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CIVIL & ENVIRONMENTAL ENGINEERING | RESEARCH ARTICLE

The understanding of the social determinants factors of public acceptance towards the end of life vehicles

Charli Sitinjak¹, Rozmi Ismail¹, Edward Bantu^{2*}, Rizqon Fajar³ and Karuhanga Samuel²

Abstract: Indonesia is one of the highest producers of the automotive industry in Southeast Asia. However, rapid progress in this sector directly poses a threat to the increase in End-of-Life Vehicles in Indonesia. Several policies and instruments have been implemented to reduce the high number of ELVs, such as raising vehicle taxes and requiring periodic emissions testing systems to determine vehicle eligibility. These initiatives, however, do not reduce the use of ELV vehicles in Indonesia. Indonesia did not win the ELV because of high rejection from the users. To date, no research has been done to determine public acceptance of ELV policies. This study aims to examine the public acceptance of ELV management, particularly to gauge information about people's knowledge, attitude, social influence, and institutional trust as mediation variables. A cross-sectional survey was conducted involving 243 respondents from JABODETABEK (Jakarta, Bandung, Depok, Tangerang, Bogor, and Bekasi). After passing satisfactory reliability and validity tests, the hypothesized research model was estimated using structural equation modelling. The study found that knowledge, attitude, social influence, and institutional trust all had a significant influence on public acceptance. The result also indicated that institutional trust variables serve as effective mediators. The proposed model is a good model (overall $R^2 = 0.703$, $F = 58.2$, $p = 0.00$). The implication of this study suggested that policymakers should consider that implementing ELV-related policies is not only a solution to the automotive cycle and environmental health but also must address individual differences by taking into the factors forming one's acceptance.

Subjects: Transport & Vehicle Engineering; Health & Safety Law; Statistics for Social Sciences; Social Work

Keywords: Car use reduction; ELV; air quality; acceptance

1. Introduction

In Indonesia, environmental issues and conservation practices have long been unresolved issues. For example, the problem of environmental pollution followed by the indiscriminate disposal of industrial waste has become a major dilemma in the country; Especially with issues regarding illegal garbage disposal, which always make headlines from time to time in newspapers and other media.

One of the industrial waste that is not realized by the people of Indonesia is ELV. ELV is a vehicle that has reached the end of its service life. ELV must be properly avoided by environmental pollution and regain useful materials, such as iron raw materials (Deendarlianto et al., 2020). In recent years, the Malaysian government has given special attention to ELV because it contributes

Table 1. Hazardous ELV waste/components and their main characteristics (Liu et al. 2014)

Hazardous waste components	Characteristic
Waste liquid gas storage tank	Reactivity (R), flammability (F)
Unsafe airbag	Reactivity (R)
Waste battery	Toxicity (T), Corrosivity (C)
Waste gas purification catalysts	Toxicity (T)
Waste oil	Flammability (F)
Waste brake fluid, antifreeze, riot agent	Toxicity (T)
Waste air conditioning refrigerant	Toxicity (T)

Table 2. Sample characteristic

Male(%)	68.3
Female (%)	31.7
18-20 Years	3.3
21-30 Years	17.3
31-40 Years	24.3
41-50 Years	11.1
51-60 Years	35
>61 Years	9.1
Educational Level (% University Degree)	91.3
Motors/Cars ownership	93.5

to global warming. ELV waste contains a harmful chemical, as shown in [Table 1](#), so it must be removed and separated under existing ELV management standards (Li et al., 2014).

Older vehicles or ELVs are eight times more likely to contribute to the increase in air pollution than new vehicles, and 15-year-old trucks contribute ten times more to air pollution than new trucks (Marino et al., 2020; Meir & Oron-Gilad, 2020; Xiao et al., 2019). Along with the increase of vehicles on the streets in Indonesia, the threat of the decline in air quality in urban areas is inevitable (Deendarlianto et al., 2020), let alone the absence of regulations that specifically deal with ELVs.

Currently, vehicle recycling or solid waste in Indonesia is very disorganized (Fitria Maryanti, 2017; Susmono, 2017). The informal sector that does not follow legal/environmental/ethical norms carries the management of old vehicles out. The non-scientific way in which processes are carried out in the informal sector leads to low material recovery. This has caused environmental damage through water/air/soil pollution and provided unsafe conditions for workers. Vehicle owners are also likely to be harmed and get into trouble because vehicles sold to the market may be used in illegal activities.

Good ELV management is a crucial element in a suite of environmental interventions for sustainability management development in Indonesia. However, changing social practices, social beliefs, and conventional value systems, poses a major problem to build a sustainable society. Furthermore, people in developing countries are more concerned with their basic needs and disregard the negative effects that old vehicles can have. By changing social perception and attitudes by increasing knowledge and giving socializing to embrace and implement the benefits of implementing ELV policy is an important aspect of better ELV management in Indonesia.

In our extensive review of the literature, we found limited study-related psychosocial factors in implementing waste management. A systematic examination of the psychosocial aspect is critical,

we found that knowledge and attitude play important role in intention as well as waste management behavior, we also found that knowledge and method of waste management do not significantly affect the intention or actual people's behavior. Whereas institutional trust has significant aspects to increasing individual acceptance. ELV management programs have generally focused on awareness and infrastructure. Our findings suggest that governments need to recognize social factors, organization, and individual factors before making policy.

This paper tries to investigate the determination of the individual level against public acceptance related to ELV management. Based on a survey of people among citizens in the JABODETABEK, the study also expands on previous research on public acceptance of policy measures on urban transportation and examines the following research questions:

RQ1: What is the level of public acceptance of ELV management?

RQ2: What are individual-level variables associated with acceptance?

The goals of this study are to look at the effectiveness of variable knowledge, attitude, and institutional trust, in the general structural model to investigate the extent to which these variables affect people's willingness to adopt and implement ELV-related regulations. By making interpersonal behavior theory look a complex way social, organizational, and individual factors in the process of policy acceptance, as well as provide a deep understanding of social acceptance related to ELV management to policymakers and practitioners.

2. End of life vehicles treatment practice

The processes of ELV treatment are summarized in [Figure 1](#). As shown in [Figure 1](#) the treatment process starts from the depollution stage, this stage is removing fluids (e.g., engine oil) from an ELV (Hedayati & Subic, 2011). After that, the ELV is passed onto the dismantling processes which remove any parts. The crushed vehicle hulk is then transported to a metal shredding factory, where the metallic and non-metallic components of ELVs are separated (Chung Chen et al., 2010).

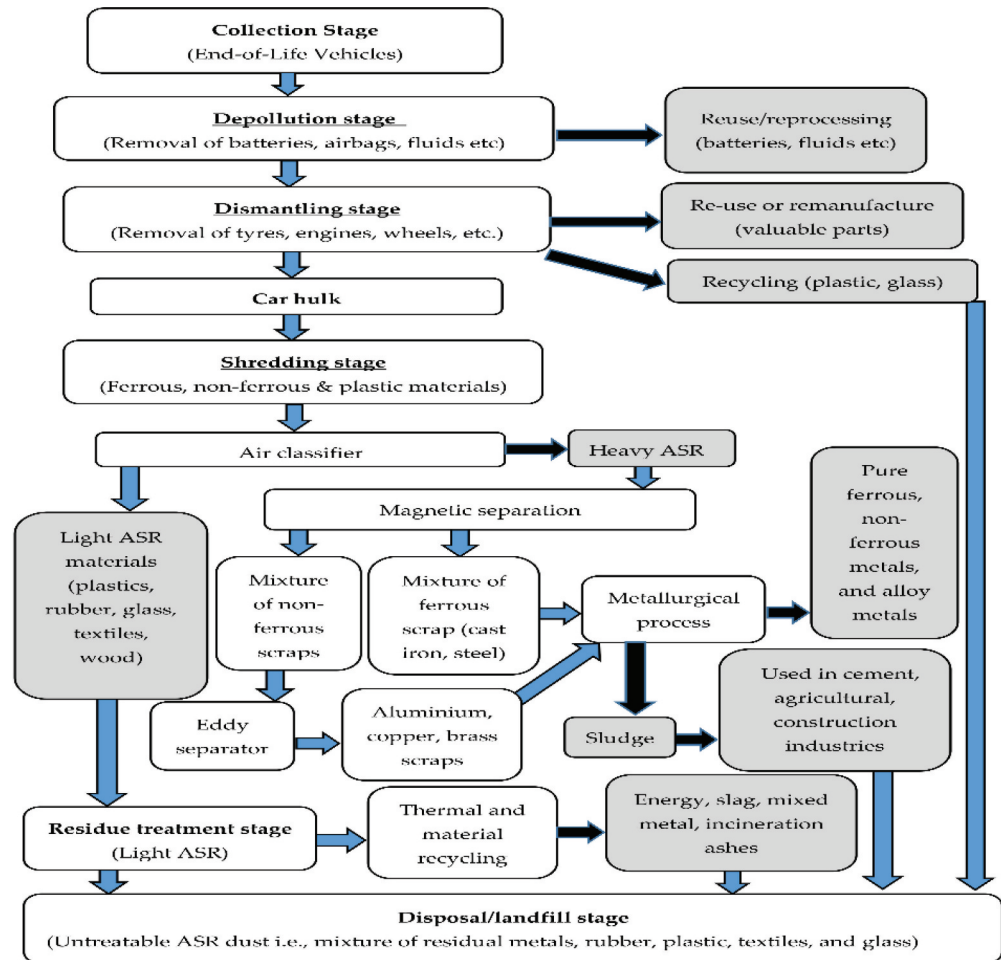
ASR (automobile shredder residues) or "ASR" is the residue produced by the shredding procedures of the "Aeraulic separator" and "Eddy current separator" in [Figure 1](#) (Hiratsuka et al., 2014; Sato et al., 2019). After separating ferrous and nonferrous metal from shredder output, ASR is defined as a primarily nonmetallic material that remains (Ichi Sakai et al., 2014; Ruffino et al., 2021; Yi & Lee, 2021).

3. Social acceptance framework

Several studies have looked into public acceptance of waste management policies aimed at reducing pollution. This study, which included a public opinion survey on ELV management, described popular approval of these policies and looked into their individual and contextual determinants. Following a categorization of the elements that influence the adoption of transportation policies and environmental regulations, we review some of these studies in this section, as shown in [Figure 2](#).

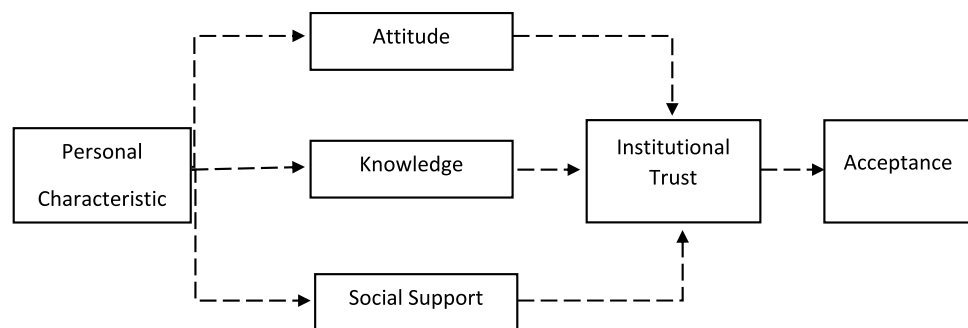
Gender, age, education level, income, and car ownership are the first set of important individual-level characteristics that influence ELV policy approval. Women, for example, show lower levels of support for transportation regulations than men, according to several research. Acceptance is also influenced by educational and socioeconomic position. For example, education and income had a substantial effect on acceptability, with individuals with the highest educational level and income indicating the most support for an imposing congestion strategy. Sfendonis et al. (Sfendonis et al., 2017) investigated public opinion toward low-emission zones in Volos and discovered that lower-income and young people have less support. Sociodemographic differences become the initial factor that determines a person's acceptance of a rule, Schade and Schlag (Schade & Schlag, 2003), in their research found that only socioeconomic status affects people's acceptance level.

Figure 1. Processes involved in the treatment of ELVs (Cossu and Lai, 2013).



When a person’s attitude is based on their old vehicle or their attitude toward their environment, the sociodemographic influence of acceptance can be lost. Regulations that are burdensome to vehicle owners are frequently rejected, according to Allen et al (Allen et al., 2006). In his research of the Edinburgh congestion charge, he discovered a strong association between discharges and vehicle owners. Eliasson & Jonsson (Eliasson & Jonsson, 2011) found a similar result, stating that respondents who own a car are more likely to oppose ELV policy than those who do not own a car

Figure 2. Suggested explanations for policy acceptance.



because they believe they will not be harmed by the policy's implementation, whereas those who do not own a car may see benefits from the policy's implementation.

Beyond sociodemographic factors, policy knowledge is an important factor in policy acceptance. Ajzen et al. (Ajzen et al., 2011), for example, found that one's expertise is positively connected with individual acceptance in a study. Other research has looked into the relationship between acceptance and knowledge. According to Skoumpopoulou et al. (Skoumpopoulou et al., 2018), providing thorough knowledge to the entire community will aid in changing their perceptions of the regulations, allowing them to gradually change their behaviors and direct them to follow the new norms.

Social impact is another important individual-level driver of acceptance. The conviction in a rule that is impacted by the social context is known as social influence. According to Mensah (Mensah, 2019), social influence has a significant impact on people's behavior. Moussaid et al. (Moussaid et al., 2013) discovered that social influence is the ability of people to alter, revise, and change their conduct as a result of social interaction with others. According to Beldad and Hegner (Beldad & Hegner, 2018), there is a considerable relationship between social influence and new policy acceptance. In recent research on Thailand, Yukalang, Clarke, and Ross (Yukalang et al., 2017) discovered that the failure of good waste management ignition in Thailand is due to a lack of social influence.

Finally, institutional trust is an important determinant in the acceptance of a policy tool. Faith in the political institutions accountable for adopting a policy action is a critical factor influencing opinions in complicated and contentious matters. Institutional trust is seen to be an important component in determining public acceptance of government programs (Zannakis et al., 2015). There have been few attempts to study the importance of other emotions, such as interest, fear, fury, or hope, in policy acceptability in this environment, but the research suggests that emotions are crucial. Views on certain policies are frequently based on emotional and value-related factors rather than the plan's more explicit projected impacts (Nilsson et al., 2016). In this case, the role of specific and general emotions and feelings in policy acceptability must be considered.

4. Material and method

4.1. Study subjects

The research was conducted through surveys organized online on people residing in Jakarta, Tangerang, Bogor, Depok, and Bekasi (JABODETABEK). The respondents taken were respondents who were over 18 years old and had worked.

4.2. Study design

The current study is a cross-sectional survey conducted in Jakarta, from January 2022 to February 2022. The study used self-administered questionnaires given to randomly selected respondents.

4.3. Participant

Cross-sectional studies using surveys have been conducted on adult respondents. A total of 243 people living in JABODETABEK participated in this study and completed the survey between November 2021 and February 2022. Participants are selected by a simple random sampling technique. Knowledge, attitude, social influence, institutional trust, and acceptance toward ELV of participants are investigated. All questionnaires that have been filled out are then scored in detail. In this study, almost all respondents were men (68%) with an average age of 51–60 years (35%). Most of them have a bachelor's degree (91.3%). Almost all of the respondents owned a private vehicle (motorcycle/car) (93.5%) (see [Table 2](#)).

4.4. Questionnaire

In order to answer a series of questions, questionnaires are designed based on previous research reviews and interviews with multiple respondents. In addition to gathering basic demographic

Table 3. The item for studied variables

Variable	Survey Question	Response Categories
Attitude	I will support all ideas relating to old/damaged vehicles, as well as imposing payment of processing fees if any	1 (totally disagree) to 5 (totally agree)
Knowledge	I know the benefits of implementing the ELV policy	1 (totally disagree) to 5 (totally agree)
Social influence	The social environment determines my attitude to accepting or rejecting new rules	1 (totally disagree) to 5 (totally agree)
Institutional trust	overall, local governments are capable and professional institutions to make policy	1 (totally disagree) to 5 (totally agree)
Acceptance	I want to implement the ELV policy	1 (totally disagree) to 5 (totally agree)

information about participants, we ask questions about their perceptions of problems, institutional beliefs, and previous values and attitudes, such as the desire to implement ELV policies or attitudes toward environmental protection. Participants are given one page of information about ELV management. Table 3 shows an overall evaluation of ELV-related admissions at the end of the questionnaire, which includes questions, and measurement items related to attitudes, knowledge, social influence, trust in government, and ELV-related admissions.

The Cronbach alpha test was used to confirm the rehabilitation of the questionnaire prior to the use of the question device. The alpha efficiency value for the question device was 0.897 based on the test results of 100 respondents, indicating that this set of questions can be used.

4.5. Analysis

Univariate descriptive analysis of main dependent variables (acceptance) is performed using SPSS 26.

Bivariate analysis is conducted to look for relationships between management ELV acceptance and independent variables and to test the differences between those who support and oppose the implementation of ELV Management. For this purpose, respondents were categorized into two: opponents and supporters based on the results of their responses to a set of questions. Those who voted 1 and 2 are considered opponents; Those who voted 4 and 5 were considered supporters, and respondents who voted 3 were neutral. There were 120 naysayers, 52 neutrals, and 71 supporters among the 243 people who responded. Personal qualities, attitudes, knowledge, social influence, and government opinions are contrasted between supporters and opponents. The disparities in earlier verifications of the normality of the measures between opponents and supporters were investigated using Pearson’s χ^2 test and an ANOVA test.

In the final stages, pathway analysis modeling is used to test the relationships between the various independent variables included in the acceptance model. Multivariate regression analysis is executed on each variable. The standard coefficients for direct and indirect effects are calculated for all possible paths in the acceptance model. Only a path with a significant effect (2-sided bootstrap p-value <0.05) is maintained in the model. Given that path analysis is based on non-latent variables, the coefficient of determination (R²) is used as a measure of the overall match of the model. The data corresponds to normality based on the normal probability of Q-Q residual plots.

Table 4. Responses to the definitive application of the ELV management in Indonesia

Category	Total	Percentage
Unacceptable	120	49.38%
Neither acceptable nor unacceptable/undecided	52	21.40%
acceptable	71	29.22%
Total	243	100.00%

5. Result

5.1. Descriptive and bivariate analysis

Table 4 shows the distribution of management ELV receipts among survey respondents. The results showed that most respondents (49.38%) rejected the application of ELV management in Indonesia, 21.39% were unsure and 29.21% accepted ELV management.

Table 5 shows differences in characteristics, attitudes, knowledge, social influence, and trust in institutions that express a low and high level of management ELV acceptance. The analysis we use is a bivariate analysis to show relevant differences in each variable. From these results, we can see women are more likely to support ELV-related rules applied than men. People's attitudes also show that many people still reject this rule because of various factors. From Table 5 we can see that although the community has provided support related to implementing ELV but the low level of public knowledge and level of trust in the government becomes a determining factor in the low community that is supporting the enactment of ELV policies.

5.2. What explains public acceptance?

To test determinants directly or indirectly from the elv management acceptance we submitted in this study, several independent variables were selected for track analysis. Figure 3 displays a diagram of the proposed path in Table 5 presents the direct and indirect standard effects of the selected explanatory variables (Attitude, knowledge, social influence, and institutional trust) upon acceptance.

The results of the model show, first, that ethics, knowledge, social influence, and belief in the institution are significant direct contributors to the variation in individual acceptance. Institutional trust was the strongest predictor of acceptance (effect 0.383), followed by social influence (direct

Table 5. Comparison between respondents supporting and opposing ELV management

	Opponents	Supporters	P-Value
Female (%)	30.00%	39.40%	0.202
Male (%)	70.00%	60.60%	0.202
Education (%)	65.00%	63.40%	0.976
Age (Most of respondent)	37.50%	33.80%	0.871
Attitude toward implementing ELV	32.50%	8.50%	0.001
Knowledge toward ELV management	60.80%	29.20%	0.000
Social influence (% of high and very high)	8.50%	77.50%	0.000
Institutional trust	53.40%	24.60%	0.247

effect 0.226), and knowledge (direct influence 0.187). Attitude has a weak but significant influence on acceptance (direct effect 0.180).

Second, institutional trust is proven to be a good mediation between attitude, knowledge, and institutional trust relationships. The total indirect relationship between attitude and acceptance was 0.563 (> compared to 0.180 direct relationships), while the total indirect relationship between knowledge and acceptance was 0.570 (> compared to 0.187 direct relationships), an indirect relationship between social influence and acceptance also showed greater results than the direct relationship of 0.609.

Overall, the regression model had a good model fit (Adj. R2 = 0.703, F = 58.2, p = 0.00). Table 6 summarizes the effects of each of the variables in the model on the acceptance of ELV management.

6. Discussion

In this paper, we use survey data to test the impact of various variables at the individual level (Attitude, knowledge, social influence, institutional trust, and acceptance) on public acceptance of ELV management in Indonesia. This paper is the first paper that looks at the psychological and sociodemographic factors that influence community acceptance. The paper also contributes to providing literature on people’s attitudes to new policies to reduce the number of older vehicles by assessing the impact of these factors. We also offer a comprehensive framework for examining public reactions to implementing ELV policies, assuming that public acceptance is a key point for the successful implementation of these regulations.

Figure 3. Final path model with standardized regression coefficients.

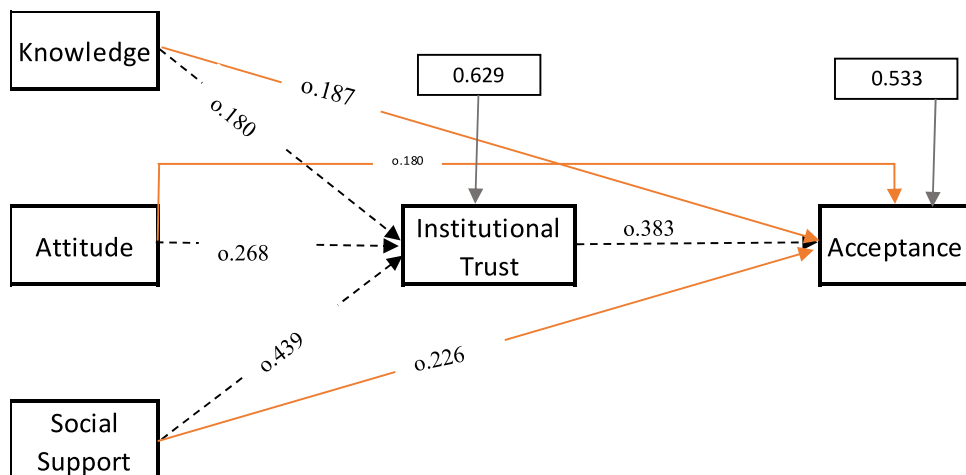


Table 6. Direct and indirect effects of independent variables on ELV management acceptance

	Direct effect Beta Coef (p-value)	Indirect effect Beta Coef (p-value)
Attitude	0.268	0.563
Knowledge	0.187	0.57
Social influence	0.226	0.609
Institutional trust	0.383	-

We report the following key findings. First, we found that most of the surveyed residents did not accept the application of ELV management. They reject ELV policies because lack of knowledge related to ELV management, so they think the implementation of ELV management will harm them. These findings are in line with previous research that stated that a lack of knowledge regarding a regulation would cause a rejection (Li & Zhao, 2019). Othman (2021), In his paper, also stated that a lack of infrastructure in developing countries commonly results in a lack of information, which leads to a lack of public understanding of vehicle policies.

Second, the results of this study show that the low attitude of people who still choose to use old vehicles in Indonesia and choose not to heed the dangers of ELV causes the Indonesian government difficulty in implementing regulations to reduce old vehicles. The government once tried to implement regulations on emissions tests but was rejected because of people who have an indifferent attitude regarding age and the impact of pollution caused by their vehicles. This finding is following previous research that states that attitudes can be a determinant of individual acceptance related to the regulations applied (Abebe et al., 2021; Park et al., 2020; Wielicka-Regulska, 2020).

Third, the poor society's trust in government capabilities is an important note considering the public's confidence in the capacity and capability of the government in making a rule the main key to the success of a new rule. These results are in line with research conducted by Zanakis et al. Who found that trust is an important factor that can increase public acceptance of government regulations in the field of the environment (Astuti et al., 2019; Jagers et al., 2017).

The high rejection can also be because of the social perception that they feel lost by implementing ELV management in Indonesia. People prefer to sell their vehicles to the informal sector because it is considered more profitable. Referring to the Malaysian government's initiative to offer cashback of RM5,000 for people who want to exchange their old vehicles (over the age of 7 years; Jawi et al., 2016), This idea can be adopted by the Indonesian government to reduce the high number of ELV and increasing social acceptance. Along with research conducted by Tahmasseby et al. (2021), which claims that imitating developed countries when developing policy drafts has a higher success rate.

The model in this study also showed something consistent with previous research. The importance of attitude, knowledge, social influence and institutional support is a determining factor in acceptance (Cantarelli et al., 2018; Eriksson et al., 2008; Jakobsson et al., 2000). Attitudes, knowledge, and social influence have a significant direct influence on acceptance, although small compared to indirect influence with institutional trust as mediation variables (Nilsson et al., 2016).

7. Conclusion

ELV management is a rule that has been shown to have a positive impact on the automotive industry and to be capable of reducing pollution caused by ELV. However, the benefits of ELV management will not be felt by a country if the best policy is not developed and accepted by the community. This study found that Indonesians have a lack of understanding about ELV management, the majority of respondents are also apathetic about issuing ELV, there is a lack of social influence, and public confidence in government performance is low. This is an important point to consider because the government's success in implementing a new rule requires support from a variety of sectors (individual and social).

In this study, we discovered a new variable that can act as a mediator variable. The relationship between free variables (knowledge, attitude, social influence) and bound variables can be improved by institutional trust (acceptance). In general, the greater the public's trust in a government's credibility, the easier it will be for the government to enact policies.

The findings of the study have a number of policy implications. To begin, emphasize the positive impact of ELV management on community and environmental quality of life. Furthermore, because the Indonesian government's ignorance toward the ELV issue, has a significant impact on public health, the environment, and the automotive industry itself, the ELV policy cannot be implemented immediately because some people continue to oppose the regulation as unfair and detrimental. In this case, the government's involvement in community support through ELV-related campaigns to increase public knowledge is critical. The government is also obligated to provide support and good infrastructure so that the level of public acceptance of ELV policies increases.

There are many limitations in this study that we have to admit. First, the study used online surveys. We also had a slightly skewed sample where our sample included more educated respondents at the vulnerable age of 40. Where most people who use ELV vehicles are taxi, truck, or bus drivers who may not have a bachelor's degree. We also do not consider instrument which acceptance policies in other countries. In this study, although our proposed acceptance model proved to be a significant relationship, an experimental or longitudinal study would be needed to establish specific variables and sequences of relationships.

This report does not go into detail about the habits of Indonesians who prefer to sell autos in the informal sector. Most people also practice Vulcanization (used tire repair) and PANTEK (welding back on the frame of the vehicle, brake canvas, clutch, bearing, etc.). Another significant cause is the rejection of ELV management, which is yet not discussed in this study.

For further research, we recommend using a wider sample and not only limited to JABODETABEK to be able to take samples from other cities. The use of interview methods to get more complex data is also recommended for the next research. Although the model we proposed has good results, we still recommend adding variables to dig deeper into the factors of one's acceptance related to ELV management.

In this paper, we investigate individual-level factors that explain the public acceptance of ELV management. Our findings offer new insights into how citizens shape attitudes regarding policy interventions to reduce urban air pollution. Using the high case of ELV vehicles in Indonesia and based on surveys among the population; we concluded that attitudes, knowledge, social influence, and institutional trust play an important role in the tendency of individuals to accept a rule.

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Disclosure statement

The author declares that there is no conflict of interest regarding the submission.

correction

This article has been corrected with minor changes. These changes do not impact the academic content of the article.

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