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Strategy for the Adaptation of Electric Vehicles in Saudi Arabia Using Fuzzy based Model

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Abstract

With the increasing global emphasis on sustainable transportation, electric vehicles (EVs) have emerged as a viable solution to reduce greenhouse gas emissions and enhance energy efficiency. Saudi Arabia, historically reliant on fossil fuels, presents a unique opportunity for the adoption of EVs. This paper examines the current landscape of EV deployment in Saudi Arabia, reviews recent literature, and proposes a fuzzy-based model strategy to improve the efficiency of EV applications through studying the barriers and challenges. The proposed strategy to enhance electric vehicle (EV) adoption in Saudi Arabia is not only timely but also vital to achieving the kingdom's strategic vision 2030 and long-term sustainability goals. As global emissions continue to rise and concerns about climate change intensify, countries are increasingly looking toward electric mobility to reduce their carbon footprint. This initiative will not only benefit the environment but also diversify Saudi Arabia's economy, traditionally reliant on oil revenues, thereby positioning the kingdom as a leader in renewable energy initiatives. The suggested strategy emphasizes criteria such as infrastructure development, consumer incentives, and public awareness, highlighting the importance of a collaborative approach among stakeholders.

Keywords
Electric Vehicles, Fuzzy-based Model, Strategy, Vision 2030, Defuzzification.

1. Introduction
The Kingdom of Saudi Arabia stands at a crossroads in its energy landscape. As it seeks to diversify its economy and reduce dependence on oil, the promotion of electric vehicles offers a promising pathway to enhance sustainability. The transition to electric mobility not only aligns with global environmental goals but also meets local objectives related to air quality improvement and innovation in the automotive sector. This paper proposes a solution strategy to enhance the application of electric vehicles in Saudi Arabia, using a fuzzy model to address the complexities of this transformation.

Recent studies indicate a growing interest in electric vehicles worldwide, with significant investments directed towards research and development in battery technologies, charging infrastructure, and consumer engagement (Deloitte, 2020). In Saudi Arabia, the initiative to integrate EVs is still in its nascent stages. Alshahrani (2021) highlights the country's commitment to sustainability and Vision 2030, which emphasizes clean transportation solutions. The challenges identified thus far include the limited availability of charging infrastructure, high upfront costs of EVs, and lack of public awareness regarding the benefits of electric mobility (Alrabghi & Alshahrani, 2022). A fuzzy model can effectively address the uncertainties within these challenges, facilitating better decision-making strategies in the EV adoption process.

Biographies

Alaa Momena, is an associate professor in the industrial engineering department at Prince Sattam bin Abdulaziz University (PSAU), Al-Kharj, Saudi Arabia. Before that he served as Director General of Information Affairs and Liaison Officer with Saudi Ministry of Education (MOE) at the private sector in Saudi Arabia. He has considerable experience in government & semi-government sectors after serving in various capacities, including working in projects control management with mega governmental projects.

Dr. Momena Holds a B.S. degree in Industrial Engineering from King Abdulaziz University (KAU), Jeddah, Saudi Arabia, M.S. degree in Engineering Management from Milwaukee School of Engineering (MSOE) and a Ph.D. in Industrial and Manufacturing Engineering from University of Wisconsin – Milwaukee (UWM), Milwaukee, WI, USA. Areas of research and expertise for Dr. Momena include Multiple Criteria Decision-Making models, Fuzzy decision making models, Project Management, Materials selection applications and operations management. He is currently working on a research regarding fuzzy Multiple Criteria Decision-Making approaches in engineering applications. He is a member of the Saudi Council of Engineers (SCE).