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MODELLING STUDENTS OF TUN MUSTAPHA RESIDENTIAL COLLEGE READINESS TO USE PUBLIC TRANSPORT USING LINEAR REGRESSION

Mohd Azizul, Ladin[1], Victor, Chai[1], Lim Tiam Yang, Franklin[1], Farith Ismeh, Jaimin[1]

Mohd Azizul Bin Ladin
Universiti Malaysia Sabah
azizul@ums.edu.my

Victor Chai
Universiti Malaysia Sabah
victor_cjw@yahoo.com

Franklin Lim Tiam Yang
Universiti Malaysia Sabah
lim.franklin@hotmail.com

Fariq Ismeth Bin Jaimin
Universiti Malaysia Sabah
fariq.ismeth@gmail.com

ABSTRACT

This paper present the factors which influence the readiness of students in choosing public transport as their mode of transportation in UMS. Public transport is a type of travel services which allow a group of people travel along set routes. In Malaysia, public transportation is a crucial part to the nation to bring a better quality of life. In this study, State Preference Survey has been used through distribution of questionnaire forms to 150 students as respondents. Data aggregation and analysis works were conducted using Microsoft Excel. Based on the result, the highest frequency for the students who are willing to use public transport is seven times per day. In additions, linear regression is used to develop three transportation models in logistic model form which reflected the readiness of students to use public transport. Hence, it will aid transportation engineer to assess and develop a sustainable campus in the view of transportation aspect in UMS.

Keywords: Linear Regression, Transportation Model, Logistic Model, Excel

1. Introduction

Linear regression is the most primitive type of regression and it is widely used in predictive analytics. It is a statistical method commonly used to summarize and study relationships between two continuous (quantitative) variables of interest. In this study, public transportation and student's readiness will be the variable of interest. According to ACCT (2004), transportation is fundamental to quality of life, economic vitality, and a vibrant community. In recognition of this, the public makes a considerable investment in public transportation to ensure access to education, training, jobs, child care, goods and services, medical care, social and recreational activities, and other necessary life purposes (Shariff, 2012). Although Malaysia is working hard in providing fulfilling and dynamic public-transport infrastructure, it still need to steadfast in resolving the need of public transportation usage to make it as primary mode of transport, especially among urban youth. According to Dahalan et al. (2014) enhancing the needs of public transportation among urban youth offers many favors, and one of the significant fundamentals in managing the urban environment is to curtail dependency on private motor vehicles.

Based on Rahmat (2004), the car as private transport is one of the major modes of personal transport in Malaysia mainly because it is affordable and more reliable than the other transport available. The rise in ownership of private vehicles is caused by the problem of public transports being unable to fulfill the public's needs. This made the commuters prefer to use their own vehicles rather than public transports (Ladin et al, 2015). In the context of developing countries Khorasani & Zeyun (2014) listed passenger volume, fleet utilization, vehicle-km, break-down in service, fuel consumption, staff ratio, accidents and cost of bus services as operation performance indicators in addition to quality indicators. Iseki et al (2007) also stated that accessibility and reliability are the two crucial factors in assessing the effectiveness of the services at the bus stop and bus terminal, and followed closely by the safety factor. From passenger perception, Veliou (2010) discover that the number of passengers increased by increasing the performance of the transportation.

In Universiti Malaysia Sabah (UMS), the public bus transportation (PBT) is provided (Figure.2). Although subsidies for public transport play an important role in mobility policy, providing free access to public transport is not a common policy. A policy of unlimited access has been implemented in the United States. This is an arrangement between universities and public transit agencies to provide fare-free transit service for all students (De Witte, 2006).

Figure 1. Location of Tun Mustapha Residential College in UMS.

Figure 2. Public Transport provided by UMS.

Many measures can be used to minimize the utilization of private cars such as banning cars in certain areas, increasing the minimum driving age, increasing the cost of parking, improving public transport and create other convenience types of public transportation such as Park and Ride system (Mohammed et al, 2013). Therefore, this research focus more on studies and data analysis in order to develop a transportation modelling of Tun Mustapha Residential College students readiness to use public transport in UMS.

2. Method

After completed the data collection from 150 students of Tun Mustapha Residential College, all the information from the questionnaire was generated into a computer. The data will be Key-in into Microsoft Excel. The works of data entry can be done by simply selecting from the list that have been set, and not to key-in the data one by one. The data is then compiled using software (Microsoft Excel) into ownership of vehicle before any works on aggregation and analysis. When the all data has been compiled, aggregation of the data is carried out by dividing the data to the categories which are specified in the questionnaire form. With thoroughly, the aggregation of data is done according to certain categories so that the requirements of the study can be found. The importance of data aggregation to be done by a transportation engineer is owning to the fact that the data can be analyzed to forming an equation, which can be used later on as ease in the design or planning purposes. The results of this study will help in the transportation development of the Universiti Malaysia Sabah.

The aggregation works required the calculation in the number of respondents in certain categories. Furthermore, the total of respondents will be calculated into percentage in all of the categories. All the aggregation works can be done by using Microsoft Excel. Thus, the data that has been stored in the software can be directly used in aggregation works. The number of respondents can be calculated by using a function which is available in Microsoft Excel. The data that has been aggregated will be reused for analysis. In the data analysis study, there are three main independent variables that which will be analysed. The frequency has been identified as the independent variables that can be analysed using analysis of logistic and analytical modelling equation of linear regression. All of these are done by using Microsoft Excel. Logistic function that is commonly used in transportation modelling is:

Where $$P = \frac{1}{1+De^{(\alpha x+\beta y+\cdots)}}$$

P is the probability
x and y are the independent variables
a and β are coefficients that should be calibrated
D is constant

3. Results

Data aggregation was done and the result shown in Figure 3, 4, 5 and 6. From Figure 3, it is found that the public transport possess a well done in terms of cleanliness and safety. Meanwhile, the rating shows fairly in terms of information availability which mean that there are students that still confuse with the operation time of the public transport. At the meantime, the accessibility, punctuality and seat availability shows a

negative view by the residents of the college. Among the services, accessibility to the public transport shows the most critical view by the respondents. This scenario is also influence by the public transport not being on time and the lack of seat availability in the bus. Therefore, in achieving the sustainable campus in term of transportation, this disadvantage must be taken into consideration. Figure 4 shows the percentage of student's readiness to use public transport for a predetermined frequency in general. The graph shows clearly the increasing of the frequency the decreasing for the percentage of students' readiness in public transport usage. Generally, for the frequency of less or equal to 1, the percentage of students is 100%. In the end, it is decreasing to 4% for a frequency of less or equal to 8. This possess that the students are not often to choose public transport for their journey in daily basis.

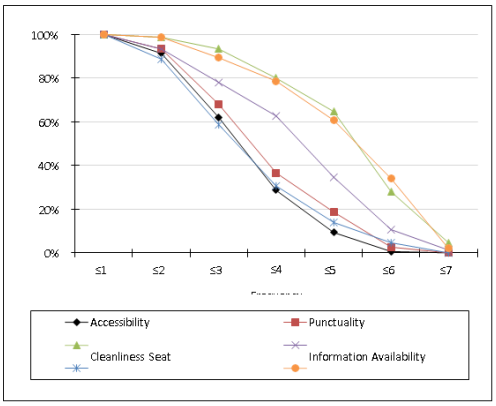

Figure 3. Rating of the Services of Public Transport.

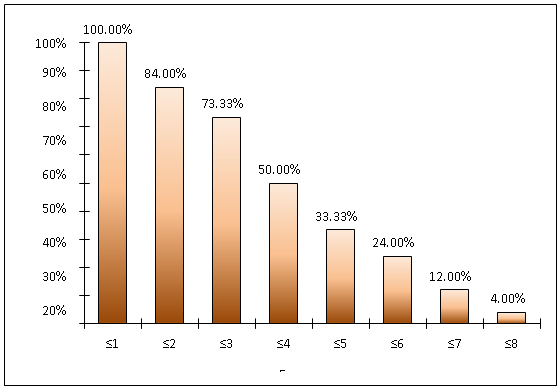

Figure 4. Percentage of General Public Transport Usage per Day.

From Figure 5, it was found that 100% of students had a frequency of less or equal to 1 and 95.33% of students had a frequency less or equal to 2 on readiness to use public transport. Simultaneously, 90.67% of students had a frequency less or equal to 3. The bars decrease rapidly at last to 26.67% at which the frequency less or equal to 8 on the readiness to use public transport. By referring to Figure 6, it was found that 100% of students had a frequency of less or equal to 1 and 97.33% of students had a frequency less or equal to 2 on readiness to use public transport. Simultaneously, 94.00% of students had a frequency less or equal to 3, the bars keep dropping slowly and decreasing rapidly in the end to 31.33% which is the frequency less or equal to 8.

These two bar chart of Figure 7 and 8 are showing that implementation of parking fee and reducing of parking spaces in UMS could enhance the willingness of students to use public transport.

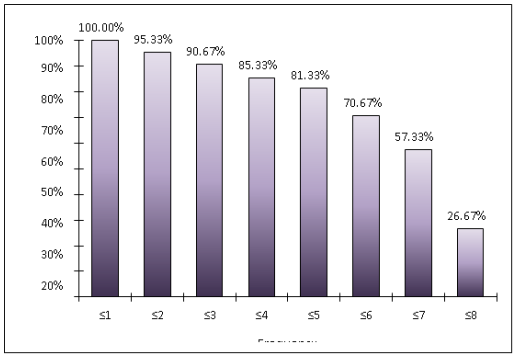

Figure 5. Percentage of Readiness on Public Transport Usage by Students Due to Implementation of Parking Fee.

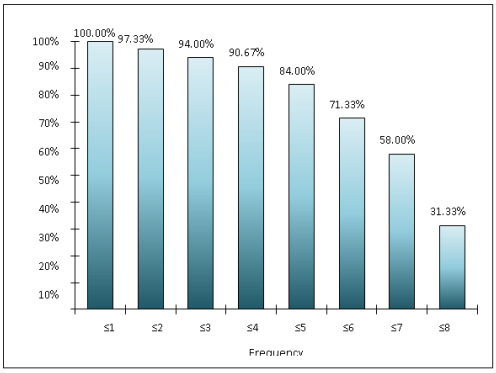

Figure 6. Percentage of Readiness on Public Transport Usage by Students Due to Reduce of Parking Spaces.

The data that has been aggregated will be reused for analysis. For the model of students' readiness to use public transport in general, the following model is developed after the linear regression in data analysis procedure:

$$P = \frac{1}{1+0.038826852e^{0.773913835x}}$$

The first model can be used to determine the student's readiness to use public transport in a day. If students use it infrequently, then the quantity and quality of bus and bus stop should be considered.

For the second transportation model, which is the model of students' readiness to use public transport if parking fee is implemented is provided as below:

$$P = \frac{1}{1+0.014080073e^{0.604414686x}}$$

To reduce the use of private transport by the students, the major factors that can be considered is to implement the parking fee for private vehicles. In this case, the second model is very helpful which can help transportation engineer to design a sustainable campus to prevent congestion, accidents, pollution and so on that cause by the private transports. This model also can help to encourage motorists to change in mind and use public transport. In the meantime, the third transportation model of students' readiness to use public transport if parking spaces are reduced is as follow:

$$P = \frac{1}{1+0.006798900e^{0.691613344x}}$$

Among other factors that can help to encourage road users to take the public transport is by reducing the parking spaces in the campus. Therefore, the third model was developed to help transportation engineer to assess and develop a sustainable campus in the view of transportation aspect.

4. Discussion

The study and analysis on the modeling students of Tun Mustapha residential college readiness to use public transport has been conducted. In this study, students as respondents are very useful to provide the information about the effectiveness of the

facilities applied in the university compound. To the effectiveness of design, the designer should take more concern about the human characteristics and the suitability for user and not only concerning about the engineering aspect to avoid wastage and malfunction facilities. The sudden increase in the use of private vehicles contributed to the increase in traffic congestion, road accidents, insufficient of parking space and pollutions. As a conclusion, UMS should study from the past experience and looking for the countries that promoted a well public transportation to achieving a sustainable campus. UMS need to implement some rules and laws to encourage motorist to shift to use public transport in the campus, such as implementing the policies of parking charge and reduce the parking spaces in the campus. The appropriate transportation models were successfully produced. Thus, the objectives of the study are achieved.

5. Conclusion

Surface approaches are seen as being motivated by the learner's desire to meet minimum requirements with minimum effort.

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