Modelling of Tun Mustapha Residential College's Students Readiness to Cycling Mode in University

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Abstract: The objectives of this research were to study and develop model based on the willingness of students to ride bicycle at University. A contribution of total 150 respondents was randomly chosen from Tun Mustapha Residential College in Universiti Malaysia Sabah (UMS). Stated preference survey was used for data collection and analysed using Microsoft Office Excel 2010 to form a logistic model analysis and linear regression analysis. It is found that the number of cycling users will increase if facilities such as cycling lane and bicycle parking were provided. Moreover, students in Tun Mustapha College also willing to travel further distance if these amenities fully provided. The study found that the suitable distance to for cycling is within a distance of 3000m with proper facilities; bicycle lane and bicycle parking.

Keywords: *Cycling, Range, University, Model Developed, Cycling's Facilities*

1. INTRODUCTION

The Malaysian government has encouraged the citizens to use non-motorized transport such as bicycles. This is a wise step that taken by the government because the non-motorized transport not only avoids the traffic congestion but also reduces accidents and pollution. As an effective way, government has provided bicycle facilities to increase attraction towards cycling. Among the facilities that provided are cycling lanes, bicycle parking.

Cycling is categorized as non-motorized transport. Cycling presents a number of advantages over other modes of transport. The European Commission with other related non-government organisations agreed with the benefits of cycling practice to both the environment and to the public health [1][2]. Commuting using bicycles to work or school promotes healthy lifestyle and environmentally friendly and even more effective. Compared to walking, cycling enables people to traverse in longer distances and compared to public transit or cars, cycling is apparently less expensive. Bikes also consume much less space than cars on road and for parking. Benefits of cycling already proven in reducing the congestion due to the space required for bikes is smaller and can become one of the best solution to replace other modes of transportation especially private cars [3]. Since the cost is less than private cars and public transport, cycling is widely considered and affordable and equitable mode of transport. Additionally, it poses far less threats to other road users than motorized vehicles [4]. Physical exercise from cycling is good for health [5]. Moreover, it requires less public spending on infrastructure than motorized transport mode.

2. BACKGROUND

From environment aspect, motorized transportation can be very detrimental. In Europe and North America, the emission of motorized transportation contribute to 24% from the overall of greenhouse gases [6]. Looking at developed countries like Japan, Britain and the United States as shown in Figure 1, they are encouraging citizens to use non-motorized transport like bicycle compared to motorized transport. Statistically, 30% of their adults from countries like China, Holland, France and Germany are cycling to work [7]. Australia is another example of country that was estimated about 1.9 million of their residents were cycled in 2008 and the Australian National Cycling Strategy has targets to double the number by 2016 [8]. They took these steps to reduce parking and upgrade the transit transport system so that society can utilize the transport effectively. Positively, their country managed to reduce traffic congestion, pollution and accidents[9].

Unfortunately, as from public view in Southeast Asia, they categorised walking, cycling and public transport as the lower class transportation when it compared with private vehicle [10]. However, Thailand has started to develop several approaches in order to promote cycling after they acknowledged the benefits

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through cycling [11]. Even Singapore had provided their first on-road bicycle lane on the Sentosa resort island to be fully used for public in 2016 [12].



Fig 1: The percentage trip of three different transportation modes in Japan, United States and Britain.[9]

Therefore, one study have been conducted with anticipation of giving awareness to the road user shifting to use bicycles rather than private vehicles. The study was conducted in Universiti Malaysia Sabah (UMS). Main objective of this research is to study and analyze student's readiness to use a bicycle. Since, majority of university student's living in residential college, they were using transport to reach their schools. However, student tends to use car and motorbike more than bicycle makes the number of bicycle riders seems to be apparently less than nonriders. A stated preference survey was conducted among the students that stayed in residential college in University Malaysia Sabah in order to evaluate the current situation and the potentials of cycling between them. The purpose of this research was also to develop a model based on the readiness of student to cycling in university.

3. LIMITATIONS OF THE MODELLING RESEARCH

The research was restricted and conducted within University Malaysia Sabah, Kota Kinabalu. The scope of the study is based on the willingness of cycling as a mode of transport in which involved the students lived in Tun Mustapha Residential College of Universiti Malaysia Sabah as the respondents. A total of 150 respondents of Tun Mustapha Residential were involved in this study. The method used in this study was Stated Preference Survey. The result of this survey plays a very important role since it was collected from respondents and then organized using computer software. The data was then analyzed using the logistic model analysis and linear regression analysis to develop the logistic model. From there, the model of student readiness to cycling in university will be developed.

The research was conducted in University Malaysia Sabah, Kota Kinabalu. Respondents were students that lived in Tun Mustapha Residential College. The stated preference survey was used to obtain the data needed. The study was carried out by completed the survey form by the respondents. A total of 150 respondents from Tun Mustapha residential college have been involved in this study.

The data was then analyzed using the logistic model analysis and linear regression analysis to develop the logistic model. Logistics functions that are commonly used in transport modelling is shown in Equation (1):

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

Where,

P is the probability,

x and y are independent variables,

 $\boldsymbol{\alpha}$ and \boldsymbol{b} are the coefficients to be calibrated

D is a constant

5. MODELLING OF TUN MUSTAPHA RESIDENTIAL COLLEGE'S STUDENT TO CHOOSE CYCLING

Data obtained were classified according to specified categories such as in the questionnaire form. From the data's, they will be aggregated according to independent variables such as (i) gender, (ii) distance travelled, (iii) distance travelled if bicycle lane is provided, (iv) distance travelled if secure bicycle parking is provided

5.1 Gender

Table 1 shows percentage of Vehicle Ownership based on Gender. From this table, Figure 2 has been plotted and it is found that 59% of students own a vehicle and 41 % of students do not have a vehicle. 59 % of the vehicle owner, 33 % of them were female and 26 % were male. Meanwhile, 41% of students are not having a vehicle, 25% were female and 16% were male. It is clearly shows that more female students own a vehicle compared to male students. Most recent reasons students owning a vehicle was due to the distance of faculty and residential college in UMS were far apart from each other. Other than that, owning a vehicle is more convenient because student can have absolute freedom on deciding the schedule and roads to reach their destination. Apart from that, car or motorcycle

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can move quickly from one place to another. Thus, students do not have to waste their time and wait for a bus. Therefore, those were the strongest reasons for the students own a vehicle.

Table 1: Percentage of Vehicle Ownership based on GenderLiving in Tun Mustapha Residential College

	Vehicle Own		
Gender	Yes	No	Total (%)
Male	26	16	42
Female	33	25	58
Total	59	41	100



Fig 2: The percentage of vehicle ownership based on gender for resident living in Tun Mustapha Residential College

5.2 Distance Travelled

Table 2 shows that the highest percentage of students that willing to cycling based on maximum distance travelled are 35% at the maximum distance travelled of 2000 m. Table 2 have been summarized into Figure 3 and it was found that the percentage of student that willing to cycling based on distance travelled in less than 1000m indicated was 100% and decrease until 1% in distance travelled of less than 7000 m. It clearly shown that, the increase of travel distance causing the percentage of student's willingness to cycling also decreased gradually because the distance becomes longer. Most students prefer to take short trip distance compared long trip distance. This is because an increased in the distance travelled will increased the time and effort needed for travelling, and therefore the percentage of willingness to cycling for a long trip was low in the travel distance choice.

Table 2: Willingness of Tun Mustapha Residential CollegeResident to Cycling Based on Distance Travelled

Max. Dist. Travelled (m)	1000	2000	3000	4000	5000	6000	7000
Num. of Respondent	46	52	35	10	4	2	1
Percentage	31	35	23	7	3	1	1
Dist. Travelled	≤	≤	≤	≤	≤	≤	≤
(m)	1000	2000	3000	4000	5000	6000	7000
Num. of Respondent	150	104	52	17	7	3	1
Percentage	100	69	35	11	5	2	1



Fig -3: Percentage of Resident in Tun Mustapha Residential College to Cycle Based on Distance Travelled

5.3 DISTANCE TRAVELLED IF BICYCLE LANE IS PROVIDED

Based on Table 3, it was found that the highest percentage of students that were willing to cycling based on maximum distance travelled is 35% at the maximum distance travelled of 3000 m. The highest percentage based on maximum distance travelled is slightly different compared to the situation that does not provide bicycle lane. This is because when bicycle lane not provided the highest percentage is at maximum distance travelled of 2000 m.

Aside from that, the percentages of student who are willing to cycling for each distance travelled and maximum distance travelled were increased compared to the situation that does not provide bicycle lane. This is due to the existence of bicycle lanes enable students to cycling with far distance. This indicates that the choice of transport mode is influenced by the presence of bicycle lane. This is because bicycle lanes provide a physical separation of bike riders from motor vehicles on a road. The physical separation makes the bike lane more comfortable and increased the aspect of safety for people that choose to ride their bicycle.

Furthermore, Figure 4 shows the comparison between if bicycle lane provided versus if bicycle not provided for the student. The graph slightly different compared to the situation that does not provide bicycle lane from the figure, the percentage of student's willingness to cycling for a distance from 2000m to 7000m was increased if bicycle lane was provided. So, this research proved that by providing a bicycle lane, it help to increase the student's willingness to cycling.

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Table 3: Percentage of Cycling based on Distance Travelled ifBicycle Lane is provided at the university

Max. Dist. Travelled (m)	1000	2000	3000	4000	5000	6000	7000
Num. of Respondent	26	36	52	19	9	5	3
Percentage	17	24	35	13	6	3	2
Dist. Travelled (m)	≤ 1000	≤ 2000	≤ 3000	≤ 4000	≤ 5000	≤ 6000	≤ 7000
Num. of Respondent	150	24	88	36	17	8	3
Percentage	100	83	59	24	11	5	2



Fig 4: The comparison between if Bicycle Lane provided and if Bicycle Not Provided for the student in Tun Mustapha Residential College

5.4 DISTANCE TRAVELLED IF SECURED BICYCLE PARKING IS PROVIDED

Based on Table 4, it shows that the highest percentage of students who were willing to cycling based on maximum distance travelled is 32% at the maximum distance travelled of 3000 m. The highest percentage based on maximum distance travelled is slightly different compared to the situation that does not provide secure bicycle parking. Because when the secure bicycle parking not provided the highest percentage is at maximum distance travelled of 2000 m. Besides that, Table 1.4 also shows the percentages of student who are willing to cycling for each distance travelled and maximum distance travelled were increased compared to the situation that does not provide secured bicycle parking.

This is due to the existence of secure bicycle parking at university will encouraged more students to cycling. This is because at the end of the trip, the bicycles can be safely placed and the risks for bicycles from theft or damaged can be avoided. This indicates that the choice of transport mode is influenced by the presence of secure bicycle parking.

While, Figure 5 shows the comparison between both conditions. The graph slightly different compared to

the situation that does not provide secure bicycle parking. The percentage of student's willingness to cycling for a distance 2000m to 7000m was increased if secured bicycle lane was provided. So, this research proved that by providing a secure bicycle parking increased the student's willingness to cycling.

Table 4: Percentage of Cycling based on Distance Travelled if asecure Bicycle Parking is provided in the University

Max. Dist. Travelled (m)	1000	2000	3000	4000	5000	6000	7000
Num. of Respondent	22	31	48	30	11	5	3
Percentage	15	21	32	20	7	3	2
Dist. Travelled	≤	≤	≤	≤	≤	≤	≤
(m)	1000	2000	3000	4000	5000	6000	7000
Num. of Respondent	150	128	97	49	19	8	3
Percentage	100	85	65	33	13	5	2



Fig 5: The Comparison between Secure Bicycle Parking When Provided and When Not provided in Tun Mustapha Residential College

6. CONCLUSIONS

In this paper, main objectives of this study which are to study and analyzed Tun Mustapha Residential College student's readiness to cycling mode in university and to develop models based on the readiness of student Tun Mustapha residential college to cycling in university has successfully achieved. The Model student's readiness to cycling based on distance travelled that has been produced is as below:

$$\mathbf{P} = \frac{1}{1 + 0.072900e^{\ 0.001076x}}$$

Next, model student's readiness to cycling based on distance travelled if bicycle lane is provided that has been produced is as below:

 $P = \frac{1}{1 + 0.028577e^{\ 0.001091x}}$

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Lastly, model student's readiness to cycling based on distance travelled if secure bicycle parking is provided that has been produced is as below:

 $P = \frac{1}{1 + 0.019114e^{0.001142x}}$

Through this study, found that by providing bicycle lane and secure bicycle parking at the university has been encouraging students to cycling. From the table 1.4 and 1.5 found that distance travelled of 3000 m is suitable for bicycle lane and secure bicycle parking is provided because most students are willing to cycling.

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