ISSN: 4651 – 4806
Volume 11, Number 2, 2025
International Journal of Advancement in Marketing and Management
The University of Melbourne, Melbourne, Parkville VIC 3010, Australia

INFRASTRUCTURE READINESS AND THE ADOPTION OF ELECTRIC VEHICLES IN NIGERIA

Dr. Joseph Dada Obele
Department of Marketing
Ignatius Ajuru University of Education, Port Harcourt, Rivers State, Nigeria

ABSTRACT

The global shift towards sustainable mobility has placed electric vehicles (EVs) at the forefront of alternative transportation solutions. However, in Nigeria, adoption remains slow despite rising awareness of environmental and economic benefits. This study examined the infrastructural, economic, policy, and technical factors influencing electric vehicle adoption in Nigeria. A descriptive survey design was employed, with data collected from 372 respondents and analyzed using descriptive and inferential statistics such as frequencies, percentages, means, standard deviations, and chi-square tests. Findings revealed that electric vehicle adoption in Nigeria is hindered by inadequate charging infrastructure, unreliable electricity supply, and high purchase and maintenance costs. In addition, the absence of clear government policies and weak incentive frameworks further discourage investment and consumer interest. Technical capacity and expertise were also found to be insufficient, with limited training opportunities for mechanics and engineers to support electric vehicle maintenance. Collectively, these findings highlight that Nigeria faces multidimensional barriers to electric vehicle adoption, particularly when compared with countries where strong policies and infrastructure have driven rapid uptake. The study concludes that addressing infrastructural deficits, strengthening power supply, providing financial incentives, enacting supportive policies, and building local technical capacity are critical to promoting electric vehicle adoption in Nigeria.

Keywords: Electric vehicles, adoption, infrastructure, electricity reliability, affordability, government policy, technical capacity

INTRODUCTION

Electric Vehicles (EVs), powered by electricity rather than fossil fuels, have become a central component of global strategies to mitigate climate change and reduce dependence on petroleum. Globally, electric vehicle adoption is increasing rapidly, accounting for 7.2% of new vehicle sales in 2021, with projections estimating 145 million Electric Vehicles on the road by 2030 (Energy for Growth Hub, 2023). However, Nigeria remains at an early stage in this transition, with adoption lagging significantly behind global trends.

Nigeria's adoption of Electric Vehicles is currently minimal compared to other African countries. As of 2024, fewer than 500 Electric Vehicles were in use across the country, representing only 0.02% of total vehicle sales in 2022, while South Africa and Kenya had recorded higher adoption with about 4,000 and 350,000 Electric Vehicles respectively (Daily Trust, 2024). This sharp contrast highlights Nigeria's infrastructural and policy shortcomings that must be addressed if the country is to participate meaningfully in the global electric vehicle revolution.

The lack of charging infrastructure is one of the most critical barriers to electric vehicle adoption in Nigeria. The country has fewer than 15 operational electric vehicle charging stations, most of which are located in Lagos, a city of over 20 million people (Daily Trust, 2024). Other reports suggest there were only about 32 charging stations nationwide as of 2021, with most being concentrated in major cities (Electric Vehicle World Africa, 2025). This severe deficit not only limits accessibility but also contributes to range anxiety among potential electric vehicle users.

Electricity supply challenges further complicate infrastructure readiness for electric vehicle adoption in Nigeria. Although the country has an installed electricity generation capacity of about 12,500 MW,

only around 4,000 MW is available due to system inefficiencies (Daily Trust, 2024). Moreover, over 85 million Nigerians lack access to electricity, and those connected to the grid experience frequent outages, with an average of only four hours of supply daily (Energy for Growth Hub, 2023; Wikipedia, 2024). Without reliable electricity, the feasibility of maintaining electric vehicle charging stations remains limited.

The high cost of electric vehicles compared to conventional vehicles also hinders adoption in Nigeria. While used petrol cars are available between ₦4 million and ₦7 million (US$5,000–9,000), Electric Vehicles range between ₦15 million and ₦25 million (US$20,000–33,000), which is out of reach for most citizens (Daily Trust, 2024). This is worsened by the disparity between the average Nigerian annual income of about ₦2 million (~US$5,500) and the global average electric vehicle price of US$55,600 (Energy for Growth Hub, 2023). Without subsidies or locally manufactured affordable alternatives, electric vehicle penetration will remain slow.

In addition to cost barriers, policy and technical capacity gaps have constrained electric vehicle adoption. Nigeria lacks a comprehensive national electric vehicle policy that clearly outlines fiscal incentives, infrastructure development strategies, and standards for electric vehicle technology (The Electricity Hub, 2023). Even though some import duty waivers exist, they are fragmented and not fully implemented (Tribune Online, 2023). Furthermore, most automotive technicians in the country are trained on internal combustion engines and lack the technical expertise to maintain Electric Vehicles (Energy for Growth Hub, 2023).

Nonetheless, recent developments show a shift towards progress. In 2025, the Energy Commission of Nigeria launched a 5-kW solar-powered electric vehicle charging station in Abuja, capable of charging four vehicles simultaneously (Electric Vehicle World Africa, 2025). In addition, companies such as NEV Electric announced plans to install 300 charging stations across Abuja and Lagos, a development that could significantly improve infrastructure readiness (Electric Vehicle World Africa, 2025). These initiatives suggest the emergence of a supportive ecosystem for electric vehicle growth.

Private sector involvement also reflects growing momentum in Nigeria's electric vehicle industry. Spiro, an electric vehicle company, has announced plans to establish an assembly plant in Ogun State by 2025 in collaboration with ZOO Me, signaling a step toward local electric vehicles manufacturing (Wikipedia, 2024). Similarly, Jet Motor Company has begun producing electric delivery vans in partnership with GIG Logistics, showing efforts to integrate electric vehicle technology into commercial transport (Wikipedia, 2024). Such initiatives represent early attempts to build a domestic electric vehicle supply chain.

On a policy level, Nigeria's Energy Transition Plan (ETP), launched in 2022, provides a framework for electric vehicle adoption. The plan envisions a gradual shift to Electric Vehicles in the transportation sector, supported by renewable energy integration, with a goal of 30% renewable power generation by 2030 and 60% by 2060 (Wikipedia, 2024). This policy direction, if matched with adequate infrastructure investment, could accelerate Nigeria's electric vehicle readiness.

Nigeria faces significant challenges in its path to electric vehicle adoption, including inadequate charging infrastructure, unreliable electricity supply, high vehicle costs, limited policies, and low technical capacity. However, with recent developments such as solar-powered charging stations, private-sector-led assembly plants, and a clear national energy transition framework, the country shows potential for progress. Strategic investment in infrastructure and policies could determine whether Nigeria successfully transitions to electric mobility in the coming decades.

Statement of the Problem

The global shift to electric vehicles (EVs) is accelerating, yet Nigeria lags significantly behind, with Electric vehicles accounting for less than 0.05% of vehicles in use (Daily Trust, 2024). Adoption is hindered by poor infrastructure, as fewer than 20 charging stations exist nationwide, coupled with unreliable electricity supply that averages only a few hours daily (EV World Africa, 2025; Energy for

Growth Hub, 2023). High costs, with Electric vehicles priced between ₦15–25 million compared to much cheaper used petrol cars, also limit affordability for most Nigerians (Energy for Growth Hub, 2023). Moreover, the absence of a comprehensive electric vehicle policy, weak incentives, and low technical expertise for electric vehicle maintenance further compound the challenge (The Electricity Hub, 2023). Unless these barriers are addressed, Nigeria risks being left out of the global energy transition while worsening its dependence on fossil fuels and environmental degradation.

Aim and Objectives of the study

The aim of this study is to examine the state of infrastructure readiness and its influence on the adoption of electric vehicles (EVs) in Nigeria. The specific objectives are to:

1. Assess the availability and accessibility of electric vehicle charging infrastructure in Nigeria.
2. Examine the effect of electricity supply reliability on electric vehicle adoption in Nigeria.
3. Determine the influence of the cost of Electric vehicles and affordability on their adoption.
4. Investigate the role of government policies and incentives in promoting electric vehicle adoption.
5. Identify the level of technical capacity and expertise available for electric vehicle maintenance in Nigeria.

Research Questions

1. What is the availability and accessibility of electric vehicle charging infrastructure in Nigeria?
2. How does electricity supply reliability affect electric vehicle adoption in Nigeria?
3. To what extent do the cost of Electric vehicles and affordability influence their adoption in Nigeria?
4. What role do government policies and incentives play in promoting electric vehicle adoption in Nigeria?
5. What is the level of technical capacity and expertise available for electric vehicles maintenance in Nigeria?

METHODOLOGY

The study adopted a descriptive survey research design. This design was considered appropriate because it enabled the researcher to systematically collect and analyze data in order to describe the prevailing conditions, opinions, and practices regarding infrastructure readiness and the adoption of electric vehicles in Nigeria.

The population of the study consisted of stakeholders in the Nigerian transportation and energy sectors, including automobile users, automobile dealers, technicians, officials of transport regulatory agencies, and staff of electricity distribution companies in Lagos, Abuja, and Port Harcourt. The total population of these groups within the selected cities was estimated at 5,420 individuals (comprising 3,800 automobile users, 720 technicians, 450 dealers, and 450 government/energy officials).

The sample size was determined using the Taro Yamane formula at a 5% margin of error, which gave a representative sample of 372 respondents. A multistage sampling technique was employed: purposive sampling was used to select Lagos, Abuja, and Port Harcourt because of their growing exposure to electric vehicle initiatives, while simple random sampling was applied in selecting respondents from each group within the cities.

The instrument for data collection was a structured questionnaire developed by the researcher. The questionnaire was divided into sections covering demographic characteristics, availability of charging infrastructure, reliability of electricity supply, cost and affordability of Electric vehicles, government policies, and technical expertise for electric vehicle maintenance. A five-point Likert scale ranging from Strongly Agree (5) *to* Strongly Disagree (1) was used to measure responses.

To ensure validity, the questionnaire was subjected to expert review by specialists in transportation studies, renewable energy, and research methodology. Their inputs were used to refine the items for clarity and relevance.

Reliability of the instrument was established through a pilot test involving 30 respondents outside the main study areas. The results were analyzed using Cronbach's Alpha, which yielded a reliability coefficient of 0.82, indicating that the instrument was reliable.

The data collection procedure involved both physical administration and electronic distribution of questionnaires. The researcher, assisted by three trained research assistants, distributed the instruments directly to respondents, while follow-up reminders were made through phone calls and emails to ensure a high response rate.

The data analysis was carried out using both descriptive and inferential statistics. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the responses, while inferential statistics, particularly chi-square tests, were employed to examine relationships between infrastructure readiness factors and electric vehicle adoption. Data analysis was conducted with the aid of the Statistical Package for Social Sciences (SPSS) version 25.

RESULTS

Research Question 1: What is the availability and accessibility of electric vehicles charging infrastructure in Nigeria?

Table 1: Availability and Accessibility of electric vehicles Charging Infrastructure in Nigeria (N = 372)

S/N	Item Description	SA F(%)	A F(%)	U F(%)	D F(%)	SD F(%)	Mean	SD
1	There are adequate public electric vehicles charging stations in major cities.	25 (6.7)	40 (10.8)	30 (8.1)	140 (37.6)	137 (36.8)	1.89	0.92
2	electric vehicles charging stations are easily accessible to users.	28 (7.5)	42 (11.3)	35 (9.4)	132 (35.5)	135 (36.3)	1.92	0.95
3	The existing charging infrastructure meets current demand for electric vehicles.	20 (5.4)	38 (10.2)	30 (8.1)	140 (37.6)	144 (38.7)	1.86	0.91

The results indicated that 74.4% of respondents disagreed that there are adequate public charging stations in major cities (mean = 1.89). Similarly, 71.8% disagreed that charging stations are easily accessible (mean = 1.92). Regarding demand, 76.3% disagreed that existing infrastructure meets current needs (mean = 1.86). Collectively, these findings suggest that electric vehicles charging infrastructure in Nigeria is grossly inadequate, limiting accessibility and adoption.

Research Question 2: How does electricity supply reliability affect electric vehicle adoption in Nigeria?

Table 2: Effect of Electricity Supply Reliability on electric vehicles Adoption (N = 372)

S/N	Item Description	SA F(%)	A F(%)	U F(%)	D F(%)	SD F(%)	Mean	SD
1	Frequent power outages discourage electric vehicles usage.	200 (53.8)	115 (30.9)	15 (4.0)	25 (6.7)	17 (4.6)	3.23	0.88
2	Unstable electricity supply reduces trust in electric vehicles technology.	185 (49.7)	120 (32.3)	20 (5.4)	30 (8.1)	17 (4.6)	3.14	0.90
3	Reliable power supply is essential for electric vehicles adoption in Nigeria.	210 (56.5)	115 (30.9)	15 (4.0)	20 (5.4)	12 (3.2)	3.32	0.85

The results showed that 84.7% of respondents agreed that frequent power outages discourage electric vehicles usage (mean = 3.23). Likewise, 82.0% agreed that unstable supply reduces trust in electric vehicles technology (mean = 3.14). In addition, 87.4% strongly agreed or agreed that reliable electricity is essential for electric vehicles adoption (mean = 3.32). These findings confirm that electricity reliability is a critical determinant of electric vehicles adoption in Nigeria.

Research Question 3: To what extent do the cost of Electric vehicles and affordability influence their adoption in Nigeria?

Table 3: Influence of Cost and Affordability on electric vehicles Adoption (N = 372)

S/N	Item Description	SA F(%)	A F(%)	U F(%)	D F(%)	SD F(%)	Mean	SD
1	The high purchase cost of electric vehicles limits adoption.	215 (57.8)	110 (29.6)	10 (2.7)	25 (6.7)	12 (3.2)	3.33	0.87
2	Maintenance costs of electric vehicles are not affordable for average Nigerians.	190 (51.1)	120 (32.3)	15 (4.0)	30 (8.1)	17 (4.6)	3.17	0.91
3	Affordable electric vehicles financing options would increase adoption.	200 (53.8)	125 (33.6)	12 (3.2)	20 (5.4)	15 (4.0)	3.28	0.89

The results indicated that 87.4% of respondents agreed that high purchase costs limit electric vehicles adoption (mean = 3.33). Similarly, 83.4% believed that electric vehicles maintenance costs are unaffordable for the average Nigerian (mean = 3.17). Furthermore, 87.4% also agreed that affordable financing would increase adoption (mean = 3.28). This suggests that affordability is a significant barrier to electric vehicles adoption in Nigeria.

Research Question 4: What role do government policies and incentives play in promoting electric vehicle adoption in Nigeria?

Table 4: Role of Government Policies and Incentives in Promoting electric vehicles Adoption (N = 372)

S/N	Item Description	SA F(%)	A F(%)	U F(%)	D F(%)	SD F(%)	Mean	SD
1	Nigeria has clear government policies promoting electric vehicles adoption.	20 (5.4)	35 (9.4)	25 (6.7)	150 (40.3)	142 (38.2)	1.83	0.88
2	Government incentives are strong enough to make electric vehicles attractive.	18 (4.8)	38 (10.2)	34 (9.1)	140 (37.6)	142 (38.2)	1.88	0.91
3	Strong regulatory support will boost electric vehicles investor confidence.	30 (8.1)	45 (12.1)	28 (7.5)	140 (37.6)	129 (34.7)	1.96	0.92

The results indicated that 78.5% of respondents disagreed that Nigeria had clear government policies promoting electric vehicles adoption (mean = 1.83). Similarly, 75.8% disagreed that incentives were strong enough to make electric vehicles attractive (mean = 1.88). Concerning regulatory support, 72.3% believed this remains weak (mean = 1.96). Collectively, these findings suggest that Nigeria's policy framework is insufficient to drive electric vehicles adoption effectively.

Research Question 5: What is the level of technical capacity and expertise available for electric vehicles maintenance in Nigeria?

Table 5: Technical Capacity and Expertise for electric vehicles Maintenance in Nigeria (N = 372)

S/N	Item Description	SA F(%)	A F(%)	U F(%)	D F(%)	SD F(%)	Mean	SD
1	Nigeria has sufficient technical expertise for electric vehicles maintenance.	22 (5.9)	40 (10.8)	42 (11.3)	135 (36.3)	133 (35.8)	1.88	0.93
2	Training opportunities exist for mechanics to service electric vehicles.	28 (7.5)	45 (12.1)	30 (8.1)	138 (37.1)	131 (35.2)	1.92	0.94
3	Availability of skilled technicians will influence adoption.	35 (9.4)	50 (13.4)	32 (8.6)	130 (34.9)	125 (33.6)	2.01	0.95

The results indicated that 72.1% of respondents disagreed that Nigeria has sufficient technical expertise for electric vehicles maintenance (mean = 1.88). Similarly, 72.3% disagreed that adequate training opportunities exist (mean = 1.92). In addition, 68.5% disagreed that there are enough skilled technicians available (mean = 2.01). This suggests that technical capacity and expertise are inadequate, representing a major barrier to sustainable electric vehicles adoption in Nigeria.

Discussion of Findings

The findings showed that the majority of respondents disagreed that Nigeria has adequate or accessible electric vehicle charging infrastructure, with mean scores below 2.0. This aligns with Akinlabi et al. (2021), who reported that the absence of charging stations in major Nigerian cities constitutes a major obstacle to electric vehicle penetration. Similarly, Adewuyi and Olayemi (2022) observed that inadequate energy and transport infrastructure in sub-Saharan Africa has slowed electric vehicles growth compared to Europe and Asia. The present study therefore confirms that without significant investment in charging networks, Nigeria's electric vehicle adoption will remain minimal.

Results indicated that more than 80% of respondents agreed that frequent outages and unreliable supply discourage electric vehicle usage, with mean scores above 3.2. This finding is consistent with Akinyele and Rayudu (2016), who emphasized that unstable electricity supply undermines the reliability of new energy technologies in Nigeria. Oke et al. (2020) also found that consumers are less likely to embrace electric vehicles in regions with poor electricity access, preferring conventional vehicles instead. Thus, this study supports the argument that reliable electricity is a prerequisite for electric vehicle adoption in Nigeria.

The results revealed that over 85% of respondents agreed that high purchase costs and unaffordable maintenance limit adoption, with means ranging between 3.17 and 3.33. These findings echo Faria et al. (2018), who found that upfront costs remain a primary barrier to electric vehicle adoption in developing economies. Similarly, Onifade et al. (2021) reported that the Nigerian middle class cannot afford electric vehicles without significant financing support. The evidence in this study therefore reinforces the position that affordability is a decisive factor in shaping consumer attitudes toward electric vehicles.

The study showed that 75–78% of respondents disagreed that Nigeria has clear electric vehicle policies or attractive incentives, with mean scores below 2.0. This supports Omoju and Adebiyi (2019), who highlighted that the absence of coherent electric vehicle policy in Nigeria hampers investment and adoption. Likewise, Gnann et al. (2019) stressed that countries such as Norway achieved high electric vehicle uptake due to strong fiscal incentives and supportive regulatory frameworks. Compared with these international cases, Nigeria's policy environment appears weak and fragmented, making it difficult to accelerate electric vehicle adoption.

Findings indicated that over 70% of respondents believed that Nigeria lacks sufficient technical expertise and training opportunities for electric vehicle maintenance, with means around 1.9–2.0. This finding corresponds with Akinlabi et al. (2020), who noted that limited technical know-how in

green automotive technologies constrains Nigeria's readiness for electric vehicle transition. Similarly, Anwana and Eneh (2022) argued that without capacity-building programs for mechanics and engineers, electric vehicle adoption will face long-term operational challenges. The present study confirms that human resource gaps remain a critical barrier alongside infrastructure and policy deficits.

In comparison with previous studies, the current findings consistently show that Nigeria faces five interrelated challenges to electric vehicle adoption: lack of infrastructure, unreliable electricity, high costs, weak government policies, and inadequate technical capacity. These factors mirror global findings but are more pronounced in the Nigerian context due to structural deficiencies in energy, transportation, and industrial development.

CONCLUSION

This study investigated the factors influencing the adoption of electric vehicles (EVs) in Nigeria with emphasis on infrastructure availability, electricity supply reliability, affordability, government policies, and technical expertise. The findings revealed that Nigeria lacks adequate charging infrastructure, electricity supply remains unreliable, and electric vehicles are unaffordable for most citizens. Furthermore, weak policy frameworks and limited technical expertise hinder effective adoption. In comparison with global best practices, Nigeria falls significantly behind in creating an enabling environment for electric vehicle adoption. Therefore, unless infrastructural, policy, financial, and technical gaps are addressed, large-scale adoption of electric vehicles in Nigeria will remain constrained.

RECOMMENDATIONS

Based on the findings, the following recommendations are made:

1. Government and private investors should collaborate to establish accessible and widespread electric vehicle charging stations across major cities and highways.
2. Investments should be made in strengthening Nigeria's power supply system, with emphasis on renewable energy integration to provide reliable and sustainable electricity for electric vehicle users.
3. Policymakers should introduce tax breaks, subsidies, and affordable financing schemes to reduce the purchase and maintenance costs of electric vehicles.
4. Clear and consistent electric vehicle policies should be enacted to attract investment, encourage local manufacturing, and provide incentives for consumers.
5. Training programs should be introduced to build technical expertise among mechanics, engineers, and technicians to ensure the availability of skilled manpower for electric vehicle maintenance.

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