019. http://www.mai.org.my/?option=com_content&view=article&id=32&Itemid=111&lang=en
- Matthies, E., S. Kuhn, and C. A. Klöckner. **Travel Mode Choice of Women: The Result of Limitation, Ecological Norm, or Weak Habit?** *Environment and Behavior*, Vol. 34, No. 2, 2002, pp. 163–177.
- Mauch, M., and B. D. Taylor. **Gender, Race, and Travel Behavior: Analysis of Household-Serving Travel and Commuting in San Francisco Bay Area**. In *Transportation Research Record 1607*, TRB, National Research Council, Washington, D.C., 1997, pp. 147–153.
- McGuckin, N., and E. Murakami. **Examining Trip-Chaining Behavior: Comparison of Travel by Men and Women**. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1693, TRB, National Research Council, Washington, D.C., 1999, pp. 79–85.
- Ming, O. K. And Fong, J. (2016) **‘The SUNWAY Bus Rapid Transit (BRT) Line: Lessons For The Future 1’**.

- Minhans, A., Shahid, S. & Ahmed, I. (2014). An Investigation into Qualitative Differences Between Bus Users and Operators for Intercity Travel in Malaysia. *Jurnal Teknologi*. 70(4): 71-81.
- Muñoz, J. C., & Gschwender, A. (2008). Transantiago: A tale of two cities. *Research in Transportation Economics*, 22(1), 45-53.
- Bannister, S. (2017) 'Implementing Bus Rapid Transit in eThekweni: Challenges, Lessons and Opportunities', *Skills at Work: Theory and Practice Journal*, 8(1), pp. 59-74.
- Mukhopadhyay, C. (2017) 'Public Transport And Bus Rapid Transit As A Tool Of', *Public Transport And Bus Rapid Transit As A Tool Of Decarbonization In Malaysia*, Pp. 1-43.
- Namgung, M. and Akar, G. (2014) 'Role of gender and attitudes on public transportation use', *Transportation Research Record*, 2415, pp. 136-144.
- Nasrin, S. (2015) 'Acceptability of Bus Rapid Transit (BRT) to Commuters in Dhaka'.
- NCSS Statistical Software and LLC (no date) '420-1 Factor Analysis', (1989), pp. 1-16. Available at: https://ncss-wpengine.netdna-ssl.com/wp-content/themes/ncss/pdf/Procedures/NCSS/Factor_Analysis.pdf.
- Omar, A., Lamin, F. and Osman, M. R. (2017) 'Bus Rapid Transit in Malaysia, a Review on Recent Developments', 35(10), pp. 2235-2244. doi: 10.5829/idosi.wasj.2017.2235.2244.
- Pallant, J. (2013). *SPSS Survival Manual. A step by step guide to data analysis using SPSS*, 4th edition. Allen & Unwin, www.allenandunwin.com/spss.
- Patricia Mokhtarian and Ilan Salomon (2001), "How Derived is the Demand for Travel?" *Transportation Research A*, Vol. 35, No. 8 (www.elsevier.com), September, pp. 695-719.
- Patterson, Z., G. Ewing, and M. Haider. Gender-Based Analysis of Work Trip Mode Choice of Commuters in Suburban Montreal, Canada, with Stated Preference Data. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1924, Transportation Research Board of the National Academies, Washington, D.C., 2005, pp. 85-93.
- MI TINGHAO, M. H. A. (2018) 'Public Transport Selection among Young Adults : the Case of Mass Rapid Transit and University Students (Pilihan Pengangkutan Awam di kalangan Belia : Kajian kes Mass Rapid Transit dan

Pelajar Universiti) MI TINGHAO , MOHD HELMI ALI *', *Jurnal Personalia Pelajar*, 21(2), pp. 95–102.

- Rahman, M. S. (2010). **Bus Service for 'Women Only' in Dhaka City: An Investigation**. *Journal of Bangladesh Institute of Planners*, 3, 17-32.
- Roderick B. Diaz (editor), Mark Chang, Georges Darido, Mark Chang, Eugene Kim, Donald Schneck, Booz Allen Hamilton Matthew Hardy, James Bunch, Mitretek Systems Michael Baltes, Dennis Hinebaugh, National Bus Rapid Transit Institute Lawrence Wnuk, Fred Silv, D. + H. (2004) **'Characteristics of Bus Rapid Transit for Decision-Making'**, (August), p. 301.
- Rohani, M. M., Wijeyesekera, D. C. and Karim, A. T. A. (2013) **'Bus operation, quality service and the role of bus provider and driver'**, *Procedia Engineering*, 53, pp. 167–178.
- Rohani, M. M., Wijeyesekera, D. C. and Karim, A. T. A. (2013) **'Bus operation, quality service and the role of bus provider and driver'**, *Procedia Engineering*, 53, pp. 167–178. doi: 10.1016/j.proeng.2013.02.022.
- Rosenbloom, S., and E. Burns. **Gender Differences in Commuter Travel in Tucson: Implications for Travel Demand Management Programs**. In *Transportation Research Record 1404*, TRB, National Research Council, Washington, D.C., 1993, pp. 82–90.
- Sarkar, P. P. & Mallikarjuna, C. (2018). **Effect of Perception and Attitudinal Variables on Mode Choice Behavior: A Case Study of Indian City, Agartala**. *Travel Behaviour and Society*. 12: 108-114.
- Sharmeen, N. and Houston, D. (2019) **'Spatial Characteristics and Activity Space Pattern Analysis of Dhaka City, Bangladesh'**, *Urban Science*, 3(1), p. 36. doi: 10.3390/urbansci3010036.
- Shojaei Baghini, M. et al. (2017) **'Bus Rapid Transit (BRT) System Impacts to Environmental Quality'**, *Research Journal of Applied Sciences, Engineering and Technology*, 7(7), pp. 1344–1350. doi: 10.19026/rjaset.7.400.
- Singh. (1996). **Factors influencing mode choice for journey to work among government employee. Case study: Johor Bahru**. Master Dissertation Page 143-145. Universiti Teknologi Malaysia, Skudai.
- Steg, L. (2003). **Can public transport compete with the private car?** *IATSS Research*. 27: 27-35.

- Steg, L. (2003). Can public transport compete with the private car? IATSS Research. 27: 27-35.
- Stevens, J. P. (2002). Applied multivariate statistics for the social sciences (4th ed.). Hillsdale, NS: Erlbaum.
- Stevens, J. P. (2012) Applied Multivariate Statistics for the Social Sciences. 5th edn. London: Routledge
- Tabachnick, B. G., & Fidell, L. S. (2007). Using multivariate statistics (5th ed.). Boston, MA: Allyn & Bacon.
- TCRP. (2003). Transit Capacity and Quality of Service Manual. 2nd Edition. Washington, DC: Transit Cooperative Research Program.
- TCRP. 2003. Transit capacity and quality of service manual. Transportation Research Board, National Board of Academies.
- Thomas, E. (2001). Bus Rapid Transit. In Presentation at the Institute of Transportation Engineers Annual Meeting.
- Transportation Research Part F: Traffic Psychology and Behaviour, 6 , 217-231.
- Tse, J.L.M., R. Flin, and K. Mearns. 2000. Bus driver wellbeing review: 50 years of research. Transportation Research Part F: Traffic Psychology and Behaviour 9(2): 89-114.
- Ul, N. (2016) **'An Easy Approach to Exploratory Factor Analysis: Marketing Perspective'**, 6(1), pp. 215–223.
- Van, H. T., Choocharukul, K., & Fuji, S. (2014). The Effect of Attitudes Toward Cars and Public Transportation on Behavioural Intention in Commuting Mode Choice-A Comparison Across Six Asian Countries. Transportation Research Part A. 69: 36-44.
- Van, H. T., Choocharukul, K., & Fuji, S. (2014). The Effect of Attitudes Toward Cars and Public Transportation on Behavioural Intention in Commuting Mode Choice-A Comparison Across Six Asian Countries. Transportation Research Part A. 69: 36-44.
- VAN, H. T., NAKAMURA, F., FUJII, S. and EMORI, H. (2007) **'Educational Methods To Change the Attitudes of Transport Planners Towards Environmentally Sustainable Transportation Systems in Developing Countries'**, IATSS Research. International Association of Traffic and Safety Sciences, 31(2), pp. 74–83.

- Wan, Q. K. & Lo, H. K. (2005). Effect of Attribute Perceptions on Mode Choice Behaviour in a Transit Market. *Journal of the Eastern Asia Society for Transportation Studies*. 6: 1740 - 1750.
- Weinstock, A., Hook, W., Replogle, M. and Cruz, R. (2011). Recapturing Global Leadership in Bus Rapid Transit: A Survey of Select U.S. Cities. Accessed August to December, 2012 from: http://www.itdp.org/documents/20110526ITDP_USBRT_Report-LR.pdf
- Wener, R., G.W. Evans, and P. Boately. 2005. Commuting stress: Psychological effects of a trip and spillover into the workplace. *Transportation Research Board* 1924/2005: 112-117.
- Wright, L. and Hook, W. (2007) 'Bus rapid transit planning guide', Institute for Transportation & Development Policy, (June), p. 836.
- Wright, L. and Hook, W. (2007) 'Bus rapid transit planning guide', Institute for Transportation & Development Policy, (June), p. 836. doi: 2007.
- Wright, L. Bus Rapid Transit. In Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) (Eds.) *Sustainable Transport: A Sourcebook for Policy-makers in Developing Countries (Module 3b)*. (2006).
- Wu, I. and Pojani, D. (2016) 'Obstacles to the creation of successful bus rapid transit systems: The case of Bangkok', *Research in Transportation Economics*. Elsevier Ltd, 60, pp. 44–53. doi: 10.1016/j.retrec.2016.05.001.
- Yankees, R. S. (2011) 'Cross Tabulation Analysis', *Qualtrics, Ico*, pp. 1–4
- Yunos, F. and Johar, F. (2015). Social Development Initiative Toward Enhancement of Bumiputera Value in Iskandar Malaysia. (JOBSTS) *Journal of Borneo Social Transformation Studies*, 1.