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Urban Design and Active-Transport

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Abstract: - Active transport is vital to ensure urban living in a clean, healthy and quality environment. Today, rapid motorisation in Malaysia has been associated with congestion and accidents. Besides, carbon gas emission is polluted the environment and grossly affect people's quality of life. This study is aimed to introduce a new approach to change the attitude of urban population to shift to active transport for short trips. The study employed a survey method, where a set of questionnaire was distributed to 400 samples involved population of five sub-districts in Kota Bharu, which is within 12 km radius from the city centre. The data indicated that almost 100% of the respondents and their households use passive transport for daily activities. Whereas 52% of respondents agreed to switch to active transport and the rest did not agree. Maximum distance to walk is not more that 5 km radius and cycling 10 km. Willingness to shift to active transport based on state preference survey is greatly influence by urban design that foster safety and closeness between activity centres. A study using Theory Planned Behaviour has shown that the highest positive value are health benefits (0.95), the influence of neighbours and close friends (0.95) and travel time to reach the destination (0.93). These two studies indicated that the willingness of Kota Bharu residences to shift to active transport are greatly influenced by compact urban design with open, wide and direct active transport facilities and good neighbourhood environment.

Index- Theory planned behavior, passive transport, active transport, cycling, walking, urban design.

I. INTRODUCTION

Active transport includes all forms of travel that do not rely on an engine or motor for movement. This includes walking and bicycle, and using small-wheeled transport (skates, skateboards, push scooters and hand carts) and wheelchair. These modes of transport can provide both recreation and transportation. For example, some people will choose to walk or bicycle rather than drive because they enjoy the activity. The importance of active transport can be summarized as follows: (1) they provide door-to-door transport, (2) Active transport infrastructure usually has a very high spatial penetration, (3) Active transport do not lead to waiting times compared with waiting at public transport stops, (4) Active transport have a favourable environmental performance, (5) they are low-cost transport modes, (6) Active transport are essential elements in multimodal transport chains, (7) Active transport are healthy activities [1]. The increase in population and economy of a city will also increase the rate of travel. Without the initial distribution of land-use planning (urban design) can lead to longer journey times and congestion. Increase the economic will impact the transportation system, especially the addition of private vehicle owners and travel demand [2,3].

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Increased use of passive transport can cause congestion that contributes to the increase in accidents, air pollution, noise and disturbance to human psychology [4]. It also contributes to air pollution by carbon dioxide and ozone by burning fuel that can enhance global warming [5,6,7]. Incidence of disease among humans in this day associated with unhealthy lifestyle such as lack of exercise. Lack of sufficient activity alone, resulting in increased mortality rates and double the risk for various chronic diseases such as cardiovascular disease, diabetes, hypertension and cancer [8],9]. WHO [10] Study 1998, found the practice of healthy lifestyle is one of the ten major causes of death for more than two million deaths associated with lack of exercise. The study also found that less than 60% of the world's population fails to achieve the minimum target for physical activity moderately for 30 minutes a day three times a week

II. METHOD

The target respondents of this survey are any individual who uses a passive transport to get feedback from them about their readiness to shift to active transport (walking and cycling). Questionnaires were used to collect data in this study. According to Ahern et al. (2007) [11] the choice of survey questionnaires (stated preferences) is used for actual users and potential of an attitude or a choice of consumers when they face a choice situation. Respondents are required to make decisions on the options was determined researchers when faced with certain situations. The data obtained were analyzed using the Statistical Package for Social Sciences Software (SPSS) version 19 and this data was then put into programme AMOS 19 that is available for SPSS with a user-friendly graphic surface. A field study was conducted at the Kota Bharu in the Kelantan of the Malaysia. A total of 400 of the respondents in this study have been involved. This amount was obtained from the calculation of the total sample schedule made by the Bartlett et al (2001) [12] by Cochran formula introduced in 1977. They were elected by a simple (convenience) in which they are involved in the requested fill in the questionnaire in person. Before filling in the questionnaire respondents were given a description of research and instruction - instruction in the questionnaire.

III. RESULTS AND DISCUSSION

Respondents based on a study conducted on 400 people Kota Bharu town. The results Figure 1 showed all 100% (400) of the respondents and their household use motorised transportation. While more than half of the respondents (52%) agree to switch to active transport, a minority of them (48%) did not agree to switch to active transport before the study was conducted.

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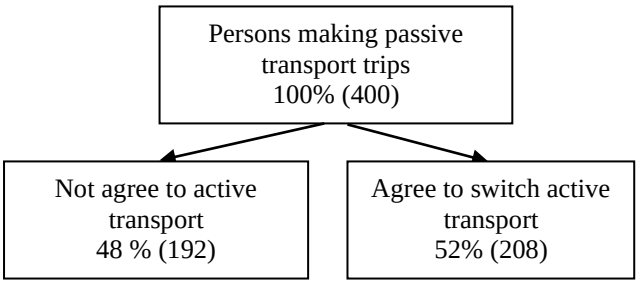

Figure 1. Categorization of the trip, person and household records in the sample for analysis

In determining the spatial accessibility of a facility, the distance decay curve is developed. Mathematical methods in estimating distance decay function have been identified [13]. Figure 2 shows relationship between modal share and trip distance. Using the modal share of each of the modes in each distance category, a scatter plot was done in Microsoft Excel. The curve fitting procedure was then used in adding a curve to the points, choosing each mode at a time. Based on the survey data, these curves were mostly polynomial curves with only one of them yielding a power functional curve as shown in Table 1. This was to give a general share of each mode of transport in relation to distance travelled. These were seen to be the various modes of transport for the people of Kota Bharu. As expected most of the trips less than one kilometer were predominantly made by walking with a sharp decrease in modal share as the distance becomes longer. From the curve, it was observed that commuters were willing to walk for about 5 km from their origin to their destination. The bicycle modal curve also followed an expected curve. Increasing over some few kilometers and decreasing gradually as the distance become longer. A distance of about 10 kilometers was observed to be the allowable distance commuters were willing to cycle from their origin to their destination. Based on the survey data, the following modal function can be used to describe relationship between trip distance and modal share. Where, Y is percentage of travel by all modes, X is trip distance. R^2 is correlation coefficient.

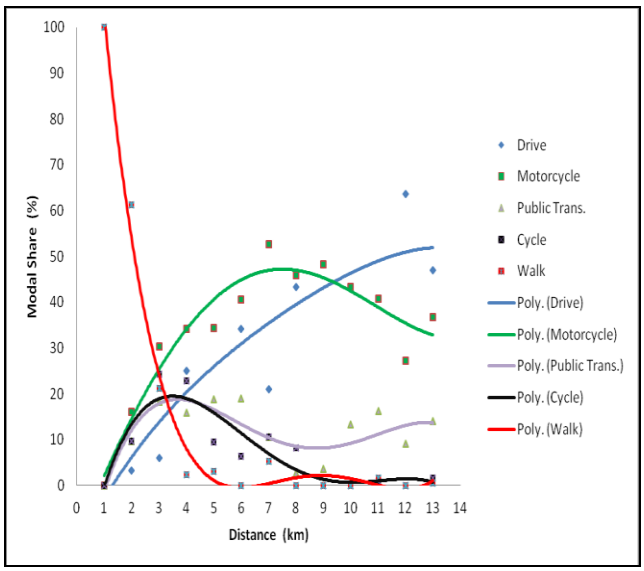

Figure 2. Modal Distribution Curves

Table 1. Modal Functions

Mode Transport (%)	Modal Function	R^2
Drive	$-0.0028x^4 + 0.0838x^3 - 1.136x^2 + 11.738x - 13.544$	0.859
Motorcycle	$0.0062x^4 - 0.1343x^3 - 0.0239x^2 + 12.783x - 10.395$	0.9009
Public Transport	$-0.0184x^4 + 0.6159x^3 - 6.986x^2 + 30.075x - 25.089$	0.6503
Cycle	$-0.0141x^4 + 0.5227x^3 - 6.6101x^2 + 30.506x - 25.298$	0.8557
Walk	$0.029x^4 - 1.0881x^3 + 14.756x^2 - 85.102x + 174.33$	0.9895

For further analysis and modelling exercise (SEM) in future work, the Theory of Planned Behaviour (TPB) models have been adopted to test the relationship constructs variables between intention and behaviour variables based on review of previous studies. These proposed models have been adapted from Haustein & Huneke (2007) [14] , and Kamarudin (2011) [15] those successful in predicting behavioral intention in their studied. Figure 3 presents the SEM derived from the TPB. It consists of the structural model, which specifies the causal relations between the latent variables and the measurement model for the latent variables. Participants were asked at least four questions, which were designed to measure each of the four TPB parameter: positive attitude, negative attitude, subjective norms and Perceived Behavioral Control (Table 2). All of the standardized questionnaire items were specifically formulated for the domain of travel mode choice. Participants stated their levels of agreement on a 7-point Likert scale ranging from 1 (totally disagree) to 7 (totally agree). Amos software version 7 is used to analyze the data. Value Comparative Fit Index (CFI), Tucker Lewis Index (TLI) and the RMSEA is used to maintain and drop items. Lastly, studies using confirmatory factor analysis measurement model has dropped 7 items and 10 items maintain a valid and reliable to measure the four constructs. This instrument can be used to model the use of active transport on the Theory of Planned Behaviour (TPB), a bicycling and walking in the making as the preferred mode of active transport in Malaysia. Based on the Theory of Planned Behaviour (TPB) model, the study findings could help clarify to which extent the residents of Kota Bharu would use active transport. Among the items that gave highest values were walking and cycling can provide many benefits such as health (0.95) for the positive attitude construct, walking and cycling take a long time to reach the destination (0.93) for the construct of negative attitude, neighbours and close friends influence users to walk and cycle (0.95) for the self-control construct, and daily activities that really need a lot of physical movement (0.95) for perceptual control construct.

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The evaluation of absolute indices of structural TPB models showed the criteria of the models is good-of- criteria, with value greater than 0.90 and root mean square error approximation (RMSEA) less than 0.08. These findings could direct transportation planners to select urban design and maintenance items that are likely to increase active transport rates.

Table 2. Descriptive statistics for indicator variables

Constructs
Positive Attitude
SBA : Use of non motorized are not made me feel relaxed, happy and calm.
SBC : I like to use a non motorized because it provides many benefits such as health
SBD : I like to use a non motorized because it provides a clean environment
Negative Attitude
SBF : Use of non motorized will take a long time to get to their destinations
SBG : Use of non motorized can make me feel tired and fatigue
SBI : non motorized use may be difficult to bring together products
Subjective Norms
SBL : Neighbours and close friends influenced me to use non motorized are not the same if they were doing
SBM : Employers and the authorities are very influenced me to use non motorized are not the same if they were working.
Perceived Behavioral Control
SBP : My daily activities need to a lot of physical movement.
SBQ : Requirements of physical movement is very important in carrying out the duties / responsibilities.

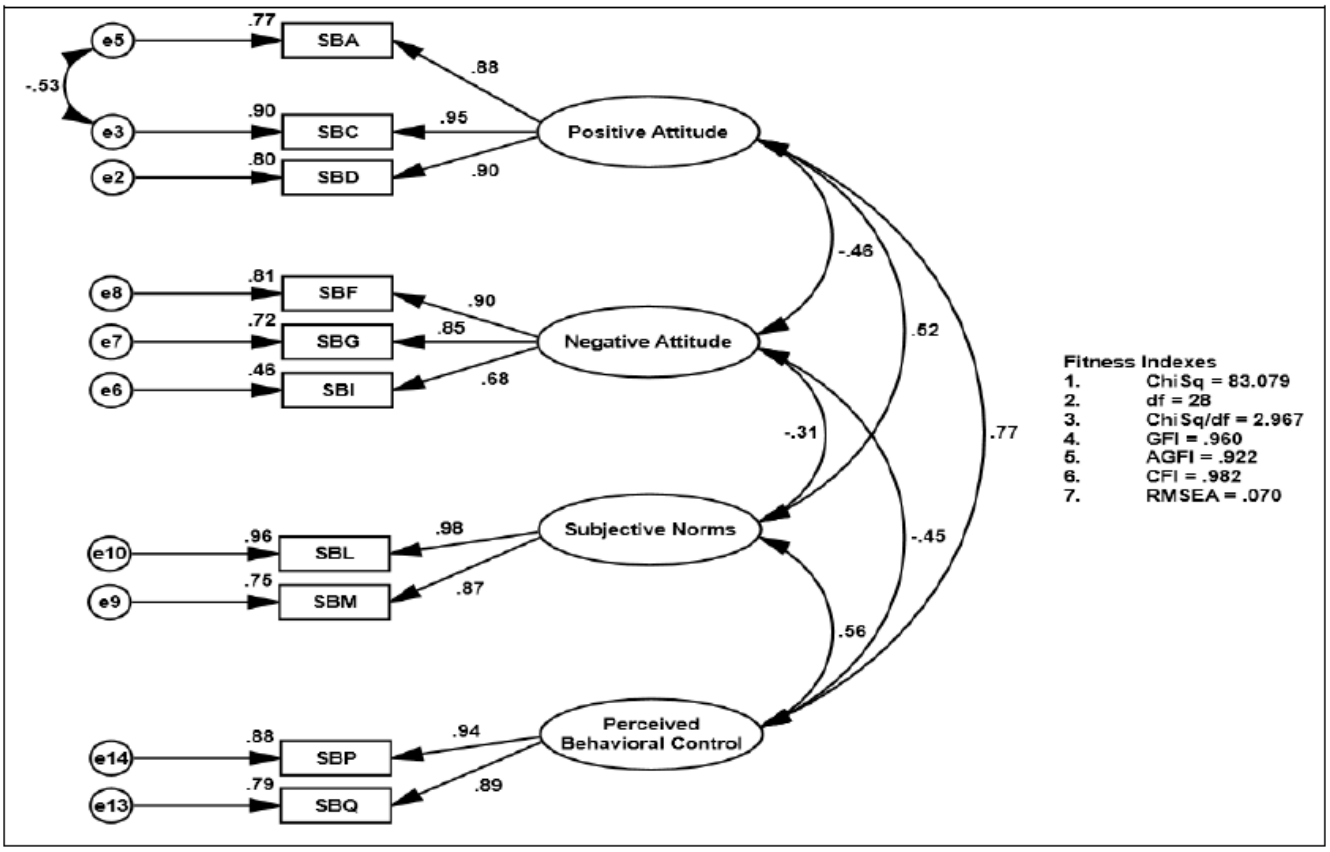

Figure 3. The factor loading for all items of the respective construct

IV. CONCLUSION

The use of active transport in Malaysia may elevate the environmental awareness in the country. However is not easy to implement due to the clogging up of central business districts with cars, and the recent economic crises. Sustainable transportation seems to mean that it is the right time now to implement active transport as an integral part of the transportation system. The decision will also be an opportunity for the design urban and development of as well as active transport facilities including the layout of buildings and infrastructure. Most European cities give priority on active transport on certain streets and intersections when designing green phases at traffic lights. Some one-way streets have been transferred into two-way streets for active transport moreover active transport are exempted from many turn restrictions for cars. Some European cities have dedicated car parking space to active transport lanes or active transport parking.

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In case of Malaysia the same move can be done by upgrading the active transport facilities. Malaysia needs to focus on designing networks in neighbourhood areas and focuses on linking with existing road infrastructure to improve active transport quality. In this paper, through curve fitting, a modal function was developed, yielding distances of 5 and 10 kilometres as walking and cycling thresholds for active transport commuters of Kota Bharu. In the future transportation development, sustainable travel mode structure is like this : Active transport prevails in short distance trip, active transport transfer to public transportation (railway, bus) triumphs in long distance trip. Malaysian people should be made aware of air pollution and its hazards to reduce air pollution. A shift towards active transport can reduce the emission of CO2. Finally, the realization of the above sustainable travel mode structure requires support of reasonable policy strategy, these is need to policies might include improved services level of public transportation, improved bicycle and pedestrian infrastructure and many others.

V. ACKNOWLEDGMENT

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