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CONSUMER INTENTIONS AND SOLAR PV: AN ANALYSIS OF GREEN CONSUMPTION, PRICE VALUE, SOCIAL INFLUENCE, AND FACILITATING CONDITIONS IN INDONESIA

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ABSTRACT

Extant solar energy research generally investigates the macroeconomic factors behind Indonesia's slow adoption of solar photovoltaic (PV) systems. Meanwhile, this paper focuses on individual consumers' intention to adopt the technology. It investigates whether price value, green consumption value, social influence, and facilitating condition has any impact towards the behavioral intention. Data from a final sample of 210 valid respondents were collected using simple random sampling and analyzed using PLS-SEM. Price value, green consumption value, and facilitating condition significantly and positively affect intention to adopt solar panels, while social influence has an insignificant role to the decision-making process. These findings provide insights that can aid policy initiatives and marketing strategies in promoting renewable energy solutions in Indonesia.

Keywords: Facilitating Condition, Green Consumption Value, Price Value, Social Influence

INTRODUCTION

Following the increasing awareness of global warming, countries all around the world are transitioning from fossil fuels to clean, renewable energy (RE), one of them being solar energy. Indeed, adoption of solar photovoltaic (PV) technologies has observed remarkable progress. For instance, solar capacity in the US has increased by 94.3% since the last decade (Tabassum et al., 2021), while European countries' have installed 41.4GW of solar power capacity or equivalent to electricity for 12.4 million houses in 2022 (SolarPower Europe, 2022).

As a tropical country with high solar radiation, Indonesia presents a large potential for solar panel adoption (Tarigan, 2020). Unfortunately, the industry itself is still at its infancy, having only grown by 6.4% in the last decade (Abdullah et al., 2023). Even when compared to neighboring countries of similar economic and social condition, such as India and Sri Lanka, RE adoption in Indonesia is considered unprogressive (Burke et al., 2019; Sovacool, 2018). This reflected towards the lack of research as well- while numerous studies on green technology have been done in the context of developed nations (Dharshing, 2017; Feldman et al., 2021; Fernández, Payán, & Santos, 2021) research on green purchase intention in Indonesia is still at a nascent stage (IESR, 2022).

Extant solar PV studies in Indonesia generally focus on technical and socio-regulatory factors (Abdullah et al., 2023; Sumarsono, Wahyuni, & Sudhartio, 2022; Xu et al., 2023) or institutions and powerful stakeholders impeding the country's transition from coal to renewable energy (Burke et al., 2019; Setiawati, 2020). These researches highlighted macroeconomic factors slowing down the adoption rate of solar PV, yet there is a gap in research using a microeconomic approach (i.e. examining intention to adopt solar PV among households). In fact, solar panel usage needs to expand to individual household level if Indonesia wishes to grow its meager solar PV adoption rate. By studying factors influencing consumers' intention to adopt solar PV, this paper makes an original contribution to green marketing in Indonesia and addresses the aforementioned research gap.

Ajzen (2005) suggested that three elements shape behavioral intention: personal factors (including values and attitudes which influence the individual's assessment of the behavior), societal influences (arising from expectations within social groups), and control aspects (comprising self-efficacy and external elements that affect the simplicity of executing the behavior). To investigate factors affecting behavioral intention towards solar panels, four factors are chosen: (1)

price value and (2) green consumption value (GCV), to reflect the individual attitude and evaluation of solar panels; (3) social influence, to reflect normative beliefs on solar panel adoption; and (4) facilitating conditions, to reflect the consumer's perceived control over adoption of solar panels.

In the field of consumer behaviour studies, price is an essential component, often seen as a significant aspect of a consumer's perceived value (Parasuraman & Grewal, 2000). On the other hand, studies focusing on eco-friendly products and services typically include environmental concern or consciousness as a precursor to the intention to purchase green products (Risitano, Romano, La Ragione, & Quintano, 2023; Sun, Wang, Huang, & Ho, 2018). Indeed, there is a complex interrelationship between price and environmental values, which shapes an individual's disposition towards green products. For instance, a socio-cultural investigation into frugality and ecological consciousness conducted by Chen, Ren, Gu, and Zhang (2019) discovered that environmental awareness influences an individual's assessment of whether a product's monetary cost is justified. Consequently, while previous research has evaluated these elements individually, our work aims to explore their combined impact specifically within the Indonesian context

This study will also leverage aspects of normative and control belief, specifically focusing on social influence and facilitating condition. The theoretical framework for these two elements was developed by Venkatesh, Morris, Davis, and Davis (2003), who drew upon prior technology acceptance theories by eminent researchers such as Ajzen (1991), Thompson, Higgins, and Howell (1991), and Moore and Benbasat (1991). These two consolidated variables are chosen due to their enhanced predictive capabilities compared to previous models (Rondan-Cataluña, Arenas-Gaitán, & Ramírez-Correa, 2015). Furthermore, Venkatesh, Thong, and Xu (2012) have enriched their paper by introducing a series of measurement items that can assist in forming the research design.

The purpose of this paper is twofold. Academically, this research contributes to extant literature on green behavioral intention, especially in the context of a developing country. Practically, the research aims to highlight the most influential antecedents of green behavioral intention. It will guide both businesses and policymakers in crafting the most appropriate strategies to encourage adoption of solar PV among Indonesian consumers.

In the following sections, this paper will lay out the theoretical background and research hypotheses, research methodology, result and its implications, as well as research limitations and recommendations.

LITERATURE REVIEW

Behavioral intention

Behavioral intention refers to the degree in which a user has made a conscious decision in using a technology (Ajzen, 2005; Venkatesh et al., 2003). The latter researcher has also found that intention is a critical predictor of actual behavior. In the context of solar PV technology, behavioral intention refers to customers' willingness to adopt this alternative energy, which will then lead to the actual purchase and installation of solar panels in their house (Lau et al, 2020).

Generally, "intention to use" and "plan (to use the product) in the future" are identified elements of behavioral intention (Castillo, Cabanillas, & Ramos, 2023; Sun & Wang, 2019). In addition, researchers have also used word-of-mouth (WOM) as an element of behavioral intention (Abu-Taieh et al., 2022; Li, Tse, Zhang, & Phi, 2023; Nguyen & Phan, 2022). Since recommending a product symptomizes a consumer's positive perceived value towards it, positive WOM is found to be closely linked to actual purchase (Abu-Taieh et al., 2022; Anderson, 1988; Nguyen & Phan, 2022). Thus, the present authors define behavioral intention as a person's intention to adopt, future plan to use, and likelihood of recommending solar PV technology.

Price value

According to Dodds, Monroe, and Grewal (1991), price value is the tradeoff between perceived benefits of a product with the perceived cost of using them (Dodds, Monroe, & Grewal, 1991). In the present study, an example of a benefit from using solar energy would be the electricity bill savings, while costs refer to the technology's capital investment and maintenance (Hasheem, Wang, Ye, Farooq, & Shahid, 2022; Schulte, Scheller, Sloot, & Bruckner, 2022). Currently, there are conflicting findings in regards to the role of price value on behavioral intention. For instance, in studies on health or finance related technology acceptance, some found that price value positively impacts intention to use (Barua & Barua, 2023; Kilani, Kakeesh, Al-Weshah, & Al-Debei, 2023) while others found it had no significant influence (Gansser & Reich, 2021; Sebastián, Antonovica, & Guede, 2023).

Currently, there is limited research measuring the consumer's perceived monetary value of green technology. For example, Aggarwal, Syed, and Garg (2019) researched on "price value" and adoption of rooftop solar PV, but their measurement items reflected that they do not adopt Dodds et al (1991) definition on the variable, as they investigated the consumers' opinion on whether "electricity should be affordable" and "economic viability of rooftop solar PV is important". Meanwhile, most research on green technology uses terms such as perceived economical return (Jayaraman, Paramasivan, & Kiumarsi, 2017) and relative advantage (Alam, Ahmad, Othman, Shaari, & Masukujjaman, 2021) instead of price value. These variables would measure "environmental performance" and whether "credit/loans are needed", instead of solely focusing on how the individual would 'balance' the perceived benefit and cost of solar PV. Hence, the authors hypothesize the following:
H1. Price value positively impacts consumers' intention to adopt solar PV technology.

Green consumption value
As solar PV is a clean, renewable energy, research on the topic often studies environmental concern as one of its predictor variables. This construct is commonly called "environmental concern" (Chen & Zhang, 2021; Hasheem et al., 2022; Pandey & Yadav, 2023), though there are studies using the term "environmental beliefs" (Aggarwal et al., 2019) and "green concern" (Zhang, Li, Cao, & Huang, 2018). These terms essentially measure the awareness and importance of environmental issues for the consumer.

Conversely, this research will use green consumption value (GCV), which is the tendency to express the value of environmental protection through one's purchases and consumption behaviors (Haws, Winterich, & Naylor, 2013). GCV not only implores the consumers' environmental concern (e.g. "I am concerned about wasting the resources of our planet"), but it also measures the extent to which the consumer is willing to carry out environmentally responsible behavior ("I am willing to be inconvenienced in order to take actions that are more environmentally friendly"). Through Haws et al (2013) theoretical and empirical study, it was revealed that the GCV six-item measure significantly predicts consumers' preference for greener products. Henceforth, the authors arrive at the second hypothesis:
H2. GCV positively impacts consumers' intention to adopt solar PV technology.

Social influence
Social influence is the extent to which consumers perceive important others, such as family and friends, would advocate the use of a certain technology (Venkatesh et al., 2012). Studies in India (Aggarwal et al., 2019) and Kenya (Opiyo, 2019) found that social influence is a significant predictor of behavioral intention: if people within his social circle install a solar panel, the consumer would be more likely to adopt the technology as well. In contrast, research done in Germany and the US found this independent variable to have negligible effect on intention to adopt (Schmitz, Díaz-Martín, & Yagüe Guillén, 2022).

These conflicting findings suggest cross-country differences in levels of collectivism, which would justify the need to replicate this research in Indonesia. To confirm the significance of social influence among Indonesian consumers, the authors hypothesize the following:
H3. Social influence positively impacts consumers' intention to adopt solar PV technology.

Facilitating condition

As seen in the survey items of Venkatesh et al. (2012), facilitating condition was derived from 4 root constructs which were synthesized from previous scholars' theories. Namely, they are: Resource (Ajzen, 1991), Knowledge and skills (Ajzen, 1991), Ability to get support from others (Thompson et al., 1991), and Compatibility of the new technology with existing technology or conditions (Moore & Benbasat, 1991). Studies utilizing one of these root constructs generally show that it positively and significantly impacts behavioral intention. For example, consumers who perceive favorable resource factors (i.e. has time and money to purchase and maintain solar PV) are more willing to shift to solar energy (Akroush, Zuriekat, Al Jabali, & Asfour, 2019; Tanveer, Zeng, Irfan, & Peng, 2021). How compatible solar PV technology fits with the consumer's current lifestyle or rooftop condition has also been shown to affect intention (Hasheem et al., 2022; Sun et al., 2018).

In contrast, when these four aspects are measured collectively under the variable facilitating condition, several research shows that facilitating condition plays an insignificant role in behavioral intention (Kilani et al., 2023; Schmitz et al., 2022; Sebastian et al., 2023). Noting this variability, the authors thereby hypothesize the following:

H4. Facilitating conditions positively impacts consumers' intention to adopt solar PV technology.

METHODOLOGY

A cross-sectional research design with a quantitative approach was utilized. Data from the intended participants was gathered through online questionnaires made in Google Form and shared through various social media platforms. This study targeted people who have the following criterias: (1) above 20 years old; (2) living in a house; (3) have graduated middle school; (4) earning above Rp10M monthly. The criterias are set to target people who possess purchasing power for solar PV systems and have a roof onto which installing solar panels is possible. Participants were provided with essential information to assist them in completing the questions, such as average solar panel pricing before answering price value questions. Participants were selected through simple random sampling method. This study requires respondents to answer a 1 (strongly disagree) to 6 (strongly agree) Likert scale, with items seen in Table 1. Note that PV 4 & PV 5 are reversed questions.

Table 1
Operational Definition of the Variables

Behavioral Intention (Alam et al., 2021)
1. I am willing to purchase solar PV technology
2. Plan to purchase solar PV technology in the future
3. I would highly recommend PV Solar technology for other people to use
Green Consumption Value (Risitano et al., 2023)
1. It is important to me that the products I use do not harm the environment
2. I consider the potential environmental impact of my actions when making many of my decisions
3. My purchase habits are affected by my concern for our environment.
4. I am concerned about wasting the resources of our planet
5. I would describe myself as environmentally responsible
6. I am willing to be inconvenienced in order to take actions that are more environmentally friendly
Price Value (Lau et al., 2020)
1. Solar PV system is reasonably priced
2. Solar PV system has good value for money
3. Solar PV system is a good investment for future generations
4. Cost of investment in solar PV is higher than the benefits it can generate
5. Investment in solar PV system is not worth it
6. Solar PV system is less expensive compared to conventional electricity consumption
7. Solar PV system installation should be made cheaper to encourage usage
8. Maintenance of solar PV system is affordable
Social Influence (Aggarwal et al., 2019)

1. I always ask a friend about his/her experience with a new product before I buy it
2. If people around me has a positive experience with solar PV, I will be inclined to buy it as well
3. People who matter to me (friends, families, neighbors) think that I should install solar PV
4. I value the opinions of people who matter to me

Facilitating Condition (Lau et al., 2020)
1. I have the resources (money, time, effort) necessary to use the solar PV system
2. I have the knowledge necessary to support the use of solar PV system
3. I have the knowledge and expertise necessary to maintain the solar PV system
4. I would heavily rely on after-sales service to maintain my solar PV system
5. I think that using solar PV system fits into my living environment
6. I know where to seek assistance if I were to use solar PV system
7. I am given timely assistance If I were to use solar PV system
8. I can get assistance from others when I have difficulties using the solar PV system

This research utilizes a self-administered questionnaire segmented into two primary sections: The first section collects the respondents' profile while the second evaluates each construct using the designated items. The first section was further divided into two parts; filtering questions (age, housing tenure, last education, and monthly income) and introductory (gender and monthly electricity bill). The questionnaire items were primarily taken from validated empirical studies.

The questionnaire was first shared to 10 respondents for piloting, as it is necessary to improve the quality of the main study (Hair, 2017). After incorporating feedback from pilot respondents, the real questionnaire was spread. Partial least squares (PLS) structural equation modeling was applied through Smart PLS Version 4 to explore the research hypotheses and the research model. Each construct underwent convergent validity, discriminant validity, and reliability testing. It was further assessed by processing the data through three important steps which are model specification, outer model evaluation, and inner model evaluation (Hair, Hult, and Ringle, 2017). In the structural model, green consumption value, price value, social influence, and facilitating conditions serve as exogenous constructs, while behavioral intention is an endogenous construct.

ANALYSIS AND DISCUSSION

Out of the 247 responses collected, 210 fulfilled the aforementioned criteria and became the final sample size. Table 2 shows the 20 retained items of the final model, which passed the 0.707 cutoff value (Hair et al., 2017) and met the minimum threshold value of 0.500 for the average variance extracted (AVE) (Barclay, Thompson, & Higgins, 1995). There are five items that were excluded from the final model due to insufficient factor loadings: one from social influence (SI 4), three from price value (PV 3, PV 4, PV 5), and one from facilitating conditions (FC 4). Furthermore, composite reliability of each construct exceeded the recommended 0.700 cutoff value, affirming the model's convergent validity.

Table 2
Convergent Validity (n = 210)

Construct	Items	Outer Loadings	Cronbach's Alpha	AVE	rho A	rho C	VIF
Behavioral Intention	BI1	0.868	0.805	0.719	0.808	0.885	1.851
	BI2	0.855					1.872
	BI3	0.820					1.587
Green Consumption Value	GCV1	0.756	0.867	0.600	0.879	0.900	1.974
	GCV2	0.814					2.306
	GCV3	0.840					2.375

	GCV4	0.757					1.907
	GCV5	0.745					1.751
	GCV6	0.727					1.514
Price Value	PV1	0.806	0.771	0.518	0.803	0.841	2.176
	PV2	0.828					2.265
	PV6	0.682					1.424
	PV7	0.606					1.403
	PV8	0.651					1.480
Social Influence	SI1	0.523	0.626	0.560	0.770	0.785	1.146
	SI2	0.786					1.392
	SI3	0.887					1.314
Facilitating Condition	FC1	0.661	0.898	0.623	0.905	0.920	1.565
	FC2	0.744					2.341
	FC3	0.768					2.482
	FC5	0.786					1.987
	FC6	0.879					3.927
	FC7	0.829					2.755
	FC8	0.838					2.887

Table 3
HTMT Criterion Result

Construct	FC	GCV	BI	PV	SI
FC					
GCV	0.569				
BI	0.890	0.646			
PV	0.732	0.519	0.862		
SI	0.546	0.530	0.621	0.545	

Discriminant validity is measured using cross-loadings, Fornell and Larcker criterion, and the Heterotrait-Monotrait (HTMT) criterion. Each item's cross-loadings value was at least 0.100 smaller than its factor loading value. Moreover, this study aligns with Fornell and Larcker (1981) recommendation where the square root of the AVE for each construct should be greater than the correlation values.Table 3 shows that the HTMT for each construct was below the 0.85 (Clark & Watson, 1995; Kline, 2011), confirming discriminant validity.

Based on the findings' structural model, three variables were found to positively and significantly influence Behavioral Intention, namely: Price Value (beta = 0.321, p < .01), Green Concern Value

(beta = 0.155, p < .01), and Facilitating Condition (beta = 0.436, p < .01). However, the direct effects of Social Belief (Beta = 0.77, p = 0.296) on Behavioral Intention was not significant. Meanwhile, ANOVA results reveal R^2 of 0.683 and R^2 adjusted of 0.677.

Discussion

Aligned with our first hypothesis, price val[37] positively impacts consumers' intention to adopt solar PV technology. This finding confirms Lau et al. (2020) and Kilani et al. (2023) findings. A report by McKinsey (2022) states that Indonesian consumers are highly price sensitive. This is despite the country's increasing average income levels. Indonesians are known to hunt for bargains and are often influenced by promotional offers. Practically, this also suggests that implementing the right pricing strategies is very important. Promotional pricing or attractive installment schemes could be utilized to increase perceived affordability of solar PV technology.

Next, GCV positively impacts solar PV adoption which supports H2. This finding is aligned with Risitano et al. (2023) and Chatterjee, Sreen, Sadarangani, and Gogoi (2021), which means that consumers with more concern towards the environment are showing more willingness in adopting solar PV. In this case, raising consumers' awareness about the scarcity of non-renewable energy and educating people about the negative impact of using coal to generate electricity will positively influence solar PV adoption rate in Indonesia.

H3 is unsupported as social influence does not significantly affect intention to adopt solar PV technology among Indonesian consumers. This unexpected finding that social influence displays a weak effect in a collectivist country like Indonesia provides intriguing theoretical implications. One plausible explanation is the limited peer adoption in the status quo- Indonesia's solar PV adoption rate has decreased by 78% from 2020 (IESR, 2022). Hence, social influence may be undermined by the uncertainty or skepticism around the technology due to the lack of success stories of household solar PV. Future research could further investigate why social influence did not significantly impact intention by studying people who have adopted solar PV as their sample.

Lastly, results show that facilitating conditions positively impact intention to adopt solar PV, supporting H4. This confirms the results of Akroush et al. (2019), Lau et al. (2020), as well as Tanveer et al. (2021). The result suggests that facilitating conditions like high accessibility to solar PV sellers or getting the support needed when having troubles with the system will highly encourage people to try out solar PV. Sellers of solar PV systems should place importance on highlighting their after-sales services and guarantee. Future research could identify what kind of facilitating condition impacts customers' willingness to adopt solar PV the most.

CONCLUSIONS AND RECOMMENDATIONS

This research is conducted to analyze cons[33]er intention on using solar PV. Four variables, namely green consumption value, price value, social influence, and facilitating conditions, are used as variables impacting intention to purchase solar PV. A total of 210 vali[4]esponses are analyzed using PLS-SEM. The finding shows that price value, green consumption and facilitating conditions positively and significantly affect intention to purchase. Social influence, however, does not significantly impact intention to adopt solar PV among Indonesian consumers.

These findings have several managerial implications that can help boost the national adoption rate of solar technology. Offering discounted prices or special offers can make solar technology more affordable and attractive to potential customers.Working in collaboration with government agencies to provide financial incentives, such as tax credits or subsidies, can further reduce the cost of adopting solar technology.Introducing flexible payment options, such as installment plans or subscription models, can make it easier for individuals and businesses to afford and transition to solar technology.In addition to these strategies, raising awareness among the general public is crucial. This can be achieved through effective awareness campaigns and school programs that educate people about the environmental benefits of solar PV and how it works. By increasing

public knowledge and familiarity with solar technology, more individuals will be inclined to consider adopting it.

While this study has shed valuable insights, the authors acknowledge its limitations. First, reliance on self-reported data potentially leads to response bias especially in the case of GCV. Next, the present study has a limited geographic scope focusing on one sole province (i.e East Java), which limits the generalizability of the findings. Future researchers should increase the sample size and replicate the study in other regions of Indonesia, to improve study robustness. Finally, to enrich the literature, comparative studies can be done among different demographic groups, using factors such as age, education, and income as moderating variables.

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