



Trip characteristics as the determinants of intention to shift to rail transport among private motor vehicle users in Kuala Lumpur, Malaysia



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ARTICLE INFO

Keywords:

Private vehicle
Urban rail transport
Trip characteristics
Intention to shift

ABSTRACT

Introduction: This study aims to understand the trip characteristics of private and public transport users in Kuala Lumpur, and the intention of private motor vehicle users to shift to rail transport if available.

Method: We conducted a travel survey in the corridor of an upcoming mass rapid transit line in Kuala Lumpur. We then analyse the characteristics of the trips recorded from the survey on a weekday and weekend. We used binary logistic regression to find the association between the trip characteristics and the intention to shift from private motor vehicles to rail transport if available.

Results: There were less than 15% of public transport users among the survey respondents. However, 48% of the weekday trips and 39% of the weekend trips were intended to shift to rail transport if available. Regression for the weekday trips showed that trip duration, distance, purpose, vehicle occupancy, and presence of child passengers were significantly associated with the intention to shift. For weekend trips, only the trip duration and presence of child passengers were significantly associated with the intention to shift.

Conclusion: This study shows that the population's intention to shift from private motor vehicle to rail transport could be influenced by the trip characteristics.

1. Introduction

Urban transportation is an issue of concern in cities worldwide. Urban agglomeration with inadequate public transport network has caused people to turn to automobile for transport. Such phenomenon contributes to both social economic burden and large emissions of carbon dioxide and environmental pollutions (Chapman, 2007; Krzyzanowski et al., 2005). Besides, the motor vehicle traffic could adversely affect the citizens' health through air pollution, noise disturbances and the involuntary uptake of sedentary lifestyle (Khreis et al., 2016; Babisch, 2006; Lachapelle, Frank, Saelens, Sallis, & Conway, 2011).

In Kuala Lumpur, the spillover effect of the population to the urban outskirts has caused increased traffic entering the city daily. The Kuala Lumpur metropolitan area or Greater Kuala Lumpur covers Kuala Lumpur itself, and nine other local governments in the neighbouring Selangor state. The urban sprawl due to decentralization has increased car dependency as many places do not have access to public transport (Kasipillai and Chan, 2008). During the morning peak hours, 70% of the traffic on major roads were single occupancy cars, which proves an extremely inefficient way of travelling in the city (Mohamad and

Kiggundu, 2007). Consequently, forests were cleared to build more roads to accommodate the large volume of vehicle traffic. Such situation clearly connotes the need for an urgent improvement of transport system in the city.

Public transport is an important element in the global propagation towards sustainable transport. Compared to the neighboring Asian countries, Malaysia has a relatively low rate of public transport usage (Almselati, Rahmat, & Jaafar, 2011). The modal share of public transport had reduced considerably from 34% in 1985–10% in 2008 (Performance management delivery unit (PEMANDU), 2010). Based on Jemali (2011), 83% or 6 million trips in the Kuala Lumpur metropolitan area were made on private motor vehicles, while only 17% or 1.24 million trips were made by public transport. This was partly due to the insufficient public transport network, where only 10% to 20% of the urban areas were accessible by rail transit (Ministry of Natural Resources and Environment Malaysia (NRE), 2011). Nonetheless, rail transport constituted 52% of the public transport modal share (Land Public Transport Commission (SPAD), 2014). Therefore, the government has put in concerted efforts under the Land Public Transport Master Plan to improve the public transport infrastructure in Kuala Lumpur (Land Public Transport Commission (SPAD), 2013).

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Transport modal choice can be influenced by personal characteristics, trip characteristics and attributes of the environment such as land use, accessibility and availability of transit services (Ortúzar, de, & Willumsen, 2001; Racca & Ratledge, 2003). Other factors include the local psychosocial values, mobility biographies due to life-course transitions, and national economic policies (Chowdhury and Ceder, 2016; Müggelburg, Busch-Geertsema, & Lanzendorf, 2015). This paper focuses mainly on the influence of vehicle trip characteristics on the users' intention to shift to rail transport. Previous studies in different cities have shown that transport modal shift could be influenced by: the original transport mode, trip frequency, geographical location, trip distance, trip duration, cost, and purpose of trips (Wang et al., 2012; Kumar and Electricwala, 2014; van der Waerden, Timmermans, & Berenos, 2008; Wang, Li, Wang, Lv, & Wang, 2013). An Australian study indicated that public transport use was induced by parking problems, and vehicle accessibility especially among students (Corpuz, 2007). In Malaysia, studies by Nurdden et al. (2007) and Chuen et al. (2014) revealed that the preference towards public transport could be encouraged by fare subsidy, reduced transit time, reduced distance from home to transit stations, and home to work location.

As Malaysia aims for sustainable transport, it is necessary to understand the current trip characteristics in Kuala Lumpur in order to formulate effective transport strategies. In Malaysia, there is a lack of published studies on the local trip characteristics and their influences on modal shift. At the advent of a Mass Rapid Transit (MRT) infrastructure in the Kuala Lumpur metropolitan area, we took the opportunity to examine the trips characteristics of private motor vehicles in the corridor of the MRT line, and their association with the public's intention to shift to rail transport. The 51 km MRT Sungai Buloh – Kajang (SBK) line is the first MRT infrastructure in Malaysia. It has 31 stations and an expected daily ridership of 400,000 people. During this study, the large scale construction of the MRT track, which started in 2011 was in the middle construction stage.

2. Method

A cross sectional questionnaire survey was conducted on the local population in the corridor of the MRT (SBK) line by multistage sampling. First, we systematically sampled eight out of the 31 MRT stations. Then, we chose the supermarkets that were situated within five kilometres relative to these sampled MRT stations, which were then still under construction. An intercept survey was done to get the respondents at the supermarkets. The locations of the supermarkets are shown in Fig. 1. There were only seven locations shown in the map because one of the supermarkets chosen (S6) was situated within 5 km to two MRT stations, and there were no other suitable locations in the area. We chose local supermarkets as our survey locations in order to approach the household residents in the area. This is because it is expected that most of the MRT users would be the local residents as 90% of the property units within 500 m of the MRT line were residential houses (Detailed Environmental Impact Assessment report (EIA), 2011). We conducted the questionnaire survey on weekends when most people do grocery shopping. The respondents were interviewed face to face, and given a small token of appreciation at the end of the 10 min' questionnaire. The questionnaire survey was done between February 2015 and June 2015.

The questionnaire included the respondents' demographic background and trip characteristics on a conventional weekday and weekend. The trip characteristics form was adapted from the template of travel diary used in Boulder Valley (National Research Center, 2013). The questionnaire in English was translated to Malay language back to back, and pretested before use to ensure that it is easily understandable, and the trip attributes such as trip purposes were suitable for the local context. The respondents were directed to recall the trips made on the closest regular weekday (e.g. Thursday), and the previous weekend before the interview. The trip characteristics enquired included

destinations, transport mode, trip duration, trip distance, vehicle occupancy for private vehicle users and the presence of child passengers (age < 18). At the end of the descriptions of each trips, we added a column asking the respondents' intention to shift each particular private vehicle trips to rail transport if available (Fig. 2). Due to some respondents being unsure of their trip distance, we applied Google maps to estimate the kilometers travelled by the respondents, using the shortest distance to the destinations.

We applied IBM SPSS version 22 for data analysis. From the trips recorded, we analysed the modal share and compared the trip characteristics between the private motor vehicle and public transport using Kruskal Wallis H test, followed by Mann-Whitney U pairwise comparison for non-parametric analysis. A backward stepwise binary logistic regression was run to identify the trip characteristics that were associated with the intention to shift from private motor vehicles to rail transport if available.

3. Results

3.1. Socio-demographic characteristics of respondents

A total of 509 respondents were interviewed. Table 1 shows the socio-demographic characteristics of the survey respondents. Most of the respondents fell within the age range of 18–29 (35.4%) and 30–39 (32.6%). Each gender (male and female) constituted half of the total respondents, with majority from the ethnicity of Malay (65.0%) followed by Chinese (24.4%), Indian (4.9%) and others (5.7%). A large proportion of the respondents were married (70.5%) and about half of them (55.0%) have children below 18 years old. There were 42.6% of the respondents with education above the degree level, followed by 29.3% with college level and 28.1% at secondary school level and below. The highest percentage of income group was in the range of RM 2001–4000 (31.8%), followed by RM 6000+ (27.1%).

3.2. Modal share

The respondents were asked about their conventional trips on a weekday and a weekend. Among the respondents, there were 35 and 102 people who reported making no trips on the weekday and weekend, respectively, and were excluded. The respondents were then separated according to their main transport mode, which were determined by the transport mode of their longest journey on the day. Results show that more than half of the respondents used car (63.7%) for their main journeys on the weekday, followed by motorcycle (18.8%), rail (10.3%) and bus (2.7%). For the weekend, there were more respondents using car (86%), followed by 5.4% rail, 3.2% motorcycle, and 2% bus. There was less public transport use on the weekend than the weekday.

Overall, we recorded 1615 trips on the weekday and 1110 trips on the weekend from the respondents. We excluded outstation trips and included only trips within the Kuala Lumpur metropolitan area. On the weekday, 61.4% of the trips were made by car, followed by 15.8% by motorcycle, 6.7% by rail and 3.8% by bus. On the weekend, 77.4% of the trips were made by car, followed by 4.9% by rail, 4.2% by motorcycle, and 2.9% by bus. Walking trips, which mostly came from walking to and from the public transit stations, were at 11.0% and 9.2% on the weekday and weekend, respectively. For the binary logistic regression analysis on private vehicle users' intention to shift to rail transport, we used the trips recorded under the respondents whose main transport were car driver, car passenger and motorcycle. This was to exclude the motor vehicle trips made by public transport (rail and bus) users who drove or rode to stations. The percentages of the trips by transport mode are presented in Table 2.

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