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Integration of Theory of Planned Behavior and Norm Activation Model on Student Behavior Model Using Cars for Traveling to Campus

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Abstract: Although there are clear environmental, economic, and social drawbacks in using private vehicles, students still choose cars to get to campus. This study reports an investigation of psychological factors influencing this behavior from the perspective of the Theory of Planned Behavior and Norm Activation Model. Students from three different university campuses in Surabaya, Indonesia, (n = 312) completed a survey on their car commuting behavior. Results indicated that perceived behavioral control and personal norm were the strongest factors that influence behavioral intention. Attitude, subjective norm, perceived behavioral control, and personal norm explain 62.7% variance of the behavioral intention. In turn, behavioral intention explains 42.5% of the variance of the actual car use. Implications of these findings are that in order to alter the use of car, university should implement both structural and psychological interventions. Effective interventions should be designed to raise the awareness of negative aspects of car use.

Keywords: Students' car use; theory of planned behavior; norm activation model.

Introduction

Campus generally has an economic appeal; around campus will be attractive for various businesses. The concentration of activities at the same time and space could potentially raise various problems, such as disruption to the teaching-learning process, the loss of open green space, destroying the environment as a result of the provision of parking facilities, as well as the impact on health of the campus community. In addition, campus also gives effect to the community living around the campus, among others, traffic congestion and social conflict with residents.

The active role of campus is very important to achieve sustainable campus transportation, to keep the quality of life of the campus community, as well as people living around it, and to reduce the environmental impact as a result of the use of motor vehicles [1]. Campus is the right environment to experiment and to implement transport policy changes, as well as having authority with respect to the management of transportation facilities in the campus [2].

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In addition, travel pattern and an awareness of the impact of transport on the environment experienced by students during their study will affect their travel behavior in the future [3].

An effective solution to address the problems related to the use of cars requires a reduction in car traffic volume based on changes in car user behavior [4]. Because the journey is an expressive activity, there is an instrumental and affective component in the behavior and travel options [5,6]. Thus, policy to change individual behavior on the use of cars would be more effective when the intervention or action is directed to motivational use of cars [7,8,9].

Currently, utility theory is the most dominant model used to study how people make choices related to the travel activities, travel destinations, and mode of transportation. Various studies have been conducted based on random utility theory relating to the selection of transportation mode. Generally attention is focused on the evaluation of attributes associated with the options available [10]. Random utility theory assumes that individual choice related to a particular transportation mode is based on the individual socio-economic characteristics and attributes that describe the available options.

Research in developing countries has managed to prove that some social-psychological variables, factors related to attitudes, and affective evaluations, can contribute significantly to the utility model, and help to increase compliance on the utility model [11]. Thus, it is important to include the attitude and

personality traits through latent variables approach, since there is interaction between the beliefs, values, emotions, attitudes, and personality traits when individuals choose an alternative and to integrate attitudes and personality traits with the estimation of mode choice model in order to understand the influence of the variables underlying mode choice [12].

Behavior model is a method to determine psychological factors that mostly affect students' behavior in using cars for traveling to campus. Such information is a useful input in designing various campus transport policies. Anable et al. [13] stated that there are different models of behavior that can be used to study the psychological factors that affect the individual mode choice; among others, the Theory of Planned Behavior (TPB) and Norm Activation Model (NAM).

The Theory of Planned Behavior (TPB) is the development of the Theory of Reasoned Action [14]. TPB is the most popular conceptual frame at this time to explain the determinants of specific behavior. TPB has been used in a variety of research to provide a better understanding of the diverse behavior, not only in the field of social psychology but also in other fields [15]. TPB has also been used to study the behavior of mode choice to travel among students [9,16,17]. In contrast to TPB which refers to a non-altruistic behavior (the attitude of helping others insincerely), Norm Activation Theory (NAT) or Norm Activation Model (NAM) is proposed to explain the psychological process related to altruistic behavior (the attitude of helping other people sincerely). NAM was initially developed to describe the behavior of the pro-social behavior. As a consequence, researchers use NAM in the conceptualization of behavior to reduce car use as a behavior that is driven mainly by the motivation of pro-social behavior. That view is reflected in the assumption that normative self-expectations or personal norm (PN) is the most important determinant of mode choice [18]. When individuals value the well-being of other individual and believe that his behavior will give other individuals the consequences, or the awareness of the consequences (AC), and feel a personal responsibility due to the consequences, or the ascription of responsibility (AR), such individual will feel a moral obligation to protect the well-being of others. AC and AR are important precondition cognitive for the establishment of PN.

So far, however, there has been little discussion about the integration of TPB and NAM on student behavior model using cars for traveling to campus [9,16]. Therefore, to understand the nature of the relationships between the various psychological factors that affect the behavior of students' car use for university routes, the main issues that will be explored through this research is to determine these relationships based on the integration of TPB and NAM. The psychological factors analyzed in this study are: (1) attitude (ATT), (2) subjective norms (SN), (3) perceived behavioral control (PBC), (4) awareness of consequences (AC), (5) ascription of responsibility (AR), and (6) personal norm (PN).

It is expected that the research findings can be beneficial for designing campus transportation policies to reduce students' car use for university routes. Findings on the psychological factors that mostly affect students' behavior using car to campus can provide recommendation in considering the kind of psychological interventions, in addition to the structural interventions, which needs to be applied by the campus to affect the behavior of students' car use for university routes.

Methods

The research used a convenience sample of 312 student university-based car commuters from three private universities in Surabaya, Indonesia: (1) Petra Christian University, (2) Surabaya University, and (3) Widya Mandala Catholic University [19]. The study utilized a self-report paper and pencil questionnaire. All latent variables of the model were measured by two or more indicators, with exception for actual behavior (Table 1). For AC and AR, three indicators were used; while for PBC, two indicators were used.

Before analyzed, data were filtered to check the existence of outlier. This screening was conducted in two stages i.e. filtering univariate outlier and multivariate outlier. Univariate outlier test begins by calculating a Z-score response of each question in questionnaire that will be used in the structural equation model analysis using Statistical Package for the Social Science (SPSS) [20].

Based on an examination of the results of univariate outlier test, on 380 data, there were 41 data that has a range of Z-score outside the required range of Z-score < -3.00 or Z-score > 3.00 [21]. Multivariate outlier test was done by computing the Mahalanobis D^2 [21]. From 339 data that have gone through stages of univariate outlier test, there were 27 data with a probability value of Mahalanobis $D^2 \leq 0.001$. Thus, the number of test data left after performing multivariate outlier test is 312 data.

Table 1. Indicators Used for the Latent Variables

Latent Variable	Indicator
Attitude	ATTAS1: Driving a car means freedom to me
(4 items; Cronbach's α = 0.81;	ATTAS2:I love riding my car
Construct Reliability (CR) = 0.88;	ATTAS3:I like driving a car because I can decide whom to drive with (privacy)
Variance Extracted (VE) = 0.48)	ATTAS5: Riding my car is relaxing
	When you use the car for university routes next time, this will be …
	… flexible (ATTIN1)
	… convenience (ATTIN2)
	… comfortable (ATTIN3)
	… safe and secure (ATTIN4)
Subjective Norm	Do you think that ... believe that a car is a necessity in daily life?
(8 items; Cronbach's α = 0.88; CR	… your parents … (BoNO1)
= 0.86; VE = 0.46)	… your brother/sister … (BoNO2)
	… your boy/girlfriend/best friend … (BoNO3)
	… your friend … (BoNO4)
	How strong would … support you if you use the car for university routes next time?
	… your parents … (SN1)
	… your brother/sister … (SN2)
	… your boy/girlfriend/best friend … (SN3)
	… your friend … (SN4)
Perceived Behavioural	I am able to use forms of transport other than the car to get to university (PBC2)
Control (2 items; Cronbach's α =	It would be easy for me to reduce my car use when getting to university (PBC3)
0.77; CR = 0.79; VE = 0.65)	
Awareness of Consequences	Constructing new roads and parking places for the increasing number of car threatens
(3 items; Cronbach's α = 0.69; CR	the last intact biosphere in this country (AC1)
= 0.75; VE = 0.51)	Avoiding using the car to commute to and from campus will help to solve wider
	environmental problems (air pollution, noise) (AC2)
	I can help to solve my campus's transport problems by avoiding car use (AC4)
Ascription of Responsibility	It is not only the state and the industry who are responsible for reducing the traffic
(3 items; Cronbach's α = 0.76; CR	related environmental pollution, but me too, for example with my decision to use car for
= 0.77; VE = 0.53)	university routes (AR1)
	I feel personally responsible for the problems resulting from car use (AR2)
	I contribute to environmental problems if I use car for university routes (AR3)
Personal Norm	I am trying to use the car less (PN5)
(4 items; Cronbach's α = 0.60; CR	Reducing my car use would make me feel good (PN7)
= 0.77; VE = 0.46)	For the sake of environment, car users should pay higher taxes (PN8)
	*Due to my values/principles, I feel obligated to use the car for university routes (PN13)
Behavioural intention	*I intend to reduce car use for university routes during the next semester (BI1)
(4 items; Cronbach's α = 0.63; CR	How often will you use the car for university routes during the next semester (BI2)
= 0.76; VE = 0.44)	*Do you do various things to refrain from car use for university routes (BI3)
	*Have you ever had a commitment to reduce the use of car for university routes (BI4)
Actual Behavior	How often did you travel by car for university routes in the previous semester (AB)
(1 item)**	

All items used scales with response options: disagree strongly, disagree, neither agree nor disagree, agree, agree strongly. Disagree strongly was coded as 1 and agree strongly as 5.
Indicators marked * were reverse coded for analysis. They were used scales with response options: never, rare, occasionally, often, always. Never was coded as 1 and always as 5.

Results

Estimation of model was determined using Analysis of Moment Structure (AMOS) [22] and the result met the statistical portion of the suitability of the model (Table 2). There are four invalid constructs with Variance Extracted (VE) < 0.50, i.e. ATT (0.42), SN (0.45), PN (0.31), and BI (0.32), but the majority of invalid constructs are qualified CR ≥ 0.70 (Table 3). The Model is considered optimum because Modification Indices (MI) does not propose any addition of error covariance that can increase model goodness of fit, and increase validity and reliability model construct significantly.

Figure 1 shows the structural model. All Standard Loading Factor (SLF) and the correlation between constructs are significant (p-value ≤ 0.05), except for the effect of AC to PN (p-value = 0.106). There is a positive and significant correlation between ATT, SN, and PBC respectively, and similarly between AC and AR. Construct ATT, SN, and PBC gives significant positive influence to BI, and construct AR and AC gives significant positive influence to PN. However, the influence of AC to PN is insignificant.

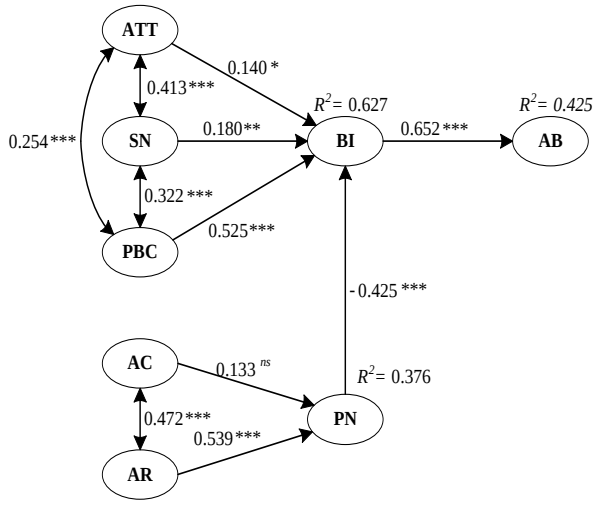
Increasing of AC and AR will increase PN. Increasing of ATT, SN, and PBC will increase students' behavioral intention (BI) using cars for traveling to

Table 2. Model Goodness of Fit

Goodness of Fit Indicators	Acceptable Threshold Levels	Estimate	Note
Absolute-Fit Measures			
χ^2 (Chi-Square)	expected low	1284.65	-
Significance of Probability	≥ 0.05	0.00	insignificant
Degree of Freedom		454.00	-
CMIN/df	≤ 2.00	2.83	insignificant
GFI	≥ 0.90 (*good fit*), 0.80 ≤ GFI < 0.90 (*marginal fit*)	0.80	marginal fit
RMR	≤ 0.05 (*good fit*)	0.09	insignificant
RMSEA	≤ 0.08 (*good fit*), < 0.05 (*close fit*)	0.08	good fit
Incremental-Fit Measures			
TLI		0.80	marginal fit
NFI		0.76	insignificant
AGFI	≥ 0.90 (*good fit*), 0.80 ≤ GFI < 0.90 (*marginal fit*)	0.76	insignificant
RFI		0.72	insignificant
IFI		0.83	marginal fit
CFI		0.83	marginal fit

campus. Meanwhile, increasing PN will reduce BI. Thereafter, increasing or decreasing of BI will increase or decrease students' actual behavior (AB) using cars for traveling to campus. About 38% variance of PN is explained by AC and AR whereas construct ATT, SN, PBC, and PN can explain about 63% variance of BI, while 43% variance of AB is explained by BI (Figure 1).

Construct PN is mostly affected by construct AR (SLF = 0.539; p-value ≤ 0.001), while construct BI is mostly affected by construct PBC (SLF = 0.525; p-value ≤ 0.001). Based on the value of the SLF, it can be interpreted that if construct PBC is increased by one standard deviation, BI will be increased by 0.525 standard deviation (Figure 1).



ns = non significant ($p > 0.05$); *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Figure 1. Structural Model of TPB+NAM

Table 3. Validity and Reliability of Model Constructs

Construct	Indicator Code	SLF	*p-value*	CR	VE
ATT				0.85	0.42
	ATTAS1	0.54			
	ATTAS2	0.70	< 0.001		
	ATTAS3	0.79	< 0.001		
	ATTAS5	0.54	< 0.001		
	ATTIN1	0.63	< 0.001		
	ATTIN2	0.67	< 0.001		
	ATTIN3	0.66	< 0.001		
	ATTIN4	0.66	< 0.001		
SN				0.85	0.45
	BoNO1	0.35	< 0.001		
	BoNO2	0.37	< 0.001		
	BoNO3	0.42	< 0.001		
	BoNO4	0.45	< 0.001		
	SN1	0.87	< 0.001		
	SN2	0.93	< 0.001		
	SN3	0.82	< 0.001		
	SN4	0.83			
PBC				0.78	0.65
	PBC2	0.68			
	PBC3	0.91	< 0.001		
AC				0.76	0.52
	AC1	0.70			
	AC3	0.66	< 0.001		
	AC4	0.80	< 0.001		
AR				0.77	0.53
	AR1	0.64			
	AR2	0.81	< 0.001		
	AR3	0.72	< 0.001		
PN				0.63	0.31
	PN5	0.68			
	PN7	0.62	< 0.001		
	PN8	0.51	< 0.001		
	PN13	0.34	< 0.001		
BI				0.65	0.32
	BI1	0.55			
	BI2	0.71	< 0.001		
	BI3	0.47	< 0.001		
	BI4	0.50	< 0.001		

Discussion

The results indicate that students' behavior intention to use cars is strongly predicted by their attitude, subjective norm, perceived behavioral control, and personal norm. Their personal norm, is strongly predicted by their sense of responsibility (ascription of responsibility, AR) rather than by awareness of the consequences (AC).

Behavior model is a method to determine the psychological factors that mostly affect students' behavior in using cars for traveling to campus. Such information is a useful input in designing various campus transport policies. Based on the structural model of TPB+NAM, BI is influenced more by PBC than by PN. The combination of positive influence of TPB construct (ATT, SN, and PBC) and negative influence of NAM construct (PN) lead to increasing or decreasing of students' behavioral intention (BI); furthermore, it will increase or decrease students' actual behavior (AB) in using cars for traveling to campus.

Based on the relationship between psychological factors in model TPB+NAM, campus needs to devise strategies of intervention which is a combination of the structural interventions (hard transport measure) and the psychological intervention (soft transport measure), to affect students' motivation to reduce the use of cars. Motivation to reduce car use is influenced by individual and contextual factors. Such interventions should be directed primarily to enhance students' sense of responsibility (ascription of responsibility, AR) with regard to the negative impact of using car for traveling to campus.

Structural intervention can be either facility incentives or disincentives (such as bicycle facilities, preferential parking space, student dormitories, restricted parking location). Other structural interventions can be either financial incentives or disincentives (e.g. ease of bicycle ownership installment, the chance to try a vanpool service (free of charge), guaranteed ride home, and the enforcement of the more expensive parking fee rates for those who drive alone). Meanwhile, the psychological intervention can be in the form of educational programs and campaigns (e.g. travel awareness campaigns on the negative impact of using car and positive impact of car-share). Another form of psychological interventions are such as personalized travel planning, public transport and car-sharing marketing information schemes.

Further research needs to be done by adding the various factors that influence the behavior of the model allegedly, such as car ownership and distance of residence, to get a better behavioral model that can explain students' behavior intention and actual behavior using car for traveling to campus. It is also recommended to perform further research to analyze the psychological factors that mostly affect the actual behavior and behavior intention of students' car use for university routes, due to the implementation of structural interventions and psychological interventions during a specific time period, for example the ride share program. Thus, the sensitivity of each psychological factor in behavioral models can be evaluated, as well as the effectiveness and feasibility of implementing these interventions to reduce students' car use.

Conclusion

Student behavior model using cars for traveling to campus is an important contemporary issue, influencing such factors as traffic congestion and social conflict with residents. This study explored the relationship between the various psychological factors that affect the behavior of students' car use for university routes based on integration of Theory of Planned Behavior (TPB) and Norm Activation Model (NAM). Overall, the results highlight that students behavior intention is influenced more by the perceived behavioral control than by personal norm. The combination of positive influence of TPB constructs (attitude, subjective norm, and perceived behavioral control) and negative influence of NAM construct (personal norm) leads to increasing or decreasing of students' behavioral intention. Furthermore, it will increase or decrease students' actual behavior in using cars for traveling to campus.

The results of the research have implications for university policy aimed at reducing the number of students using cars for traveling to campus. It is suggested that the main strategy should be to focus on raising students' personal norm, specifically attempting to raise the awareness of negative aspects of car use, through implementation of both structural and psychological interventions.

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