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# Implications of automotive product sustainability on young customers' purchase intention in developing countries: an experimental approach

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**Abstract.** Manufacturing of sustainable products is on a high demand in order to attain a global responsible consumption and production pattern. Among the emerging efforts of various manufacturing companies, production of sustainable vehicles takes a special attention due to its massive impacts to the world's sustainability dimensions. Meanwhile, youngsters in developing countries are interesting prospective customers for automotive products because their mysterious characteristics and potential to contribute to the future sustainability. The research investigated the connectivities between automotive products sustainable designs and young customers purchase intention in Indonesia, using an experimental workshop. Empirical results have shown that each dimension has a significant effect to the youngsters' preferences, although with different levels.

**Keywords:** purchase intention, sustainable products, automotive, customer behaviour

## 1. Introduction

Since the responsible consumption and production pattern has become one of the pillars for a global sustainability, sustainable product development has been a concern for manufacturing industries in recent years [1,2]. Therefore, paradigm in product development area has shifted to a direction with more environmental and social considerations in developing new products, which subsequently are mentioned as sustainable products. Several methods to design these sustainable products have been proposed and have led to the creation of new products in many aspects of human life [3-5]. Among these aspects, transportation vehicles one of the most common example where sustainability concept has been widely implemented due to its significant impact to the environment and society [6-9].

As the sustainable vehicles are proliferating in markets around the world, responses obtained in different countries may vary. The most significant gap can be seen in developed countries and developing countries, due to disparities found in the customer behaviour [10]. These disparities may come from different level of education and prosperity, so that the awareness level of sustainability also differs. Regarding the size of markets in developing countries is unneglectable [11], it is crucial to develop more understanding about correlations between customers' behavior and sustainable automotive products in developing countries to develop further strategies directing to the global sustainability.

Furthermore, we agree that strategic policies of related industries should be made based on observations through young people in age 18 – 30 [12-13]. As one of the reasons, young customers buying intention toward sustainable products reflects the opportunity of sustainable living style in the



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future [14-15]. We have seen how these young people give great influence in consumption pattern during these years, and this millennial behavior is still moving extremely fast, sometimes to unpredictable directions. Further, regarding the millennials as potential market for automotive products in the future, it is essential for the designers to pay attention on what attracting them to purchase sustainable cars or motorcycles. By taking the tripple bottom line (TBL) as the dimensions of sustainability [16], it is interesting to find whether the environmental concern, the social impact, or economic reasons affect the young customers most in taking the purchase decision. Therefore this study focuses on discussion about how young customers in a developing country (Indonesia as a case study) respond to products' sustainability dimensions (TBL) in a manner of purchase intention. The results can provide useful resources for the designers and other interested scholars to understand young customer behavior in designing sustainable products for developing countries with similar characteristics.

## 2. Literature Review

### 2.1. Automotive Product Sustainability

Sustainability in one product is assessed through all its life cycle, considering several category / dimension of sustainability. These dimensions are subsequently divided into criteria reflecting more specific condition (table 1). Since this research discusses sustainability in customer's perspective, criteria discussed in this research are limited to those only with direct benefits to the customer.

**Table 1.** Criteria in Automotive Product Sustainability Assesment (Customer's View)

Category	Criteria	Criteria's code	References
Environmental Impact	Global warming and ozone depletion	E1	[6,17,18]
	Toxicity and pollution to the environment	E2	[6,17,18]
	Scarcity of resources	E3	[6,17,18]
Social Impact	User's Health	S1	[6,17,18]
	User's Safety	S2	[6,17,18]
	User's Comfort (vibration, noise)	S3	[6,17]
	User's Mobility (performance and durability)	S4	[6,17,18]
Economic Impact	Operating Cost	M1	[6,17,18]
	Maintenance Cost	M2	[6,17,18]
	Used product value	M3	[17,18]

Refferences about vehicle sustainability assessment methods are not many, however several studies have been accomplished to develop the methods. Each methods present different criteria, although having similarities. Ungureanu [6] proposed a framework consisting six category, constituting triple bottom line with functionality, manufacturability and recyclability as additional points. Functionality had many similar functions with social criteria, while manufacturability and recyclability sub criteria can be categorized in environment criteria. Shuaib et al [18] still used TBL in his method, which can be used for general products, to score the product's sustainability index. Salvado [7] also used TBL in his work, generating sustainability index using analytic hierarchy process. Meanwhile, Jasinski [17] argue resource impact as another criteria inspite of TBL, because automotive products are recognized as one of the most resource-consuming products used by the society. However, it is assumed from the

customers' point of view, resource consumption also means environmental sake. For practical reasons, criteria used in this discussion uses basic TBL in product operating phase.

### *2.2. Product Sustainability and Consumers' Purchase Intention*

Purchase intention of customers is a measuring value for predicting future sales of a certain product, although it is not the only factor to be considered in marketing [19]. Researches related to the field are enormous with different aims and approaches, and those which relates to product sustainability are sufficiently provided as well. Understanding customer purchase intention is a crucial part of planning future sustainability, because achieving sustainable consumption pattern also partially means selling sustainable products to as many customers as possible around the world.

The problem is, although the sustainable products sales trend recently shows an inclination [20-21], its percentage among other conventional products trend is still low. Customer's reluctance mostly comes from unawareness, lack of information and poor habits toward sustainability (Tang 2008). However, by increasing customer's perceived value of the product and knowledge about related risks, customer's purchase intention is aimed to be higher [22]. While knowledge is wished to be obtained by education and advertisements, products' perceived value should be build integrated in the product design [23]. Incorporating sustainability dimensions in a product requires a comprehensive design method, which is limited by several boundaries including technology availability, customer behaviour considerations, ruling policies and the effects of the design to sustainability dimensions. Though the process is surely more complex and more cost demanding than the old conventional product design methods, applying these sustainable methods is a necessity to attain excellences in nowadays competitive markets [24].

Correlations between product sustainability dimensions and customer's purchase intention has been investigated in prior studies, and some of them are given here. Chen [25] investigated whether an eco-motorcycle design affect consumers' purchase intentions in Taiwan. The research has proven that customer's knowledge holds significant role in increasing purchase intention. Toppinen [26] found that consumer's preferences to sustainable wood products in Finnish should be divided into dimensions: environment and social. Park [27] has proposed a concept using the TBL framework to conceive customer's perception in fashion industry.

Many studies have been conducted in developed countries, while consumers in developing countries are recognized having different characteristics than those who live in developed countries [28]. A few samples of studies conducted in developing countries related to the discussion are mentioned here. Handriana [29] examine three groups constituting professionals, housewives and young people in Indonesia as a developing country. All groups showed positive response to green products, even each has different level of familiarity. Interesting participants in this research were the young people, which represented potential of future sustainability in developing countries. They seem to have more interest in global issues. For instance, in comparison to housewives, young people are more familiar and having higher buying intention to green products. However, Shamsi [30] found that the customer's educational backgrounds is the most significant aspect in determining the response to green products. It is affected by the amount of information gained by the prospective customers, and how this information interact with the customer's knowledge related to sustainability.

## **3. Methods**

### *3.1. Hypotheses Development*

Ghazali et al [31] investigated cultural influences on green product preferences in Indonesia. Among the cultural traits presented, authors found the salient factors influencing the market are uncertainty avoidance and long-term orientation. Further, it can be concluded from the discussion that the society has pragmatism point of view about green products, referring to money savings oriented. This is supported by Lim [32] who revealed that economic incentive has significant influence in Malaysian antecedents' purchase intention, while the environmental issue does not. Chen [33] found that perceived monetary value could highly seduce consumers to buy green products, but environmental awareness was also considered by consumers in purchase decision making. However, this pragmatism

financially related mind is not seen in young consumers. Lian and Yoong [34] have revealed that young consumers in Malaysia prefer to consider social dimension (health and safety) in comparison to affordability. From another study, Kowang [35] stated functionality of vehicles influences youth's purchase intention significantly in Malaysia, reflecting the youngsters have high preferences to the engine performance and the vehicles durability. It shows that youngsters relatively have attention to social dimension sustainability like health, safety and products functionality. This behavior is easily understood as consumers' basic consideration in buying products, also applied for older community. For instance, in certain types of product, health concern engaged with sustainability issue, got the highest attention from prospective customers in an online market website [36]. While Hung [37] found that vehicle safety awareness among consumers is very high more than economic reasons, which can influence their buying intention to the related products. These findings might lead to a hypothesis that social dimension would be the top reason for young customers to buy green vehicles. While economic dimension might be the less consideration, since the respondents in the proposed workshop would be assumed financially adequate to buy the variant models.

Meanwhile, environmental impact consideration is still unfamiliar for several market segments, the youngsters have recognized the issue quite well [24]. This is because young customers are widely opened to new information and affected easily by media [38]. For these millennials, getting a comprehensive understanding about environmental issues is not a difficult thing to do since there are many advertisements related to environmental issues in media recently. In prior researches, it has been clarified that a better level of knowledge is considered to increase the purchase intention on eco products among young customers [30]. In addition, Setyawan [39] found that even though currently for most Indonesian adolescents environmental issues have not been a main topic in their mind, their purchase intention to green products might increase significantly by applying adequate information delivery. These findings are similar with Zhang's research [14] in China with green houses as the purchasing objects. He acclaimed that young customers in China are willing to buy green houses as long as they get sufficient explanation about urgency of the green products. According to these findings, the following hypotheses are proposed.

**H1:** Social dimension of sustainability has a significant impact to young customers purchase intention and it has higher impact in comparison to other dimensions.

**H2:** Environmental dimension of sustainability has a significant impact to young customers' purchase intention which is lower than the social dimension, but higher than economic dimension.

**H3:** Economic dimension of sustainability has significant impacts to young customer's purchase intention, but has the lowest influence compared to other dimensions.

### *3.2. Workshop as an Experimental Tool*

Relation between sustainable features in automotive product and customers' purchase intention should be examined by eliminating influences from other factors outside the variables such as brand loyalty, pricing, etc. For this research, it is decided to enroll experimental research, in form of a workshop. Experimental method have been used widely in measuring consumer's behavior to sustainable products in various way. Some of them measured the customer's willingness to pay [40-41]. The method is acclaimed to decrease the bias possibility due to the preliminary treatments to the participants because it consists explanation session from the researchers. In this case, there are two main subjects to be described to the respondents at the beginning of the workshop, which are a brief explanation of sustainability concept and the characteristics of the product models used in the research.

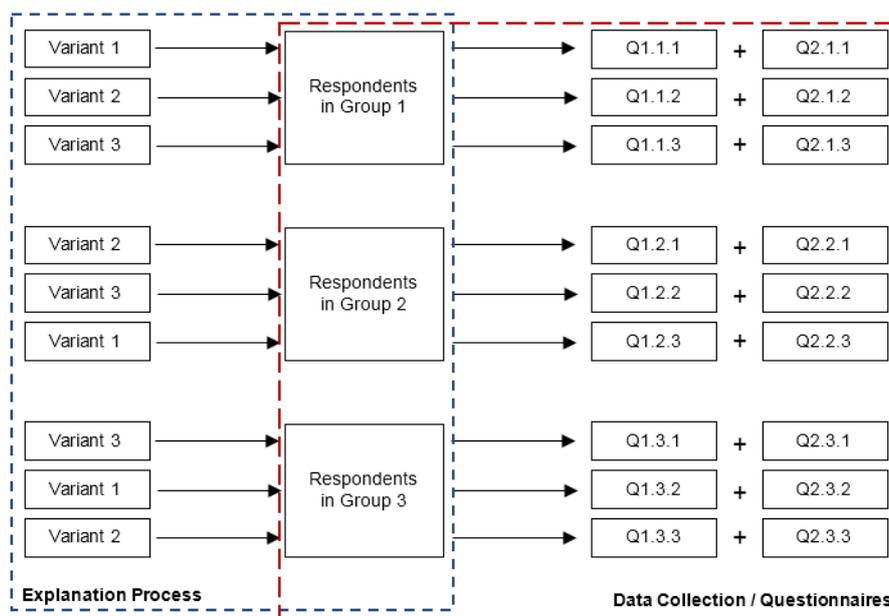
As the experiment object, motorcycle variants were chosen as the product models to be presented in the workshop due to their wide usage among youngsters in Indonesia. Three imaginary motorcycles with different characteristics were developed to be explained to the respondents in a certain sequence (table 2), then the respondents were asked to fill questionnaires related to the products (Q1) and their intention to buy them (Q2). There are 10 questions in each questionnaire constituting the sustainability criteria as listed in table 1. Likert scale 1 to 5 was used to analyze whether the respondents are strongly agree, agree, normal, disagree or strongly disagree with the statements.

Each motorcycle variant represents excellences in environmental, social and economic dimension respectively, so that the respondents' purchase intention to each variant should depict the respondents' preferences to sustainability dimensions. Other factors which might effect the respondents decision, such as the bike shape, brand, price, colors, are set to be flexible according to the respondents' taste.

**Table 2.** Motorcycle Variants as Product Models and Their Characteristics

	Criteria's Code	Performance Defined		Criteria's Code	Performance Defined		Criteria's Code	Performance Defined
<b>Variant 1</b>	E1	Excellent	<b>Variant 2</b>	E1	Poor	<b>Variant 3</b>	E1	Poor
	E2	Excellent		E2	Poor		E2	Poor
	E3	Excellent		E3	Poor		E3	Poor
	S1	Poor		S1	Excellent		S1	Poor
	S2	Poor		S2	Excellent		S2	Poor
	S3	Poor		S3	Excellent		S3	Poor
	S4	Poor		S4	Excellent		S4	Poor
	M1	Poor		M1	Poor		M1	Excellent
	M2	Poor		M2	Poor		M2	Excellent
M3	Poor	M3	Poor	M3	Excellent			

During the workshop, respondents should be grouped into classes, where each class should contain at least 30 respondents for the sake of measurement validity. These classes are required to avoid the testing factor where a certain sequence in explaining things in a workshop might have effects to the respondents' responses. In avoiding such a phenomena, in each class the products explanation sequences would be set differently. Figure 1 is presented as a model to understand how the workshop would be conducted.



**Figure 1.** The Experimental Workshop Model

Workshops in these classes were conducted simultaneously with the same materials and questionnaires, only with different respondents and sequence of product explanation. Since Q1 and Q2

questionnaire each contains 10 questions, thus totally there are 303 respondents' responses for the three variant models. These data subsequently are analyzed by using statistical tools to reveal the respondents purchase intention to each variants.

#### 4. Results and Discussions

The experimental workshop has been conducted in August 2019, where 101 respondents were involved. The profiles of the respondents are given in table 3.

**Table 3.** Respondents Profiles

Respondents Profiles		Freq	%
Gender	Male	59	58,4
	Female	42	41,6
Education Level	High School	42	41,6
	Bachelor	45	44,5
	Master	14	13,9
Age	18 – 21	51	50,4
	22 – 26	40	39,6
	27 – 30	10	10

An experimental work requires less respondents in comparison to a full survey work. It has relatively stronger internal validity, though it suffers weaker external validity [35]. KMO and Bartlett's tests have been implemented to the data and have confirmed that the measuring instrument has fulfilled the threshold level (KMO > 0.5; all factor loadings > 0.5; Bartlett's should be significant with  $p < 0.05$ ). In addition, by analyzing communalities and factor loadings, it is described that each dimension of TBL has specific significant effect to the customer purchase intention. Therefore for each dimension' the cronbach's alpha has been counted and validated above the required level (Cronbach's alpha > 0.7). The results are given in table 4.

**Table 4.** Validity and Reliability Tests Results

Measurements		
Kaiser-Meyer-Olkin sampling adequacy tes		0.793
Bartlett's Test of Sphericity	Approx Chi Square	3129.217
	Df	45
	Sig	0.000
Cronbach's alpha (environmental dimension)		0.919
Cronbach's alpha (social dimension)		0.970
Cronbach's alpha (economic dimension)		0.896

Once the validity and the reliability of the instruments has been validated, it is essential to ensure that the respondents' perception to the presented products is correct. Questionnaire Q1 has been

provided for this intention, then a manipulation check using T-test, means value and significance has been enrolled to reveal the perception. As the result, most of respondents clearly understand the characteristics and the excellences of each variant. For examples, the respondents confirmed that variant 1 is the best for its environmental dimension characteristics while the variant 2 has the best performance in social dimension, and so on. All data have significance below 0.05, so it is considered that the respondents' perception is sufficient. It is assumed that the experimental workshop method is an appropriate approach to reveal young customers behavior due to its ability to clarify the problems to the audience at the beginning of the workshop. Thus the measurement of their purchase intention should be more valid under this condition, as on Table 5.

**Table 5.** Homogeneity Test

Classifications	Age	Education Level	Gender
Asymptotic Sig. (Pearson Chi Square)	1.000	1.000	1.000

Subsequently, the respondents' profiles should be examined whether these factors affect the purchase intention or not. There are three classifications in the profiles which should be noticed: age, education level and gender. Using crosstabulations and chi square tests for the 3 classifications versus the 3 variants, data in table 5 has been collected. It shows that none of these classification has a noticeable effect to the respondents' purchase intention, because it requires value under 0.05 for the asymptotic significance to be considered as significant. While other studies proposed that difference in education background should affect customers preferences, it is assumed that a brief good explanation as conducted in the workshop could eliminate this knowledge limitation among the respondents [33, 40-41].

**Table 6.** Univariate Analysis of Variance

	(I) code	(J) code	Mean Difference (I-J)	Std. Error	Sig.	Subset		
						1	2	3
<b>Tukey HSD &amp; Bonferroni</b>	Variant 1	Variant 3	2.9307	0.85454	0.002	29,10		
		Variant 2	-2.8218	0.85454	0.003			
	Variant 2	Variant 1	2.8218	0.85454	0.003	31,93		
		Variant 3	5.7525	0.85454	0.000			
	Variant 3	Variant 1	-2.9307	0.85454	0.002	26,17		
		Variant 2	-5.7525	0.85454	0.000			

**Model Summary**

Model	R	R Square	Adjusted R Sq	Std. Error of the Estimate
1	0.765	0.616	0.615	4.03002

The connectivities between the product sustainability dimensions to the young customers' purchase intention has been investigated on data collected through questionnaire Q2, using univariate analysis of variance. By using between-subject tests and multiple comparisons based on Tukey HSD and Bonferroni methods, the results clarify that all sustainability dimensions have specific effects to the

customers' purchase intention, although with different level. It is shown by the significance value, with all value are below 0.05. This result should be a good sign that sustainable motorcycles might have better responses from Indonesian customers in the future.

Furthermore, the analysis from homogenous subset reveals that the social dimension has the highest implication on the purchase intention, followed by the environmental and economic dimension respectively. The results fulfill the hypotheses, where the young customers do not focus on financial benefits from the products, but they prefer to satisfy their personal needs first and contribute to the environmental issues instead. Overall, the sustainability dimensions in the automotive product models have affected the young customers' purchase intention by 61% compared to other reasons. This result validates the hypotheses described in previous section (table 6).

## 5. Conclusion

An investigation to young customers' purchase intention to sustainable vehicles has been conducted using an experimental workshop in Indonesia. Three motorcycle models with specific characteristics have been used to test the preferences of 101 respondents. As the result, it can be seen that young customers in Indonesia have main interests on social dimension criteria in purchasing a motorcycle, constituting health, safety, comfort and product functionality considerations. Oppositely, these young customers put economic dimension, including used product value, operational and maintenance cost as the lowest consideration. One can argue that the condition is caused by the assumption made at the beginning of the workshop, where the respondents were assumed financially adequate. Thus the respondents' preference may differ in the real life condition, when facing economical boundaries. On the other side, environmental dimension considerations may have a good opportunity to be highly considered by customers in the future, regarding good education and advertisements about the urgency of taking care of the nature. Even in developing countries, environmental issue shall be a good added value for products to attract more customers, because the awareness of sustainability among youngsters have been existed.

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