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Perceived Cost Competitiveness and Electric Vehicle Adoption among Electric Vehicle Users in Kenya

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Abstract

Consumer adoption of electric vehicles (EVs) in Kenya remains low despite the country's renewable energy potential, sustainable transport commitments, and local innovation. This study examined the relationship between perceived cost competitiveness and electric vehicle adoption among current EV users in Kenya. The study was anchored on Porter's Generic Strategies and complemented by the Diffusion of Innovations Theory. The study adopted a cross-sectional explanatory design and used stratified convenience sampling at charging and battery-swapping stations in Nairobi, Mombasa, and Kisumu counties to recruit current EV users from a target sample of 334, of whom 276 returned usable questionnaires (82.6%). Primary data were collected using a structured questionnaire and analysed using descriptive and inferential statistics, including Pearson correlation and simple linear regression. Correlation results showed a moderate, positive, and significant relationship between cost competitiveness and consumer EV adoption in Kenya ($r = 0.449$, $p < .001$). Regression results showed that cost competitiveness was a positive and significant predictor of consumer EV adoption ($B = 0.376$, $p < .001$) and explained 20.1% of the variation in EV adoption ($R^2 = 0.201$). The study concludes that cost competitiveness is positively associated with consumer EV adoption among current EV users in Kenya. The study contributes survey evidence from three Kenyan counties on how current EV users perceive cost competitiveness. Because the design was cross-sectional, the sample was non-probabilistic, and no control variables were modelled, the findings represent associations rather than causal effects. The study recommends that manufacturers, dealers, and financial institutions improve affordability and expand flexible financing options.

Keywords: *Cost competitiveness, consumer adoption, electric vehicles, purchase cost, total cost of ownership*

1.0 Introduction

The global automotive industry is undergoing a significant transition towards electric mobility, and electric vehicles (EVs) are becoming increasingly important in transportation systems. According to Gartner, Inc. (2025), the global electric vehicle fleet, comprising battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), is projected to reach approximately 116 million vehicles by the end of 2026. Of this fleet, approximately 76.3 million are expected to be BEVs and 39.8 million PHEVs, while China is projected to account

for about 61% of the global installed base. This expansion has drawn attention to the economic conditions that determine whether consumers can acquire and sustain EV ownership. Purchase price, operating expenditure, maintenance costs, energy expenses, financing arrangements, and government incentives have consequently become central considerations in assessing the economic feasibility of EVs across markets.

The growth of the global EV market has been accompanied by changes in the cost structure of EV ownership. The International Energy Agency (IEA, 2025) reports that global EV production increased from 12.4 million units in 2023 to 17.3 million units in 2024, with China accounting for more than 70% of global production. This expansion has intensified competition among manufacturers and increased the availability of EV models in international markets. Concurrently, battery costs and production efficiencies have shaped the price structure of EVs (Rapson & Muehlegger, 2023). The economic assessment of an EV therefore extends beyond its initial purchase price to include electricity expenditure, maintenance, financing, depreciation, and other ownership costs. The relationship between acquisition costs and recurring operating costs is particularly important because lower running expenses may offset a relatively high initial purchase price over the useful life of the vehicle.

Differences in cost conditions are evident across major EV markets. Countries such as Norway, China, and Germany have recorded substantial EV adoption within policy environments characterised by taxation measures, subsidies, financial incentives, and other mechanisms affecting the cost of ownership (Graham & Brungard, 2021; Li, 2024; Ali et al., 2026; Shou & Li, 2025). In China, government support and large-scale production have contributed to the availability of relatively affordable EV models, while Norway has used taxation and other fiscal measures to reduce the financial burden associated with EV acquisition (Li, 2024). These experiences demonstrate that the cost competitiveness of EVs is shaped not only by manufacturer pricing but also by taxation, subsidies, financing, energy prices, maintenance expenditure, and the cumulative cost incurred throughout ownership. Consequently, differences in total cost of ownership (TCO) can contribute to differences in EV adoption across countries.

The cost challenge is more pronounced in African markets, where EVs account for less than 1% of the continental vehicle fleet despite growth in selected segments (Africa E-Mobility Alliance, 2025). High acquisition prices, limited access to affordable credit, and constrained purchasing capacity continue to affect the expansion of electric mobility. In addition, the cost of electricity, battery replacement, maintenance services, spare parts, and charging services contribute to the financial burden of EV ownership (Gicha *et al*., 2024; Kimuli & Kirabira, 2025). These cost pressures are particularly relevant to electric motorcycles and three-wheelers, which constitute a substantial share of the emerging African electric mobility market. Business models such as battery leasing and battery-swapping can reduce the initial acquisition burden by separating vehicle ownership from battery costs. These developments underscore the importance of cost structures and financing arrangements in determining the accessibility of electric mobility in African markets.

South Africa illustrates the financial challenges associated with EV adoption in Africa. As the continent's largest automotive market, South Africa has recorded increasing EV activity, with more than 6,000 electric vehicles and approximately 500 to 600 public charging stations reported by 2025 (Africa E-Mobility Alliance, 2025; Creamer, 2025). Nevertheless, relatively high vehicle prices and limited financial incentives remain among the constraints affecting wider adoption (Moeletsi, 2021; Okoh & Onuoha, 2024). Morocco and Egypt have also developed emerging electric mobility markets supported by import measures, incentives, and vehicle assembly activities (Africa E-Mobility Alliance, 2025). These experiences show that

the increasing availability of EVs does not necessarily eliminate financial barriers to adoption. The affordability of acquisition, access to financing, operating expenditure, and the availability of fiscal support remain important determinants of EV ownership.

In Kenya, electric mobility has emerged as an important component of the national transport transition. The Kenya National Energy Efficiency and Conservation Strategy established a strategic objective of electrifying 5% of the national vehicle fleet by 2030 (Ministry of Energy, 2020). Electricity consumption for electric mobility increased from approximately 2.92 million kWh in 2024 to 8.43 million kWh in 2025, indicating substantial growth in EV use (Kenya Power, 2026). However, increasing use does not necessarily imply that electric vehicles have become financially accessible to a broad consumer base. The Kenyan market continues to experience relatively high initial acquisition costs for EVs (Fwande & Majiwa, 2024; Odhiambo, 2024), limited financing options, and dependence on imported vehicles. These conditions make the relationship between the initial purchase price and subsequent ownership costs particularly important in understanding the pace of consumer adoption.

The financial burden associated with EV ownership in Kenya extends beyond the initial purchase price. Consumers consider expenditure on electricity, charging services, maintenance, replacement components, financing, and battery-related services over the period of ownership. Although EVs may generate savings through lower energy and maintenance expenditure, these benefits accrue over time and may not immediately offset the initial acquisition cost. Financial incentives, including tax reductions, subsidies, preferential tariffs, and other fiscal measures, can alter this cost balance. Similarly, financing mechanisms such as leasing, instalment payments, trade-in arrangements, and battery-as-a-service models can reduce the immediate capital requirement for consumers (Jerab & Mabrouk, 2023; Ma *et al*., 2025). The extent to which these cost-reduction mechanisms improve the economic competitiveness of EVs remains an unresolved issue in the Kenyan market. Nairobi has emerged as a major centre of electric mobility activity, with firms offering electric motorcycles, buses, charging, and battery-swapping services. However, high acquisition costs, limited access to affordable financing, and uncertainty about long-term ownership costs continue to constrain wider EV adoption in Kenya.

1.1 Statement of the Problem

Despite Kenya's commitment to sustainable transport and the emergence of electric mobility businesses such as Roam, BasiGo, and Ampersand, consumer adoption of electric vehicles remains limited. As of 2026, cumulative EV registrations stood at 39,324 units, and electric motorcycles accounted for more than 90% of the registered fleet (Ministry of Roads and Transport, 2026). This level of adoption remains modest relative to Kenya's renewable electricity potential and national objectives for reducing carbon emissions (Electric Mobility Association of Kenya [EMAK], 2025). Limited adoption slows the transition from conventional vehicles, reduces the contribution of electric mobility to lower fossil-fuel dependence, and limits the expansion of the emerging electric mobility sector. Persistently low consumer adoption therefore presents a practical problem that requires investigation of the cost-related factors influencing the uptake and continued use of EVs in Kenya.

Cost competitiveness is an important consideration in EV adoption because consumers incur costs related to vehicle acquisition, financing, electricity, charging, maintenance, replacement components, and battery-related services. However, the extent to which these costs collectively influence consumer adoption of EVs in Kenya remains insufficiently established. Fwande and Majiwa (2024) examined the cost competitiveness of electric motorcycles relative to petrol motorcycles in Nairobi County, Kenya. They found that the advantage of lower operating and maintenance costs was offset by high upfront prices, which constrained affordability and

slowed adoption. Nevertheless, that study was confined to 100 electric motorcycle users in one county and did not examine other EV categories or consumers in other counties. This limitation leaves an empirical gap in survey evidence on how EV users across vehicle categories and counties perceive cost competitiveness in relation to EV adoption in Kenya.

Methodologically and contextually, existing studies provide limited explanatory evidence on the relationship between cost competitiveness and consumer adoption of electric vehicles. Odhiambo (2024) examined the cost of electric vehicles and their adoption by public service vehicle (matatu) SACCOs in Nairobi City County, Kenya, focusing on an organisational transport segment rather than individual EV consumers. Fwande and Majiwa (2024) similarly focused on electric motorcycles in Nairobi County. Both studies were therefore conducted within specific economic, organisational, and geographical contexts and did not treat cost competitiveness as a broader construct incorporating acquisition, operating, maintenance, energy, financing, and other ownership costs. The present study addresses these gaps by adopting an explanatory design and surveying EV consumers accessing charging and battery-swapping services in Nairobi, Mombasa, and Kisumu counties.

1.2 Research Objective

The study sought to examine the relationship between perceived cost competitiveness and electric vehicle adoption among current EV users in Kenya.

1.3 Research Hypothesis

The study tested the following null hypothesis:

$H0_1$: Cost competitiveness is not significantly associated with electric vehicle adoption among current EV users in Kenya.

2.0 Literature Review

2.1 Theoretical Review

Porter's Generic Strategies (Porter, 1985) explain how firms achieve competitive advantage through cost leadership, differentiation, and focus. The framework proposes that firms should establish a clear strategic position by aligning their resources and capabilities with market conditions and customer requirements (Acar, 2024; Ramadania & Dharma, 2024). Cost leadership emphasises achieving lower costs than competitors, differentiation focuses on offering distinctive attributes valued by customers, and focus targets a specific market segment through either cost advantage or differentiation (Sarkar, 2025). Porter further argues that firms lacking a clear strategic position risk becoming stuck in the middle, which weakens their competitive position (Ateljević *et al*., 2023). The framework therefore provides a basis for understanding how strategic choices influence competitiveness and market positioning.

Porter's framework is particularly relevant to cost competitiveness because cost leadership focuses on achieving lower production and operating costs than competitors. Firms can pursue cost leadership through economies of scale, efficient resource utilisation, supply-chain optimisation, and effective cost management, which enables them to offer products at competitive prices (Bhat *et al*., 2024; Greckhamer & Gur, 2021). In the EV market, cost competitiveness can shape consumer perceptions of affordability and value, particularly where consumers are sensitive to purchase and ownership costs. A focus strategy may also enable firms to target specific consumer segments by offering products or services suited to their financial capacity and mobility requirements (Acar, 2024). Porter's framework therefore provides a theoretical basis for examining how cost competitiveness may influence consumer adoption of EVs in Kenya.

Porter's Generic Strategies have, however, attracted criticism concerning their assumptions and applicability in changing competitive environments. Critics argue that the framework may oversimplify strategic choices by presenting three distinct strategies and giving insufficient attention to hybrid approaches that combine cost leadership and differentiation (Clegg *et al*., 2022; Leppänen *et al*., 2023). The framework has also been criticised for placing limited emphasis on external influences, including regulatory changes and economic fluctuations that can affect competitive strategies (Hayati *et al*., 2021). Nevertheless, its emphasis on cost leadership provides a useful foundation for examining cost competitiveness as a strategic driver of EV adoption. Lower production, purchase, financing, energy, and maintenance costs can improve affordability and strengthen the economic attractiveness of electric vehicles (IEA, 2024, 2025; Sheldon & Dua, 2024).

Porter's framework is, however, a firm-level theory, whereas the unit of analysis in this study is the individual EV user. It is therefore used here to interpret how firms' cost positions, expressed through prices, operating costs, and financing terms, are perceived by consumers as cost competitiveness, rather than to derive consumer-level propositions directly. The consumer-level link is provided by the Diffusion of Innovations Theory, in which relative advantage, including economic advantage and cost savings, is a key attribute shaping the rate at which an innovation is adopted (Rogers, 2003). Treating perceived cost competitiveness as a form of relative advantage allows the hypothesis to be stated at the consumer level, while Porter's framework is retained for the supply-side interpretation of the results. Consumer adoption models that incorporate total cost of ownership, such as UTAUT2 and perceived-value approaches, offer logical extensions for future research.

2.2 General Literature Review

2.2.1 Cost Competitiveness

Cost competitiveness refers to the ability of EVs to provide transport value at an affordable cost relative to conventional vehicles while maintaining acceptable quality and performance (Francis, 2023; Vîrjan *et al*., 2023). It encompasses purchase price, energy, maintenance, financing, charging, and end-of-life costs, which collectively determine total cost of ownership (Kumar *et al*., 2023; Zaino *et al*., 2024). Although EVs often have higher initial prices because of battery costs, their simpler drivetrains, lower energy consumption, and reduced maintenance requirements can provide operational savings over time (Bushnell *et al*., 2022; Forsythe *et al*., 2023). Cost competitiveness therefore shapes consumer perceptions of affordability and the economic feasibility of electric mobility.

In emerging economies such as Kenya, cost competitiveness is particularly important because limited purchasing power and restricted access to credit can make high upfront prices a significant barrier to EV adoption (Oginga Martins, 2025). High battery costs, limited local production, and limited economies of scale can increase EV retail prices relative to conventional vehicles (Koniak *et al*., 2024; Odhiambo, 2024). However, manufacturers can improve cost competitiveness through battery innovation, automation, supply-chain efficiency, and productivity improvements (Ma *et al*., 2025). Fiscal incentives, including tax reductions, import-duty exemptions, and subsidised financing, can further lower entry costs and improve affordability (Ajeigbe & Holt, 2025; Corradi *et al*., 2023).

Fuel and energy savings also contribute significantly to EV cost competitiveness because electricity and maintenance expenses are often lower than those of conventional vehicles (IEA, 2024; Woody *et al*., 2024). In Kenya, lower operating costs and reduced dependence on imported fuels are recognised as potential benefits of electric mobility (Ministry of Roads and Transport, 2024). However, electricity tariffs, charging accessibility, and supply reliability

determine the savings realised. Kenya's time-of-use e-mobility tariff provides lower electricity charges during off-peak periods, creating opportunities to reduce charging expenses (Energy and Petroleum Regulatory Authority [EPRA], 2024). EV cost competitiveness therefore depends on the combined effects of purchase price, energy costs, charging infrastructure, taxation, financing, and maintenance expenses.

2.2.2 Consumer Adoption of Electric Vehicles

Consumer adoption of electric vehicles refers to the process through which individuals and organisations choose, acquire, and use electricity-powered transport as an alternative to conventional fossil-fuel vehicles (Zaino *et al*., 2024). It reflects consumer acceptance, confidence in vehicle reliability, and willingness to integrate EVs into daily mobility, and it also signals infrastructural readiness and commercial viability (Bryła *et al*., 2023). High adoption may reflect growing consumer trust, supportive policies, and favourable market conditions, whereas slow adoption may result from high purchase costs, limited charging infrastructure, inadequate policy coordination, and insufficient consumer awareness (Pamidimukkala *et al*., 2024). In this study, EV adoption was conceptualised in terms of purchase or intention to purchase, usage frequency, transition from conventional vehicles, and willingness to continue using electric vehicles. Because all respondents were current EV users, the outcome captures continued use, satisfaction, and commitment among adopters rather than the initial decision to adopt.

Purchase or intent to purchase represents an important stage in electric vehicle adoption, reflecting consumers' willingness and readiness to acquire an EV and transition from intention to actual ownership (Fu & Fu, 2021; He & Hu, 2024; Zaino *et al*., 2024). Adoption is also reflected in the frequency and consistency with which consumers use electric vehicles for routine activities such as commuting, errands, and business travel (Farinloye *et al*., 2024; Olayode *et al*., 2024). Frequent use indicates that consumers have integrated EVs into their regular mobility choices, whereas infrequent use may suggest partial adoption arising from concerns about driving range, charging availability, performance, or convenience. In this study, adoption was assessed through the current and regular use of EVs, since all respondents were already EV users.

The extent of transition from conventional to electric vehicles reflects the degree to which consumers replace internal combustion engine vehicles with EVs in their daily transportation activities. This transition is influenced by charging infrastructure availability and reliability, electricity supply, and charging costs, which affect consumers' confidence in EVs as practical alternatives (Moeletsi, 2021; Olayode *et al*., 2024). It ranges from limited use of EVs alongside conventional vehicles to substantial or complete reliance on electric mobility (Gicha *et al*., 2024). Willingness to continue using EVs represents sustained commitment after initial adoption and is influenced by experiences with performance, reliability, safety, convenience, driving range, and operating costs (Gicha *et al*., 2024; Linda & Mzozo, 2024).

2.3 Empirical Literature Review

This section reviews empirical evidence on the relationship between cost competitiveness and consumer adoption of EVs, focusing on purchase price, financing, operating costs, and related economic factors. Woody *et al*. (2024) compared the cost competitiveness of EVs with that of gasoline vehicles across cities in the United States using a comparative TCO analysis. The study assessed the economic costs of different vehicle types across locations, considering purchase price, financing, taxes and fees, insurance, fuel and refuelling, maintenance, repairs, and charging equipment. The findings revealed substantial variation in total ownership costs across vehicle types and locations, indicating that the cost competitiveness of EVs depends on

vehicle characteristics, driving patterns, energy prices, and local cost conditions. However, the distinct vehicle markets, energy prices, financing conditions, and infrastructure of the United States limit the applicability of these findings to Kenya, where imported vehicle prices, electricity costs, and charging infrastructure may shape EV cost competitiveness differently.

Ji and Gan (2022) examined the influence of cost information on the intention of consumers below 40 years of age to adopt EVs in China. The study employed a stated-preference experiment and a rank-ordered logit model to assess how information on five-year fuel costs and TCO influenced consumers' EV purchase preferences. The findings showed that providing information on five-year fuel costs and TCO significantly increased the stated preference for EVs, suggesting that awareness of long-term cost savings can strengthen purchase intention. However, the reliance on stated preferences and a younger sample limits the generalisability of the findings to the broader population. In addition, the Chinese market context differs from Kenya in terms of vehicle prices, energy costs, financing arrangements, incentives, and charging infrastructure.

Champeecharoensuk *et al*. (2025) conducted a comparative analysis of the total cost of ownership for internal combustion engine and electric vehicles for passenger cars and motorbikes across Indonesia, Malaysia, Thailand, the Philippines, and Vietnam. Using 2023 market data, the study applied comparative cost modelling to assess energy costs, government incentives, and electric vehicle market maturity. The findings showed substantial cross-country variation in cost competitiveness, largely influenced by policy incentives and energy market conditions, while high upfront purchase costs remained a major adoption barrier. However, the study focused on macro-level cost comparisons rather than individual adoption behaviour, which limits its explanatory power regarding actual purchase decisions. In addition, the exclusion of African markets creates a contextual gap, particularly for markets such as Kenya, where import duties, limited charging infrastructure, and constrained consumer purchasing power significantly influence cost dynamics. The reliance on secondary data further restricts insights into consumer perceptions, affordability thresholds, and behavioural intentions.

Naicker (2021) analysed the importance of optimal costing decisions in enhancing the global competitiveness of an automobile manufacturing company in Durban, South Africa. The study employed a case study methodology involving standard operating procedures, online questionnaires, and interviews to assess sourcing processes, cost estimation practices, and their effects on cost competitiveness. The findings indicated that cost estimation was incorporated late in the project life cycle, complicating the organisation's ability to maintain competitive pricing, particularly for small injection-moulded components that constituted a significant proportion of high-cost manufacturing. However, Naicker (2021) focused on a single automobile manufacturer and internal operational cost structures, with global competitiveness as the dependent variable rather than electric vehicle adoption. The study also gave limited attention to consumer affordability, behavioural intentions, charging infrastructure, renewable energy integration, and government incentives. Moreover, its South African manufacturing context differs from Kenya's emerging electric vehicle market in infrastructure, policy, and market maturity.

Adebayo *et al*. (2025) examined the cost competitiveness and environmental implications of EVs relative to internal combustion engine vehicles (ICEVs) in Nigeria. The study employed a techno-economic and environmental comparative analysis using national transport data, cost indices, and charging characteristics. The analysis considered purchase costs, operating costs, maintenance expenses, electricity costs, and capital costs to assess the economic implications of EV ownership. The study identified high capital costs, unreliable electricity supply, and limited charging infrastructure as barriers to EV adoption, indicating that the economic

advantages of lower operating costs may not immediately offset the initial financial and infrastructural constraints facing consumers. However, Adebayo *et al*. (2025) focused on techno-economic and environmental comparisons rather than directly examining consumers' perceptions, purchase intentions, or actual EV adoption behaviour.

Malima and Moyo (2023) examined the economic viability and cost competitiveness of EVs relative to internal combustion engine (ICE) vehicles in Tanzania, with implications for Sub-Saharan Africa. The study employed a TCO comparison to assess the economic differences between EVs and ICE vehicles, considering purchase prices, import taxes, operating costs, and TCO per kilometre. The findings showed that electric cars had a higher TCO per kilometre than comparable ICE vehicles, indicating limited cost competitiveness under the conditions examined, whereas electric two-wheelers were economically competitive with their ICE counterparts. However, Malima and Moyo (2023) focused on comparative TCO rather than directly examining consumers' perceptions, intentions, or actual adoption behaviour. In addition, the Tanzanian context differs from Kenya in terms of import taxation, vehicle markets, electricity costs, charging infrastructure, and policy conditions, limiting the direct transferability of the findings.

Fwande and Majiwa (2024) compared the cost competitiveness of electric and internal combustion engine motorcycles in Nairobi County. Using a cross-sectional survey of 100 electric motorcycle users, structured questionnaires, secondary data, and cost–benefit analysis, the study found that electric motorcycles had significantly lower operating and maintenance costs, although high upfront prices constrained affordability and slowed adoption. However, Fwande and Majiwa (2024) focused specifically on electric motorcycles in Nairobi County, limiting generalisation to other electric vehicle categories and regions. Methodologically, the small sample and cross-sectional design limit generalisability and do not capture changes in cost perceptions over time. These limitations justify broader empirical research examining cost competitiveness alongside other determinants of electric vehicle adoption in Kenya.

2.4 Conceptual Framework

Figure 1 presents the hypothesised relationship between cost competitiveness, the independent variable, and EV adoption, the dependent variable. Cost competitiveness is treated as the perceived economic relative advantage of EVs (Rogers, 2003).

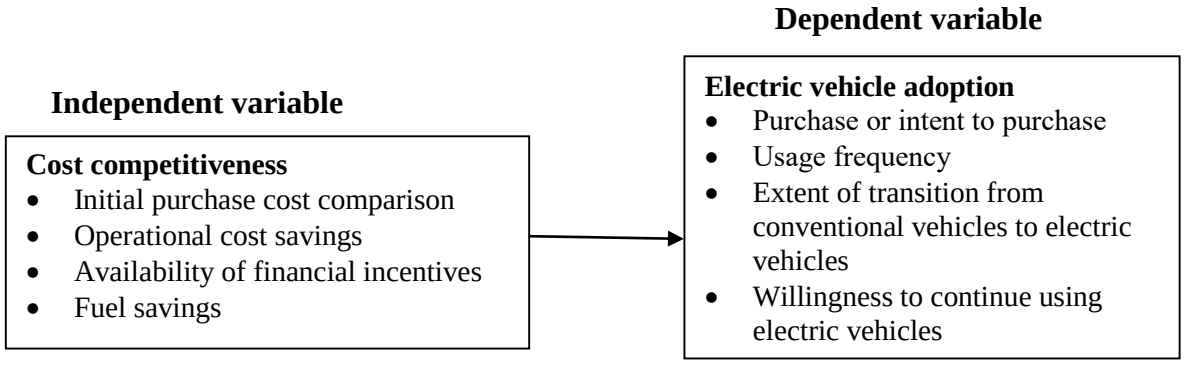


Figure 1: Conceptual Framework

3.0 Research Methodology

This study adopted a positivist research philosophy and a cross-sectional explanatory research design. The study population comprised EV consumers in Kenya who access services from charging stations. As of 2026, Kenya had 39,324 registered electric vehicles, including cars, buses, three-wheelers, and motorcycles (Ministry of Roads and Transport, 2026). The target population comprised EV consumers accessing charging services in Nairobi, Mombasa, and

Kisumu counties. These counties were selected because they have a higher concentration of EV charging infrastructure than other counties (Ministry of Roads and Transport, 2024). The target population consisted of an estimated 2,015 EV consumers at 74 charging stations across the three counties, with Nairobi accounting for the largest proportion, followed by Mombasa and Kisumu. This figure was estimated by applying an assumed number of regular users per station (25, 30, or 35, depending on the operator) to the stations listed by EMAK (2025) and is not a registry count.

Slovin's formula was used to determine the sample size because the population size was known, with the margin of error set at 0.05. Slovin's formula assumes simple random sampling at a 95% confidence level with maximum variability (p = .5). Because convenience sampling was used, the 5% margin is nominal and does not quantify sampling error; the formula served only to set a pragmatic recruitment target where no sampling frame of EV users existed. For the achieved sample of 276, the nominal margin of error is approximately 5.6%. The formula is expressed as follows:

$$n = \frac{N}{1 + Ne^2}$$

$$n \approx 334$$

Where: n = Sample size; N = Population size; e = Margin of error (0.05)

$$n = \frac{2015}{1 + 2015 * 0.05^2} = 333.75$$

$$n \approx 334$$

The study employed stratified convenience sampling, whereby the target population was divided into subgroups from which accessible, eligible, and willing participants were recruited. EV charging and battery-swapping stations constituted the strata, with each station representing a distinct sampling group based on location and operating company. Within selected stations, EV owners and users were recruited based on accessibility, availability, eligibility, and willingness to participate during data collection. Additional respondents were reached through EV dealerships, owner associations, and online EV communities within the selected counties. Because these additional respondents were not recruited at stations, the station-based frame is approximate. This approach was appropriate because a comprehensive and verifiable sampling frame of EV users was unavailable. Stratification facilitated coverage of different locations and service providers, while convenience sampling enabled access to eligible respondents (Clark *et al.*, 2021; Hair *et al.*, 2020). However, non-random selection limits the statistical generalisability of the findings.

Table 1: Sample Size Distribution

Counties	Companies	Number of Stations	Target Population	Sample Size
Nairobi	Kenya Power	5	150	25
	TotalEnergies	13	390	65
	BasiGo	7	210	35
	EVChaja	2	60	10
	Ecotrify	2	60	10
	SupaChaja	1	35	6
	UTU	1	35	6
	Roam Hub	6	150	25
	Ampersand	8	200	33
	Spiro	9	225	37
	Arc Ride	8	200	33
Mombasa	Spiro	7	175	29
	Ampersand	2	50	8
Kisumu	Spiro	3	75	12
Total		74	2015	334

Source: Adapted from Electric Mobility Association of Kenya (2025)

The study used a structured questionnaire as the primary data collection instrument to obtain information on cost competitiveness and EV adoption in Kenya. The questionnaire captured the demographic characteristics of respondents and items on the two study variables. It comprised mainly closed-ended questions to facilitate quantitative analysis and ensure consistency across respondents. A five-point Likert scale was used to measure respondents' perceptions, attitudes, and experiences regarding the study variables, allowing subjective responses to be quantified for statistical analysis. Questionnaires were appropriate because they enable efficient collection of standardised data from a geographically dispersed population of EV users. Pandey and Pandey (2021) and Tumiran (2024) note that questionnaires support response consistency, data reliability, and systematic analysis of relationships among variables, making them suitable for explanatory research.

Following approval by the Daystar University Institutional Scientific and Ethical Review Committee (DU-ISERC), a research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Research assistants were trained, and permission to collect data was obtained from relevant organisations. Data were collected between 20 July and 7 August 2026 using structured questionnaires administered to eligible EV consumers at charging and battery-swapping stations in the three selected counties. Physical recruitment was conducted at designated stations and EV dealerships after eligibility screening. Respondents requiring additional completion time were provided with a QR code linking to the electronic questionnaire. Six questionnaires were completed electronically, while the remainder were completed physically. Participation was voluntary and based on eligibility, accessibility, willingness, and questionnaire completion.

The research instrument was pretested, validated, and tested for reliability before the main study. A pre-test involving 33 EV consumers, representing 10% of the sample, was conducted between 15 and 17 July 2026 at selected EV charging and battery-swapping stations in Nairobi. The exercise assessed the questionnaire's clarity, relevance, structure, and practicality, and the 33 respondents were excluded from the final study. Face, content, and construct validity were assessed through expert review, the Content Validity Index (CVI), and exploratory factor analysis, respectively. A CVI of at least 0.80 indicated adequate content validity, while factor

loadings of 0.50 or higher supported construct validity (Almanasreh *et al*., 2022). Reliability was assessed using Cronbach's alpha, with values of 0.70 or higher considered acceptable (Hair *et al*., 2020). In the main study (n = 276), Cronbach's alpha was 0.65 for the cost competitiveness scale (10 items) and 0.65 for the adoption scale (11 items), with mean inter-item correlations of about 0.16 and 0.14. These values, computed from the item standard deviations in Tables 6 and 7 and the composite-score variances implied by Tables 9 to 11, fall below the 0.70 threshold. The scales therefore show modest internal consistency, and scale-level results should be read with caution (see Limitations).

The structured questionnaire generated quantitative data, which were analysed using both descriptive and inferential statistics with SPSS version 27. Descriptive analysis employed means, standard deviations, frequencies, and percentages to summarise the central tendency and variability of responses. Composite scores were computed as the mean of all items measuring each construct, so that each item contributed equally. Inferential analysis comprised Pearson correlation and simple linear regression, and the following model was used to test the hypothesis:

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon \text{ ……..Hypothesis 1}$$

Where: Y = Adoption of electric vehicles; X_1 = Cost competitiveness; β_0 = constant; β_1 = Regression coefficient of cost competitiveness; ε = Error term

Before regression analysis, diagnostic tests were conducted to assess whether the assumptions underlying the regression model were satisfied. Linearity was assessed using scatterplots to determine whether linear relationships existed between the independent variable and EV adoption (Latwal, 2020). Heteroscedasticity was examined using the Breusch-Pagan test of residuals against fitted values, run with the Stata estat hettest command because SPSS version 27 lacks a built-in procedure; a significant p value ($p < .05$) indicates non-constant residual variance (Kumar, 2023; Reddy & Henze, 2023). Normality was assessed using the Shapiro-Wilk test on the regression residuals. A p value greater than .05 indicates insufficient evidence to reject the normality assumption (Yang & Berdine, 2021). These tests ensured that the regression model satisfied key assumptions and that the resulting inferences were reliable.

The study adhered to ethical standards to protect participants' rights, privacy, and welfare. Authorisation was sought from relevant institutions and companies before data collection. Participants were provided with information on the study's purpose, procedures, voluntary nature, and intended use of the data, and informed consent was obtained before participation. Anonymity and confidentiality were maintained by excluding identifying information and presenting findings in aggregate form. Data were securely stored in password-protected electronic files and locked cabinets, accessible only to the researchers, and retained for five years before secure destruction. The researchers also maintained originality, proper citation, objective analysis, and accurate reporting of findings.

4.0 Results and Discussion

A total of 334 questionnaires were distributed to eligible EV consumers across the three counties, of which 276 were fully completed and retained for analysis, yielding a response rate of 82.63%.

4.1 Diagnostic Test Results

Diagnostic tests for linearity, heteroscedasticity, and normality were conducted to verify the regression assumptions. Linearity was assessed to determine whether an approximately linear relationship existed between cost competitiveness and EV adoption. As presented in Table 2, cost competitiveness showed a positive linear relationship with EV adoption ($R^2 = 0.201$). The

results suggest an approximately linear relationship, although R^2 summarises explained variance and does not by itself test linearity.

Table 2: Linearity Test Results

Independent Variable	Direction of Relationship	R^2	Interpretation
Cost competitiveness and consumer EV adoption	Positive linear	0.201	Consistent with a linear relationship

The Breusch-Pagan test was applied to examine whether the variance of the error terms was constant. As shown in Table 3, the test yielded a chi-square value of 1.63 (df = 1) and a p-value of .202. Since the p-value exceeded .05, the null hypothesis of constant variance was not rejected, indicating that the assumption of homoscedasticity was satisfied.

Table 3: Breusch-Pagan Test for Heteroscedasticity

H0: Constant variance	
Variables: Fitted values of consumer EV adoption	
$\chi^2(1)$	1.63
p	.202

The Shapiro-Wilk test was applied to assess the normality of the regression residuals. As shown in Table 4, the test produced a Shapiro-Wilk statistic of 0.992 with 276 degrees of freedom and a non-significant p-value of .159. Since the p-value exceeded .05, the null hypothesis of normality was not rejected, indicating that the residuals were approximately normally distributed.

Table 4: Shapiro-Wilk Test for Regression Residuals

Model	Shapiro-Wilk Statistic	df	p
Cost competitiveness and consumer EV adoption	.992	276	.159

As presented in Table 5, the residuals recorded a skewness of 0.240 and a kurtosis of −0.313. Both values were within acceptable ranges, which confirms that the normality assumption was satisfied.

Table 5: Skewness and Kurtosis of Residuals

Variable	Skewness	Kurtosis
Cost competitiveness	0.240	-0.313

Source: Research Data (2026)

4.2 Descriptive Analysis

Means and standard deviations were used to describe the central tendency and variability of responses for each study variable.

4.2.1 Cost Competitiveness

The findings in Table 6 indicate that respondents generally agreed that EVs were cost competitive, as reflected by an aggregate mean of 4.201 (mean of the item standard deviations

= 0.653; the composite score had an SD of approximately 0.32, derived from the regression output). Specifically, respondents agreed that EVs reduce maintenance and operating costs compared with conventional vehicles, with a mean of 4.32 (SD = 0.578). Fuel cost savings were an important factor in the purchase decision, with a mean of 4.32 (SD = 0.574). Respondents also indicated that using an EV had significantly reduced fuel-related expenses, with a mean of 4.30 (SD = 0.545). Similarly, respondents reported realising cost savings from EV use over time, with a mean of 4.25 (SD = 0.592). Lower electricity costs relative to fuel had reduced transport expenses, with a mean of 4.22 (SD = 0.654). The overall cost of owning an EV was considered reasonable in relation to long-term benefits, with a mean of 4.21 (SD = 0.616).

The findings further show that the initial purchase cost of EVs was perceived as relatively high, with a mean of 4.18 (SD = 0.699). Financial incentives influenced purchase decisions, with a mean of 4.14 (SD = 0.709). Respondents also agreed that EVs were competitively priced compared with conventional petrol or diesel vehicles, with a mean of 4.08 (SD = 0.763). Government incentives such as tax reductions or subsidies recorded the lowest mean of 3.99 (SD = 0.804), although respondents still agreed that they contributed to affordability. These findings indicate that respondents assessed cost competitiveness mainly in terms of fuel savings, operating and maintenance costs, long-term ownership benefits, purchase price, and financial incentives.

Table 6: Descriptive Statistics for Cost Competitiveness

	Mean	Std. Deviation
Electric vehicles are competitively priced compared to conventional petrol or diesel vehicles in the market	4.08	0.763
The initial purchase cost of my electric vehicle was relatively high	4.18	0.699
The overall cost of owning an electric vehicle is reasonable considering long-term benefits.	4.21	0.616
Electric vehicles reduce my maintenance and operating costs compared to conventional vehicles	4.32	0.578
Lower electricity costs compared to fuel have reduced my transport expenses	4.22	0.654
Over time, I have realized cost savings from using an electric vehicle	4.25	0.592
Government incentives such as tax reductions or subsidies contributed to the affordability of my electric vehicle	3.99	0.804
Financial incentives influenced my decision to purchase an electric vehicle.	4.14	0.709
Using an electric vehicle has significantly reduced my fuel-related expenses.	4.30	0.545
Cost savings on fuel were an important factor in my decision to purchase an electric vehicle.	4.32	0.574
Average of item means and item standard deviations	4.201	0.653

Source: Research Data (2026)

4.2.2 Consumer Adoption of Electric Vehicles

The findings in Table 7 indicate that respondents generally agreed that they had adopted and actively used EVs, as reflected by an aggregate mean of 4.31 (mean of the item standard deviations = 0.58; the composite score had an SD of approximately 0.27, derived from the ANOVA in Table 10). Respondents indicated that they currently used an EV as part of their daily transportation, with a mean of 4.22 (SD = 0.533). They also agreed that they had shifted from conventional fuel vehicles to EVs, with a mean of 4.33 (SD = 0.583). Frequent use of EVs for transport needs recorded a mean of 4.27 (SD = 0.555), while intention to continue using an EV recorded 4.32 (SD = 0.578). Willingness to recommend EV use to others recorded the highest mean of 4.44 (SD = 0.546). EVs were also perceived to meet daily transport needs effectively, with a mean of 4.37 (SD = 0.573).

The findings further indicate that the availability of charging stations influenced how often respondents used their EVs, with a mean of 4.33 (SD = 0.574). Respondents agreed that charging infrastructure in Kenya supported their continued use of EVs, with a mean of 4.27 (SD = 0.623). Satisfaction with the performance and reliability of EVs recorded a mean of 4.30 (SD = 0.573), while preference for EVs over conventional vehicles recorded 4.29 (SD = 0.616). Respondents also agreed that they were committed to continuing to use EVs as their main mode of transport, with a mean of 4.26 (SD = 0.574). The findings demonstrate consistently high agreement across the adoption indicators. Because all respondents were existing EV users, these scores describe continued use and satisfaction among adopters, and their concentration at the upper end of the scale restricts variation in the outcome.

Table 7: Descriptive Statistics for Consumers' Electric Vehicle Adoption

	Mean	Std. Deviation
I currently use an electric vehicle as part of my daily transportation.	4.22	0.533
I have shifted from using conventional fuel vehicles to electric vehicles.	4.33	0.583
I use my electric vehicle frequently for my transportation needs.	4.27	0.555
I intend to continue using an electric vehicle in the future	4.32	0.578
I would recommend electric vehicle use to others based on my experience.	4.44	0.546
Electric vehicles meet my daily transportation needs effectively.	4.37	0.573
The availability of charging stations influences how often I use my electric vehicle	4.33	0.574
Charging infrastructure in Kenya supports my continued use of an electric vehicle.	4.27	0.623
I am satisfied with the performance and reliability of my electric vehicle.	4.30	0.573
I prefer electric vehicles over conventional fuel vehicles for my transport needs.	4.29	0.616
I am committed to continuing the use of electric vehicles as my main mode of transport.	4.26	0.574
Average of item means and item standard deviations	4.31	0.58

4.3 Correlation Analysis

Pearson correlation analysis was used to determine the strength and direction of the relationship between cost competitiveness and EV adoption, and the results are presented in Table 8. The findings indicate a positive, moderate, and statistically significant relationship between the two variables ($r = 0.449$, $p < .001$). Higher perceived cost competitiveness was therefore associated with higher levels of adoption, and the relationship was significant at the .01 level.

Table 8: Correlation between Cost Competitiveness and EV Adoption

		Consumer Adoption of Electric Vehicles	Cost Competitiveness
Consumer Adoption of Electric Vehicles	Pearson Correlation	1.000	
	Sig. (2-tailed)		
	N	276	
Cost Competitiveness	Pearson Correlation	.449**	1.000
	Sig. (2-tailed)	< .001	
	N	276	276

Note. ** Correlation is significant at the .01 level (2-tailed).

4.4 Regression Analysis

A simple linear regression model was used to examine the relationship between cost competitiveness and EV adoption among current EV users in Kenya. As shown in Table 9, R^2 was 0.201, indicating that cost competitiveness explained 20.1% of the variation in EV adoption, while the remaining 79.9% was attributable to factors outside the model.

Table 9: Model Summary for Cost Competitiveness and Consumer Adoption of Electric Vehicles

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.449[a]	.201	.198	.24242

a. Predictors: (Constant), Cost Competitiveness

ANOVA was used to assess the statistical significance of the overall regression model. As shown in Table 10, the F-statistic of 68.999 ($p < .001$) indicates that the overall model was statistically significant at the .05 level. The model was therefore suitable for examining the relationship between cost competitiveness and EV adoption in Kenya.

Table 10: ANOVA for Cost Competitiveness and Consumer Adoption of Electric Vehicles

Model		Sum of Squares	df	Mean Square	F	p
1	Regression	4.055	1	4.055	68.999	< .001[b]
	Residual	16.102	274	.059		
	Total	20.157	275			

a. Dependent Variable: Consumer Adoption of Electric Vehicles

b. Predictors: (Constant), Cost Competitiveness

The regression equation based on the unstandardised coefficients was as follows:

$Y = 2.757 + 0.376X_1$

As shown in Table 11, the unstandardised coefficient for cost competitiveness was 0.376 (95% CI [0.287, 0.465], calculated from B and SE; $p < .001$), indicating a moderate, positive, and statistically significant relationship with EV adoption. This implies that a one-unit increase in cost competitiveness is associated with a 0.376-unit increase in consumer adoption. Therefore, the null hypothesis (H01), which stated that cost competitiveness is not significantly associated with EV adoption, was rejected.

Table 11: Regression Coefficients for Cost Competitiveness and Consumer Adoption of Electric Vehicles

Model		Unstandardized Coefficients		Standardized Coefficients	t	p
		B	SE	Beta		
1	(Constant)	2.757	.190		14.539	< .001
	Cost Competitiveness	.376	.045	.449	8.307	< .001

a. Dependent Variable: Consumer Adoption of Electric Vehicles

4.5 Discussion of Findings

The aggregate mean of 4.201 (SD = 0.653) indicates that respondents agreed that EVs are cost competitive in Kenya. This perception rests on purchase cost comparisons, operational cost savings, financial incentives, and fuel savings. The findings are consistent with Zhuge *et al*. (2020), who demonstrated that cost-related factors, particularly subsidies, can influence EV proliferation. The findings also accord with Borlaug *et al*. (2020), who established that lower charging costs and substantial lifetime fuel savings enhance the economic attractiveness of EVs relative to conventional vehicles. The correlation results indicate a positive, moderate, and statistically significant relationship between cost competitiveness and EV adoption ($r = 0.449$, $p < .001$), suggesting that higher perceived cost competitiveness is associated with higher adoption. The finding agrees with Ji and Gan (2022), who reported that information on long-term fuel costs and TCO increased consumer preference for EVs. The regression results indicate that cost competitiveness is positively and significantly associated with EV adoption among current EV users in Kenya ($B = 0.376$, $p < .001$). The finding is consistent with Fwande and Majiwa (2024), who established that electric motorcycles have lower operating and

maintenance costs than conventional motorcycles, although high upfront purchase costs may constrain affordability and adoption.

Porter's Generic Strategies, particularly cost leadership, offer an interpretation of this finding, since achieving lower overall costs strengthens competitive positioning. In the EV market, efforts to reduce production, operating, maintenance, and energy costs can enhance cost competitiveness and increase the attractiveness of EVs to consumers. Although the initial purchase price may remain relatively high, lower operating expenses and long-term ownership savings can improve the economic value of EVs. Boopathi and Kautish (2024) further emphasised the importance of cost-management strategies in strengthening competitive positioning and resilience in the automotive sector. Consequently, when consumers perceive EVs as economically beneficial over the ownership period, their willingness to adopt them is likely to increase.

The association should nevertheless be interpreted with caution. Evidence from other markets shows that cost competitiveness is not uniform across vehicle types. Malima and Moyo (2023) found that electric cars in Tanzania had a higher total cost of ownership per kilometre than comparable ICE vehicles, while electric two-wheelers were economically competitive, and Champeecharoensuk *et al*. (2025) reported that high upfront prices remained a major adoption barrier across Southeast Asian markets despite favourable operating costs. Because over 90% of registered EVs in Kenya are motorcycles (Ministry of Roads and Transport, 2026), the present findings may reflect the cost profile of two-wheelers more than that of cars. In addition, because all respondents already used an EV, the results speak to continued use and satisfaction rather than to the decision to adopt, and the model omits other determinants identified in the literature, such as charging infrastructure and vehicle type (Pamidimukkala *et al*., 2024; Zaino *et al*., 2024). Theoretically, the results are consistent with the Diffusion of Innovations Theory (Rogers, 2003), in which perceived relative advantage, including cost savings, is a central attribute of adoption, and they suggest that consumers' cost perceptions are one channel through which firms' cost positions may translate into adoption.

Consumer adoption research supports this interpretation. Financial incentives and charging infrastructure were positively associated with EV market share across 30 countries (Sierzchula *et al*., 2014), and purchase cost, driving range, and charging availability are among consumers' main concerns (Egbue & Long, 2012; Rezvani *et al*., 2015). Cost perceptions are therefore best treated as one of several interrelated determinants rather than a sole driver, a distinction that the single-predictor model cannot capture.

5.0 Conclusions

The study examined the relationship between perceived cost competitiveness and EV adoption among current EV users in Kenya. Descriptive results showed that respondents agreed that EVs are cost competitive in Kenya. Inferential results revealed a moderate positive correlation ($r = 0.449$, $p < .001$) and a positive, significant regression coefficient ($B = 0.376$, $p < .001$). The null hypothesis was therefore rejected, and the study concludes that greater perceived cost competitiveness is positively associated with continued EV adoption among current users in Kenya.

6.0 Recommendations

Given the positive and significant relationship between cost competitiveness and EV adoption, the study recommends measures that improve affordability and reduce the overall cost of ownership. Manufacturers, assemblers, importers, and dealers should provide affordable EV models, competitive pricing, and cost-effective maintenance solutions. Financial institutions should develop accessible financing arrangements, including asset financing, lease-to-own

options, battery-as-a-service models, and other flexible products. Government measures that narrow the initial price gap, such as tax relief, import-duty adjustments, and targeted fiscal incentives, warrant future testing, since the study did not measure policy effects. Such interventions should be stable and predictable and should account for purchase prices, charging costs, maintenance, battery replacement, and financing expenses.

National and county governments could also strengthen the infrastructure and regulatory environment for affordable EV adoption, although this implication requires testing because the study did not measure infrastructure or regulatory variables. This may include suitable charging and parking facilities, streamlined approvals for charging infrastructure, and transparent and competitive charging tariffs. Attention should be given to productive-use vehicles, including electric motorcycles, taxis, and commercial fleets, where lower operating costs can enhance economic viability. The study further recommends a national framework for monitoring EV cost competitiveness by tracking vehicle prices, financing costs, charging tariffs, maintenance expenses, battery replacement costs, and total ownership costs across vehicle categories. Such information would support evidence-based policy adjustments and enable consumers, investors, and financial institutions to make informed decisions regarding electric vehicle adoption.

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