

Analysis of the Level of Public Acceptance of Road Pricing Policies with Value Belief Norm Theory Approach

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Abstract— The Transport Demand Management (TDM) policy is aimed at reducing the use of private cars. Concern and awareness of the environment is the basis for the TDM strategy acceptance model. This research aims to analyze and describe problem awareness, personal norms, willingness to reduce car use, justice, violations of freedom, acceptance, intentionality, and behavior in accepting TDM policies (one of which is road pricing). The method used is a combination of Value Belief Norm (VBN) theory and the level of public policy acceptance using Structural Equation Model (SEM) analysis. The total survey data used/verified was 451 respondents who were residents of Yogyakarta. The research results show that the VBN variable (36.7%) has a greater influence on the acceptance of road pricing policies, while violations of freedom do not have a significant influence (-8.7%) and the fairness variable is -7%.

Index Terms— policy acceptance, road pricing, TDM, value belief norm.

I. INTRODUCTION

Population growth in Special Region of Yogyakarta (DIY) increases every year. According to data from the Central Bureau of Statistics of DIY, in 2022 the population reached 4,021,816 people (*BPS Provinsi D.I. Yogyakarta*, 2022). This high population growth has also resulted in rapid growth of private vehicles (car and motorcycle) due to high mobility needs, growth reaching 7.59% per year for motorcycles and 10.45% per year for car vehicles (Kresnanto, 2023). And the derivative impact of the high growth of vehicles is transportation problems in the form of road congestion. Congestion causes air pollution to increase and results in negative effects on the environment. Broadly speaking, emissions from motor vehicles contribute greatly to the release of greenhouse gases or other pollutants. Reducing the use of motor vehicles is the main solution to reduce negative effects on the environment (Lind et al., 2015). To overcome these problems, strategies are used *Transport Demand Management* (TDM). TDM aims to limit the use of private vehicles. One of the policies in TDM is *road pricing* or paid roads (Kresnanto, 2024; *What Is TDM - Association for Commuter Transportation*, n.d.). If the vehicle will pass a road section and at certain hours will be charged or a predetermined rate. Road users will be faced with several choices, namely paying and being able to pass the road section, change the travel route, change the travel time, and switch to public transportation. If the policy *road pricing* applied at a fairly high cost, the community will switch to public transportation which is relatively cheaper (Hsieh, 2022; Mattsson, 2008; A. S. Putra, 2020).

However, before the policy is implemented, it is necessary to study the public's acceptance of the policy (Bhardwaj et al., 2024). Public acceptance of road pricing policies can vary depending on a variety of factors, including how the policy is implemented, its impact on individuals and communities, and how information and understanding of the policy is conveyed to the public. In an acceptance, of course, there are many things to consider, such as justice and violations of freedom. Returning to the purpose of the TDM strategy is to limit the use of private vehicles, this becomes a personal awareness and norm in the community to do so because the use of motor vehicles can result in negative impacts on the environment. This concern and awareness of the environment became the basis for the acceptance of the TDM strategy (Lind et al., 2015). Based on this background, research can be formulated as (1) what is the level of public acceptance of the road pricing policy? and (2) what factors influence public acceptance in accepting the road pricing policy? The objectives of this study are to create an acceptance model of TDM strategy road pricing policy and analyze factors that influence public acceptance of the implementation of road pricing policies.

II. LITERATURE REVIEW

A. TDM Acceptance Model

Transport Demand Management (TDM) is often referred to as *mobility management* which includes all methods that will increase the utilization of existing facilities and transportation facilities more efficiently by regulating or minimizing the use of motor vehicles by influencing travel behavior. Travel behavior includes frequency, destination, mode, and travel time traveled. The main purpose of TDM is to reduce the number of vehicles using the road network system by providing many mobility options (ease of travel) for travelers. General purpose of TDM is to improve the overall efficiency of traffic movement by providing high accessibility by balancing between demand and available supporting facilities, saving fuel use, and travel time more efficiently (Broaddus et al., 2009; Fidel, 2015; Kresnanto, 2021; R. W. Putra, 2023).

The definition of acceptance is described as an attitude of accepting something that is offered or given affirmatively (Kushari, 2005). It can also be interpreted as a "response" or "reaction" to something offered or given. Acceptance in policy is a behavior. Behavior is a psychological tendency expressed by evaluating an entity with several perceived factors. In this case, acceptance as a behavior would be an affirmative attitude through a specific object e.g. policy. This means that acceptance as a behavior can be defined as behavior that is in accordance with the aims and objectives of the policy system to be applied (Lata & Kumar, 2022). Therefore, goals and desired behavior patterns must be defined first.

Acceptance of TDM is critical to determining whether or not the action will effectively change the traveler's behavior. However, TDM measures or policies are rarely considered effective and considered acceptable by travelers. In various studies from several countries of impetus action (*Push*) is considered less acceptable than the pull action (*pull*). TDM acceptance has been studied as an indicator of readiness to act in environmental care (Lata & Kumar, 2021). Environmental beliefs and norms that form the basis for TDM evaluation (Eriksson et al., 2006). In the TDM acceptance model is made into 2 parts where the orientation is to care for the environment, awareness of problems, personal norms, and willingness to reduce the use of private cars (value belief norm (VBN) theory). Then in the use of cars between users with each other will arise a sense of injustice and affect the subsequent freedom of acceptance of TDM (level of acceptance/public policy acceptance (PPA)) (Figure 1).

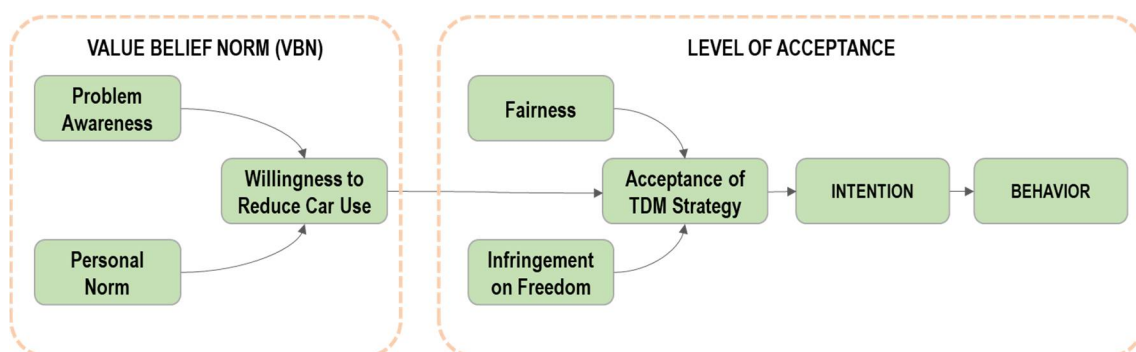


Figure 1. TDM acceptance purposed model

B. Structural Equation Modeling

Structural Equation Modeling (SEM) is a statistical technique that analyzes patterns of relationships between latent constructs and indicators, latent constructs with one another, and direct measurement errors (Hair et al., 2012). Hence, the primary prerequisite for utilising SEM is constructing a theoretical model comprising a structural and a measurement model in the shape of a path diagram grounded on theoretical rationale. Structural Equation Modelling (SEM) is a set of statistical methods that enable the simultaneous assessment of several relationships. The association is formed between one or more independent variables (Sarwono & Sarwono, 2018).

III. METHODOLOGY

The research was conducted in the Special Region of Yogyakarta, which has a population of 3.7 million people. To guarantee representativeness, the minimum number of respondents (based on Slovin's formulation) required is more than 400, selected randomly from the existing population. Respondent selection was carried out with a minimum age limit of adulthood, namely individuals who were deemed to have the capacity to make rational decisions. The collected data was then processed using spreadsheet and SPSS software to facilitate statistical analysis. Data analysis was carried out using the SEM method with the help of SmartPLS software, which made it possible to identify complex relationships between the variables observed in this study.

Questionnaire design based on the TDM (road pricing) Acceptance structural model with a combination approach of PPA and VBN as in Table . Measuring answers to the questionnaire uses a 1-7 level Likert Scale.

TABLE I. QUESTIONNAIRE FOR INDICATOR MEASUREMENT

THOERY	LATENT VARIABLES	OBSERVED INDICATORS
VALUE BELIEF NORM (VBN) Pro-Environment Orientation	Problem Awareness (PA)	(VBN1) I am of the opinion that emissions from motorized vehicles have a detrimental effect on both human health and the surrounding ecosystem. (Eriksson et al., 2006)
	Personal Norm PN)	(VBN2) I am ethically obligated to decrease the utilization of private vehicles to mitigate adverse effects such as pollution and fuel wastage. (Eriksson et al., 2006)
	Willingness Reduce Car Use (WR)	(VBN3) I am willing to decrease the utilization of private vehicles in order to mitigate the adverse effects associated with pollution and fuel consumption. (Eriksson et al., 2006)
PUBLIC POLICY ACCEPTANCE (PPA)	Fairness (FR)	(FR) I feel that I and other drivers are treated unfairly by the TDM (road pricing) policy. (Jou et al., 2010)
	Infringement On Freedom (IF)	(IF) Since travel expenses are rising, I believe that TDM (road pricing) violates the freedom to choose routes. (Jou et al., 2010)
	Acceptance (AC)	(ACP ₁) From my perspective, the road pricing scheme is a beneficial measure for addressing traffic congestion. (Jou et al., 2010) (ACP ₂) If you participate in a voting, what is the likelihood that I will endorse TDM policies? (Jou et al., 2010)
	Intention (IN)	(IN ₁) I support the adoption of the TDM (road pricing) policy as a means to mitigate traffic congestion. (Hsieh, 2022)
	Behavior (BE)	(BEH ₁) I will continue to use the road notwithstanding the introduction of road charging, without seeking alternative routes. (Gibson & Carnovale, 2015)
		(BEH ₂) I will seek alternative methods to circumvent road fees. (Gibson & Carnovale, 2015) (BEH ₃) I will adjust my travel schedule to avoid being impacted by the road pricing policy. (Hsieh, 2022)

IV. RESULTS AND DISCUSSION

A. Study Location, Procedure, and Respondents

This research was carried out by conducting an interview survey with respondents in DIY. DIY was chosen as the research location considering the fairly high growth of private vehicles, namely more than 10% per year (Nindyo Cahyo Kresnanto, 2019). Respondents are people who travel every day to the Yogyakarta City area. With a population of DIY of 4,021,816 people, a minimum sample size was determined based on the Slovin Formula (*Research Assignments - Slovin's Formula*, n.d.) with a margin of error of 5% is > 400 respondents. The number of respondents obtained during the interview was 451 with characteristics as in Table II.

TABLE II. RESPONDENT CHARACTERISTICS

Characteristics	Num of Respondents	Persen (N = 419)
Age		
15 - 20	59	14.08%
21 - 30	245	58.47%
31 - 40	55	13.13%
41 - 50	48	11.46%
51 - 60	8	1.91%
> 60	4	0.95%
Gender		
Male	251	59.90%
Female	168	40.10%
Education Level		
Elementary school	3	0.72%
Junior high school	19	4.53%
Senior High School	251	59.90%
Diploma	17	4.06%
Bachelor Degree	115	27.45%
Master Degree	11	2.63%
Doctoral	3	0.72%
Income per Month (Rupiah – Rp)		
< Rp2.500.000	277	66.11%
Rp2.600.000 - Rp5.000.000	85	20.29%
Rp5.100.000 - Rp7.500.000	26	6.21%
Rp7.600.000 - Rp10.000.000	15	3.58%
Rp10.100.000 - Rp12.500.000	7	1.67%
Rp15.100.000 - Rp20.000.000	5	1.19%
> Rp20.000.000	4	0.95%
Main Transport Mean		
Walking	14	3.34%
Cycling	6	1.43%
Motorbike	348	83.05%
Car	43	10.26%
Transit	8	1.91%
Purpose of Daily Travel		
Working	259	61.81%
Shoping	2	0.48%
Studying in Bachelor Degree	49	11.69%
Studying in Junior/Senior High School	66	15.75%
Lainnya	43	10.26%

B. Validity and Reliability

The total survey data obtained by 451 respondents was then carried out data quality tests which included validity tests and reliability tests using SmartPLS software. The following are the results of data quality tests using *SmartPLS* software. It can be concluded that all data tested passed the validation test, because the loading factor value > 0.70 (Table 3).

TABLE III. DATA VALIDITY TEST RESULTS

Variables	Code	Loading Value	Information	Cronbach's Alpha	Information
Problem Awareness	VBN1	1,000	Valid	1,000	Reliable
Personal Norm	VBN2	1,000	Valid	1,000	Reliable
Willingness to Reduce Car Use (WR)	VBN3	1,000	Valid	1,000	Reliable
Fairness	FR	1,000	Valid	1,000	Reliable
Infringement on Freedom	IF	1,000	Valid	1,000	Reliable
Acceptance	ACP1	0,916	Valid	0,785	Reliable
	ACP2	0,898	Valid	1,000	Reliable
Intention	INT	1,000	Valid	1,000	Reliable
Behavior	BEH1	0,877	Valid	0,751	Reliable
	BEH2	0,709	Valid		
	BEH3	0,754	Valid		

C. Result of Structural Equations

The results of the analysis can be seen in the schematic in figure 2. Problem awareness statements have a 100% influence on the WR. Statements about personal norms (*person norms*) have a 100% influence on the WR. The statement of WR has a 100% effect on *acceptance*. Fairness statements have a 100% influence on *acceptance*. Infringement on freedom has a 100% effect on acceptance. The statement of *acceptance* has an influence of 90.6% - 90.9% on *intention*. Statements about *intention* have a 100% influence on behavior.

From the scheme above, it can be concluded that personal norms are more influential on the desire to reduce car use than *problem awareness*. Personal norms get 52.7% while *problem awareness* only gets 23.5%. The WR had an effect of 36.7% on *acceptance*. Fairness did not have a significant effect because it only got -7% of acceptance, while infringement on freedom also got -8.1%. Acceptance affects 75.2% of *intention*. Intention affects 54.9% of behavior.

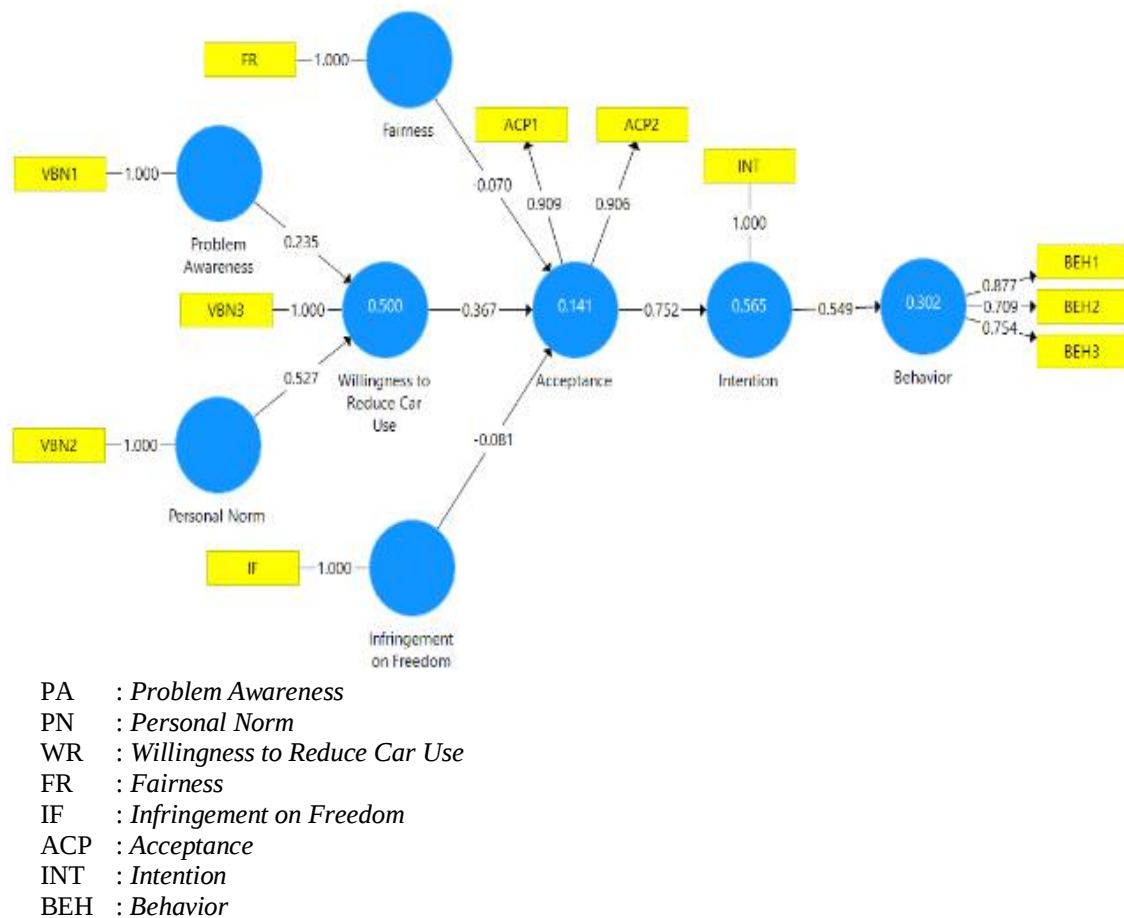


Figure 2. SEM analysis scheme

Table shows the average results and standard deviation of respondents' assessments of the VBN and PPA variables. In the VBN, problem awareness (PA) of respondents showed a good response (mean > 5) related to awareness about the bad consequences of motor vehicle pollution. Likewise with the personal norm (PN), with a mean close to 5. Nevertheless, it should be noted that possessing high levels of issue awareness (PA) and personal norm (PN) does not necessarily ensure that individuals will be inclined to engage in sustainable transportation practices. This is evident from the fact that the average willingness to reduce car usage is lower than the levels of problem awareness and personal norm.

TABLE IV. MEAN AND STANDARD DEVIATION FOR VBN AND PPA VARIABLES

		Road Pricing	
		Mean	S.D.
Value Belief Norm (VBN)	Problem Awareness (VBN1)	5.304	1.356
	Personal Norm (VBN2)	4.922	1.337
	Willingness tor Reduce Car Use (VBN3)	4.698	1.264
	Fairness (FR)	4.149	1.183
	Infringement On Freedom (IF)	4.432	1.212
Public Policy Acceptance (PPA)	AC1	4.621	1.272
	AC2	4.412	1.282
	Intention (INT)	4.647	1.427
	BEH1	4.304	1.384
	BEH2	4.297	1.375
	BEH3	4.601	1.397

Scales 1–7 (1 = strongly disagree, 2 = more disagree, 3 = disagree, 4 = undecided, 5 = agree, 6 = more agree, 7 = strongly agree)

Meanwhile, a simple way to see whether intentions can be realized into behavior is to create a behavioral intention diagram matrix (Figure 3). From Figure 3 it can be concluded that in accepting the road pricing policy, the average community's intention is to agree or be at level 5 (dark brown at level 5 intention). Meanwhile, when it comes to behavior, the average community behavior does not agree or is at level 3. So it can be concluded that the intention towards the road pricing policy has not been able to encourage community behavior to reduce the use of private vehicles.

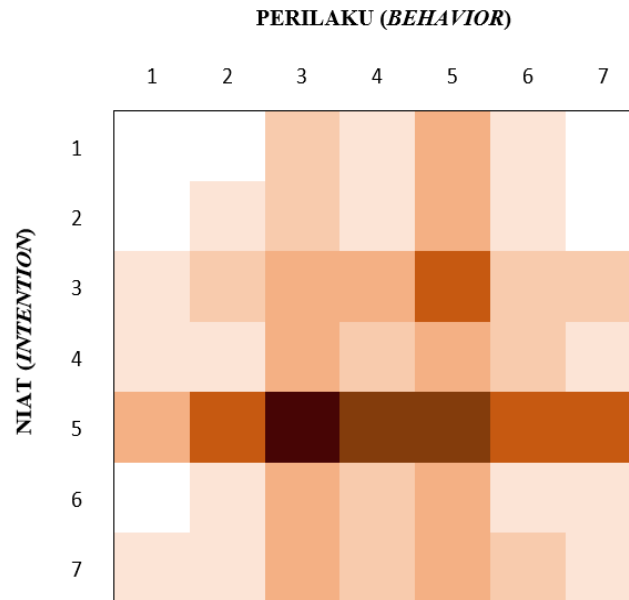


Figure 3 Comparison of intention and behavior

V. CONCLUSIONS

The VBN variable is more influential on the acceptance of road pricing *policies* than justice and freedom violations. Because VBN is more influential in acceptance, it can be interpreted that the public's desire to reduce car use greatly influences the community in accepting *road pricing policies* in DIY.

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