The influence of green products and green knowledge on electric motorcycle purchase decisions with environmental awareness as a moderating variable (empirical study of electric motorcycle buyers in Central Java, Indonesia)

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Abstract

In terms of pollution mitigation, individuals should strive to reduce activities that contribute to pollution, especially by switching from using fossil fuel vehicles to electric vehicles. The fact shows that purchasing decisions made by the public for environmentally friendly products are increasing. A purchasing decision is a stage where an individual decides to buy a product when they have examined its differences from other products. There are factors that influence a purchasing decision, including green products, green knowledge, and environmental awareness. How does the influence of green products and green knowledge on purchasing decisions for electric motorbikes with environmental awareness as a moderating variable? This research aims to test the influence of green products and green knowledge on purchasing decisions for electric motorbikes with environmental awareness as a moderating variable. The type of research is quantitative used a questionnaire which was distributed to 110 respondents. This research used WarpPLS 7.0 to data analysis. The final results show that green products and green knowledge can have a positive and significant influence on purchasing decisions, then environmental awareness as a moderation strengthens the influence of green products and green knowledge and has a positive and significant influence on purchasing decisions. It can be concluded that this research can validate the Theory of Reasoned Action (TRA). The managerial implications of the research show that there is an increase green products and green knowledge can be maximized to increase purchasing decisions for electric motorbikes, with environmental awareness as a strong moderating factor. Besides that, it is hoped that this can be useful for other researchers to conduct future research as a reference It is also hoped that it can become a source of information and knowledge regarding natural sustainability from environmental pollution.

Keywords

Environmental awareness, Green knowledge, Green product, Purchasing decisions

Introduction

As time goes by, the needs of society also increase, driving the need for efficient transportation to help individuals move towards their desired destination. In addition, private vehicles remain an integral need for certain communities, because private vehicles offer better flexibility compared to public transportation. Usually, most of the private vehicles owned by society are conventional types of vehicles that rely on fuel as their main energy source, such as motorbikes [1]. Despite the mentioned advantages, the significant degree of dependence on conventional vehicles also presents certain disadvantages.

Launching from data [2], in 2020 residents in 98 cities in Indonesia experienced quite high levels of exposure to air pollution. Many residents breathe air that exceeds the threshold resulting from various sources of pollution, such as conventional vehicles. In terms of pollution mitigation, individuals should strive to reduce activities that contribute to pollution, especially by switching from using public transportation to electric vehicles. Based on data results [3] which is taken from research by Deloitte and Foundry Research, that the use of electric motorbikes in Indonesia has proven a substantial 13-fold increase in the span of two years. As seen in Table 1.

Table 1. Electric motorbike users in Indonesia (2020-2022)

Year	Electric Motor/Unit
2020	1,947
2021	5,486
2022	25,782

Source: databoks.katadata.co.id (2023)

The increase in the use of electric motorbikes is supported by the extensive purchase of two-wheeled electric vehicles which are equipped with facilities to exchange old batteries for new ones or also known as battery swaps. Looking at the data and the fact that air pollution exists, it can be concluded that one way to reduce this problem is to use environmentally friendly alternatives such as electric motorbikes. This fact can also show that purchasing decisions made by the public for environmentally friendly products are increasing. A purchasing decision is a stage where an individual decides to buy a product when they have examined its differences from other products. There are factors that influence a purchasing decision, including green products and green knowledge.

The first factor is green products which are an alternative for people to start using environmentally friendly products. Green products are a type of product that guarantees individual and environmental safety, because it avoids wasting resources and minimizes excessive waste production. As a result, this product does not harm individuals or the environment [4]. This is in line with research conducted by [5] where they concluded that green products had a significant positive effect on purchasing decisions. Different from research conducted by [6] where they concluded that green

products had no significant effect on purchasing decisions. The second factor, namely, green knowledge or green knowledge is an influence that functions as a catalyst for the decision-making process before making a purchase. Green knowledge is something related to the understanding that society has about a product that has the potential to influence the surrounding environment [7]. This is in line with research conducted by [8] where they concluded that green knowledge had a significant influence on purchasing decisions. Different from research conducted by [9] where they concluded that green knowledge had no significant effect on purchasing decisions.

This research was conducted to understand the aspects that influence consumer behavior in purchasing decisions. Theory of Reasoned Action puts forward various conceptual frameworks to ensure individual behavior is based on rationality, with the aim of determining behavior in the context of decision outcomes. Purchasing decisions can be influenced by variables such as green product, green knowledge, and environmental awareness because these factors have the potential to influence an individual's propensity to make a purchase.

Literature Review

Theoretical

Theory Of Reasoned Action was originally developed to provide consistency in the study of the relationship between behavior and attitudes. Later the theory was expanded and revised by Martin Fishbein and Ajzen Icek, who assumed that individuals are generally rational and use available information systematically, and that individuals consider the consequences of their actions before acting. The development of this theory can predict and understand the theory of reasoned action which explains the existence of beliefs, behavior, intentions and attitudes [10]. The Theory of Reasoned Action is based on the assumption that humans act consciously, taking into account existing information and the potential consequences of their actions. As per this theory, the intention behind an action plays an important role in determining its manifestation. Intention, in turn, is formed by two fundamental aspects, namely personal factors and social influence factors. These two factors have a positive influence on an individual's behavioral intentions, thereby giving rise to the desired behavior [11]. This purchasing decision is related to the marketing consumer behavior model, where this is decided by each individual or consumer themselves. In this case, consumers have complex purchasing behavior when they are highly involved in the purchase and perceive there are significant differences between brands. A person's purchase is influenced by factors such as attitudes and subjective norms. It can be interpreted that consumer behavior in purchasing decisions includes internal factors, which are directly related to individuals such as personal preferences, needs and perceptions.

The Influence of Green Products on Purchasing Decisions

Green products is a product that is characterized as a product that does not pose a danger to humans and the surrounding environment, does not waste energy resources, and does not produce waste or pollution. When the green products created have been tested for environmental friendliness and have a creative and attractive appearance, this will trigger purchasing decisions from consumers. Theory Of Reasoned Action emphasizes the role of attitudes as a factor influencing intentions and behavior. In the case of green products, subjective norms can include influence from friends, family, or social groups who consider it important to use environmentally friendly products. In the context of green products, consumer attitudes towards environmentally friendly products, for example the belief that the product is better for the environment, can form intentions to purchase and use the product [12]. Research by [13] states that green products have a significant positive effect on purchasing decisions. Additionally, research [8] also states that it is a green product has a significant positive effect on purchasing decisions.

H1: Green products have a positive effect on purchasing decisions

The Influence of Green Knowledge on Purchasing Decisions

Green knowledge is knowledge related to green products which provides education to consumers about environmental issues and the impact of using environmentally friendly products and what benefits are felt when using environmentally friendly products. Theory Of Reasoned Action which combines the roles of consumer attitudes, intentions and behavior. In the context of green knowledge, it can be considered as an internal factor that influences the formation of subjective attitudes and norms. Therefore, education and increasing environmental knowledge can be an effective strategy in changing consumer attitudes and behavior regarding environmentally friendly products. Research by [14] states that green knowledge has a positive and significant effect on purchasing decisions. Additionally, research of [8] also stated that green knowledge has a significant positive effect on purchasing decisions.

H2: Green knowledge has a positive effect on purchasing decisions

The Influence of Environmental Awareness in Moderating Green Products on Purchasing Decisions

Environmental awareness which is one way to understand the vulnerability of the environment around us and the importance of protecting it. Theory Of Reasoned Action, where subjective norms include an individual's view of the expectations of the people around them regarding their behavior. Therefore, in designing marketing movements or interventions to encourage sustainable behavior, it is necessary to understand and utilize an individual's level of environmental awareness as a modifying factor in the context Theory of Reasoned Action. Research by [15] states that environmental awareness has a positive and significant effect on purchasing decisions. Additionally,

research [5] also stated that green products have a positive and significant effect on purchasing decisions.

H3: Environmental awareness can moderate the influence of green products on purchasing decisions

The Effect of Environmental Awareness in Moderating Green Knowledge on Purchasing Decisions

Environmental awareness is awareness that begins with an understanding of environmental efforts. Environmental awareness has the potential to function as a trigger to increase green knowledge. Theory Of Reasoned Action, the concept of intention functions as a direct sign of a person's subsequent actions. Environmental awareness can act as a trigger or reinforcer of attitudes, subjective norms, and perceived behavioral control, which in turn influence consumer intentions and behavior. Environmental awareness is an important aspect in the consumption sector. Consumers are now starting to consciously support environmental sustainability by utilizing their purchasing power coupled with post-consumption obligations. Research by [16] states that environmental awareness has a positive and significant effect on purchasing decisions. Additionally, research [14] also stated that green knowledge has a positive and significant effect on purchasing decisions.

H4: Environmental awareness can moderate the influence of green knowledge on purchasing decisions

Conceptual Framework

In the empirical study above, there are two independent variables, namely green product and green knowledge. And there is a dependent variable, namely, purchasing decisions with environmental awareness as a moderating variable for electric motorbike buyers. The conceptual framework can be seen in Figure 1.
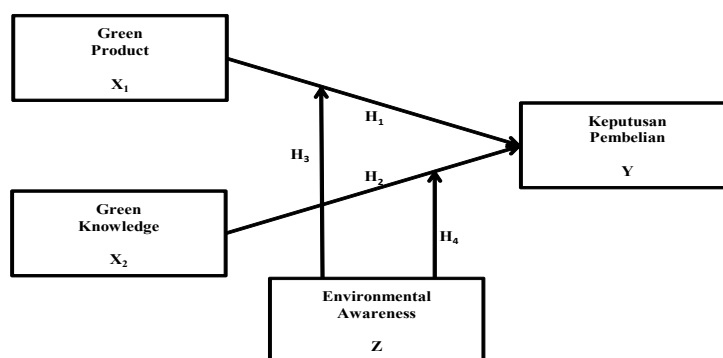

Figure 1. Conceptual Framework of green products and green knowledge influencing purchasing decisions, environmental awareness as a moderator between the influence of green products and green knowledge on purchasing decisions

Method

Research Design

The type of data used in this research is quantitative research methods. Quantitative research methods are approaches to research that use data in the form of numbers or statistics as the main focus to answer research questions [17]. The data source used in this research is primary data. Primary data is a data collected directly from the object being researched by the individual or group conducting the research. The population used in this research was electric motorbike buyers in Central Java.

Sampling

The sampling technique used in this research is purposive sampling, namely a sampling technique with certain considerations that first takes into account several factors that are generally applicable to the research objectives or problems [18]. In this sampling technique, there are specified sample requirements so that respondents can be said to be eligible to be given a questionnaire, namely respondents who have purchased an electric motorbike at least once and respondents who are at least 17 years old.

Measurement

This research examines the influence of green products and green knowledge on purchasing decisions with environmental awareness as a moderating variable. The measuring instrument used in this research uses a Likert scale to measure the level of influence exerted by the indicators manifested in these variables which include five levels of variable measurement preferences, which are shown in Table 2.

Table 2. Operational definition of variables and variable measurement

Variable	Operational definition	Indicator
Buying decision [19]	Respondents' perceptions regarding the efforts made to meet important needs	Recognition of needs Information search Evaluation of alternatives Purchase Post purchase
Green Products [19]	Respondents' perceptions regarding environmentally friendly products refer to products that ensure consumer and environmental safety by minimizing resource consumption and avoiding excessive waste generation.	Natural and safe ingredients Environmentally friendly product Certified product Product durability
GreenKnowledge [19]	The respondent's perception of something is related to the awareness that the public has about commodities or businesses that can have an impact on the environment.	Green brand knowledge Consumer expectations of green brands on the environment Consumers' positive attitudes towards green brands

Variable	Operational definition	Indicator
Environmental Awareness [19]	Respondents' perceptions regarding understanding of natural habitats, the impact of human behavior on them, and the importance of conservation.	Environmental issues Knowledge of environmental issues Awareness of environmental responsibility The seriousness of the environmental problems around Support for environmental protection by governments or other organizations

Data Collection

The data collection technique in this research is by distributing a Google form (questionnaire), namely providing a collection of questions or written statements to respondents for the purpose of getting responses. This research used a questionnaire which was then distributed to 110 respondents, namely consumers who purchased electric motorbike products with at least one purchase and were at least 17 years old.

Data Analysis

The technique used to manage data in this research is the SEM-PLS program analysis tool, WarpPLS 7.0 software [20]. The outer model or measurement model defines how each indicator relates to its latent variable [21]. Then, the inner model is often also called the inner relation model which descry bes the relationship between latent variables based on substantive theory [21]. Designing a structural model of the relationship between latent variables is based on the problem formulation or research hypothesis.

Findings

Respondent Characteristics

The 110 respondents in this study were mostly female with a total of 83 or 75.5%. Then, the largest age group of respondents was 17-22 years old with a total of 92 or 83.6%. This happens because at the age of 17-22 years, most young people like the latest trends. Meanwhile, based on the latest education, the SMA/Equivalent level is 85 or 77.3%. Due to this level, many young people are faced with complex lifestyle decisions. As seen in Table 3.

Table 3. General description of respondents

Information	Criteria	Frequency	Percentage
Gender	Man	27	24.5%
	Woman	83	75.5%
	Amount	110	100%
Age	17-22 years old	92	83.6%
	23-28 years old	13	11.8%
	29-34 years old	3	2.7%
	35-40 years	0	0
	> 41 years	2	1.8%
	Amount	110	100%

Information	Criteria	Frequency	Percentage
		1	0.9%
	Elementary school/equivalent	4	3.6%
	Middle school/equivalent	85	77.3%
	High school/equivalent	18	16.4%
Last education	Diploma/Bachelor (D1/D2/D3/D4/S1)		
	Postgraduate (S2/S3)	1	0.9%
	Other...		
		1	0.9%
	Amount		
		110	100%

Validity test

In this study, the validity test uses a loading factor >0.70 and the cross loading to other variables is smaller than the loading value to the variable itself [22]. All variable item statements in the questionnaire data show a loading factor value of >0.70, which means that the items really measure the variable itself. Thus, this research has fulfilled the required convergent validity tests for variables or constructs and discriminant validity, so that it can confirm its validity for use in research. The results of the cross-loading show that all statement items are higher than the other variables, this shows that these variables are indeed different. As seen in Table 4.

Table 4. Validity test

Variable	Indicator	GP	NO	KP	EA	Information
Green Products	GP1	(0.904)	-0.076	-0.256	0.139	Valid
	GP2	(0.881)	0.066	-0.018	-0.020	Valid
	GP3	(0.858)	0.105	0.174	-0.012	Valid
	GP4	(0.770)	-0.102	0.128	-0.127	Valid
GreenKnowledge	GK1	0.162	(0.850)	-0.087	-0.047	Valid
	GK2	0.114	(0.892)	-0.061	-0.036	Valid
	GK3	0.404	(0.833)	0.155	-0.106	Valid
	GK4	0.241	(0.868)	0.162	-0.090	Valid
	GK5	0.325	(0.886)	0.112	-0.163	Valid
	GK6	-0.448	(0.847)	-0.053	0.097	Valid
	GK7	-0.493	(0.868)	-0.100	0.224	Valid
	GK8	-0.305	(0.875)	-0.124	0.122	Valid
Buying decision	KP1	0.028	-0.248	(0.872)	0.107	Valid
	KP2	0.065	-0.060	(0.806)	0.073	Valid
	KP3	-0.247	0.225	(0.760)	0.059	Valid
	KP4	0.191	-0.179	(0.863)	-0.075	Valid
	KP5	-0.067	0.304	(0.816)	-0.163	Valid
Environmental Awareness	EA1	0.186	-0.205	-0.016	(0.939)	Valid
	EA2	0.223	-0.157	-0.157	(0.905)	Valid
	EA3	-0.260	0.235	-0.004	(0.901)	Valid
	EA4	-0.176	0.111	0.176	(0.926)	Valid
	EA5	0.025	0.024	-0.003	(0.856)	Valid

Reliability Test

A variable can be said to be reliable if the Cronbach's alpha and composite reliability values are >0.70, in exploratory research 0.60-0.70 is still acceptable [22]. Based on the test results in the table above, it can be concluded that all of these variables (purchasing

decisions, green products, green knowledge, and environmental awareness) show Cronbach's alpha and composite reliability values >0.70, so it can be concluded that the four variables above can be said to be reliable and acceptable. As seen in Table 5.

Table 5. Reliability test

Variable	Cronbach's Alpha	Composite Reliability	Information
Green Products	0.876	0.915	Reliable
GreenKnowledge	0.952	0.960	Reliable
Buying decision	0.881	0.914	Reliable
Environmental Awareness	0.945	0.958	Reliable

Goodness Of Fit Model

The resulting fit indicators include Average Path Coeffiecient (APC), Average R-Squared (ARS), and Average Variance Inflation Factor (AVIF). The p value for APC and ARS must be <0.05 or significant. In addition, AVIF as an indicator of multicollinearity must be <5 [20].Based on the test results, the APC value was 0.358 with a p value <0.001, the ARS value was 0.683 with p <0.001, while AVIF had a value of 3.762 with a value <5. In testing, the AVIF indicator is the main value because WarpPLS uses interactions between variables, so this shows that what is proposed is good or fit. The goodness of fit model test values are as shown in Table 6.

Table 6. Test goodness of fit model

Model Of Fit	P-Value	Model Results	Information
Average Path Coefficient (APC)	P<0.001	0.358	Good (fit)
Average R-Squared (ARS)	P<0.001	0.683	Good (fit)
Average Block Variance Inflation Factor (AVIF)	<=5	3,762	Good (fit)

Hypothesis Testing Results

1. Direct Effect Test

Direct hypothesis testing is used to understand the direct influence of each independent variable on the dependent variable. The first test, the influence of the green product variable (X1) on purchasing decisions (Y) has a path coefficient value of 0.16 with a positive sign. Meanwhile, the p-values are 0.04 or means p<0.05. The second test, the influence of the green knowledge variable (X2) on purchasing decisions (Y) has a path coefficient value of 0.67 with a positive sign. Meanwhile, p-values are <0.01 or mean p<0.05. Test the hypothesis directly as shown in Figure 2.
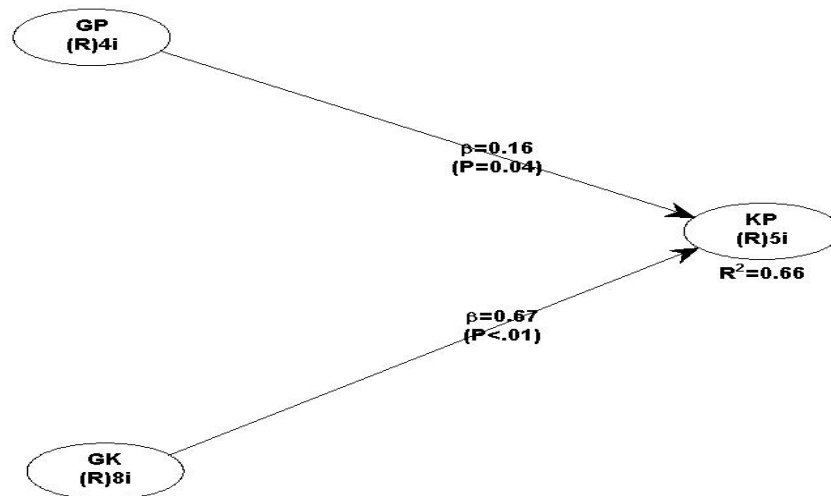
Figure 2. Direct influence test model

2.   Moderation Test

The moderation test or indirect hypothesis is used to test the influence of the independent variable on the dependent variable by including a moderating variable. In the first test, the environmental awareness variable (Z) as a moderating influence between green products (X1) on purchasing decisions (Y) has a path coefficient value of 0.31 with a positive sign. Meanwhile, p-values are <0.01 or mean p<0.05. The second test, the environmental awareness variable (Z) as a moderating influence between green knowledge (X2) on purchasing decisions (Y) has a path coefficient value of 0.29 with a positive sign. Meanwhile, p-values are <0.01 or mean p<0.05. Indirect moderation or hypothesis test as seen in Figure 3.
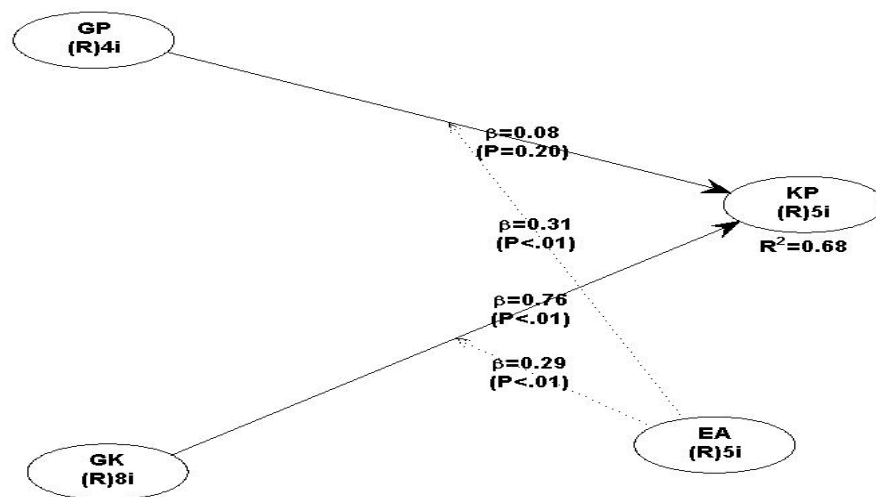

Figure 3. Moderation test model

Discussion

The Influence of Green Products on Purchasing Decisions

The results of the analysis with WarpPLS 7.0 explain that the hypothesis directly shows that the green product variable has a positive and significant effect on purchasing

decisions. So, it can be concluded that the hypothesis is accepted. This explanation can be interpreted as the higher the green product in electric motorbike products, the higher the purchasing decision by the public. In relation to consumer behavior theory, green products are an external factor in the consumer behavior model which is influenced by external factors from society regarding the emphasis on the importance of environmentally friendly products. When consumers observe green products, they will consider the product attributes and characteristics that differentiate them from conventional products. So, in this case green products are driven by influences from outside the individual.

The results of this research are in accordance with previous research conducted by [13] states that green products have a significant positive effect on purchasing decisions. Additionally, research [8] also stated that green products have a significant positive effect on purchasing decisions.

The Influence of Green Knowledge on Purchasing Decisions

The results of the analysis with WarpPLS 7.0 explain that the hypothesis directly shows that the green knowledge variable has a positive and significant effect on purchasing decisions. So, it can be concluded that the hypothesis is accepted. This explanation can be interpreted as the higher the green knowledge regarding electric motorbike products, the higher the purchasing decision will be. In relation to consumer behavior theory, green knowledge is an internal factor in the consumer behavior model which depends on experience, education and individual interest in environmental issues. In this case, the green knowledge possessed by individuals can influence personal preferences, perceptions and behavior towards environmentally friendly products.

The results of this research are in accordance with previous research conducted by [14] states that green knowledge has a positive and significant effect on purchasing decisions. Additionally, research [8] also stated that green knowledge has a significant positive effect on purchasing decisions.

The Influence of Environmental Awareness in Moderating Green Products on Purchasing Decisions

The results of the analysis with WarpPLS 7.0 explain that the moderation test shows that the environmental awareness variable as a moderator strengthens the influence of green products on purchasing decisions. In a positive and significant sense, it can be concluded that the hypothesis is accepted. This explanation can be interpreted as meaning that when individuals feel that green products on electric motorbikes increase and environmental awareness is high, this can strengthen individuals in choosing green products to then make purchasing decisions. In relation to consumer behavior theory, environmental awareness in the context of green products is an internal factor in the consumer behavior model where when people have high environmental awareness, they tend to take into account the environmental impact of purchasing decisions and include choosing green products.

The results of this research are in accordance with previous research conducted by [15] stated that green products influence purchasing decisions which are moderated by environmental awareness.

The Effect of Environmental Awareness in Moderating Green Knowledge on Purchasing Decisions

The results of the analysis with WarpPLS 7.0 explain that the moderation test shows that the environmental awareness variable as a moderator strengthens the influence of green knowledge on purchasing decisions. It is proven from the path coefficient value = 0.29 and p-values < 0.01 or p < 0.05 in a positive and significant sense, it can be concluded that the hypothesis is accepted. This explanation can be interpreted as meaning that when an individual's green knowledge regarding electric motorbikes increases and environmental awareness or environmental awareness is high, it can strengthen the individual's understanding of green knowledge to then make purchasing decisions. In relation to consumer behavior theory, environmental awareness in the context of green knowledge is an internal factor in the consumer behavior model where green knowledge often depends on the individual's level of environmental awareness. Individuals who have a high level of environmental awareness tend to have better knowledge about environmentally friendly products and are interested in choosing them.

The results of this research are in accordance with previous research conducted by [16] states that environmental awareness has a positive and significant effect on purchasing decisions. Additionally, research [14] also stated that green knowledge has a positive and significant effect on purchasing decisions.

Managerial Implications

The managerial implications of the research show that there is an increase green products and green knowledge can be maximized to increase purchasing decisions for electric motorbikes, with environmental awareness as a strong moderating factor. This matter is hoped that this can be useful for other researchers, and can be used as a reference for future researchers and It is hoped that it can become a source of information and knowledge regarding natural sustainability from environmental pollution. With a comprehensive and collaborative approach, using a branding strategy that emphasizes the company's commitment to the environment. Effective communication about how environmentally friendly the product is will increase awareness and purchase decisions. That way, the business world, government and other parties can work together to increase awareness and adoption of electric motorbikes, thereby having a positive impact on the environment and creating a more sustainable market.

Stronger perceived behavioral control can increase the likelihood that consumers will actually choose the product. Thus, the higher the environmental awareness, the more influence green products will have on purchasing decisions. When consumers have high

green knowledge about an environmentally friendly product, the consumer will be encouraged to make purchasing decisions.

Theoretical Contributions

The main contribution of this research is to provide deep theoretical insights reduce activities that contribute to pollution, especially by switching from using public transportation to electric vehicles. Full support from the community is very important to encourage the development of environmentally friendly vehicle innovation. This can be achieved by choosing a private vehicle that is able to uphold the principles of clean air sustainability in Indonesia. Additionally, show influence green product quality and extensive green knowledge on motorbike purchasing decisions, strengthened by environmental awareness as a moderator.

Limitations

This research only focuses on objects located in Central Java, therefore the findings of this research are not sufficient to describe the relationships between variables that can be applied broadly. This research also only examines green product and green knowledge variables on purchasing decisions, but there are still many other variables that can influence purchasing decision variables. Then, this research uses a questionnaire method (Google form), so that weaknesses arise where respondents can provide responses that do not accurately reflect the actual situation and there are also possible limitations in providing the information given due to the limited nature of the statements submitted.

Conclusion

Based on the results, this research aims to analyze the positive or negative influences of several factors in it. The results show that green products and green knowledge can have a positive and significant influence on purchasing decisions, then environmental awareness as a moderation strengthens the influence of green products and green knowledge and has a positive and significant influence on purchasing decisions. It can be concluded that this research can validate Theory of Reasoned Action, where an effective marketing strategy must understand and address these factors to increase the likelihood of the product winning in the market. Expectation to obtain is the most influential determinant in consumer purchasing decisions. Thus, the combination of high-quality green products, extensive green knowledge and high environmental awareness will drive stronger electric motorcycle purchasing decisions, helping to achieve sustainability goals and reduce negative impacts on the environment.

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