Technology Acceptance Model (TAM) Study on Electric Vehicle Adoption in Indonesia: The Influence of Perception of Convenience and Benefits With Gender As Moderation

Hamka Mansyur

Hasanuddin University, Makassar, Indonesia

mansyurh23a@student.unhas.ac.id

Abstract. The adoption of electric vehicles (EVs) is gaining global traction due to their environmental benefits and energy efficiency. However, public acceptance remains a significant challenge, especially in developing countries such as Indonesia, where infrastructure and societal perceptions vary. This study aims to analyze the impact of perception of convenience and perception of benefits on the intention to use electric vehicles, with gender as a moderating variable. Using the Technology Acceptance Model (TAM) as a framework, a quantitative survey was conducted with 120 respondents in major Indonesian cities, collecting data through an online questionnaire. The results indicate that both perception of convenience and perception of benefits significantly influence the intention to use electric vehicles, highlighting that ease of operational use and long-term economic benefits are key factors driving adoption. Gender analysis through Multi-Group Analysis (MGA) reveals that perception of convenience is a stronger predictor of adoption among males, while perception of benefits influences both genders equally. These findings suggest that marketing strategies should emphasize operational ease for males and highlight long-term environmental benefits for both genders to enhance EV adoption rates. Additionally, the study underscores the importance of expanding charging infrastructure to strengthen public perceptions of EV convenience. This study contributes valuable insights for policymakers, manufacturers, and marketers in promoting electric vehicle adoption in Indonesia and provides a foundation for future research on demographic factors influencing technology adoption.

Keywords: Electric Vehicles, Technology Acceptance Model, Perception of Convenience, Perception of Benefits , Gender.

1 Introduction

Innovation in transportation technology has accelerated rapidly in recent decades, driving significant changes to electric vehicles as a solution to reduce negative environmental impacts and reduce reliance on fossil energy. Electric vehicles not only represent environmentally friendly transportation technology, but also create a more

M. Nohong et al. (eds.), *Proceedings of the 9th International Conference on Accounting, Management, and Economics 2024 (ICAME 2024)*, Advances in Economics, Business and Management Research 331,
https://doi.org/10.2991/978-94-6463-758-8_242

efficient alternative in terms of operational and maintenance costs compared to conventional vehicles [1]. Based on data from the International Energy Agency (IEA), the adoption of electric vehicles has increased sharply in various developed countries, especially with the support of government regulations that set carbon emission reduction targets and provide incentives for electric vehicle users [2].

Indonesia as a developing country is also feeling the impact of the growth of electric vehicles, although its adoption is still relatively limited. The Indonesian government has committed to supporting the development of electric vehicles, as part of efforts to achieve the target of reducing greenhouse gas emissions by 29% by 2030 [3]. Various policies have begun to be implemented to increase public interest in electric vehicles, including through regulations, tax reductions, and the development of charging infrastructure [4]. However, the adoption rate of electric vehicles in Indonesia is still relatively low compared to developed countries due to challenges in terms of infrastructure, public perception, and lack of awareness of the long-term benefits of this technology.

The challenges to adopting electric vehicles in Indonesia are largely tied to public perceptions regarding the ease of use and economic advantages of this technology. In terms of ease of use, electric vehicles require adequate charging infrastructure so that users can easily charge their vehicles [5]. In addition, perceptions related to battery durability, mileage per charge, and accessibility of charging stations are still the main obstacles. These obstacles reinforce the perception that electric vehicles are not yet fully practical for daily transportation needs in Indonesia, especially for users who often travel long distances [6].

From the perspective of benefits, people are still not aware of the long-term benefits of electric vehicles, including savings in fuel costs, maintenance, and their positive impact on the environment [7]. Although the government provides incentives for electric vehicle users, such as tax exemption and ease of registration process, there are still many prospective users who question the effectiveness of electric vehicles in meeting their transportation needs. In this case, people's knowledge and perception of electric vehicle technology greatly influence their decision to switch to this technology [8].

When studying the adoption of new technologies, the Technology Acceptance Model (TAM) is commonly applied as a theoretical basis to assess how public perceptions influence decisions to adopt a given technology. Introduced by Davis in 1989, TAM emphasizes two key factors: perceived ease of use and perceived usefulness, each of which plays a critical role in shaping individuals' interest in and attitudes toward technology use [9].

In the context of electric vehicles, the perception of ease of use can include various aspects such as ease of charging, ease of maintenance, and accessibility of spare parts. Users who feel that electric vehicles are easy to operate, maintain, and have adequate supporting infrastructure will be more interested in adopting this technology. The perception of benefits, on the other hand, includes the view that electric vehicles provide added value in terms of energy efficiency, long-term cost savings, and contribution to environmental sustainability. Studies show that the higher the perception of ease of use and benefits of a technology, the more likely it is to be accepted by the public [10].

In addition to the perception of convenience and benefits, this study also considers the role of gender as a moderation variable in the relationship between perception and interest in using electric vehicles. Gender has become one of the important variables in technology adoption research because men and women have differences in preferences, behaviors, and perceptions of new technologies [11]. According to some studies, men tend to be more technology-oriented and have a higher level of confidence in trying new technologies compared to women. This is supported by research that shows that men tend to be more quick to adopt new technologies that are considered "sophisticated" or "complex," while women tend to consider the safety, long-term benefits, and stability factors of such technologies before adopting them [12].

Several studies on the adoption of electric vehicles in developing countries show that adoption rates are still low due to a lack of understanding of long-term benefits, infrastructure unpreparedness, and differences in user preferences [13]. Factors such as price perception, availability, and added value of these technologies are still the main concerns of people in these countries. For example, a study by Zhang et al. [14] found that the perceived factors of convenience and benefit, as well as the perceived risk factors, are the main obstacles in the adoption of electric vehicles in China.

In Indonesia, there are not many studies that focus on the adoption of electric vehicles with a TAM perspective, especially those that consider gender as a moderation variable. However, it is important to look at how psychological, social, and economic factors affect the interest of Indonesians in using electric vehicles. Given that Indonesia has a unique market with social and cultural factors that greatly influence consumer behavior, the TAM approach can provide valuable insights for stakeholders in designing strategies to increase interest in electric vehicles.

This study evaluates how perceptions of convenience and benefits influence public interest in adopting electric vehicles, with gender as a potential moderating factor. Using TAM as a framework, the research aims to enhance understanding of psychological and social factors affecting EV adoption decisions in Indonesia. It provides empirical data to support governments, developers, and marketers in designing strategies that encourage EV adoption. Practically, the findings guide EV developers in aligning vehicle designs with consumer preferences and inform government policies to promote EV adoption, emphasizing economic and environmental benefits. This study also expands literature on technology adoption in developing countries, offering insights into how diverse populations accept and use new technologies, especially EVs, and suggesting avenues for future research on adoption factors in Indonesia.

2 Methods

This study uses a survey-based quantitative approach to analyze the influence of perception of convenience and benefits on interest in using electric vehicles, with gender as a moderation variable. The research population is large urban communities in Indonesia, with a sample of 120 respondents selected through purposive sampling, meeting the criteria for understanding electric vehicles.

Primary data was gathered via an online questionnaire utilizing a 5-point Likert scale. The questionnaire includes variables: Perception of Convenience (X1), Perception of Benefits (X2), and Interest in Use (Y), as well as Gender as moderation variables.

The data analysis employed the Partial Least Squares-Structural Equation Modeling (PLS-SEM) method to examine the relationships between variables. This analysis includes:

1. Outer Model: Validity and reliability are tested through convergent validity, discriminant validity, composite reliability, and Cronbach's alpha.
2. Inner Model: Examining the direct influence between variables and the effects of gender moderation with multi-group analysis (MGA) for gender-based comparisons.

3 Results

3.1 Data Description

Data was collected from 120 respondents, consisting of 60% men and 40% women, aged 20 to 50. Most respondents were professionals interested in eco-friendly technology, particularly electric vehicles, and had basic knowledge about EV operation and environmental benefits.

3.2 Outer Model Analisys

Validity and Reliability of ConstructionThe outer model test shows that all indicators have a loading factor value above 0.7, indicating good convergent validity [9]. The Average Variance Extracted (AVE) value for all latent variables also exceeded 0.5, meeting the criteria for discriminant validity [15]. The reliability of the construct was tested through Composite Reliability and Cronbach's Alpha, with values above 0.7 each, indicating that the research instruments were consistent [16].

3.3 Inner Model Analysis

The effect of Perception of Convenience and Benefits on Interest in UseThe results of the analysis of the inner model show that the perception of convenience ($\beta = 0.45$, $t = 4.27$, $p < 0.05$) and perception of benefits ($\beta = 0.53$, $t = 5.12$, $p < 0.05$) have a positive and significant effect on interest in using electric vehicles. These findings indicate that perceptions regarding the ease of operation and benefits of electric vehicles, such as cost efficiency and environmental impact, are key factors in increasing user interest [10].

Gender ModerationThe gender moderation analysis was carried out through Multi-Group Analysis (MGA) to compare the effects of perception of convenience and benefits on the interest in use between men and women. The results showed that the influence of convenience perception was more significant in the male group ($\beta = 0.52$, $t = 3.98$, $p < 0.05$) than in women ($\beta = 0.39$, $t = 2.87$, $p < 0.05$). On the other hand, the

perception of benefits had a similar effect on both gender groups, with β = 0.51 in males and β = 0.55 in females, with no significant difference between the two [11]. This indicates that men are more influenced by the ease of adopting electric vehicles, while the benefits are felt equally by both gender groups.

3.4 **Discussion**

The results of this study are consistent with previous research findings, which demonstrates that perceptions of convenience and benefits are key factors in technology adoption[13]. This study strengthens the evidence that gender can moderate the relationship between perception of convenience and interest in use, with men being more driven by the aspect of ease of use. On the other hand, the perception of benefits as a general factor, shows that the community as a whole understands the benefits of electric vehicles in the long term, both in terms of energy efficiency and contribution to the environment.

4 Discussion

The results of this study strengthen the role of convenience perception and benefit perception as the main factors in encouraging user interest in electric vehicle technology. The perception of convenience has a significant impact on the interest in using electric vehicles, especially in male respondents, who tend to be more interested in the aspects of operational ease and time efficiency [9]. These findings are consistent with previous research that shows that the perception of convenience is a critical factor in technology adoption, where users who consider a technology easy to use are more likely to adopt it [15].

The perception of benefits, which includes cost efficiency and positive impact on the environment, has also been shown to significantly influence user interest. This is in line with studies showing that long-term benefits, such as fuel cost savings and environmental contributions, greatly influence users' decisions to switch to electric vehicles [13]. The high perception of benefits among respondents shows public awareness of the benefits of electric vehicles, especially in the context of the energy crisis and increasing environmental concern in Indonesia [18].

In addition, the results of gender moderation analysis indicate that there is an important difference in the perspective of men and women towards ease of use. Male respondents tend to be more interested in the convenience aspect, which indicates that they are more responsive to functional factors in adopting new technologies [10]. In contrast, women showed similar perceptions in terms of benefits, but did not show the same strong response to ease of use. This is in line with the research of Venkatesh and Morris which found that men are generally more receptive to new technologies that are considered efficient, while women are more concerned about the stability and security of such technologies [11].

This discovery has important practical implications for electric vehicle developers and stakeholders in designing marketing strategies. Based on the difference in perception between genders, a segmented marketing strategy can increase user interest. For example, marketing campaigns that highlight ease of

operation and time efficiency are better suited for men, while women may be more interested in campaigns that emphasize the safety and long-term benefits of electric vehicles [8].

This research also highlights the importance of developing charging infrastructure to improve the perception of convenience. The existence of adequate infrastructure will strengthen the public's perception that electric vehicles are practical for daily needs [5]. The government's efforts to provide more charging stations, especially in big cities, can encourage public interest and help overcome major obstacles in the adoption of electric vehicles.

Research Limitations

This study provides valuable insights into perceptions of convenience, benefits, and the role of gender in interest toward electric vehicles but has some limitations. It only included respondents from major Indonesian cities with better access to EV infrastructure. Broader research could offer a more comprehensive view of public interest in EV adoption across Indonesia [17].

In addition, this study only uses a quantitative approach through questionnaires. Qualitative approaches such as in-depth interviews can provide a deeper understanding of the user's reasons for adopting or rejecting electric vehicles. Future research that combines qualitative and quantitative approaches is expected to enrich insights into the psychological and social factors influencing the adoption of new technologies [6].

Reference

1. International Energy Agency, "Global EV Outlook 2022," IEA, Paris, 2022.
2. C. Zhang, L. Bai, dan Q. Zhang, "Analysis of influencing factors of electric vehicle adoption in China," *Journal of Cleaner Production*, vol. 156, pp. 97-103, 2017.
3. Kementerian Lingkungan Hidup dan Kehutanan, “Nationally Determined Contribution (NDC),” Jakarta, Indonesia, 2020.
4. Pemerintah Indonesia, “Peraturan Presiden Nomor 55 Tahun 2019 tentang Program Percepatan Kendaraan Bermotor Listrik Berbasis Baterai untuk Transportasi Jalan,” 2019.
5. M. Wang dan P. Liu, "Electric vehicle adoption in urban areas: The role of charging infrastructure and financial incentives," *Energy Policy*, vol. 125, pp. 163-171, 2019.
6. H. Li, X. Zhao, dan Y. Li, "Public perception of electric vehicles and its impact on adoption," *Transportation Research Part A: Policy and Practice*, vol. 129, pp. 1-13, 2019.
7. A. H. M. Al-Abdallah, "Economic and environmental benefits of electric vehicles," *Energy Reports*, vol. 6, pp. 54-63, 2020.
8. N. F. Patel dan A. J. Mehta, "The influence of perceived usefulness on the adoption of electric vehicles," *International Journal of Technological Innovation*, vol. 18, no. 4, pp. 325-332, 2021.
9. F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319-340, 1989.
10. T. Lee, C. Lee, dan H. Wang, "Factors affecting the acceptance of electric vehicles: An empirical study based on TAM," *Sustainability*, vol. 12, no. 4, pp. 165-177, 2020.
11. S. Venkatesh dan M. G. Morris, "Why do men and women differ in their acceptance of information technology? The role of gender socialization and stereotypes," *MIS Quarterly*, vol. 24, no. 1, pp. 115-139, 2000.

12. A. C. Gefen dan E. Karahanna, "Gender differences in the perceived ease of use of e-commerce," *Journal of the Association for Information Systems*, vol. 14, no. 11, pp. 742-765, 2013.
13. A. Shukla dan V. Jain, "Barriers and motivators for adoption of electric vehicles in developing countries," *Transportation Research Part D: Transport and Environment*, vol. 62, pp. 507-517, 2018.
14. C. Zhang, L. Bai, dan Q. Zhang, "Influence of perceived risk on electric vehicle adoption in China," *Renewable and Sustainable Energy Reviews*, vol. 156, pp. 874-890, 2021.
15. J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate Data Analysis*, 7th ed. Pearson, 2014.
16. C. Fornell dan D. F. Larcker, "Evaluating structural equation models with unobservable variables and measurement error," *Journal of Marketing Research*, vol. 18, no. 1, pp. 39-50, 1981.
17. A. H. M. Al-Abdallah, "Economic and environmental benefits of electric vehicles," *Energy Reports*, vol. 6, pp. 54-63, 2020.