Environmental Knowledge, Awareness, Attitude Toward Purchase Intervention Intervened by Infrastructure Readiness and Price Affordability of Electric Vehicle (Ev): Case in Indonesia

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Abstract

Research aim: *This research aims to identify factors influencing Electric vehicle (EV) ownership in Indonesia, including environmental knowledge, awareness, attitudes, and affordability as intervention factors in purchasing decisions.*
Method: *A quantitative approach was used to survey 136 eligible respondents.*
Research Findings: *Environmental knowledge, awareness, and attitudes positively influence Electric Vehicle (EV) ownership. Attitudes also significantly impact purchase intentions, with price affordability as an intervening factor.*
Theoretical Contribution: *This research adds to the literature on adopting environmentally friendly technology and consumer behavior in owning Electric Vehicles (EV) in Indonesia.*
Implications for Practitioners: *The research results provide insights for manufacturers, marketers, and policymakers to increase the adoption of Electric Vehicles (EV) through education, environmental awareness campaigns, and price incentives.*
Research Limitations: *This research has limitations, including a limited sample size and not considering infrastructure and policy factors that can also influence the adoption of Electric Vehicles (EVs).*

Abstrak

Tujuan Penelitian Penelitian ini bertujuan mengidentifikasi faktor-faktor yang memengaruhi kepemilikan *Electric Vehicles* (EV) di Indonesia, termasuk pengetahuan lingkungan, kesadaran, sikap, dan keterjangkauan harga sebagai faktor intervensi dalam keputusan pembelian.
Metode Pendekatan kuantitatif digunakan dengan survei kuesioner terhadap 136 responden yang memenuhi syarat.
Temuan Penelitian Pengetahuan lingkungan, kesadaran, dan sikap berpengaruh positif terhadap kepemilikan *Electric Vehicles* (EV). Sikap juga berdampak signifikan terhadap niat beli, dengan keterjangkauan harga sebagai faktor intervensi.
Kontribusi Teoritis Penelitian ini menambah literatur tentang adopsi teknologi ramah lingkungan dan perilaku konsumen dalam kepemilikan *Electric Vehicles* (EV) di Indonesia.
Implikasi bagi Praktisi Hasil penelitian memberikan wawasan bagi produsen, pemasar, dan pembuat kebijakan untuk meningkatkan adopsi *Electric Vehicles* (EV) melalui edukasi, kampanye kesadaran lingkungan, dan insentif harga.
Keterbatasan Penelitian Keterbatasan penelitian ini meliputi jumlah sampel yang terbatas serta tidak mempertimbangkan faktor infrastruktur dan kebijakan yang juga dapat mempengaruhi adopsi *Electric Vehicles* (EV).

Introduction

The current environment makes people willing to adopt a go-green and environmentally friendly lifestyle, such as minimizing the use of plastic bags and replacing shopping bags not made of plastic, which is implemented in most locations. The ecologically friendly trend has also influenced the automotive industry, where manufacturers are introducing, producing, and selling Full Electric Vehicles (FEVs) to support the green environment. Full Electric Vehicles have been identified as a significant technology advancement in the transportation sector that decrease future emissions and energy usage because the majority of transportations are using Gasoline-powered Vehicles (GVs) (Helmers and Marx, 2012). A study finds that transportation development includes fully electric vehicles that reduce oil dependence and greenhouse gas (GHG) emissions. In addition, full electric vehicles (FEVs) give the advantage of sustaining the environment with renewable energy, such as high efficiency, low maintenance, and environmental friendliness, reducing pollution. (Aziz and Oda, 2017).

Electronic automobiles are sometimes found on the roadways, and different car manufacturers produce various models. The study found that the motivations and buying intentions of full electric cars and the most encountered limitations are exorbitant purchase price compared to Gasoline-powered Vehicles (GVs). Secondly, the maximum range in a single charge is considered insufficient. Thirdly, battery periodic maintenance and finally, limited availability of public charging stations and (V) Lack of verified mechanics who specialize in electric-based vehicles (Buranelli de Oliveira *et al.*, 2022)Furthermore, Gasoline-powered Vehicles are still dominant and growing in the automotive market. Thus, there are categories of cars, such as LCGC (Low-Cost Green Car), that accommodate low market segments due to their price and affordability. This makes EVs a barrier to penetrating and dominating the automotive market, even though EVs provide many benefits. (Jang *et al.*, 2018). Meanwhile, the economic situation, people's skill limitations related to electric vehicles, below-average technology still in development, government regulation, environmental issues, expensive prices, and lack of infrastructure readiness are challenges to electric cars, especially in Indonesia. (Åhman and Nilsson, 2008; Foxon and Pearson, 2008). Indonesia is the largest automotive market, and electric vehicles are popular in the industry; however, the reasons above impact people's interest in using electric cars for transportation.. (Prasetio *et al.*, 2019, Maghfiroh *et al..,* 2021).

According to Gaikindo, 705 total sales were recorded in 2019; 685 units are hybrid, and 20 are Plug-in Hybrid vehicles (PHEV). As of June 2021, the number of electric vehicle sales in Indonesia totaled 1,900 units, and 33% of the sales were Battery Electric vehicles, which are fully electric. Reflecting on the 2021 sales data, the interest in the electric vehicle market is at 0.07% of total cars sold, and it concludes that the Indonesian EV sector is still in its infancy (Gaikindo Report, 2021). In addition to this, the Indonesian government is committed to capitalizing on the technological trend for vehicles which is expected to grow in the future as environmental awareness rises and fast transformation from fossil fuels to battery electric-based and committed to reducing the amount of CO2 emissions by 41% in 2030 (Kemenkeu.go.id, 2021). Such capitalizing and support by the Indonesian government provide recharging stations or SPKLU (Stasiun Pengisian Listrik Kendaraan Umum) across Indonesia. According to Market Research Indonesia, there are numbers recharging stations or SPKLU

(Stasiun Pengisian Listrik Kendaraan Umum) stationed in Indonesia, and the majority are located in Jakarta and the State's surrounding Jakarta (Jabodetabek), which has approximately 924 recharging stations (Market Research Indonesia, 2019). It is far from the expectation compared to the nation. It is in line with Prasetio et al. (2019) that Indonesia's electric vehicle infrastructure is underdeveloped, i.e., limited recharging stations, thus, do not meet the international standard of facilitating recharging stations to make people reconsider having Electric vehicles. Furthermore, price, service after sales, and little knowledge about Electric Vehicles also affect the purchasing power of Electric vehicles. Such the issues are related to environmental knowledge, environmental attitude, environmental awareness with purchase intention and also the readiness of the infrastructure and price affordable need to be studied in the context of automotive industry in Indonesia, therefore, two research question arise, firstly, Do Environmental Knowledge, Environmental Attitude, and Environmental Awareness effects Purchase Intention? Secondly, Do Environmental attitudes affect purchase Intention when Infrastructure Readiness and Price Affordability intervene? By finding answer of the research question therefore, will lead to achieve research objective which is to examine the effect between Environmental Knowledge, Environmental Attitude and Environmental Awareness on consumer Purchase Intention which is intervened by Infrastructure Readiness and Price Affordability which specific objective are, firstly, examine the effects of Environmental Knowledge towards Environmental Attitude, Environmental Awareness and Purchase Intention, secondly, examine the effects of Environmental Awareness towards Environmental Attitude and Purchase Intention and finally, examine the intervening effects of Infrastructure Readiness and Price Affordability towards the relation of Environmental Attitude and Purchase Intention. By achieving the research objective, the study contributes to two aspects, theoretically and practically. The theoretical aspect of the study explains how theory-planned behaviour, with a specific focus on consumer behaviour, is implemented in the automotive industry, especially in the Full Electric Vehicle industry in Indonesia. Meanwhile, from a practical aspect, the study gives insight into consumer behaviour toward full-electric vehicles in Indonesia by the government, car manufacturers, and stakeholders.

Theoretically, environmental knowledge is the process of developing, understanding, and appreciating the skills and attitudes that are significant in the relationship between people, culture, and the physical environment to understand their desires and value with the environment that is connected to their intention to purchase a product (Sosa-Nunez & Atkins, 2016). Thus, environmental knowledge aims to connect people, nature, and environmental problems like pollution, renewable energy, technology advancement, infrastructure readiness, and urban and rural planning (Safari et al., 2018), including green products of transportation, i.e., Electric vehicles. Having environmental knowledge means having environmental awareness and an environmental attitude. People are aware and understand the importance of the ecosystem of the environment for their lives. In addition, people act to safeguard the environment for sustainable life. One such act to protect the environment is switching from using plastic bags to paper bags that could be reusable (Hirsh, 2014). On the other hand, substituting Gasoline-powered Vehicles (GVs) with renewable energy (non-gasoline) is also part of protecting the environment from air pollution (International Energy Agency, 2017; Tu & Yang, 2019). It is in line with Snowden (2014) that People paying attention to environmental

sustainability may gravitate towards green products that directly benefit the environment, such as minimizing pollution or CO2 emissions. In addition, they are important drivers of demand for a wide range of products and are concerned about environmental deterioration that harms consumers' health and well-being (Sarigöllü, 2009). Since Electric Vehicles have recently become one of the options to minimize Gasoline-powered Vehicles, proper infrastructure should be provided, such as fast charging stations. Several fast charging stations should be stationed in many locations. It is to help the driver recharge their vehicle's power for daily needs. Furthermore, having a proper charging station in many locations shows the readiness to produce Electric Vehicles (FEV) on a large scale; therefore, the purchase intention of the people to have an Electric vehicle will increase because they were concerned for the environment (Lee, 2014); Additionally, price affordability also major factor to increase purchase intention. A combination of infrastructure readiness and price affordability leads to purchase intention. Thus, the study variables are infrastructure readiness, price affordability, and purchase intention. In addition to this, it leads to four hypotheses of the study:

H_1: *Environmental Knowledge has a significant positive effect on Environmental Awareness*

H_2: *Environmental Awareness has a significant positive effect on Environmental Attitude*

H_3: *Environmental Attitude has a significant positive effect on Purchase Intention intervened by Infrastructure Readiness*

H_4: *Environmental Attitude has a significant positive effect on Purchase Intention intervened by Price Affordability*

Asian countries like Indonesia are among the emerging countries that are concerned about the environment. One way to protect the environment without disturbing their mobilization is by having Electric vehicles. (Ismail and Mulyaman, 2021). The study finds that the public in Indonesia intends to have green automotive products, i.e., Electric vehicles, as their transportation neither for public nor private transportation. This is because they believe green automotive products will reduce Greenhouse Gas (GHG) emissions, reduce pollution, and save the environment. (Aziz and Oda, 2017) While not reducing their mobilization. The public in Indonesia is concerned about the green environment; therefore, environmental knowledge, environmental awareness, and an environmental attitude toward infrastructure readiness, as well as price affordability that leads to purchase intention, need to be studied.

Method

The study uses a quantitative method and is conducted based on cross-sectional data; thus, it only represents the potential buyer that intends to buy an Electric Vehicle at the specific period as a study sample. In addition, a unit of analysis in this study is the people who live in the Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodetabek) areas who are familiar with and have an intention to use Electric Vehicles (EV) with the range of age between 20 and 59 years old.

Data Collection

Data was collected using a survey questionnaire made in Google Forms and delivered through email and social media platforms, i.e., WhatsApp, Line, and Instagram. The questionnaires were sent to two hundred and fifty respondents aware of and potential buyers of electric vehicles.

Questionnaire development

The questionnaire was initially developed from previous literature and established measurement. The questionnaire's questions are bilingual, and the respondents adopt English and Indonesian languages to avoid misunderstandings, except for the background of the respondents who use the Indonesian language. The questionnaire is divided into seven sections: respondent profile, environmental knowledge, environmental awareness, environmental attitude, infrastructure readiness, price affordability, and purchase intention.

Measurement of the Variable

The study's measurement variable is the attribute of the phenomenon being studied. The study has six variables: environmental knowledge, environmental awareness, environmental attitude, infrastructure readiness, price affordability, and purchase intention. All the variables are measured using the same five-point Likert scale, with one being strongly disagree and five being strongly agree. However, the sources for measurement differ between one variable and the others.

a. Environmental knowledge

Environmental knowledge refers to developing, understanding, and appreciating people's skills and attitudes (Sosa-Nunez & Atkins, 2016). Measurement of environmental knowledge adopted from study Yang Li (2018) and Braun and Dierkes (2019). There are three items to measure environmental knowledge: system knowledge, social action knowledge, and effectiveness knowledge. Respondents were asked to evaluate, agree, or disagree that having environmental knowledge relates to intending to have green automotive products with a five-point Likert scale ranging from 1 = strongly disagree and 5 = strongly agree.

b. Environmental awareness

Environmental awareness refers to natural environment problems and is linked to people's actions (Frantz and Mayer, 2014)The measurement of environmental awareness was adopted from a study by Yang Li (2018). There are two items to measure environmental knowledge: environmental problems and personal responsibility. Respondents were asked to evaluate, agree, or disagree that having environmental awareness relates to intending to have green automotive products on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

c. Environmental attitude

Environmental attitude refers to personal feelings about the environment that are either positive or negative (Brick & Lewis, 2016). Yang Li (2018) adopted the measurement of environmental attitude, which uses two items: environmental sensitivity and environmental value. Respondents were asked to agree or disagree that having an environmental attitude

relates to intending to have green products in automotive, with a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

d. Infrastructure readiness

Infrastructure readiness refers to the estimate of the minimal infrastructure requirements to ensure that recharging stations are available like gas stations (Bakker & Jacob Trip, 2013). Measurement of infrastructure readiness adopted from Kasznar et al., (2018). There are three items to measure infrastructure readiness namely technology, government and raw materials. Respondent were asked to evaluate agree or disagree that infrastructure readiness relate to intend to have green product automotive with five Likert scale anchoring from 1 = strongly disagree and 5 = strongly.

e. Price affordable

Price affordable refers to the financial incentives such as vehicle price subsidies are also a tactic to achieve higher Full-Electric Vehicles adoption (Sierzchula *et al.*, 2014). Measurement of price affordable adopted from J. Ren, (2014) and Paravantis, (2018) and there are two items to measure price affordable namely price stability, inexpensive. Respondent were asked to evaluate agree or disagree price affordable relate to intend to have green product automotive with five Likert scale anchoring from 1 = strongly disagree and 5 = strongly.

f. Purchase intention

Purchase intention refers to the characteristics, prestige and social status especially if the item is expensive, can reflect their values and take on a symbolic significance for the owner (Bennett and Vijaygopal, 2018). Measurement of purchase intention adopted from (Singrungtam, 2013) which consist of two items namely, product and willingness. Respondent were asked to evaluate agree or disagree concern about green environment affect to purchase intention with five Likert scale anchoring from 1 = strongly disagree and 5 = strongly.
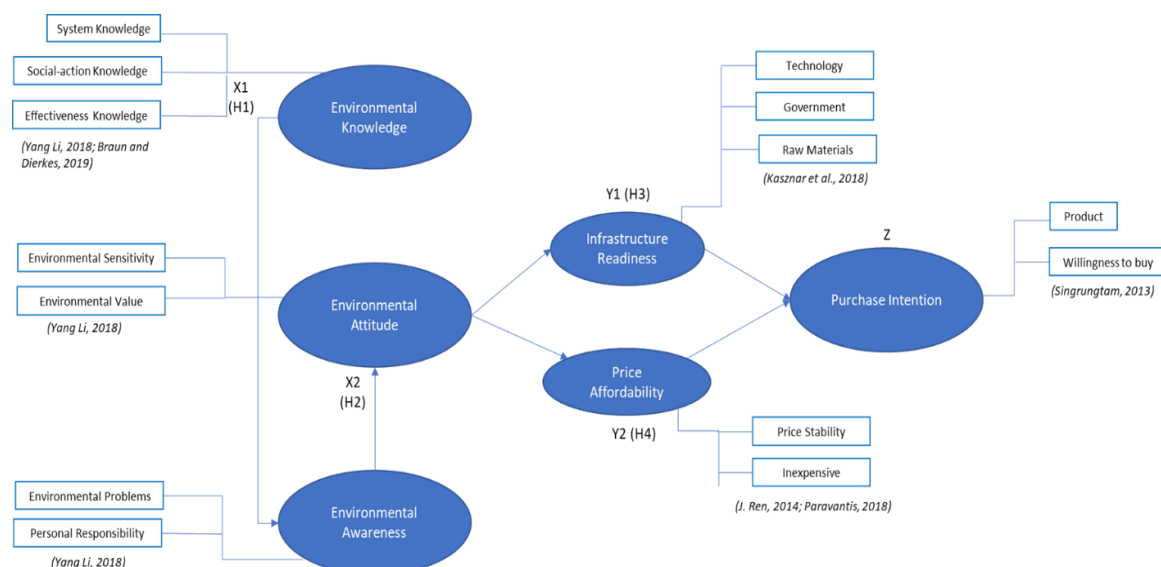

Figure 1. Conceptual Framework

Data Analyse

Data was analysed using Smart PLS 3 as well as test the hypothesis. This is because the smart PLS 3 able analyse the data with tiny sample as well as non-normal distribution. However, the study conducted descriptive analysis to measure the distribution of respondent in the study. Furthermore, it is cleaning process to ensure the reliability of data entering. Classical assumptions are used to ensure that the data free from error

Results and Discussion
Profile Respondent

Respondent profile is formed to observe the characteristic of the study's respondent. The study respondent consists of 136 respondents out of 250 who fits with the study and domiciled in Jabodetabek. Table 3.1 show profile of the respondent. since the study focuses on the people who intend to have Electric Vehicle thus, age is one of the factors to determine numbers of people aware about green environment and will to buy Electric Vehicle. Study shows people who have age 20-29 is dominant and most intention toward Electric vehicles, following people who have age 30-39 (42), 40-49 (21) and 50-59(16). It indicates Generation Y (Millennials) have an intention towards Electric vehicles exist in Indonesia compare to others generation. As Jakarta as the capital city of the Indonesia (56) is the most focus on development Electric Vehicle, following Tangerang (53) as the closest state to Jakarta while Bogor (3), Depok (3) and Bekasi (18) are the state which less in development Electric Vehicle. The majority who concern about automotive is male (98) while female (38). This is because male has better understand about the automotive compare to the female. The education shows how well respondent understand and aware about green environment and lead to have green product including intend to have Electric vehicle, as they look after the environment. Respondent who undergraduate (93) is dominant following master degree (20), thus high school – equivalent is 19 and Diploma and PhD are 2 respondents. It indicates respondent's education background is quite high and they have awareness about green environment and green products. Education relates to the profession, respondents who have profession as an employee is higher (82) than others profession such as, student (33), business owner (16), others (4) and household (1). Furthermore, majority income of respondent roughly in the range Rp10,000,001 – 30,000,000 (50), following Rp 30,000,000 – 50,000,000 (36), below < Rp10,000,000 (33) and above 50,000,000 (13), meanwhile, their wealth roughly in the range Rp100,000,001 – 500,000,000 (55), following Rp 500,000,001 – 1,000,000,000 (31), < Rp100,000,000 (29) and > Rp1,000,000,000 (21). Income and wealth show how well economic of the respondent to afford Electric Vehicle as their transportation.

Table 1. Profile Respondent

Age	Frequency
20-29	57
30-39	42
40-49	21
50-59	16

Residence	
Jakarta	56
Bogor	3
Depok	3
Tangerang	53
Bekasi	18
Gender	
Male	98
Female	38
Education Background	
Phd	2
Master	20
Undergraduate	93
Diploma	2
Highschool - equivalent	19
Profession	
Household	1
Student	33
Employee	82
Business Owner	16
Others	4
Income per/month	
< Rp10,000,000	33
Rp10,000,001 – 30,000,000	50
Rp 30,000,000 – 50,000,000	36
> Rp 50,000,000	13
Wealth	
< Rp100,000,000	29
Rp100,000,001 – 500,000,000	55
Rp 500,000,001 – 1,000,000,000	31
> Rp1,000,000,000	21

Reliability and Validity

Result of validity and reliability shows that the outputs exceed the accepted norm, which is Cronbach's Alpha and Composite Reliability is ≥ 0.7 thus, all of the variables are valid and reliable. Furthermore, the value of AVE of each variable is greater than ≥ 0.5. it shows that the variables meet the requirements.

Table 2. Reliability and Validity

Variable	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Environmental Attitude (EAT)	.843	.895	.681
Environmental Awareness (EAW)	.907	.936	.785
Environmental Knowledge (EKN)	.940	.961	.893
Infrastructure Readiness (IRE)	.871	.904	.653
Price Affordability (PAF)	.940	.961	.892
Purchase Intention (PIN)	.907	.936	.785

Result of Discriminant validity indicates that variables EAT-EAW, EKN-PAF and EAM-EKN are exceed that ≤ 0.900 (Henseler *et al.,* 2015) which mean those variables have discriminant validity concern. Therefore, it excluded

Structure Model Analysis

The analysis is used to foretell causation between latent variables. To anticipate the presence of causality, T-statistical test parameters were determined by the bootstrapping procedure (Abdillah and Hartono, 2015). In addition, the criteria should be met. The result shows that the relationship between IRE ->PIN does not meet the criteria which p-value 0.118 and standard deviation lower that 1.96 (1.568) while the others relationship between variables are met the criteria. Furthermore, intervening variable of IRE does not affect to EAT and PIN. Table 3.4 shows path coefficient of the variable.

Table 3. Indirect Effect

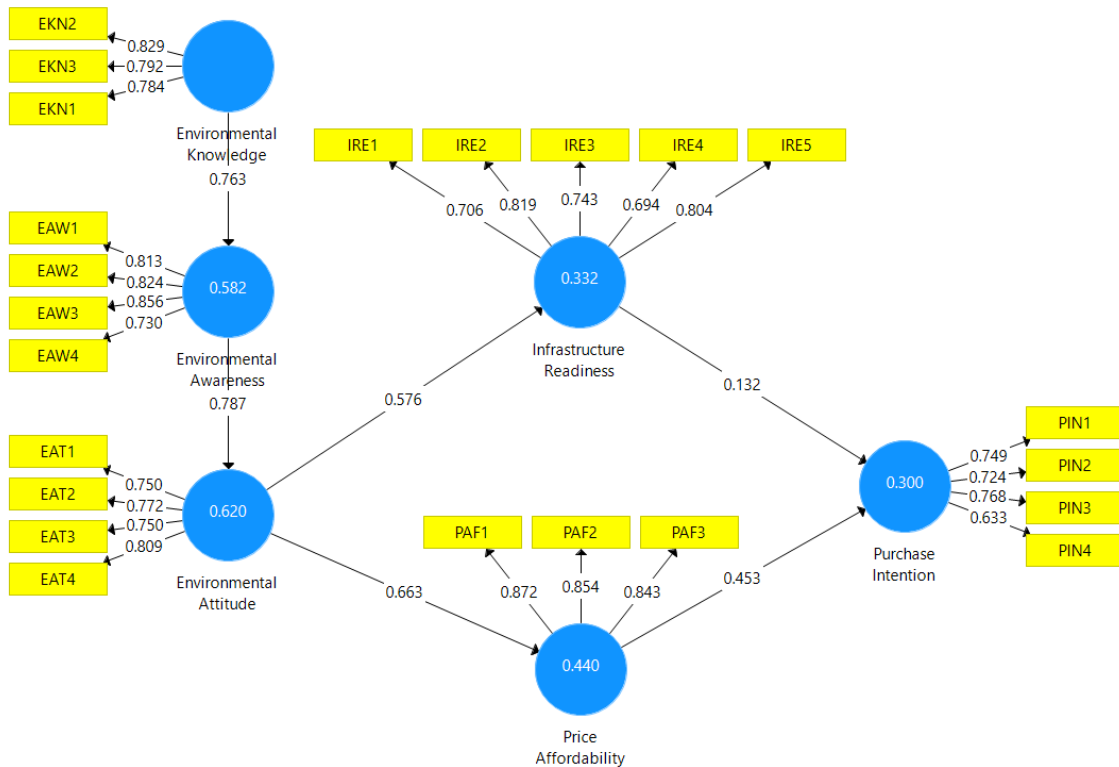| Variable	STDEV	T-test	p-value
EAT -> IRE	.066	8.690	0.000
EAT -> PAF	.068	9.767	0.000
EAW -> EAT	.042	18.737	0.000
EKN -> EAW	.051	14.835	0.000
IRE -> PIN	.080	1.646	0.100
PAF -> PIN	.079	5.758	0.000
EAT -> IRE -> PIN	.051	1.495	0.136
EAT -> PAF -> PIN	.065	4.619	0.000

Figure 2. Structure Equation Model - PLS

Furthermore, result of Goodness of Fit Index (GFI) shows that all the variables that constructed its fits because variables values exceed than ≥ 0.90. Table 3.5 shows the valuation of Goodness of Fit Index (GFI).

Table 4. Goodness of Fit Evaluation

Variable	AVE	R²	GoF
EKN	.643		
EAW	.651	.578	.952
EAT	.544	.617	.947
IRE	.571	.327	.919
PAF	.733	.435	.944
PIN	.519	.290	.909

The results from testing above indicates that the relationship between EKN, EAW and EAT are positive correlated. Furthermore, the relationship between EA and PIN – Infrastructure Readiness and also EA and PIN Price Affordability are also positive correlated. Table 3.5 is summary for hypothesis testing

Table 5. Summary Hypothesis Testing

Hypothesis	Assumption	Result
H1: Environmental Knowledge has a significant positive effect on Environmental Awareness	+	Supported
H2: Environmental Awareness has a significant positive effect on Environmental Attitude	+	Supported
H3: Environmental Attitude has a significant positive effect on Purchase Intention intervened by Infrastructure Readiness	+	Negative
H4: Environmental Attitude has a significant positive effect on Purchase Intention intervened by Price Affordability	+	Supported

According to the result analysis that Environmental Knowledge has a significant effect on environmental awareness. The word "environmental knowledge" refers to understanding and awareness of environmental problems and remedies (Zsóka *et al.*, 2013). Therefore, study finds that people need to be educated that aware of the effect between the environment and eco-friendly products. Once they learn, they will understand and aware thus act ethically. Meanwhile, having proper EV infrastructure in advance like charging station does not influence to purchase intention, this is because, people have another way to charge their car that they would charge the car at their home which more safely and efficient. However, the Indonesian government still gradually developing infrastructure for EV as it is requirement to fulfil international dan national standard of electric vehicle (EV). On the other hand, price play significant rules to purchase intention. since the price of a single fully electric vehicle is higher than that of a conventional vehicle, subsidies or price reduction should be applied to support environmental sustainability. It is supported by Yuniza et.al., 2021 that subsidies by the government will impact to the price of EV therefore, it should be applied to support environmental sustainability. Accordingly, price of EV in Indonesia varies in the range Rp. 500 million to Rp. 1 billion which still more expensive than gasoline power vehicle (GV's).

Conclusion

Full Electric Vehicles have been identified as a major technology advancement in the transportation sector that decrease future emissions and energy usage because majority transportations are using Gasoline-powered Vehicles (GVs). In addition, this type transportation give the advantage to sustain the environment with renewable energy such as high efficiency, low maintenance, environmentally friendly and reduce the pollution (Aziz and Oda, 2017). Furthermore, Full-Electric Vehicle is becoming public attention in Indonesia, its development that continues to be innovative and give education and public awareness to consider owning an electric car with a battery as its primary source of power. In addition, some

issue should take into consideration namely environmental knowledge, environmental attitude, environmental awareness with purchase intention and also the readiness of the infrastructure and price affordable. Study discovers that low widespread knowledge and comprehension of Full-Electric Vehicle, which are battery-powered vehicles that people will have to adapt to in the transportation sector that is linked with environmental concerns. In addition, infrastructure readiness and price affordability include in the study. Study finds that price affordability has an indirect positive effect on purchase intention because it is regarded as expensive and is not comparable to the average consumer's purchasing power for vehicles. Cost is the annual information that people perceive and must spend before they can enjoy the benefits of owning a battery-powered vehicle and the government and manufacturers play a significant role in enhancing the adoption of Full-Electric Vehicles by focusing more on vehicle price. Regardless, price subsidies need to be taken into account and made affordable for all social groups in order to support environmental sustainability. Statistical test finds that the most important factor influencing a consumer's desire to buy a fully electric vehicle is pricing and the intention to buy is influenced by the consumer's attitude, which is expressed by their actions. Due to the fact that FEV is considered new to Indonesian citizens, manufacturers must collaborate with the government on these concerns in order to ensure the widespread of adoption in Indonesia. Besides, the State Electricity Company (PLN) and other relevant stakeholders if it is to be on par with developed countries that have well-established regulations on the battery-powered vehicle. FEV in Indonesia are not subject to progressive taxes which is positive, and charging an electric vehicle is less expensive than filling up a conventional vehicle with gas. To feel this desire, one must first pass through the "gate," which is the intention to purchase and the willingness to spend a significant amount of money.

Since the study does not cover in every aspect, it is feasible to conduct further study like benefits or privileges of full-electric vehicles or elements related to society since it differs from other existing vehicles that people frequently own. Future studies may confirm the acceptance and development conditions for electric vehicles to identify differences, and it may be possible to talk about sophisticated technology such as V2G (Vehicle-2-Grid) systems that are already in use in other developed countriesKesimpulan menjawab apakah tujuan riset tercapai. Tegaskan kebaruan riset. Hindari penulisan poin demi poin, sebaliknya gunakan narasi mengalir dengan kalimat efektif serta tampilkan dampak dari penelitian ini.

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