

ASSESSING PERCEPTIONS TOWARDS PUBLIC BUS SERVICE AMONG THE CAR USERS IN ISKANDAR MALAYSIA

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ABSTRACT

Encouraging car users to bus use has been a central topic to control the deteriorating traffic condition. In this light, Iskandar Regional Development Authority (IRDA) has deployed extensive investments in order to improve public bus service on its connectivity, service time and etc. Nevertheless, low bus ridership remains and car use is the main contributor of vehicular activity. Under this premise, various scholars have highlighted distorted perceptions towards bus use as a barrier to promote modal shift from car to bus use. An empirical study is necessary to examine the factors that shape distorted perceptions towards bus use among the car users in Iskandar Malaysia. Therefore, this research aims to assessing perceptions towards public bus service among the car users in Iskandar Malaysia. In order to assess car users' perceptions, online questionnaire survey was conducted with sample size of 102. Car users who reside in residential neighbourhoods within 910 meters radius and nearby bus stops along Trans Iskandar BeXTRA Route BET3 were targeted as key respondents. Generalized Linear Model (GLM) is utilized in order to identify significant perceived variables that influence bus use among the car users. Results from GLM show the significant perceived variables in relation to bus use are twofold: affective i.e. safety (from crimes) and instrumental i.e. bus network, costs and bus stop facilities. Results of this research prove that perceptions in relation to instrumental and affective variables are influential to promote modal shift from car to bus use. Therefore, understanding car users' perceptions may assist in modal shift to bus use.

Keywords: Transportation, Perceptions, Modal shift, Car users, Bus use

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1. Introduction

Buses and cars are transport modes for people to travel from one geographical region to another for fulfilling a specific purpose. Out of these transport modes, proportion of vehicular activity made up by cars and buses are 75 percent and 6.25 percent in the world. Another 18.75 percent are contributed by other modes of transport (OECD, 2017). Due to increase in GDP per capita and disposable income, car ownership has been growing rapidly and car use has contributed

extensively to fast growing motorisation rate with different pace among developing countries.

As a rapid growing developing country, Malaysia possesses high private vehicle ownership. This situation has caused negative externalities environmentally, socially and economically (Kamba et al., 2007). Increased car use concerns with environmental issues such as greenhouse gas emission, carbon footprint and global warming. With respect to social issues, car use causes noise pollution, odour annoyance and local air

pollution which degrade quality of life (Steg, 2003). Moreover, increased car use makes those who are inaccessible to car become socially isolated. Also, road accidents in Malaysia 521,466 cases in 2016 due to increased motorization (MOT, 2016). Government has to bear the cost of road accidents which was estimated to be RM9.21 billion in 2016 (Gan, 2017). On economic level, car use is a threat to reduce economies of agglomeration and regional business activities (Steg, 2003).

Public bus service is one of the solutions to overcome the emerging car use. Major implementations have been undertaken in order to improve bus ridership, especially in Iskandar Malaysia. As a southern development corridor located in Johor, this region has experienced rapid urbanization since its establishment

in 2006. Population of Iskandar Malaysia between 2006 and 2010 increased higher than the projected rate. As of 2012, 1.74 million of population was recorded. Due to rapid urbanization, this region is experiencing serious urban sprawl and high automobile dependency. 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 automobile, the public transport modal share is low comparatively. Public transport modal share of Iskandar Malaysia was 10 percent in 2012 (IRDA, 2010). Table 1 compares the current and expected public transport modal share in Iskandar Malaysia and Greater Kuala Lumpur/Klang Valley (GKL/KV).

Table 1 Current and expected public transport modal share in Iskandar Malaysia & GKL/KV

Public Transport Modal Share	Iskandar Malaysia	GKL/KV
Current	10% (as of 2012)	17.1% (as of 2014)
Expected	40% (by 2025)	40% (by 2020)

Under this light, it has been proved that the distorted perceptions of public bus service among the car users are significant factors to low bus ridership (Steg, 2003, Wan & Lo, 2005, Abrahamse et al., 2009, Van et al., 2014, Loo et al., 2015, Hu et al., 2015, He & Thøgersen, 2017 & Sarkar et al., 2017). Public transport is perceived as an undesired alternative for car use generally (Steg, 2003 & Minhans et al., 2014). From perspective of car users, it is found that bus service is usually perceived as inconvenient, expensive, longer travel time, unreliable, infrequent and symbolizing lower social status (Dobbie et al., 2010 & Exel & Rietveld, 2010). These perceived negative images of public bus service cause the car users to be unattached to bus use. On the other hand, car is considered as a preferred mode among car users due to convenience, reliability, flexibility, affordability and physical comfort level (Dobbie et al., 2010 & Singh, 1996). These factors could cause continuation of high car reliance and low bus ridership.

Hence, an empirical study is necessary to examine the factors that shape the distorted perceptions towards public bus service among the car users in Iskandar

Malaysia. Without addressing distorted perceptions towards public bus service among the car users, bus ridership could be deteriorating despite of the numerous efforts input by the authority. Unfavourable perceptions towards public bus service among the car users has to be altered imperatively in order to encourage sustainable traffic growth. Therefore, this research aims to assessing perceptions towards public bus service among the car users in Iskandar Malaysia.

2. Perceptions and Transport Mode Choice

Transport mode choice concerns with the choice of transport mode in a particular trip. It is a great tool to acknowledge the catalysts and mechanism of transportation growth trend and people's travel behaviour (Danermark et al., 2002). Various studies have proven the interdependency of perceptions and transport mode choice with Ajzen's Theory of Planned Behaviour (TPB) (1991) as an underpinning theory (Steg, 2003, Wan & Lo, 2005, Abrahamse et al., 2009, Van et al., 2014, Loo et al., 2015, Hu et al., 2015, He & Thøgersen, 2017 & Sarkar et al., 2017).

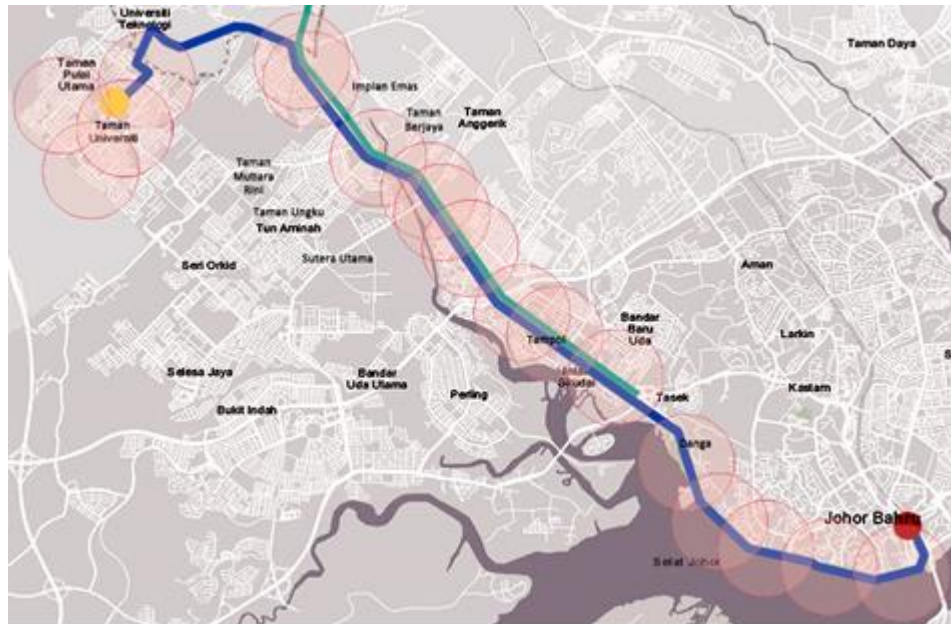


Figure 1 Study area, bus route of trans Iskandar BeXTRA BET3

Ajzen's TPB asserts that people's intended behaviour is closely based on their attitudes, subjective norms and perceived behavioural control. Various scholars affirmed the applicability of this theory on transport mode choice.

2.1 *Theory of Material Possession (MPT) by Dittmar (1992)*

According to Theory of Material Possession (MPT) by Dittmar (1992), the use of each possession is based on three motives: instrumental, symbolic and affective. As there are several of perceived variables to assess, MPT is adopted in order to classify the variables and served as framework of decision making process on transport mode choice. The three motives are explained as follows: -

- i) Instrumental motives: The ones linked with the traditional concept of rationality and deal with speed, flexibility, safety and security.
- ii) Symbolic motives: Refer to the use of the possession as a symbol to indicate a particular social status or lifestyle.
- iii) Affective motives: Concerned with emotions aroused by the use of the possession, such as comfort level and convenience.

2.2 *Choice and Captive Car Users*

In this research, car users are targeted as key respondents. Car users are grouped into two

classifications, i.e. car users who use bus as an alternative mode of transport (choice users) and who do not (captive users). This paradigm of classification has been used widely in transport market segmentation for over 30 years. In fact, the definition of captive and choice users is not restricted to any specific transport mode. For example, a "captive automobile user" means an automobile user without any alternative transport mode. While, a "transit captive user" is dedicated for a transit user who is only dependent on transit service, and vice versa (Jacques et al., 2013). It is important to note that the choice and captive users mentioned in this research is referring to car users and they are classified by whether they use bus as an alternative mode.

3. *Methodology*

3.1 *Study Area*

The Residential neighbourhoods locate nearby Trans Iskandar BeXTRA Route BET3 are dedicated as study area of this research. This is a public bus service initiated by IRDA since 2011 for improving the traffic condition in Iskandar Malaysia. This bus route is chosen as scope of study due to its service in Skudai area, which has a comparatively high average daily traffic in the region and the vehicular activity is substantially contributed by car use. Furthermore, car users who inhabit in residential neighbourhoods that

are nearby and accessible to bus stops along this bus route are dedicated as key respondents. This application is to prevent any biased perceptions or lack of acknowledgement towards public bus service from the car users as they might perceive bus use extremely negative due to inaccessible from their residences to bus stops. The bus route is shown as Figure 1. The study area of this research is residential neighbourhoods that are nearby or within 910 meters radius from bus stops, which 910 meters is the mean acceptable distance computed for walk (Rastogi & Rao, 2003). Car users who reside in the residential neighbourhoods that are nearby or within 910 meters radius from bus stops along Trans Iskandar BeXTRA Route BET3 are targeted as key respondents.

3.2 Sample Size

Confidence Interval (CI) is one of the key measurements of the quality of survey result and the three most commonly used confidence intervals are 90%, 95% and 99%. In this research, 90% of CI is used and 90% of CI means the level of certainty to achieve the identical result is 90% of the time. As the residential neighbourhoods of study area fall into administrations of MBBJ and MBIP (previously MPJBT), the total population of area within MBBJ and MBIP is 143,736. Consequently, sample size is calculated with the Yamane (1967) sample size formula. This is an ideal method to use when the underlying population to be sampled is known. Thus, this method ideally suits the situation of this research. After substituting population size as 1437,364 and CI as 90% into the calculation formula, the sample size required is 100.

3.3 Generalized Linear Model (GLM)

GLM is a great tool to find out the relationship of a binary response variable and one or more binary explanatory variables. In this research, the response variable (dependent variable) is a binary outcome, which is the probability of car users to use public bus service as an alternative mode. It is coded dichotomously with results of yes ("1") and no ("0"). Hence, random component has binomial distribution and model is called Logistic Regression. Subsequently, link function is identified to be logit link as it is utilized when data are binary. In this research, response and explanatory variables are both binary.

3.3.1 Response Variable (Dependent Variable)

Response variable is the outcome to be estimated. In this research, response variable is the probability for car users to use bus as an alternative transport mode. It is a dichotomous variable.

3.3.2 Explanatory Variables (Independent Variables)

Explanatory variables are also known as independent variables, predictors or covariates. In this research, independent variables are the perceived attributes of public bus service and each of the independent variable is binary. Variables assessed are time efficiency (buses are on time), frequency of bus, comfort of bus, affordability (bus fare), bus network, safety of bus, accessibility to bus stop, adequacy of bus stop facilities, and payment method.

4. Results and Findings

Generalized Linear Model (GLM) is utilized to examine the relationship between a response variable (probability of using public bus service as an alternative transport mode) and a set of nominal explanatory factors (perceived attributes of bus use). The response variable is dichotomous and is divided into two groups. Group who response "Yes" in the question "Do you use public bus service as an alternative transport mode?" in questionnaire survey is encoded as "1" and group who response "No" is encoded as "0".

To identify the significant variable, value of significance level between 0 to 1 could be used. In practice, researchers choose significance level equal to 0.01, 0.05 and 0.10 commonly. In this research, level of significance equal to 0.05 is used. The probability, P value that is smaller than significance level of 0.05 indicates its significant relationship with the response variable. In this light, it could be explained as P values assist to identify the significant explanatory factors. With refer to Table 2 that shows variables in GLM, P value of cost of public bus service (B_COST) is identified to be 0.003, bus network (B_NETWORK) is 0.015, safety of public bus (B_SAFETY) is 0.01 and bus stop facilities (B_BUS_STOP_FACILITIES) is 0.018. These attributes are detected to be related with the response variable significantly.

Table 2 Variables in the GLM model

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exponential (B)
			Lower	Upper	Wald Chi-Square	df	P value	
(Intercept)	-9.163	41992.5994	-82313.145	82294.820	.000	1	1.000	.000
[B_SERVICE_TIME=0]	-2.360	1.4710	-5.243	.523	2.574	1	.109	.094
[B_SERVICE_TIME=1]	0 ^b	.	.	.	.	.	.	1
[B_FREQUENCY=0]	-1.406	1.1046	-3.571	.759	1.620	1	.203	.245
[B_FREQUENCY=1]	0 ^b	.	.	.	.	.	.	1
[B_COMFORT=0]	19.017	41992.5992	-82284.965	82322.999	.000	1	1.000	1.815E8
[B_COMFORT=1]	0 ^b	.	.	.	.	.	.	1
[B_COST=0]	-3.156	1.0715	-5.256	-1.056	8.677	1	.003	.043
[B_COST=1]	0 ^b	.	.	.	.	.	.	1
[B_NETWORK=0]	-3.947	1.6192	-7.120	-.773	5.941	1	.015	.019
[B_NETWORK=1]	0 ^b	.	.	.	.	.	.	1
[B_SAFETY=0]	-7.085	2.0795	-11.160	-3.009	11.607	1	.001	.001
[B_SAFETY=1]	0 ^b	.	.	.	.	.	.	1
[B_ACCESSIBILITY=0]	-.563	1.1027	-2.724	1.598	.261	1	.610	.569
[B_ACCESSIBILITY=1]	0 ^b	.	.	.	.	.	.	1
[B_BUS_STOP_FACILITIES=0]	2.592	1.0931	.450	4.735	5.624	1	.018	13.358
[B_BUS_STOP_FACILITIES=1]	0 ^b	.	.	.	.	.	.	1
[B_PAYMENT=0]	-.663	1.1552	-2.927	1.602	.329	1	.566	.516
[B_PAYMENT=1]	0 ^b	.	.	.	.	.	.	1

[B_COST] is a nominal factor and it is coded as “0” when the key respondents do not perceive cost of bus as affordable, and it is coded as “1” when the key respondents perceive cost of bus as affordable. With regard to Coefficient (B), [B_COST=0] is accounted for -3.156 (to be rounded up as -3). It indicates that car users who do not perceive cost of bus as affordable are 3 times less likely to use bus as an alternative mode than those who do perceive cost of bus as affordable. [B_NETWORK] is a nominal factor

and it is coded as “0” when the key respondents perceived bus network as incomplete, instead it is coded as “1” when responded car users perceived bus network as complete. Coefficient (B) of [B_NETWORK=0] is -3.947 (to be rounded up as -4). This can be interpreted as the car users who perceived bus network as complete are 4 times more likely to use bus as an alternative transport mode than those who do not perceived bus network as complete. Subsequently, [B_SAFETY] is a nominal

factor and it is coded as “0” when the key respondents do not perceived public bus service as safe, and vice versa. Coefficient (B) of [B_SAFETY=0] is detected as the lowest out of all attributes. Its Coefficient is accounted for -7.085 (to be rounded up as -7). Therefore, the car users who acknowledge public bus service as safe are 7 times more likely to use public bus service than those who perceive public bus service as unsafe. In another word, it can be interpreted as car users who perceive bus use as unsafe are 7 times more likely to rely on car use only. Additionally, [B_ BUS_STOP_FACILITIES] is a nominal factor and it is coded as “0” when the key respondents do not perceived condition of bus stop facilities as good, and vice versa. Coefficient (B) of [B_BUS_STOP_FACILITIES=0] is shown as 2.592 (to be rounded up as 3). This indicates that car users who perceived bus stop facilities in good condition are 3 times more likely to use public bus service than those who perceive this attribute unfavourably.

5. Discussion

After conducting GLM, the results show the significant perceived attributes that could possibly affect the car users’ decisions to use public bus service as an alternative transport mode. The results presented four significant factors. To assess these significant factors with refer to Dittmar’s MPT (1992), instrumental and affective variables are identified to be significant to impact the bus use among the car users. This finding aligns with results of previous study, where the authors affirmed that the mode choice of bus use is affected by instrumental and affective motives among the trip makers in Johor Bahru (Loo et al., 2015). However, in view of current plans, policies and guidelines, instrumental attributes are mentioned more extensively than affective attributes. This finding highlights the lack of adoption of perceptions among the policy makers.

5.1 Safety of Public Bus Service

Safety, being an affective attribute, is identified to be the most significant factor to be emphasized in order to encourage car users to use bus as an alternative transport mode. Hence, improvement on safety of bus is imperative. In the premise of this research, it assumes that safety level in Iskandar Malaysia causes the way car users perceive safety level of public bus

service. The deteriorating safety issue with emerging crime rates could be reasons of low bus ridership in Iskandar Malaysia. Therefore, safety of public bus service, either on-bus or on the way to get to stations for riding bus is to be focused imperatively to tackle the exacerbated bus ridership.

5.2 Network of Public Bus Service

According to the results, network of public bus service is ranked as second most considerable factor to be emphasized. Over the years, bus network and connectivity have been a fundamental parameter as cited by numerous authorities. In view of national level, “11th Malaysia Plan” by the EPU and “National Land Public Transport Master Plan (2012-2030)” by the SPAD have cited bus network as a strategic driver to stimulate bus ridership. In recent years, efforts have been input by the authorities to provide a comprehensive bus network in Iskandar Malaysia, such as Bas Muafakat which aims to serve as feeder bus to connect commuters between residential neighbourhood and transport nodes. Yet, this attribute remains as one of the significant concerns of car users in order to promote bus use among them. Reasons underlie beneath this result might be higher flexibility of car use. Comparatively, bus service do not reach this level of service.

5.3 Costs of Public Bus Service

Based on “National Land Public Transport Master Plan (2012-2030)” published by the SPAD, Objective 2 namely enhancing affordability and accessibility was put forward and it stated that cost of public bus service should not be an excessive burden for the people. According to various studies in developed countries, cost of public transport is considered as a concern from the people, including car users (Steg, 2003, Dobbie et al. 2010 & Hayden et al., 2017). In Malaysia, car users perceived cost of public bus service as high (Kamba et al. 2007). The author’s finding is aligned with result of this research. In “Low Carbon Society Action Plan for Iskandar Malaysia 2025”, adoption of flat rate tickets and central area free shuttle services were acknowledged as strategic thrusts to enhance ridership of bus. Practically, Pengangkutan Awam Johor (PAJ) launched free bus service (Bas Muafakat) in 2016. However, cost of bus is not perceived as affordable among the responded

car users. It could be stipulated that car users do not have sufficient information about price of public bus service. Therefore, they rate cost of bus based on their perceptions but not travel information.

5.4 Bus Stop Facilities

Condition of bus stop facilities is identified to be a significant factor to “pull” the car users towards bus use. Bus Rapid Transit (BRT) System was proposed and it is in relation with this factor. However, the achievement of BRT System as of to-date is questionable as the first phase that ought to be completed in 2016 mentioned by IRDA is not seen as of now. If BRT System is implemented as planned, it is envisioned to attract more car users to use to public bus service in accordance to this research.

6. Conclusion

Perceptions of public bus service among the car users are identified as a barrier for encouraging bus use among them. Therefore, improving the perceptions of public bus service among car users will be an effective way to enhance bus use. To be particular, improvement on safety, network, costs of bus and bus stop facilities will have significant impact to enhance bus ridership among the car users. According to these variables, safety of bus use which is characterized as an affective variable possesses of highest significance level. Yet, current plans do not address it as extensive as other instrumental variables. This could be due to lack of assessment on perception study. Thus, this research calls for emphasis on perception study in order to achieve a sustainable transport growth in Iskandar Malaysia.

7. Suggestion for Further Study

The first future study is suggested to identify the actual attribute value of the identified significant attributes from this research in order to examine the gap between their perceived and actual value. Secondly, BRT System could upgrade the actual and perceived value of attributes of public bus service. Based on this research, possibility of car users to shift to BRT may be conducted in future studies with the identified variables (i.e. safety of bus, costs of bus, bus network and bus stop facilities) as explanatory

variables. This future study may contribute in reinforcing the aspects that need to be focused on to promote its ridership.

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