IAIC Transactions on Sustainable Digital Innovation (ITSDI)
Vol. 7, No. 1, October 2025, pp. 61∼70
E-ISSN: 2715-0461 P-ISSN: 2686-6285, DOI:10.34306

Analyzing Determinants of Consumer Purchasing Behavior toward Solar Panels in Indonesia

Dadang Hermawan[1], Sipah Audiah[2], Muhammad Faizal Fazri[3*], Ivan Kovac[4]
[1]Faculty of Informatics and Computer, STIKOM Bali, Indonesia
[2]Casindo Group, Indonesia
[3]Faculty of Science and Technology, University of Raharja, Indonesia
[4]Eduaward Incorporation, United Kingdom
[1]dadang@stikom-bali.ac.id, [2]sipah@raharja.info, [3]faizal.fazri@raharja.info, [4] kovac.van1@eduaward.co.uk
***Corresponding Author**

Article Info

Article history:

Submission August 25, 2025
Revised September 22, 2025
Accepted September 29, 2025
Published October 16, 2025

Keywords:

Consumer Purchasing Behavior
Solar Panels
Sustainability
Knowledge and Information
Economic Factors

ABSTRACT

The growing global emphasis on sustainable energy, combined with the relatively slow adoption of solar technology in Indonesia, underscores the necessity of understanding consumer purchasing behavior toward renewable energy products. **This study** aims to identify and analyze the determinants influencing consumer purchasing behavior toward solar panels in Indonesia using the SmartPLS approach. **Data were collected** through an online survey targeting individuals who are interested in or have previously purchased solar panels. The SmartPLS method was employed to examine the relationships among key variables, including perceptions of sustainability and environmental benefits, knowledge and information regarding solar panels, economic factors such as price and promotional strategies, and consumer demographic characteristics. **The analysis** revealed that sustainability perception, knowledge, and economic considerations significantly influence consumers purchase intentions. Furthermore, demographic variables such as age, income, and education were found to shape consumer attitudes and purchasing behavior. **These findings** offer valuable insights into the behavioral dynamics underlying solar panel adoption in Indonesia and provide practical implications for policymakers and industry stakeholders in designing effective marketing strategies and policy frameworks to accelerate renewable energy adoption nationwide.

DOI: https://doi.org/10.34306/itsdi.v7i1.709

1. INTRODUCTION

The growing global awareness of renewable energy has led to an increasing interest in the utilization of solar panels worldwide. Indonesia, as a nation endowed with abundant natural resources, possesses substantial potential to develop solar energy as a primary alternative to meet its escalating energy demand [1]. Nevertheless, despite this significant potential, the adoption rate of solar panels in Indonesia remains relatively low, particularly among household consumers. This study aims to identify the key factors influencing consumer purchasing behavior toward solar panels in Indonesia, thereby providing valuable insights for stakeholders in the renewable energy sector [2].

Although previous studies have explored various determinants of consumer purchasing behavior toward solar panels, further examination within the Indonesian context remains essential due to its distinctive

social, economic, and cultural characteristics [3]. Some of the research problems that are the focus of this study are:

- How do consumers demographic and socio-economic characteristics influence their propensity to purchase solar panels?
- To what extent do consumers perceptions of the sustainability and environmental benefits of using solar panels influence their purchase intentions?
- What role does knowledge and information about solar panels play in shaping consumer attitudes and purchasing behavior?
- How do factors such as price, availability, and promotions influence consumer purchasing decisions regarding solar panels?

The main objective of this research is to analyze the factors that influence consumer purchasing behavior regarding solar panels in Indonesia [4]. Specifically, this research aims to:

- Analyzing the influence of consumer demographic and socio-economic characteristics on solar panel purchasing tendencies [5].
- Assess the impact of consumer perceptions of the sustainability and environmental benefits of solar panels on purchase intentions [6].
- Examining the role of knowledge and information about solar panels in shaping consumer attitudes and purchasing behavior [7].
- Identify the influence of economic factors such as price, availability, and promotions on solar panel purchasing decisions [8].

This research is expected to make a significant contribution to the understanding of the factors influencing consumer purchasing behavior toward solar panels in Indonesia [9]. It is hoped that the results of this research can become a basis for policy designers, manufacturers and marketers to develop more effective strategies in increasing the adoption of solar panels in Indonesia [10]. Distinct from prior studies conducted in other Southeast Asian and emerging market contexts, this research highlights Indonesia unique socio-cultural and behavioral characteristics [11]. Specifically, collective environmental values, community trust, and economic sensitivity shape consumer decision-making toward solar panel adoption. The novelty of this study lies in integrating these cultural and demographic dimensions into a SmartPLS based analytical model, providing a more context-specific understanding of how perception, knowledge, and economic factors interact to influence purchase intention and actual purchasing behavior [12].

The structure of this journal is organized as follows. After the introduction, the second section discusses the literature review related to consumer purchasing concepts, factors influencing solar panel purchasing behavior, and relevant previous studies [13]. The third section explains the research methodology, including research design, sampling procedures, data collection methods, and analytical techniques [14]. The fourth section presents the results of data analysis and research findings, followed by a discussion of these findings in the fifth section [15]. Finally, the last section outlines the conclusions and implications of the study, followed by the list of references containing the sources cited in this research [16].

2. LITERATURE REVIEW

2.1. Consumer Purchasing Concept

Consumer purchasing is a complex process that is influenced by various factors, including individual characteristics, environmental factors, and psychological factors [17]. Consumer behavior theory provides a useful framework for understanding how consumers make purchasing decisions [18]. According to this theory, purchasing behavior is influenced by perceptions, attitudes, intentions, and external environmental factors [19]. Theory of Planned Behavior (TPB) explains that consumer attitude, subjective norms, and perceived behavioral

control shape purchase intention, which then leads to actual purchasing behavior [20]. This framework aligns with the variables in this study where attitude acts as a mediator linking perception, knowledge, and economic factors to purchasing behavior.

2.2. Factors Influencing Consumer Purchasing Behavior for Solar Panels

Some factors that have been identified in the literature as potentially influencing consumer purchasing behavior for solar panels include:

- Demographic and Socio-Economic Characteristics: Previous studies show that age, income, education, and socioeconomic status can influence solar panel purchasing decisions [21].
- Perception of Sustainability and Environmental Benefits: Consumers who have positive perceptions of the environmental benefits of using solar panels are more likely to purchase them [22].
- Knowledge and Information: The level of knowledge and information consumers have about solar panels can influence their attitudes and purchasing intentions [23].
- Economic Factors: Price, availability, and promotion of solar panels are also important factors influencing consumer purchasing decisions [24].

2.3. Previous Research on Purchasing Solar Panels and Analysis Methods

Several previous studies have been conducted to investigate consumer purchasing behavior toward solar panels. Common analytical methods employed in these studies include regression analysis, path analysis, analytic hierarchy process (AHP), and partial least squares (PLS) analysis. Nevertheless, most of these studies are limited to specific geographical contexts and have not comprehensively examined the range of factors influencing consumer purchasing behavior related to solar panels [25].

2.4. Conceptual Framework

Based on the literature review, a conceptual framework was developed to illustrate the relationships among factors influencing consumer purchasing behavior toward solar panels [26]. This framework serves as a theoretical foundation to guide the analysis and to enhance the understanding of the complex interactions underlying consumer purchasing decisions. Grounded in the TPB, recent studies indicate that attitude frequently mediates the influence of environmental perception and knowledge on purchase intention within sustainable energy contexts [27]. In this framework, attitude functions as a bridge between individual cognition and behavioral intention, whereas economic factors such as price and promotion may moderate these relationships by shaping the strength of consumers evaluative judgments. This theoretical reasoning provides an updated, citation-supported justification for the proposed mediating and moderating effects in the present study [28].

3. METHODOLOGY

Table 1. List of Variables in the Study

Variable Type	Variables
Independent Variables	1. Demographic Characteristics (age, income, education)
	2. Perceptions of Sustainability and Environmental Benefits
	3. Knowledge and Information about Solar Panels
	4. Economic Factors (price, availability, promotions)
Mediator Variables	1. Attitudes towards Solar Panels
	2. Solar Panel Purchase Intention
Dependent Variable	1. Solar Panel Purchasing Behavior

As presented in Table 1, the study incorporates independent, mediator, and dependent variables to examine factors influencing consumer behavior toward solar panel adoption. The study population comprised individual consumers in Indonesia who possess awareness of or interest in solar panel products. Data were collected through an online questionnaire administered via Google Form over a four-week period. A purposive

sampling technique was employed to ensure that the respondents had fundamental familiarity with solar energy technologies. In total, 100 valid responses were obtained, representing consumers from diverse age groups and income levels across various regions of Indonesia [29].

All constructs were measured using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), consistent with prior studies on behavioral and energy adoption employing the PLS-SEM approach. To ensure methodological rigor and transparency, Table 2 presents the operational definitions of the variables utilized in this study, encompassing their conceptual meanings and primary measurement indicators.

Table 2. Operational Definition of Variables

Variable	Definition	Key Indicators
Perception (PS)	Belief in the sustainability and environmental benefits of solar panels.	PS1–PS5
Knowledge (KD)	Awareness and understanding of solar panel use and function.	KD1–KD5
Economic Factors (FE)	Evaluation of price fairness and promotional appeal.	FE1–FE5
Attitude (AT)	Positive or negative evaluation toward adopting solar panels.	AT1–AT5
Purchase Intention (PI)	Willingness or readiness to buy solar panels.	PI1–PI5
Purchasing Behavior (PB)	Actual or reported act of buying solar panels.	PB1–PB5

- General Hypothesis:
  H1: Demographic characteristics (age, income, education) have a significant effect on solar panel purchasing behavior.
- Hypothesis Regarding Perception:
  H2: Perceptions of sustainability and environmental benefits have a positive effect on solar panel purchase intentions.
- Hypotheses Regarding Knowledge and Information:
  H3: Knowledge and information about solar panels have a positive effect on attitudes towards solar panels.
- Hypothesis Regarding Economic Factors:
  H4: Economic factors (price, availability, promotions) have a significant effect on solar panel purchasing behavior.

The proposed hypotheses were tested using the SmartPLS method to evaluate the extent to which the independent variables influence the dependent variable. Contextual factors and relevant literature were also considered in the formulation and testing of the hypotheses shows in Figure 1.

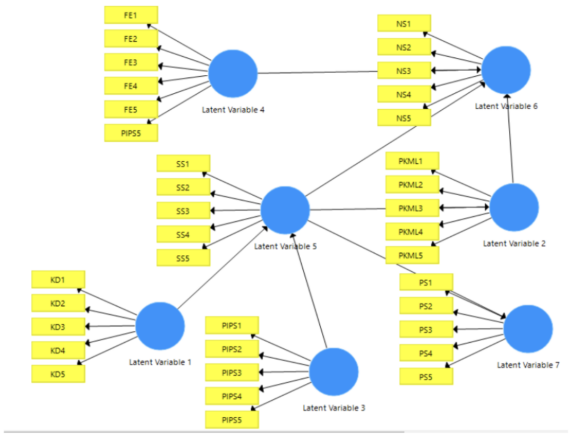

Figure 1. Hypothesis Framework

4. RESULT AND DISCUSSION

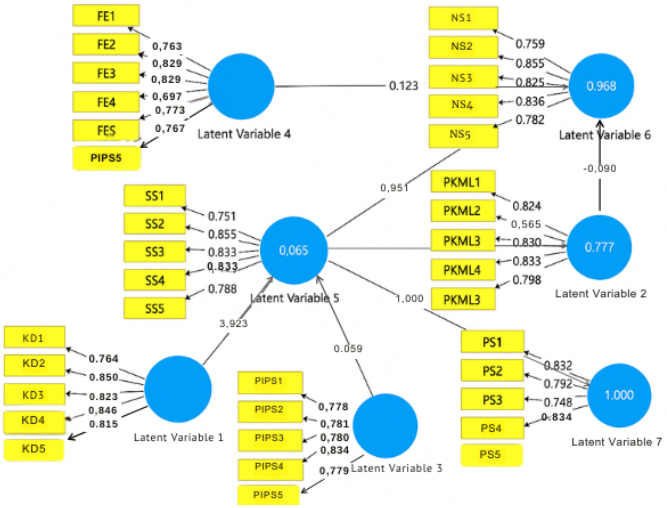

Figure 2. SmartPLS

Through the application of the analytical methods and data processing procedures, the results demonstrate significant progress in understanding and explaining the variability of the phenomena under investigation [30]. As illustrated in Figure 2, there is a substantial enhancement in the comprehension of the relationships among the observed variables [31]. The in-depth analysis reveals notable patterns within the data, providing deeper insights into the factors influencing the examined phenomena. These findings establish a robust foundation for subsequent interpretation and discussion of the theoretical and practical implications within the research context [32].

Table 3. Reliability & Validity

Latent Variable	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Latent Variable 1	0.878	0.881	0.911	0.673
Latent Variable 2	0.832	0.854	0.882	0.604
Latent Variable 3	0.850	0.852	0.893	0.625
Latent Variable 4	0.869	0.874	0.901	0.605
Latent Variable 5	0.871	0.874	0.907	0.661
Latent Variable 6	0.871	0.874	0.906	0.660
Latent Variable 7	0.871	0.874	0.907	0.661

The measurement results indicate that the latent variables demonstrate high reliability, as shown in Table 3 [33]. The elevated Cronbach's Alpha and Composite Reliability values confirm strong internal consistency among the constructs, while the high Average Variance Extracted (AVE) values show that the indicators adequately represent their respective variables. Overall, these results indicate that the measurement model meets acceptable reliability and validity standards for further structural analysis [34, 35, 36].

Table 4. Outer Loading

Indicator	Latent Var 1	Latent Var 2	Latent Var 3	Latent Var 4	Latent Var 5	Latent Var 6	Latent Var 7
FE1				0.763			
FE2				0.829			
FE3				0.829			
FE4				**0.697**			
FE5				0.773			
KD1	0.764						
KD2	0.850						
KD3	0.823						
KD4	0.846						
KD5	0.815						
NS1						0.759	
NS2						0.855	
NS3						0.825	
NS4						0.836	
NS5						0.782	
PIPS1			0.759		0.778		
PIPS2			0.781				
PIPS3			0.780				
PIPS4			0.834				
PIPS5			0.779				
PIPS5				0.767			
PKML1		0.824					
PKML2		**0.565**					
PKML3		0.830					
PKML4		0.833					
PKML5		0.798					
PS1							0.832
PS2							0.792
PS3							0.748
PS4							0.854
PS5							0.834
SS1					0.751		
SS2					0.855		
SS3					0.833		
SS4					0.833		
SS5					0.788		

The measurement results show that each indicator (FE, KD, NS, PIPS, PKML, PS, and SS) demonstrates a significant correlation with its corresponding latent variable, as presented in Table 4 [37, 38]. The numerical values reflect the strength of the relationships between each indicator and the respective construct. The high correlations among the indicators and latent variables support construct validity, indicating that the indicators effectively measure the intended latent dimensions. For instance, the indicators within the latent variable Perception of Sustainability and Environmental Benefits (PS) exhibit strong correlations, confirming the validity of this construct. Ensuring that the indicators possess adequate correlations with their latent variables is essential for establishing measurement reliability and construct validity. These findings provide a clearer understanding of the overall quality of the measurement model and the robustness of the constructs under investigation [39].

Table 5. R Square

Latent Variable	R Square	R Square Adjusted
Latent Variable 2	0.777	0.777
Latent Variable 5	0.957	0.957
Latent Variable 6	0.968	0.968
Latent Variable 7	1.000	1.000

The analysis results indicate that the R Square (R^2) and Adjusted R Square values were calculated for each latent variable within the structural model, as presented in Table 5 [40]. These statistical values describe the proportion of variance in each dependent construct that can be explained by the associated independent variables. For instance, the R^2 value for Latent Variable 2 demonstrates that approximately 77.7% of its variability is accounted for by the independent variables included in the model. The Adjusted R Square value considers the number of predictors and the sample size, providing a more conservative and reliable estimate of the model's explanatory capability [41]. High R^2 values, such as those obtained for Latent Variable 5 (approximately 95.7%) and Latent Variable 6 (approximately 96.8%), indicate that the independent variables successfully capture a substantial proportion of the variance in the respective constructs. Overall, these findings demonstrate that the proposed model exhibits strong explanatory power and effectively represents the relationships among the latent variables under examination [42].

The analysis also reveals that perception, knowledge, and economic factors exert a significant influence on purchase intention and behavior. These findings emphasize that favorable consumer attitudes and a strong awareness of sustainability play an essential role in enhancing the intention to adopt solar panels. In contrast, economic factors such as price, availability, and promotional incentives serve as external drivers that reinforce actual purchasing behavior in the context of renewable energy adoption [43]. This interpretation provides further empirical support for the theoretical assumptions underlying the relationships among cognitive, attitudinal, and behavioral constructs in the adoption of sustainable technologies.

5. MANAGERIAL IMPLICATION

The findings highlight that sustainability perception, knowledge, and economic factors significantly influence consumer purchasing behavior toward solar panels. Managers and policymakers should prioritize strategies that enhance consumer awareness, emphasize environmental and financial benefits, and improve affordability through incentives or installment programs. Market segmentation based on demographic characteristics such as income, education, and region is essential to tailor marketing and communication approaches effectively. Collaborative efforts between government and industry stakeholders are also necessary to accelerate renewable energy adoption and strengthen consumer trust in solar technology across Indonesia.

6. CONCLUSION

This study provides an in-depth understanding of the factors influencing consumer purchasing behavior toward solar panels in Indonesia. Using the SmartPLS analytical approach, the results reveal that perceptions of sustainability and environmental benefits, knowledge and information about solar panels, and economic factors such as price and promotions significantly affect consumers purchase intentions.

Moreover, demographic characteristics play a substantial role in shaping consumer attitudes and purchasing behavior. The analysis indicates that attitude acts as a mediating variable linking knowledge and perception of sustainability to purchase intention. This mediation demonstrates that positive attitudes strengthen the relationship between cognitive understanding and actual purchasing behavior, reflecting the psychological and socio-economic dimensions of renewable energy adoption.

Overall, the findings highlight the importance of integrating psychological, socio-economic, and environmental aspects in understanding consumer behavior toward renewable energy, particularly solar panels in Indonesia. The results provide practical implications for policymakers and industry stakeholders to design targeted awareness programs, financial incentives, and segmented marketing strategies that effectively promote broader solar panel adoption.

7. DECLARATIONS

7.1. About Authors

Dadang Hermawan (DH) https://orcid.org/0000-0002-9935-8090
Sipah Audiah (SA) https://orcid.org/0009-0008-3024-474X
Muhammad Faizal Fazri (MF) https://orcid.org/0009-0002-9769-0257
Ivan Kovac (IK) -

7.2. Author Contributions

Conceptualization: DH and SA; Methodology: DH, SA and MF; Software: SA and MF; Validation: DH and MF; Formal Analysis: SA and IK; Investigation: SA, MF, and IK; Resources: DH; Data Curation: DH; Writing Original Draft Preparation: SA, and MF; Writing Review and Editing: MF and IK; Visualization: IK; All authors, DH, SA, MF, and IK have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7.4. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

REFERENCES

[1] O. Candra *et al.*, "Optimal participation of the renewable energy in microgrids with load management strategy," *Environmental and Climate Technologies*, vol. 27, no. 1, pp. 56–66, 2023.
[2] M. S. A. Fathima, H. M. Batcha, and A. S. Alam, "Factors affecting consumer purchase intention for buying solar energy products," *International Journal of Energy Sector Management*, vol. 17, no. 4, pp. 820–839, 2023.
[3] U. Rahardja, P. A. Sunarya, N. Lutfiani, M. Hardini, and H. R. Dananjaya, "Analysis of renewable energy utilization using solar power technology in eliminating microplastic emissions," in *2022 IEEE Creative Communication and Innovative Technology (ICCIT)*, 2022, pp. 1–6.
[4] L. S. Lau, A. Senadjki, S. L. Ching, C. K. Choong, A. N. Seow, Y. O. Choong, and C. Y. Wei, "Solar photovoltaic as a means to sustainable energy consumption in malaysia: the role of knowledge and price value," *Energy Sources, Part B: Economics, Planning, and Policy*, vol. 16, no. 4, pp. 303–323, 2021.
[5] H. L. Huang and L. K. Cheng, "Predicting intention of residential solar installation: The role of ecological lifestyle, consumer innovativeness, perceived benefit, government incentives, and solar product knowledge," *Energy & Environment*, vol. 34, no. 6, pp. 1826–1843, 2023.
[6] A. Fathima MS, A. Khan, and A. S. Alam, "A bibliometric review of consumers' purchase behaviour for solar energy products," *International Journal of Energy Sector Management*, vol. 18, no. 6, pp. 1328–1355, 2024.
[7] E. Dolan and A. S. Bein, "Implementation of student performance management guidance to improve quality study at colleges," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 1, no. 2, pp. 160–171, 2020.
[8] W. V. Siregar, A. Hasibuan, F. Hidayatullah, and R. Al Farizi, "Green purchasing behavior on solar photovoltaic power among generation z for sustainable energy," in *Proceedings of International Conference on Finance Economics and Business (ICOFEB)*, vol. 2, December 2024, pp. 013–013.
[9] I. I. B. Espinoza, J. L. G. Alcaraz, A. J. G. López, J. R. D. Reza, and J. L. Romero, "Environmental knowledge to create environmental attitudes generation toward solar energy purchase," *Sustainable Futures*, vol. 9, p. 100558, 2025.

[10] Ministry of Energy and Mineral Resources of the Republic of Indonesia, "Minister of energy and mineral resources regulation no. 2 of 2024 on rooftop solar power plants connected to the electricity network of holders of electricity supply business license for public interest (iuptlu)," https://setkab.go.id/en/govt-issues-new-rooftop-solar-power-plant-regulation/, 2024, accessed: November 3, 2025.

[11] A. W. Kusuma, Y. Jumaryadi, and A. Fitriani, "Examining the joint effects of air quality, socioeconomic factors on indonesian health," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 5, no. 2sp, pp. 186–195, 2023.

[12] X. Liang, X. Hu, T. Islam, and M. S. Mubarik, "Social support, source credibility, social influence, and solar photovoltaic panels purchase intention," *Environmental Science and Pollution Research*, vol. 28, no. 41, pp. 57 842–57 859, 2021.

[13] L. P. Dewanti, L. Sitoayu, and A. Idarto, "Digital tele-counseling for sustainable maternal health services in indonesia: focus on telelactation," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 6, no. 1, pp. 10–20, 2024.

[14] S. Wang, R. Zhang, X. Guo, H. Ma, J. Wu, Y. Wang, and S. Fan, "Does the pro-environmental behavior of household pv installation contribute to the shaping of users' green purchasing behavior? evidence from china," *Behavioral Sciences*, vol. 13, no. 7, p. 612, 2023.

[15] K. Davis and B. Raney, "Expanding the solar workforce through the illinois community college system," Lewis & Clark Community College; Illinois Green Economy Network, Tech. Rep., 2022.

[16] D. Gathmyr, U. Suhud, H. Herlitah, H. Hamidah, R. T. H. Safariningsih, and J. Wilson, "Technological advancements in perceived organizational support enhancing healthcare systems towards sustainable development goals," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 516–526, 2025.

[17] S. L. Rosa, "Oil well monitoring system based on iot technology and machine learning," in *ICIC Artik*, 2022.

[18] O. Candra *et al.*, "Energy simulation and parametric analysis of water cooled thermal photovoltaic systems: Energy and exergy analysis of photovoltaic systems," *Sustainability*, vol. 14, p. 15074, 2022, mDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

[19] S. C. Chen, I. Yati, and E. A. Beldiq, "Advancing production management through industry 4.0 technologies," *Startupreneur Business Digital (SABDA Journal)*, vol. 3, no. 2, pp. 181–192, 2024.

[20] S. Singhal *et al.*, "Application of variable neighborhood search algorithm for time dependent school service routing problem," *Industrial Engineering and Management Systems*, vol. 21, no. 3, pp. 526–537, 2022.

[21] J. R. d. O. Júnior, R. Limongi, W. M. Lim, J. K. Eastman, and S. Kumar, "A story to sell: The influence of storytelling on consumers' purchasing behavior," *Psychology & marketing*, vol. 40, no. 2, pp. 239–261, 2023.

[22] E. E. García-Salirrosas and R. F. Rondon-Eusebio, "Green marketing practices related to key variables of consumer purchasing behavior," *Sustainability*, vol. 14, no. 14, p. 8499, 2022.

[23] A. Ingriana, "The influence of e-trust on consumer purchasing behavior in e-commerce," *JUMDER: Jurnal Bisnis Digital Dan Ekonomi Kreatif*, vol. 1, no. 3, pp. 16–31, 2025.

[24] M. Toha and S. Supriyanto, "Factors influencing the consumer research process: market target, purchasing behavior and market demand (literature review of consumer behavior)," *Danadyaksa: Post Modern Economy Journal*, vol. 1, no. 1, pp. 1–17, 2023.

[25] P. Ebrahimi, M. Basirat, A. Yousefi, M. Nekmahmud, A. Gholampour, and M. Fekete-Farkas, "Social networks marketing and consumer purchase behavior: the combination of sem and unsupervised machine learning approaches," *Big Data and Cognitive Computing*, vol. 6, no. 2, p. 35, 2022.

[26] R. Sivaraman *et al.*, "Multi-objective hybrid system development: To increase the performance of diesel/photovoltaic/wind/battery system," *Mathematical Modelling of Engineering Problems*, vol. 11, no. 3, 2024.

[27] U. Rusilowati, H. R. Ngemba, R. W. Anugrah, A. Fitriani, and E. D. Astuti, "Leveraging ai for superior efficiency in energy use and development of renewable resources such as solar energy, wind, and bioenergy," *International Transactions on Artificial Intelligence*, vol. 2, no. 2, pp. 114–120, 2024.

[28] F. Fakhreddin and P. Foroudi, "Instagram influencers: The role of opinion leadership in consumers' purchase behavior," *Journal of promotion management*, vol. 28, no. 6, pp. 795–825, 2022.

[29] L. H. Le and Q.-A. Ha, "Effects of negative reviews and managerial responses on consumer attitude and subsequent purchase behavior: An experimental design," *Computers in Human Behavior*, vol. 124, p.

106912, 2021.
[30] U. Rahardja *et al.*, "The use of hybrid solar energy to supply electricity to remote areas: Advantages and limitations," *Mathematical Modelling of Engineering Problems*, vol. 10, no. 2, 2023.
[31] V. Chang, Y. Chen, Z. J. Zhang, Q. A. Xu, P. Baudier, and B. S. C. Liu, "The market challenge of wind turbine industry—renewable energy in pr china and germany," *Technological Forecasting and Social Change*, vol. 166, p. 120631, 2021.
[32] S. Anggoro and A. Nuche, "Leadership configurations supporting togaf-based information system architecture at jenderal achmad yani university," *International Journal of Cyber and IT Service Management (IJCITSM)*, vol. 5, no. 2, pp. 134–143, 2025.
[33] S. Saleem and Y. Zhang, "Impact of knowledge and trust on households' solar energy consumption behavior: Do social influence and gender matter?" *Energy*, vol. 293, p. 130719, 2024.
[34] P. Simshauser, "Renewable energy zones in australia's national electricity market," *Energy Economics*, vol. 101, p. 105446, 2021.
[35] M. R. Anwar and L. D. Sakti, "Integrating artificial intelligence and environmental science for sustainable urban planning," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 5, no. 2, pp. 179–191, 2024.
[36] M. Grebosz-Krawczyk, A. Zakrzewska-Bielawska, B. Glinka, and A. Glińska-Neweś, "Why do consumers choose photovoltaic panels? identification of the factors influencing consumers' choice behavior regarding photovoltaic panel installations," *Energies*, vol. 14, no. 9, p. 2674, 2021.
[37] M. H. Asif, T. Zhongfu, B. Ahmad, M. Irfan, A. Razzaq, and W. Ameer, "Influencing factors of consumers' buying intention of solar energy: a structural equation modeling approach," *Environmental Science and Pollution Research*, vol. 30, no. 11, pp. 30 017–30 032, 2023.
[38] S. Syahidun, V. R. Zainal, I. Siswanti, and L. C. Nawangsari, "Integrating green intellectual capital into sustainable business practices for ecopreneurship at pertamina fuel terminal bbm proper biru," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 400–410, 2025.
[39] B. Kesari, S. Atulkar, and S. Pandey, "Consumer purchasing behaviour towards eco-environment residential photovoltaic solar lighting systems," *Global Business Review*, vol. 22, no. 1, pp. 236–254, 2021.
[40] U. Rahardja, Q. Aini, P. A. Sunarya, D. Manongga, and D. Julianingsih, "The use of tensorflow in analyzing air quality artificial intelligence predictions pm2.5," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 4, no. 3, pp. 313–324, 2022.
[41] A. Azam and I. M. Qureshi, "Predicting consumers' actual purchase behavior towards residential rooftop solar panels (photovoltaics) as sustainable energy source: evidence from pakistan," *Journal of Economics*, vol. 5, no. 2, pp. 43–66, 2024.
[42] M. Almrafee and M. Akaileh, "Customers' purchase intention of renewable energy in jordan: The case of solar panel systems using an extended theory of planned behavior (tpb)," *International Journal of Energy Sector Management*, vol. 18, no. 3, pp. 457–473, 2024.
[43] A. Kumar, P. Bhandari, and K. S. Rawat, "Numerical simulation of solar air heater using paraffin wax-aluminum compound as phase changing material," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 3, no. 2, pp. 164–170, 2021.