SciencePG
Science Publishing Group

Identify and Evaluate the Green Transport Important Parameters in National University of Malaysia (UKM) and Determine Alternative Modes

Hassan M. Abdelsalam[1, *], Muhammad Nazri Borhan[1], Riza Atiq O. K. Rahmat[2]

[1]Sustainable Urban Transport Research Centre, Faculty of Engineering, Universiti Kebangsaan Malaysia, Bangi Selangor, Malaysia
[2]Department of Civil & Structural Engineering, Faculty of Engineering, Universiti Kebangsaan Malaysia, Bangi Selangor, Malaysia

Email address:
Hmg1973.hg@gmail.com (H. M. Abdelsalam)
[*]Corresponding author

Abstract: Considering the sustained and pervasive popularity of the private vehicle not only in UKM but in most of Malaysian Universities, what makes people use or prefer the car more than public transport? What will facilitate the use of public transport? An understanding of the factors that affect mode choice is essential to the promotion of more sustainable behavior and the achievement of the state's transport targets. A sustainable transport system must provide mobility and accessibility to all urban residents in a safe and environment friendly mode of transport. The survey data collected were used to develop the models. The explanatory variables included in the models were demographic, socio-economic characteristics of individuals, trip characteristics, and mode attributes. A binary logic model was used to identify factors that are significant in determining the choice of transport and to predict the probability of a change in bus and train rider ship with respect to various travel times and cost. Attention will be paid to sensitive factors that will facilitate the use of public transportation system as a tool for addressing congestion and air pollution. Strategies employed includes, increasing parking cost for private cars, increasing the driving age, increasing the toll fees for private cars, restriction the use of private cars in some strategic places, increasing the road tax, speed-monitoring strategy for private cars, restriction the use of old cars in the cities and campuses, redirecting the private cars to a specific route especially in the cities and campuses and ensuring that safety standard are met.

Keywords: UKM Transport Sector, Private Car, Public Transportation

1. Introduction

Since the beginning of human history, transportation has been an engine of growth. Without transportation, there would have been no trade or cities [1]. In addition, the transportation sector also is one of the major components of globalization and makes a vital contribution to the economy [2]. The economic development of any nation also requires a good transportation system, but in reality, cities are now faced with transportation problems such as air pollution [3, 4] which can lead to many diseases [5], congestion [6] and road accidents [7, 8]. However, the need for transport has increased from year to year. The absence of a comprehensive management policy and strategy and specific transport systems organization has created problems among the key elements that led to the creation of urban transport issues. Transportation costs increased as a portion of household expenditures during the last century [9]. So, in this paper, it is tried to identify and evaluate the green transport important parameters in National University of Malaysia (UKM) and also determine alternative modes.

2. Method

A total of 100 questionnaires was collected over a period of 4 months from. The questions addressing car, bus and train users would address contained only in the revealed preference survey and pertained to demographic, socioeconomic characteristics and mode attributes. The respondents would be requested to report their current travel

situation by answering a set of questions. These questions were categorized into:

- Questions on respondent's current travel modes and associated tributes such as current travel mode available to the respondent, his/her current travel mode and associated travel time, cost, and access approach. The respondents were encouraged to report information on other travel mode attribute values.
- Traveler's personal information relating to travel mode choice such as age, income, gender, occupation, education, and number of vehicle ownership in the household.
- The survey information included socio-economic characteristics of individuals, trip information of individuals, and attitudes and perceptions on travel and policy measures. Socio-economic information included household income, individual's income, age, gender, vehicle ownership, and occupation and education level. Trip information of individuals included the purpose of the trip, mode of travel, total travel time and travel cost etc.

2.1. Establishment of Mode Choice Model

Determination of Mode Choice Variables: All the models on car users' mode choice behavior and potential mode shift from the car to bus/train in the literature require individual data. In this study, data collection was by SP and RP, the *two* basic approaches in data collection. The two data sets were obtained.

2.2. Revealed Preferences (rp) Data

RP data were collected on socioeconomic, mode attributes and trip characteristics. The socioeconomics data included the respondents' income, age, gender, vehicle ownership, and household income, total members in the household and their occupations and education levels. Trip information (both mode attributes and trip characteristics) included the purpose, mode of travel, total travel time, travel cost, etc.

2.3. Stated Preferences (sp)

Two SP surveys (attitudinal and hypothetical choices) were done on car users. An attitudinal survey asks the respondents for their response to various situations (e.g. would they switch to bus if the service improved) and/or to rate their liking for various changes. Hypothetical choice surveys require the respondents to choose between hypothetical alternatives with varying attributes, for data with which to develop behavioral models. The data from attitudinal surveys were used to estimate the potential impact of improving the bus service on travel mode shift and to quantify their liking for the improvement, as well as the effect of the four policies proposed – raising the minimum driving age, increasing the cost of parking, reducing the bus travel time, providing park-n-ride facilities - on increasing transit use. Figure 1 summarizes the Design of strategies used for data collection and analysis.
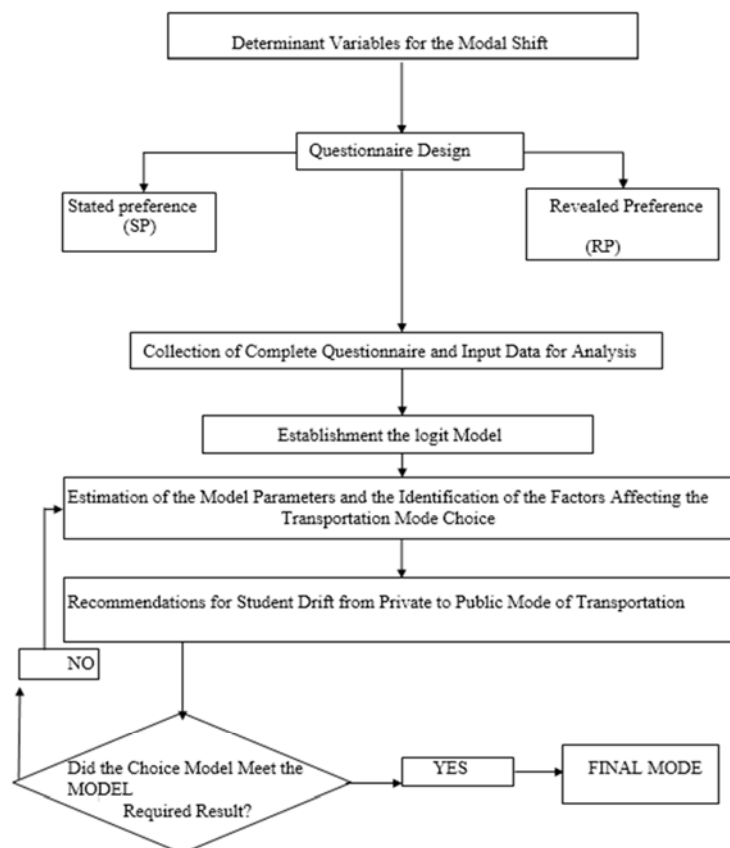

***Figure 1.** Design of strategies used for data collection and analysis.*

3. Results

3.1. Socioeconomic and Travel Characteristics

Figure 1 below shows the demographic, socioeconomic and travel characteristics of the respondents, of which 67.3% were males and 32.7% females. The highest proportion of males occurred among the young drivers. The car is popular among the young as it is a faster way to travel and can anywhere, even to areas not served by public transport. Thus, a large proportion of the car users were below 29-34 years old. Most considerably important factor affecting the cause of having private transportation is mainly appear on the place of resident, the postgraduate students whom staying outside the campus (100%) were gradually trending to move towards having private transportation within the current conditions of transportation.

3.2. Characteristics Preference for the Car Users

The studies on the different travel behavior between women and men considering the length of trips, mode choice and trip purpose were shown in the chart below. Survey shows that 67.3% were males and 32.7% females, Illustration from our survey result shows that most of the private car users in UKM campus are international students with 54.9%, from the histogram shown below, it obvious that postgraduate students within the age range of about 29-34are committed to private car as a mode of transportation followed by age range of 35-40 while age range of 47-51 represent the least. Data collected and interpreted using statistic model shown on the chart below indicated that master student's uses private car more than the PhD student with about 50%.Study from our survey shows that the higher the income the more convenient it is for postgraduate student to use private car. Private car usage is more with the household number range of 1-3. While household number more than 6 is the least users of private cars (Figure 2). different cyclics, which can run threads concurrently. Multithreading can be described as shown in Fig. 2.
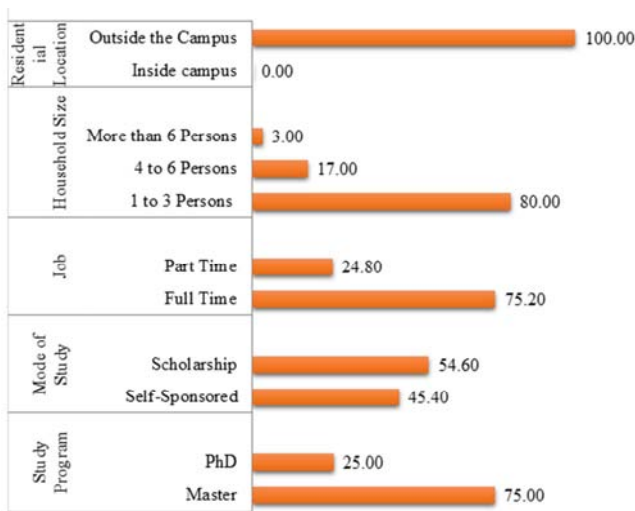

Figure 2. *Characteristics for the car users.*

3.3. Attendance of Students Per Week and their Income Ranges

The Figure 3 below illustrated the attendance of student as well as the nature of their trip to the campus weekly. Students on an income range below RM2000-3000 prefer using private car to the campus. "The size of postgraduate income influences their preference on transportation mode". From our survey result, 82% of the trips made to the campus are usually once per day.
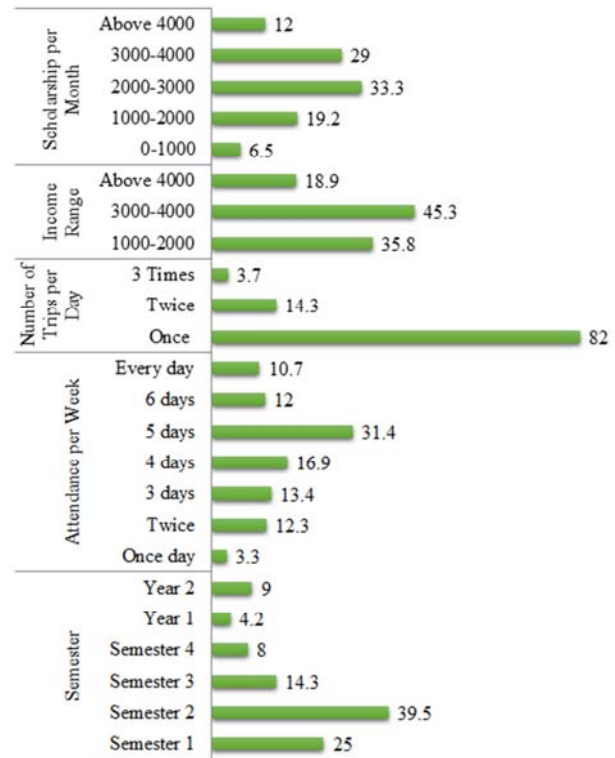

Figure 3. *Illustration indicating daily attendance.*

3.4. Analysis of the Survey Area

The Figure 4 shows the degree of acceptance of different modes of transportation available at UKM campus. From our survey result, 88.5% of our sample having public transportation available within their places of living. Taken in our account that 68.9% of the participants were having their own transportation (cars) whom living within the range of (4 to 8) Km away from the campus. Student living a bit far from the campus (less than 1 KM) appear to be the minimum users of private transportation. Another rising factor affecting our judgment of riding public transportation which is the time to reach the campus, clearly pronounced that (34%) from postgraduate students need 15 to 20 minutes to reach, that may rise the usage of private cars. Our survey shows those students leaving within the distance range of about 1000 to 2000 meters away from the bus station are the major car users while students leaving at distance more than 4000 meter from the bus station are the least private car users. From our survey, students leaving within the range of 8-

16Km are the major car users while students leaving within the range of 1-4Km are the least car users. From our survey students on an attendance of five (5) days weekly are more committed to private car usage succeeded by four (4) and two (2) days respectively. Students on six (6) days attendance are the least car users. Our survey shows that students that cover driving distance range of 10-15 minute uses private car to the campus more than

of public transportation system within the school environment. 40.6% of the students dislike the UKM transportation modes while 14.2% would like to join. Unfortunately, 54% of postgraduate students were unsatisfied with UKM transportation services which need more focus on solving and improving the given services.

Figure 5. *Preferences public transportation inside the campus.*

3.6. Improving Public Transport

Figure 4. *Analysis of the Survey Area of campus others while students within 45minutes to one hour are the least car users.*

3.5. Public Transportation Inside the Campus

The Figure 5 below illustrates postgraduate student preferences to transportation medium available in the campus. The data was collected randomly at different locations in the campus for the assessment of the suitability

Figure 6. *Survey preferences for switching from private to public transportation.*

The Figure 6 illustrated a survey result on the reasons for mode choice of transportation predominantly available in the UKM campus. From our survey result statistics, the major supportive reasons given by postgraduate student on high dependency on private car usage where it's;

3.7. Switch Mode & Modeling Analysis
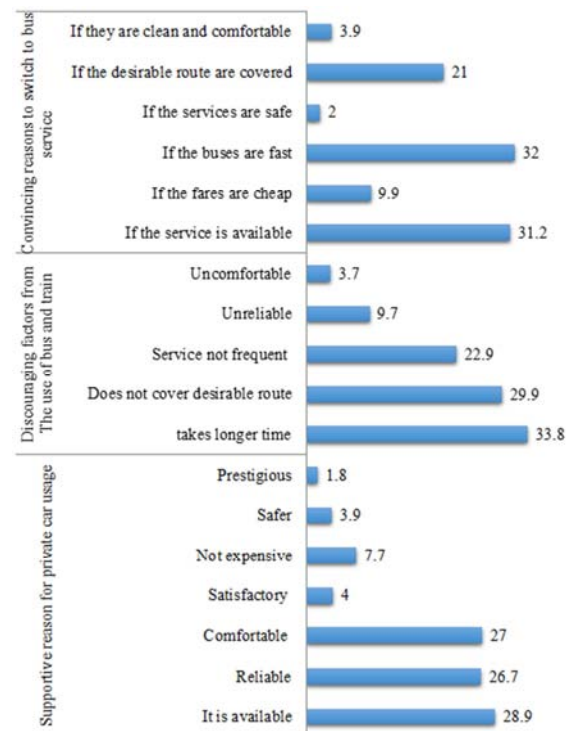
Supportive reason for switching from private to public mode of transportation if parking facilities as well as their fares are cheap were illustrated in the chart below. Majority of the postgraduate student indicated interest to shift from private to public transport only if the parking facilities are available at a low cost. From our survey, 22.2% percentage of the postgraduate student responded to switching over to the train/bus if the bus-stop/station is closer to their residence while 77.8% did not consider switching over to public mode transportation as an alternative preference. From our survey, 69.9% of the student will be attracted to public mode of transportation if the trip frequency is doubled while 30.1% of the postgraduate students prefer their private car. Our survey result shows that 80.6% among the postgraduate student will not change to public transport if the service is close to their destination (Figure 7).

Figure 7. Switching from private to public mode.

3.8. Start Charging the Parking Cost

The respondents were asked if an increase in parking cost would shift them to public transport. The present cost was assumed as showing in Table 1.

Table 1. An illustration charging the parking cost.

Parking charging	Frequency	Percent	Valid Percent	Cumulative Percent
0	28	28	28	28
RM1	11	11	11	39
RM2	14	14	14	53
RM3	22	22	22	75
RM4	10	10	10	85
RM5	15	15	15	100
Total	100	100	100	

From the results shown below, some important factors reflect in this study significant which is the values of R square, T-test, intercept coefficient and the important factor

was alpha value which is used in the equation below to verify the used model.

$$P = 1/(1 + De^{\propto(variable)})$$

From these results our model got the value of P equals to (0.000112) which somehow acceptable to be significant (significant value <0.05).

Table 2. An illustration survey results and data calibration.

Parking charging	P	(1-P)/P	Ln(1-P)/P
RM1	0.28	2.57143	0.944462
RM2	0.39	1.5641	0.447312
RM3	0.53	0.88679	-0.12014
RM4	0.75	0.33333	-1.09861
RM5	0.85	0.17647	-1.7346

$$Ln(D) = 2.2588$$

$$D = 9.5718$$

$$\alpha = -4.591$$

$$P = \frac{1}{1 + De^{\propto(variable)}}$$

Table 3. An illustration survey results and logit model results.

Parking charging	Survey results	Modeling results
RM1	0.28	0.274
RM2	0.39	0.385
RM3	0.53	0.544
RM4	0.75	0.766
RM5	0.85	0.838

3.9. Shorter Traveling Time by Bus

If the bus traveling time can be reduced of the respondents would take it instead as show in Tables below.

Table 4. An illustration reduced of traveling time.

Travel time percentage	Frequency	Percent	Valid Percent	Cumulative Percent
0	28	28	28	28
10%	17	17	17	45
30%	9	9	9	54
50%	22	22	22	76
70%	10	10	10	86
90%	14	14	14	100
Total	100	100	100	

Table 5. An illustration survey results & data calibration.

Travel time reduction	P	(1-P)/P	Ln(1-P)/P
10%	0.28	2.571429	0.944461609
30%	0.45	1.222222	0.200670695
50%	0.54	0.851852	-0.16034265
70%	0.76	0.315789	-1.15267951
90%	0.86	0.162791	-1.815289967

Table 6. *An illustration survey results &logit model results.*

Travel time reduction	Survey results	Modeling results
10%	0.28	0.270
30%	0.45	0.450
50%	0.62	0.555
70%	0.76	0.777
90%	0.86	0.847

3.10. Comfortable Waiting Time Inside or Outside Campus

Comfortable waiting time for the bus inside and outside the campus as a critical factor in switching into public transportation played a significant role in improving the objectives of this study. Mainly, a proportional relationship seems increasing regarding the reduction of waiting time. For example, at 5 minutes exactly a percentage of approximately 89% will switch for public transportations. While at 25 minutes a percentage of approximately 29% preferred to switch for public ones. It seems clearly that reduction and improvement of time waiting affects efficiently the way of postgraduate students' behavior.

3.11. Travel Cost for Both Train and Bus Improve

That 28% of the student will prefer using public bus is there is 10% reduction on the fare while 88% of the student prefers using their car. At a reduction fare of 30%, 39% of the postgraduate student will switch to public mode of transportation while 72% of the postgraduate student will be using their car as a transportation medium. As the transport fare reduces to 50%, 51% of the postgraduate student prefers using the public transport while the 50% says no to public means of transportation. The number of postgraduate students suing car increases to 70% as the transportation fare reduces to 72% while 40% of the postgraduate student prefers using their car. 88% of the postgraduate cars owners will switch over to public transport mode if the fare is reduce to 90% while 28% of the postgraduate derives more satisfaction using their respective private cars.

3.12. Subsidize Bus or Train Cost

Show that 28% of the postgraduate student using private will shift to public mode of transportation if UKM subsidizes transportation fare by 10% while 88% of the postgraduate student prefers using their private car. At a subsidizing rate of 30%, 79% of the postgraduate student prefers using their private car while 30% agrees to shift to public mode of transportation. Subsidizing the transport fare to 50% will attract 56% of the private car owner while 56% among postgraduate student derive more pleasure using their private car. 75% of the postgraduate student will prefer using the public transportation means if the UKM subsidizes the fare by 70% while 38% prefer their private car. Percentage of student that agrees to use the public transportation medium increases to 88% as soon as UKM subsidizes the fare by 90% while 28% among postgraduate students prefer using their

respective private.

4. Conclusion

The respondents were request to report their current travel situation by answering a set of questions. The techniques used for the modeling and analysis of numerical data consist of values of a dependent variable (response variable) and of one or more independent variables (explanatory variables or predictors). The main factors affect decision making in choosing travel mode from and to the work are time and cost, it seems that cost factor is not important comparable with time factor. That means, in order to convince them using public transportation than private ones, further analysis based on time as a significant factor in making decision should be done. Some sub factors derived from time shall be investigated as a preprocessing procedure for the whole survey discussion. The results shows that thirty percent respondents gave a total of 13% travel time reduction. Based on the results, 15% of respondents were attracted to board on bus if the time is reduced 30%. Approximately attract up to 79% of respondents will use bus services if waiting time not more than 15 minutes.

References

[1]   Greene DL, Wegener M. Sustainable transport. J Transp Geogr 1997; 5:177–190.

[2]   Ong HC, Mahlia TMI, Masjuki HH. A review on energy pattern and policy for transportation sector in Malaysia. Renew Sustain Energy Rev 2012; 16:532–542.

[3]   Qureshi IA, Lu H. Urban transport and sustainable transport strategies: a case study of Karachi, Pakistan. Tsinghua Sci Technol 2007; 12:309–317.

[4]   Colvile RN, Hutchinson EJ, Mindell JS, Warren RF. The transport sector as a source of air pollution. Atmos Environ 2001; 35:1537–1565.

[5]   Kargarfard M, Shariat A, Shaw BS, Shaw I, Lam ETC, Kheiri A, et al. Effects of Polluted Air on Cardiovascular and Hematological Parameters After Progressive Maximal Aerobic Exercise. Lung 2015; 193:275–281.

[6]   Downs A. Still stuck in traffic: coping with peak-hour traffic congestion. Brookings Institution Press; 2005.

[7]   Odero W, Garner P, Zwi A. Road traffic injuries in developing countries: a comprehensive review of epidemiological studies. Trop Med Int Heal. 1997; 2:445–460.

[8]   Masuri MG, Isa KAM, Tahir MPM. Children, youth and road environment: road traffic accident. Procedia-Social Behav Sci 2012; 38:213–218.

[9]   Johnson DS, Rogers JM, Tan L. A Century of Family Budgets in the United States, Monthly Labour Rev. 2001; 124:128.

Biography

Professor Dato' Ir. Dr. Riza Atiq bin Orang Kaya Rahmat. Deputy Vice-Chancellor (Academic & International Affairs), University Kebangsaan Malaysia, he finished his study during the BEng. (UTM), ME (UTM), and PhD (UKM). He has Professional Membership from Corporate member of Institution of Engineers, Malaysia, Member of The Road Engineering Association of Malaysia, Member of The Road Engineering Association of Asia & Australasia, Member of Institution of Highway and Transport, and Registered professional engineer with Board of Engineers, Malaysia

Dr. Muhamad Nazri Borhan. Lecturer of Civil Engineering, University Kebangsaan Malaysia Transportation Engineering, Travel Behavior, and Public Transportation, he finished his study during the BEng. (UKM), ME (UKM), and PhD (UKM). He has sheer interest in different fields of research including Transportation and Environmental Engineering, he had been greatly impassioned with working in several research fields including development in transportation modes and transportation materials. He has participated in different conferences and training sessions throughout the years.

Hassan M. Abdelsalam, he finished Academy study: Master Degree of Civil Engineering, University Kebangsaan Malaysia (UKM) Academic Year 2008/2009 under the direct supervision of Professor Dato' Ir. Dr. Riza Atiq bin Orang Kaya Rahmat. Now he is pursuing the PhD in Transportation and Environmental Engineering, his Careers was as a designer engineer and supervisor in a consultative geometric office (Al Emarah) which considers one of the biggest geometric offices in Libya, and Manager of projects in a consultative geometric office (Al Emarah).