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**FACTORS INFLUENCING THE ADOPTION OF ELECTRIC VEHICLES IN NAIROBI  
COUNTY, KENYA**

**ASHISH HARISHCHANDRA NARANDASS**

**(147716)**

**DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE DEGREE OF  
EXECUTIVE MBA AT STRATHMORE UNIVERSITY**



**STRATHMORE BUSINESS SCHOOL**

**STRATHMORE UNIVERSITY**


**NAIROBI, KENYA**

**AUGUST, 2024**

## DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the document contains no material previously published or written by another person except where due reference is made in the research itself.

Ashish Harishchandra Narandass



11<sup>th</sup> December 2024

### Approval

Dissertation of Ashish Harishchandra Narandass was reviewed and approved by the following:

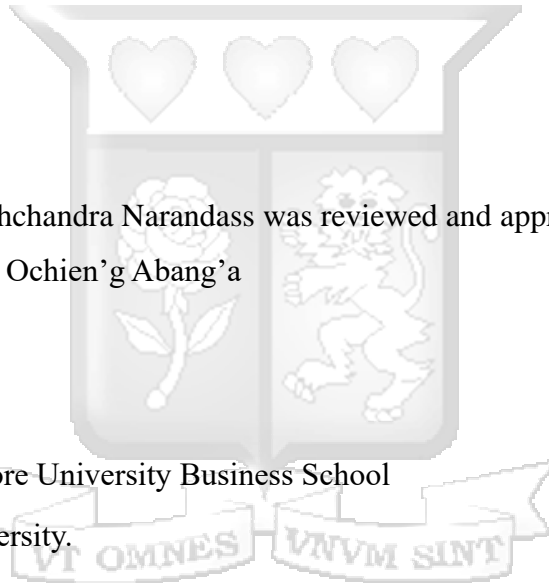
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## ABSTRACT

While EVs have been touted as one of the key solutions to the problem of climate change, the adoption of these vehicles is low, especially in developing countries. This study addressed disagreement and contextual gaps in the literature regarding the adoption of EVs in developing markets where adoption rates are low. The aim of the study was to examine the factors that influence the adoption of electric vehicles (EVs) in Nairobi City County. The specific objectives were to examine the effect of technological, economic, and infrastructural factors on the adoption of EVs. The positivism philosophy guided the study. The research employed a descriptive cross-sectional design with a sample of 400 registered drivers and vehicle owners. Structured questionnaires were used to collect primary data. Analysis of the data was performed using descriptive and inferential statistics. Descriptive statistics used were means and standard deviation, which were used to summarize the variables. Inferential statistics, especially multiple linear regression, was used to examine the association between the dependent and independent variables. The statistical package for social sciences (SPSS) software was used to analyze the data. Findings from multiple regression analysis indicate that economic and infrastructural factors have significant positive effect while the effect of economic factors is positive but not significant. Therefore, this study concludes that economic and infrastructural factors are significant predictors of EV adoption in Nairobi City County. It, therefore, recommends the government and actors in the automotive industry to adopt industrywide strategies aimed at improving economic conditions and infrastructural factors to increase the adoption of EVs.

Keywords: Electric Vehicles, technological factors, economic factors, infrastructural factors

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## ABBREVIATIONS AND ACRONYMS

AAK	Automobile Association of Kenya
ANOVA	Analysis of Variance
BRT	Bus Rapid Transit
BSS	Battery Swap Stations
EPRA	Energy & Petroleum Regulatory Authority
EV	Electric Vehicles
GHG	Greenhouse gas
ICE	Internal Combustion Engines
KDA	Kenya Drivers Association
KNEECS	Kenya National Energy Efficiency and conservation Strategy
KPLC	Kenya Power and Lighting Company
MAK	Motorists Association of Kenya
NACOSTI	National Commission for Science, Technology and Innovation
R&D	Research and Development
SPSS	Statistical Package for Social Sciences
TAM	Technology acceptance model
TPB	Theory of Planned Behavior
TRA	Theory of reasoned action
UTAUT	Unified Theory of Acceptance and Use of Technology
ZEV	Zero Emission Vehicle

## DEFINITION OF KEY TERMS

### **Adoption**

In this study, adoption has been conceptualized as the intent to purchase EVs by consumers (Abu-Alkeir et al., 2020)

### **Economic Factors**

These are the costs associated with acquiring and maintaining EVs, as well as financial savings gained from using these vehicles. Examples of these factors are price and maintenance costs (Kumar & Alok, 2020)

### **Electric Vehicles**

EVs are equipped with an electric motor and battery. These vehicles have a collector system that harnesses electricity from other extravehicular activities, like braking, which is then used to power the electric motor. Some EVs are powered by rechargeable batteries (Higuera-Castillo et al., 2020).

### **Infrastructural Factors**

These are facilities and systems that are needed for people to be able to use electric vehicles. An example is the availability of charging stations (Kumar & Alok, 2020).

### **Technological Factors**

These are the technical attributes or characteristics of electric vehicles that determine their performance. Examples of technological factors include charging time, driving range, and reliability (Ali & Naushad, 2022).

# CHAPTER ONE

## INTRODUCTION

### 1.1 Introduction

The study aimed to determine factors influencing the adoption of EVs in Nairobi City County. This chapter introduces the topic and provides a synopsis of the study by highlighting its background, problem it sought to address, research objectives, research questions, significance of the study, and scope of the study.

### 1.2 Background of the Study

Electric Vehicles (EVs) have been flaunted as one of the key ways to mitigate the problem of climate change. A leading contributor of GHG emissions is private vehicles, which account for nearly 12% of these emissions worldwide (Woodward et al., 2021). Efforts to cut transport-related GHG emissions are gaining momentum, and the automotive industry is playing a leading role by promoting the transition from internal combustion engines (ICEs) to EVs. The features of EVs can help to significantly lower transportation-related carbon footprint. First, these vehicles are more efficient compared to ICE-powered cars; they convert and transfer about 59-62% of electric energy to wheels, which is higher than the 17-24% converted by ICE cars (Larminie & Lowry, 2012). Albatayneh et al. (2020) note that “the total well to wheel (WTW) efficiency of gasoline ICE vehicle ranges between 11-27%, diesel ICE vehicle at 25-37%, compressed natural gas (CNG) vehicle at 12-25% while that of EVs ranges from 40-70%, depending on the source and location of renewable energy systems.”

Moreover, whereas “the use of EVs is expected to increase the worldwide demand for electricity by 25% during the 2020-2050 period, the higher efficiency of EVs would lead to a reduction in energy consumption and greenhouse gas (GHG) emissions” (Sperling, 2013). Additionally, EVs do not cause air pollution (Sperling, 2013). Carbon emissions linked to the production and operation of EVs are lower in comparison to those emanating from the production and operation of ICE vehicles. EVs are also mechanically simple; thus, they provide users with smooth and quiet operation with lesser vibration and noise than ICE cars (Sperling, 2013). However, a limitation associated with the adoption of EVs is the shorter distance range compared with ICE cars (Alanazi,

2023). With technological advancements, this limitation is poised to be addressed in the near future. Notwithstanding the range limitation, EVs represent an important step towards mitigating the negative impacts associated with climate change.

However, despite the growing interest in EVs, their adoption, particularly in emerging economies has been underwhelming. According to Johnson et al. (2024), while a few African countries such as Seychelles, Morocco, Mauritius, and South African are making significant strides in terms of emulating mature global markets in EV trends, “the vast majority of African countries are lagging on EV readiness, facing multiple challenges across policy, infrastructure, and marketing challenges.” For instance, only 28% of countries have implemented at least one national EV target, 39% have established legally binding EV incentives, 17% have ten or more public charging stations, 24% have motorization rates above 100 EV vehicles per 1,000 people (far below the global average of 300 and developing country average of 180), and grid reliability being a significant hurdle with only eight countries meeting the high reliability standards.

An Empirical publication by Mutiso et al. (2024) suggests that the adoption of EVs in the East African region is still in its early stages, but remains largely promising. Both Kenya and Rwanda score high on the EV Readiness and Impact Index, which takes into account various indicators across five categories: market potential, enabling policies, affordability, grid infrastructure, and power sector maturity (Mutiso et al., 2024). It is for this reason that Johnson et al. (2024) recognize these two countries as innovators, pioneering innovative approaches to EV adoption. Despite the status of EV readiness in Kenya, there are only 3,753 EVs, constituting only 1.62% of all registered vehicles (Kemp, 2024). This is surprising considering Kenya’s EV potential and also well-below government’s target of 5% of newly registered cars being electric by 2025.

Recent data shows that while North America, Europe, and China prepare for rapid EV adoption, emerging economies risk being left behind with African being the worst affected (Mutiso et al., 2024). This is because the drivers and challenges of the EV transition in the continent differ significantly from other markets, requiring tailored policies and infrastructures. Additionally, the lack of mainstream research focusing on Africa’s EV outlook means there is lack of comprehensive empirical data which can hamper policy and investment decisions across the continent (Johnson et al., 2024; Mutiso et al., 2024). Therefore, it is worth examining factors unique to Kenya’s EV landscape in an effort to provide practical solutions that may increase the uptake of electric cars.

### **1.2.1 Adoption of Electric Vehicles**

The adoption of EVs has been conceptualized differently by various authors. According to Mpoi et al. (2023), the adoption of EVs is defined as a behavioural change in which people accept and use EVs. Saputra and Andajani (2023) defined EV adoption as a process through which a decision-maker (usually a person) chooses to acquire and use EVs. For Manutworakit and Choocharukul (2022), adoption is conceptualized in terms of acceptance of EVs. The most common conceptualization of EV adoption in the literature is the intent to purchase EVs (Abbasi et al., 2021; Barisa, 2022). Other scholars have also conceptualized EV adoption in terms of actual purchase of EVs (Kim & Heo, 2019), preferences for EVs over traditional vehicles (Oleksy, 2016) and perceptions of EVs. Some scholars have described adoption using sales of EVs. In this study, adoption is conceptualized as the preference for and the intent to purchase EVs. The rationale for this conceptualization is that the number of EVs in Kenya is low; as a result, EV adoption can be studied from a decision-making perspective (Abu-Alkeir et al., 2020).

### **1.2.2 Factors Influencing the Adoption of Electric Vehicles**

While EVs are eco-friendly and offer environmental benefits, numerous factors have been reported that hinder consumers from adopting these vehicles. Significant effort was put towards research and development (R&D) to enhance the technology deployed in EVs, but less consideration was given to understanding consumer acceptance of this technology. Most consumers still view EVs as more disadvantageous than conventional cars. In the existing literature, technological factors relating to the performance of EVs, economic factors, personal characteristics, availability of infrastructure, environmental concerns, and policies have been reported to be significant factors that affect the adoption of EVs (Abu-Alkeir et al., 2020; Anastasiadou & Gavanas, 2022; He et al., 2022; Singh et al., 2020). However, for this study, only technological, economic, and infrastructural factors were studied.

While this might be too narrow of a scope, due to limited budget and timeframe, focusing on a small set of core factors allowed for deeper investigation and more robust data collection within these areas. Besides feasibility reasons, the study was confined to technological, economic, and infrastructural factors because these areas have widely been cited as the most significant hurdles to EV adoption from the perspective of developing countries (Ayeter et al., 2023; Bhattacharyya

& Thakre, 2021; Hakam & Jumayla, 2024; Higuera-Castillo et al., 2023). According to Khan et al. (2022), technological, economic, and infrastructural landscape of the developing world is markedly different from that of the developed countries on which most studies on EV adoption have been conducted. In view of the above, as noted by Mutiso et al. (2024), there is a lack of comprehensive empirical data which continues to hamper policy development and investment decisions on EVs in developing countries.

Technological factors relating to range anxiety and the time taken to recharge batteries have been identified as barriers to adoption (Abbasi et al., 2021). Technological factors relate to the characteristics of EVs, such as driving experience, driving distance, charging time, software and connectivity, autonomous driving features, and battery technology (Patil, 2020; Dixit & Singh, 2022; Higuera-Castillo et al., 2023). While these factors play a role in the acceptance of EVs, unfortunately, according to Atombo et al. (2023), Africa generally experiences a constrained technological landscape. However, Wongsunopparat and Cherian (2023) reported that battery technology is improving, enabling EVs to be driven over longer distances. Additionally, the development of faster charging systems is reducing the time taken to recharge EV batteries (Shareeda et al., 2021). Therefore, with advancements in technology, the effect of EV performance on adoption is unclear, considering the divergent views regarding the technological attributes of these vehicles. The specific technological factors that were examined in this study are ease of operating EVs, reliability, driving range and charging time.

Economic factors have also been reported as barriers to EV adoption, especially the high purchase price of EVs and the price of batteries, as well as the maintenance of these vehicles. On the one hand, EVs are viewed as “more expensive compared to traditional vehicles” (Shareeda et al., 2021). The acceptability of EVs in the Sub-Saharan African region is impeded by prices, which are often 70% higher than traditional vehicles of the same class (Gicha et al., 2024). According to Krishnan and Koshy (2021), the prices for EVs are expected to remain high than ICE vehicles until 2050. Therefore, despite more people willing to transition from traditional vehicles to EVs, the cost of acquisition is a major challenge (Gicha et al., 2024). On the opposite end of the debate, EVs are considered to be more economical in the long-term due to lower maintenance and service costs, which leads to potential savings in the long-run (Khan et al., 2022). Therefore, the contradictory views regarding the economic barriers of EVs make an interesting aspect to study.

The economic factors that were studied are the fuel economy/efficiency of EVs, price, maintenance costs and financial savings.

Infrastructural barriers have also been reported in the literature, particularly the lack of adequate charging stations. There is widespread agreement “that the limited availability of charging stations constitutes a significant barrier to EV adoption” (Manutworakit & Choocharukul, 2022). From Sub-Saharan Africa’s perspective, Gicha et al. (2024) identified “inadequate electricity grids, poor road conditions, and a shortage of public e-chargers” as critical infrastructural factors of EV adoption. The researchers add that Sub-Saharan Africa has the lowest access rate to electricity of any region in the world. It is also worth noting that those with access to electricity experience underwhelming service quality (Gicha et al., 2024). The infrastructural factors that were studied are the availability and location of charging stations.

From the numerous factors, this study focused on the technological, economic and infrastructural factors. The choice of these factors was informed by the divergent views in the literature; hence, their effect on EV adoption is not clear. Moreover, these three factors are relevant considering that advancements in EV technologies are making these vehicles more efficient and affordable compared to earlier models; hence, there is a need to determine if these improvements have positively influenced consumers’ intent to adopt EVs. Furthermore, contextual differences exist between technological, infrastructural and economic factors across geographical regions or countries. Countries differ in terms of their culture, the extent of technological progress or lag, and the costs of accessing new technologies like EVs (Khan et al., 2022). Developing countries provide a different context compared to developed countries, where adoption of EVs is already high and where most studies have been conducted.

### **1.2.3 Electric Vehicles in Kenya**

The context of the study was Nairobi County, Kenya. Urban transportation in Kenya, especially in Nairobi, is unreliable, costly, and unequipped to meet the needs of the population. Unsustainable and inefficient transportation systems can adversely affect the quality of life. Nairobi, which has 4.3 million residents, is considered “the fourth worst city worldwide and first in Africa in terms of traffic congestion” (Energy & Petroleum Regulatory Authority [EPRA], 2022). Additionally, diesel ICE vehicles cause significant air pollution, which makes it a challenge for Nairobi City to

achieve the yearly average air quality tolerance limits adopted in 2014 of 140 micrograms/cubic meter of suspended particulate matter and 60 micrograms/cubic meter of nitrogen dioxide (EPRA, 2022). For instance, the level of particulate matter in Nairobi is 2.5 times higher than the levels recommended by the World Health organization (EPRA, 2022). Therefore, a greater adoption of EVs can contribute significantly towards helping Kenya achieve its goal of lowering GHG emissions by 3.46 metric tonnes of carbon dioxide by 2030 (EPRA, 2022). Increased EV adoption presents an opportunity for Kenya to improve transportation, mitigate climate change and have cleaner air. The increase in GHG emissions contributes to global warming, which poses the need to hasten the adoption of EVs in Kenya.

Currently, in Kenya, there are at least 2.4 million operational vehicles, with over 200000 vehicles being registered yearly since 2014. Despite the large number of vehicles in the country, there are 3,753 EVs, constituting only 1.62% of all registered vehicles as of 2023 (Kemp, 2024). This is surprising considering Kenya's EV potential. Kenya's energy mix is extremely favorable in supporting the adoption of EVs. About 85% of the country's energy is obtained from renewable sources, including wind, solar, geothermal and hydropower (EPRA, 2022). Additionally, the power sector in Kenya has an excess capacity of about 1000 MegaWatts during times of peak loads, which could be used to cater for increased energy consumption from mass-scale adoption of EVs (Wachira, 2022).

The Kenyan government is keen on mitigating climate change, having hosted the African Climate Change Forum in September 2023. Increased adoption of EVs is one of the ways Kenya can contribute to mitigating climate change. The Kenyan government has adopted numerous initiatives to encourage the production and adoption of EVs. In 2020, the government adopted the Kenya National Energy Efficiency and conservation Strategy (KNEECS), which first proposed the idea of ensuring that EVs become mainstream on Kenyan roads (Wachira, 2022). In 2021, the government developed the national electric mobility policy, which includes fiscal incentives to encourage the adoption of EVs, such as plans for zero-rating taxes imposed on EVs (Khan et al., 2022). The 2023 Finance Act reduced the excise duty for EVs from 20% to 10% as Mwenda (2023) reports. Besides tax incentives, special e-mobility tariff was approved to support the development of EV charging stations and battery swapping infrastructure.

The government also established the Nairobi Metropolitan Bus Rapid Transit (BRT) system for exclusive use by EV buses (Wachira, 2022). Additionally, the Kenya Power and Lighting Company (KPLC) is in the process of building public charging points for EVs. The government has set a target of ensuring that EVs constitute at least 5% of vehicle ownership in the country by 2025. In state-owned firms, ICE vehicles are being phased gradually. For instance, in 2024, KPLC committed USD 2 million (KES 258 million) to overhaul its fleet and build charging stations countrywide (Ambani, 2024). KPLC is leveraging its nationwide distribution capacity to encourage the uptake of EVs in Kenya. The government also wants to ensure that all new public buildings have charging stations for EVs. Another initiative adopted by the government to increase EV adoption is the development of standards for EVs that are imported into the country. As at 2024, 21 standards have been developed and ratified, which cover aspects such as testing procedures, specifications, power consumption and performance.

Besides the government, some private sector players are introducing EVs in Kenya. For example, Sendy, a logistics company, is already making deliveries using electric vans. Another company known as ROAM (previously known as OpiBus) has introduced electric buses in Kenya and has plans for mass-production of such buses in the future. ROAM has also introduced electric motorcycles (Abuya, 2022). BasiGo, another Kenya-based EV company, introduced electric buses to the Kenyan market, which are capable of travelling 250 km after a single charge (Khan et al., 2022). E-cab companies like Little and E-Taxi have announced plans to go electric (Abuya, 2022). Currently, EV adoption in Kenya is mainly by corporate entities. In addition, the adoption of electric two-wheelers like scooters and bikers in Kenya is gaining traction due to the creation of battery-swapping stations (Ngila, 2022). As a result, there was a need to assess how improvements in charging infrastructure can replicate the same success in EVs.

### **1.3 Statement of the Problem**

While EVs have been touted as one of the key solutions to the problem of climate change, the adoption of these vehicles is low, especially in developing countries (Mpoi et al., 2023). This is contrasted with developed economies where EVs are competing with ICE vehicles (Conzade et al., 2022). Governments in developed countries are adopting incentives to increase the adoption of EVs (Sriram et al., 2022). The “European Union and the United States are leaders in the adoption of EVs due to incentives like tax credits, tax exemptions, purchase rebates, waivers on tolls,

parking and charging fees” (Woodward et al., 2021). However, the adoption of EVs in other regions, such as Africa, still remains low (Conzade et al., 2022). In 2021, there were about 19,000 EVs in the entire continent, which was significantly lower compared to the number of EVs in the developed countries, including the US (631152), Germany (695,657), France (322,043) and the United Kingdom (326990) (Kilgore, 2023). This data shows that Africa is lagging behind in the adoption of EVs, hence slowing down efforts aimed at mitigating climate change. Similarly, the adoption of EVs in Kenya is low (Mpoi et al., 2023; Wachira, 2022). The low adoption of EVs is a problem for consumers, auto manufacturers, and the government. Kenya’s transport sector, especially road transportation, constitutes one of the leading sources of carbon dioxide emissions due to the predominant use of ICE vehicles. Low EV adoption is linked to numerous problems, including high greenhouse gas emissions and poor quality of air (EPRA, 2022).

Factors influencing innovation adoption have been studied extensively. Internationally, Chen et al. (2020), after surveying potential EV adopters in Nordic countries, found that the ease of operation and technical reliability of EVs (technological factors) had a positive impact on adoption. In Thailand, Wongsunopparat and Cherian (2023) found that battery mileage (technological factor) did not have a significant effect on the intention to purchase EVs in the future. The prohibitive impact of price (an economic factor) on EV adoption in India was reported by Sriram et al. (2022), who cited high battery costs. In the United States, Narassimhan and Johnson (2018) observed a positive relationship between an increase in charging infrastructure installations and purchases of EVs.

Regionally, a systematic review conducted by Fedeyi et al. (2022) to examine the factors that influence technology adoption in farmers in African countries, including Malawi and Uganda, revealed that financial factors, institutional factors, demographic factors, and technology characteristics influenced adoption. In another study, Hull (2024) conducted a survey of South African vehicle owners and drivers and found that personal norms and reliability were the strongest factors that predicted the intent to own EVs. Okoh and Onuoha (2024) conducted a secondary study involving a review of policy documents to examine the transition towards EVs in the sub-Saharan region and identified inadequate EV infrastructure as a key barrier to the adoption of these vehicles.

Locally, Munguti and Opiyo (2018) examined the factors that influenced the adoption of cloud computing in software development companies. These authors showed that legal risks, technical risks, policy risks and organizational risks significantly influenced cloud computing adoption. In another study, Gor (2015) reported that the “government adoption of online tax filings was positively influenced by organizational support, system support, compatibility, complexity, relative advantage, trialability, and observability of the technology, as well as social networks.” Muriithi et al. (2016), using mixed methods research, demonstrated that the adoption of information and communication technology innovation in research collaborations was influenced by access to and availability of these technologies and the social and cultural practices of individual researchers.

Studies have been extensively conducted on the factors that influence technological innovations, such as EVs, but the concepts, methodologies, and contexts vary. Disagreement and contextual gaps have been identified in the literature with respect to the factors affecting the adoption of EVs. There are mixed findings and divergent views on the effects of technological, economical and infrastructural factors on the adoption of EVs; as a result, there is a lack of clarity regarding whether these factors are barriers or facilitators of EV adoption. In addition, contextual gaps exist in the literature with respect to the factors that determine EV adoption in Kenya. Additionally, EV adoption has been studied extensively in Western contexts (Higuera-Castillo et al., 2023; Ostorp, 2020); thus, there is inadequate research emphasis on the same in the developing world context, considering EVs are only starting to be introduced in these markets and there is low adoption. The developing world context is differentiated from Western contexts in terms of culture, state of the economy, infrastructure and demographics. As a result, the findings of existing studies on EV adoption cannot be applied to the developing world. Therefore, this study sought to address these gaps by examining the factors affecting EV adoption in Kenya.

#### **1.4 General Objective of the Study**

The general objective of this research was to examine the factors that influence the adoption of electric vehicles in Nairobi County, Kenya.

### **1.4.1 Specific Objectives of the Study**

2. To determine the influence of technological factors on the adoption of electric vehicles in Nairobi, Kenya.
3. To determine the influence of economic factors on the adoption of electric vehicles in Nairobi, Kenya.
4. To investigate the influence of infrastructural factors on the adoption of electric vehicles in Nairobi, Kenya.

### **1.5 Research Questions**

The research questions that guided the study are listed below:

1. What is the influence of technological factors on the adoption of electric vehicles in Kenya?
2. What is the influence of economic factors on the adoption of electric vehicles in Kenya?
3. What is the influence of infrastructural factors on the adoption of electric vehicles in Kenya?

### **1.6 Scope of the Research**

The concept that was examined in this study is the adoption of EVs, which was defined as was conceptualized as the preference for and the intent to purchase EVs (Abu-Alkeir et al., 2020). While there are several factors that influence EV adoption, this study focused on technological, economic and infrastructural factors. The context of the study was Nairobi County, Kenya. The methodological scope was quantitative, which was performed using a descriptive cross-sectional design. The target population consisted of vehicle owners and drivers. The target sample size was 400 vehicle owners and drivers. The study was conducted between March and April 2024.

### **1.7 Significance of the Study**

#### **1.7.1 Policymakers**

The findings from this study show the facilitators and barriers to EV adoption in Kenya. Using this information, policymakers can adopt strategies to address the barriers and promote facilitators of EV uptake. Regulators can use the findings to adopt standards that address any concerns raised by consumers that hinder their adoption of EVs. Thus, the findings from this research can be used to

inform government initiatives aimed at enhancing Kenyans' adoption of EVs. Already, manufacturers of EVs have set up operations in Kenya. Managers of auto-manufacturers can use the findings from this research to inform their product development efforts.

### **1.7.2 Practitioners**

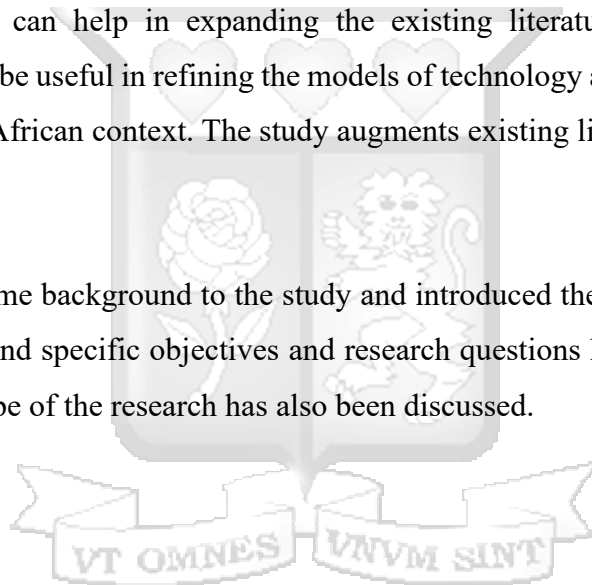
Recommendations made from this research might reveal the preferences and views of Kenyan consumers regarding EVs, which these manufacturers can adopt measures to address or rectify any misconceptions regarding EVs.

### **1.7.3 Scholars**

For scholars, this study can help in expanding the existing literature regarding technology adoption. The results can be useful in refining the models of technology adoption, especially in the Kenyan and the broader African context. The study augments existing literature on EV adoption.

## **1.8 Chapter Summary**

This chapter provided some background to the study and introduced the variables. The statement of the problem, general and specific objectives and research questions have also been described. The significance and scope of the research has also been discussed.



## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

The chapter reviews existing literature on the factors influencing the adoption of electric vehicles in order to identify research gaps that permitted further research. The chapter is organized as follows: Section 2.2 discusses the theoretical review, section 2.3 relates to empirical review, section 2.4 outlines the research gap, and section 2.5 presents the conceptual framework.

#### 2.2 Theoretical Review

The selected theories that informed this research are the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB). These theories were selected because they adequately describe the phenomenon of EV adoption. These theories and how they informed this research are discussed in the following subsections.

##### 2.2.1 Unified Theory of Acceptance and Use of Technology

The UTAUT, developed by Venkatesh et al. (2003), has been described as the most robust model that explains technology acceptance and predicts diffusion and adoption. This theory focuses on the factors influencing the intention of potential users to adopt a new innovation or technology. The UTAUT is based on “a synthesis of eight models and theories of technology use: social cognitive theory, innovation diffusion theory, model of personal computer (PC) utilization, the motivational model, decomposed theory of planned behavior, theory of planned behavior, technology acceptance model, and theory of reasoned action” (Zolfagharian et al., 2020). The UTAUT outlines “four primary factors influencing technology adoption, which are performance acceptance, effort expectancy, social influence, and facilitating conditions.” Performance expectancy refers to “the perceived extent to which a technology is considered beneficial in performing particular activities” (Zolfagharian et al., 2020). Effort expectancy refers to the perceived ease of using a new technology. Social influence denotes the degree to which potential users view that others believe they need to use a specific technology. Facilitating conditions refers to the perceptions of potential users regarding the support and resources that are available to them should they adopt a new technology (Zolfagharian et al., 2020). Additionally, UTAUT posits that

individual factor like habits, experience, gender, and age influence “the impact of performance expectancy, effort expectancy, social influence, and facilitating conditions on technology adoption.”

A strength of the UTAUT is the high explanatory power for innovation adoption due to the multiple factors incorporated in the model; hence, it is useful for supporting the technology development process. It has been used to study the adoption of various technologies and has been validated by research. For instance, Jain et al. (2022) employed UTAUT to predict the adoption intention of EVs in Indian consumers – this theory informed the choice of variables in the study, including facilitating conditions, performance expectancy and perceived risk. The findings of the study validated the propositions of the theory. Similarly, Abbasi et al. (2021) validated the propositions of UTAUT in a study to assess the factors affecting consumer motivation to use and accept EVs.

In this study, the UTAUT was used to formulate variables that influence EV adoption. The concepts of performance expectancy and effort expectancy in UTAUT were used to formulate the variable of technological factors, such as driving range and ease of operation. The concept of facilitating conditions informed the variable of infrastructural factors, such as charging point availability (Zolfagharian et al., 2020). In addition, UTAUT was used to inform the conceptualization of EV adoption in terms of the behavioral intention to adopt this technology.

### **2.2.2 Theory of Planned Behavior**

The theory of Planned Behavior (TPB), developed by Ajzen (1991) posits that intentions influence the behavior of people. Intention is, in turn, influenced by three factors, including attitudes, subjective norms and perceived behavioral control. Attitudes refer to the extent to which a person favorably or unfavorably evaluates a particular behavior of interest, which entails taking into account the outcomes associated with performing a given behavior or decision (Ajzen, 1991). The concept of behavioral intention denotes the motivational factors that influence a person to make a given decision. Subjective norms denote the belief regarding whether other people approve of the decision. Perceived behavioral control represents the difficulty or ease of making a particular decision. This theory also considers the possibility of external factors having an influence on behaviors irrespective of intention. The influence of external factors on behavior dependent on the degree of perceived behavioral control (Ajzen, 1991).

This theory has been applied to examine the adoption of technological innovations. Haustein and Jensen (2018) used TPB to compare electric cars and conventional car users in order to determine “the factors influencing the adoption of electric vehicles.” The TPB modelled the variables for the study including personal norms and attitudes. This theory was also validated by Yeğın and Ikram (2022), who demonstrated that “the purchase intention for electric vehicles was influenced by behavioral constructs.” Despite these strengths, a key weakness of the theory is that it presumes that the individual already has the resources to make the decision irrespective of the intention. Another shortcoming of this theory is that it does not consider other variables, like previous experience, mood, threat or fear, that might potentially affect motivation and behavioral intention.

In this study, TPB formed the basis for conceptualizing the independent variables of technological, economic and infrastructural factors, which were conceptualized in terms of attitudes. These variables were measured based on the consumers’ evaluation of the attributes of EVs. Additionally, the behavioral intention concept in TPB was used to conceptualize the adoption of EVs.

## **2.3 Empirical Review**

This section reviews the existing empirical literature on the factors that influence innovation adoption, especially technological, economic and infrastructural factors.

### **2.3.1 Technological Factors and the Adoption of Electric Vehicles**

Technological factors are the technical attributes or characteristics of an innovation electric that determine its performance (Collett et al., 2021). In the case of EVs, examples of technological factors include the charging time, driving range, and reliability (Ali & Naushad, 2022). The UTAUT theory supports the relationship between technological factors and the adoption of technological innovation. In the context of Kenya, some relevant technological factors associated with EVs are the ease of operating EVs, their reliability, driving range and charging time (Collett et al., 2021). The ease of operation, reliability, and driving range of the vehicle are determined by manufacturers. The charging time is influenced by the availability of charging infrastructure in a country (Collett et al., 2021). In Kenya, KPLC is in the process of building public charging points for EVs. The government also wants to ensure that all new public buildings have charging stations for EVs (Wachira, 2022).

A systematic review conducted by Fedeyi et al. (2022) to examine the factors that influence technology adoption in farmers in African countries, including Malawi and Uganda, revealed that technology characteristics were one of the significant factors that influenced adoption, especially the ease of use. In another study, Hull (2024) conducted a survey of South African vehicle owners and drivers and found that reliability was the strongest factor that predicted the intent to own EVs.

Ali et al. (2020) provided evidence showing the significant influence of technical characteristics on the adoption of innovation. In particular, these authors investigated the factors that influence the acceptance of cloud computing by Australian local governments. Using a descriptive survey, the findings revealed that complexity and security concerns were negatively associated with the adoption of cloud computing.

Munguti and Opiyo (2018) examined the factors that influenced the adoption of cloud computing in software development companies. These authors showed that legal risks, technical risks, policy risks and organizational risks significantly influenced cloud computing adoption. In another study, Gor (2015) reported that the government adoption of online tax filings was positively influenced by “technical characteristics, especially compatibility, complexity, relative advantage, trialability, and observability of the technology, as well as social networks.”

Technical features of EVs have been identified as facilitators of EV adoption, especially ease of operation, reliability of technology, design style and fuel economy. A meta-analysis performed by Geny (2021) revealed that the perceived ease of operation, reliability of EVs, speed, fuel economy and design style were positively associated with the intent to adopt EVs. Similar findings were reported by Chen et al. (2020) after surveying potential EV adopters in Nordic countries, who found that “the ease of operation and technical reliability of EVs had a positive impact on adoption.” Additionally, shorter charging times were positively associated with EV adoption intent (Chen et al., 2020; Coffman et al., 2016). Higuera-Castillo et al. (2020) reported that “driving range is an important factor that influences the intent to adopt EVs in Spanish consumers.” Similarly, Kim and Heo (2019) showed that “driving range was the most important factor.” All these factors had a significant effect on Korean consumers' intention to switch from ICE to EVs.

Chen et al. (2020), after surveying potential EV adopters in Nordic countries, found that ease of operation and technical reliability of EVs had a positive impact on adoption. In Thailand,

Wongsunopparat and Cherian (2023) found that battery mileage (technological factor) did not have a significant effect on the intention to purchase EVs in the future. The prohibitive impact of price (an economic factor) on EV adoption in India was reported by Sriram et al. (2022), who cited high battery costs. In the United States, Narassimhan and Johnson (2018) observed a positive relationship between an increase in charging infrastructure installations and purchases of EVs. In Pakistan, Lee et al. (2021) conducted a quantitative descriptive cross-sectional survey, which reported that the perceived ease of electric vehicles was “a significant factor that predicted the intention to use EVs.” In Malaysia, a quantitative study by Khazaei (2019) supported the significant influence of technological factors, especially range anxiety, on the intention to use EVs.

On the contrary, there are other technical characteristics of EVs that have been identified as barriers to adoption. For instance, a systematic review by Sanguesa et al. (2021) found that batteries constitute the main obstacle to the adoption of EVs on a wider scale. This review noted that the battery pack in EVs is the most expensive component, accounting for nearly a third of the total vehicle cost. However, Sanguesa et al. (2021) reported that better and cheaper batteries with higher capacities to extend vehicle autonomy are being developed, which help to drive down the cost of EVs. The same review also observed that the extended charging time is another limiting factor that hinders EV adoption. Standard power outlets supply about 3kW power, which means that charging a 30-kWh battery would take 10 hours. For a fast-charging system, the time needed for a full charge ranges from one to three hours. This limitation is being addressed using battery swap stations (BSS), where similar batteries can be exchanged with ones that have already been charged. Another technical limitation associated with EVs that have been reported in the literature is the driving range (Geny, 2021; Coffman et al., 2017). A meta-analysis conducted by Geny (2021) showed that driving range anxiety represents a significant concern associated with EVs. While the driving ranges for EVs have improved in recent years, they still present a concern among consumers. Even with the increased availability of charging stations, Geny (2021) found that driving range anxiety represents a significant psychological barrier. The same technical limitations of charging time and driving range were highlighted by Coffman et al. (2016) and Sriram et al. (2022).

### **2.3.2 Economic Factors and the Adoption of Electric Vehicles**

These are the costs associated with acquiring and maintaining EVs, as well as the financial savings gained from using these vehicles (Kumar & Alok, 2020). Examples of these factors are price and

maintenance costs for technological innovations (Kumar & Alok, 2020). Technological innovations are often associated with high initial investment costs, which might deter their adoption. However, in the long term, the efficiency gains can lead to significant cost savings for adopters.

The influence of economic factors on innovation adoption was demonstrated by Kumar et al. (2018) in a systematic review to examine the factors that influence the adoption of aquaculture technology. The findings from this study showed that the adoption of this technology was influenced by cost efficiency, productivity advantages and ease of maintaining the technology. Other factors that influenced the adoption decisions include profit expectations and the price of aquaculture technology.

The influence of economic factors on innovation was also demonstrated in a study conducted by Senyolo et al. (2018). These authors examined the factors that influenced the decision to adopt climate-smart technological innovations in the South African context. The findings showed that high investment costs were negatively associated with the adoption of this technology. The drivers of high initial costs identified in this study included additional labor requirements due to training employees and the high acquisition price. The negative influence of high initial costs was also demonstrated by Ali et al. (2020) with respect to the adoption of cloud computing by Australian local government agencies.

Dey et al. (2016) also presented findings showing that costs hindered the adoption of innovation. These authors examined the factors that influenced the adoption of radio frequency identification (RFID) systems in American hospitals. They conducted an online survey with chief innovation officers and information technology executives. Dey et al. (2016) reported that the costs and concerns regarding return on investment were negatively associated with the implementation of this technology.

Economic factors have been identified as both facilitators and barriers to the adoption of EVs (Geny, 2021; Kumar & Alok, 2020). The high cost/price of EVs is a significant barrier to EV adoption, as reported by Geny (2021). The technologies employed in battery packs for EVs are still new; thus, adopters have to pay a high price in order to sustain the research and development (R&D) and innovation efforts of manufacturers. Kumar and Alok (2020) observed that while the

prices of EVs have declined in the recent past, the costs are still prohibitive, which, in turn, hinders adoption. In the near future, the price of EVs will match that of conventional vehicles; however, consumers still consider EVs as being expensive compared with conventional vehicles (Cui et al., 2021). Similarly, a systematic review by Coffman et al. (2016) showed that the higher purchase price for EVs compared to ICE vehicles discourages consumers from buying EVs. The review further reported that consumers preferred to purchase conventional vehicles with higher performance at the price of EVs. Similarly, the prohibitive impact of price on EV adoption in India was reported by Sriram et al. (2022), who cited high battery costs. These studies suggest that the perceived high price of EVs serves as a deterrent against their adoption.

On the contrary, some economic factors, especially low operational costs, have been identified as facilitators of EV adoption. Coffman et al. (2017) reported that the high fuel economy coupled with lower energy costs were positively linked to the intention to adopt EVs. Similarly, Li et al. (2017) reported that lower operational costs due to free parking, waivers on road tolls, and free networks of charging stations increased the intent to purchase EVs. Additionally, the perceived low maintenance costs and operational savings emanating from the high efficiency of EVs increased consumers' intent to adopt EVs (Chen et al., 2020). The study by Chen et al. (2020) also reported that the perceived financial savings and fuel economy associated with EVs had a positive impact on their adoption intent. Comparable views were reported in a systematic review by Coffman et al. (2016), who reported that the high fuel prices and the expected financial savings from using EVs facilitate their adoption in the United States. In Sweden, Barisa (2022) provided evidence from a quantitative descriptive study showing that high fuel taxes incentivized consumers to purchase EVs.

Based on theory and previous findings, it was expected that economic factors would have a significant effect on the adoption of EVs in Kenya. In the Kenyan context, the costs of buying, maintaining and operating are still high, which can serve as a deterrent against the adoption of these vehicles (Malima & Moyo, 2023)

### **2.3.3 Infrastructural Factors and the Adoption of Electric Vehicles**

Infrastructural factors refer to facilities and systems that are needed for people to be able to use technological innovations (Kim et al., 2017). An example of EVs is the availability of charging

stations. The unavailability of appropriate infrastructure for technological innovations discourages people from adopting a technological innovation. The lack of needed infrastructure reduces the ease of use of a given technology (Sanguesa et al., 2021).

To encourage the adoption of EVs, charging network companies, automakers, government agencies, and utility companies are increasingly investing in creating charging infrastructure (Chakraborty et al., 2019). There is no doubt that public infrastructure is needed to increase EV adoption and address issues associated with range limitations and high costs of home infrastructure. However, increasing charging coverage without improving the awareness of potential adopters might lead to low usage of publicly available charging stations (Chakraborty et al., 2019). As the EV market grows, there is a need to increase the availability of public charging stations.

Infrastructural factors have been reported to influence the adoption of EVs. A key element of infrastructure that has received the most attention in the literature is the availability of charging stations (Javid & Nejat, 2017). A study by Kim et al. (2017) found that “potential adopters of EVs in the United States are not confident that they will find charging stations for their EVs.” Kim et al. (2017) found this surprising, considering the increasing number of charging stations in the country. As a result, the authors concluded that potential adopters are either unaware of the availability of charging stations or they are still holding to the notion of driving range anxiety. Coffman et al. (2017) reached the same conclusion in their review, which found that few charging stations are the primary concern that potential adopters have with EVs. They further reported that “the availability of charging infrastructure had the greatest influence on the intent to adopt EVs.” Similarly, in the United States, Narassimhan and Johnson (2018) observed a positive relationship between an increase in charging infrastructure installations and purchases of EVs. Narassimhan and Johnson (2018) concluded that “investing in charging infrastructure, especially along highways, is a potentially effective strategy for encouraging the purchase of EVs.”

Sriram et al. (2022) conducted a quantitative survey to examine the determinants of EV adoption in India. The results of this study showed that the perceived lack of charging infrastructure was negatively associated with consumers’ intention to buy EVs. Similarly, in Thailand, a quantitative comparative survey by Wongsunopparat and Cherian (2023) identified proximity to a charging station and having a home charge positively influenced the intention to purchase EVs. In China,

Ling et al. (2021) presented evidence from a quantitative survey identifying “the availability of charging infrastructure as a significant determinant of EV purchase decisions.” The positive effect of infrastructure availability on EV adoption has also been demonstrated in Vietnam (Van Tuan et al., 2022), Bangladesh (Limon et al., 2023) and the United States (Brian, 2023).

In the Kenyan context, there is no adequate infrastructure for EVs. There are few charging stations (Dioha et al., 2022). As a result, it was expected that “infrastructural factors would have a negative effect on the adoption of EVs”. Okoh and Onuoha (2024) conducted a secondary study involving a review of policy documents to examine “the transition towards EVs in the sub-Saharan region and identified inadequate EV infrastructure as a key barrier to the adoption of these vehicles.”

## **2.4 Research Gaps**

Conceptual and contextual gaps have been identified in the literature with respect to the factors affecting the adoption of EVs. There are mixed findings and divergent views on the effects of technological, economic and infrastructural factors on the adoption of EVs; as a result, there is a lack of clarity regarding whether these factors are barriers or facilitators of EV adoption (Geny, 2021; Sanguesa et al., 2021). In addition, contextual gaps exist in the literature with respect to the factors that determine EV adoption in the developing world. While there are vast research studies on the factors influencing the adoption of EVs, there is scarce emphasis on EV adoption in the developing world despite the significant potential. Most studies have been conducted in developed markets where the rates of adoption are relatively higher compared to developing nations (Chen et al., 2020; Cui et al., 2021). Considering the different economic and cultural contexts, there is a need to assess the factors influencing EV adoption in developing markets like Kenya, where EV uptake is slowly taking form. Table 2.1 presents the summary of the existing literature on the topic and the existing gaps identified (See Appendix 1)

**Table 2. 1 Summary of Literature Reviewed**

Table 2.1 offers a summary of the literature reviewed in terms of researchers, year, theories used, variables measured, findings, and gaps identified in those studies.

Authors	Year	Country of study	Theories used	Research methodology used	Factors (independent variable)	How Adoption of EV was measured	Findings	Research Gaps
Sriram et al.	2022	India	TPB	Quantitative survey	“Financial barriers, vehicle performance factors, lack of charging infrastructure, social influence, awareness of EVs”	Consumers’ intention of buying EVs	“Financial barriers, vehicle performance factors, lack of charging infrastructure, social influence, awareness of EVs predicted adoption of EVs”	Scope and conceptual
Wongsun opparat and Cherian	2023	Thailand	Rational choice theory and choice behavior theory	Quantitative survey – comparative approach	Mileage, battery, charging station, maintenance. At home charger, government policy, promotion and brand	Consumer factor	All the factors except mileage, maintenance and promotion had a significant effect on consumer factor for adopting EVs	Scope, conceptual, and contextual
Ackaah et al.	2022	Ghana	Theory of Perceived Behavior	Quantitative survey	“Environment concern, consumer knowledge, attitudes, subjective norms, government policy, perceived behavioral control”	Purchase intention for EVs	All factors predicted purchase intention for EVs	Scope and conceptual
Shareeda et al.	2021	Bahrain	TPB	Mixed method – qualitative and quantitative	Awareness, driving range and purchasing power	Consumer’s willingness to purchase EVs	“Awareness and purchasing power had a significant effect on consumer’s willingness to purchase EVs while	Scope, methodological, and conceptual

Authors	Year	Country of study	Theories used	Research methodology used	Factors (independent variable)	How Adoption of EV was measured	Findings	Research Gaps
							purchasing power did not”	
Higuera-Castillo et al.	2023	Spain and India	UTAUT and Value Belief Norm Theory	Quantitative	“Performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, environmental concern, personal norm, awareness of consequences, ascription of responsibility, altruistic values, biospheric values and openness to change”	Intention to adopt EVs	“All factors had significant effects on the intention to purchase EVs”	Scope, conceptual, and contextual
Ling et al.	2021	China	TPB and rational choice theory	Quantitative	Demographic and household factors, social status, changing and technology needs, vehicle performance, charging, and technology, financial benefits and government policy, and environmental concerns	EV purchase decisions	Previous experience of EV was positively associated with purchase intention. Other significant factors included household income, gender, and drivers’ license ownership	Scope, conceptual, and contextual
Wahab and Jiang	2019	Ghana	TPB	Quantitative	Technical specifications (charging times, battery lifespan, performance), price perceptions, driving range, age, monthly income, age, gender, household size, operating cost	Willingness to adopt electric motor cycles	“Perception of the price of the electric motorcycle, government subsidies, performance of the electric motorcycle, high usage, and maximum distance has a substantial	Scope, conceptual, and contextual

Authors	Year	Country of study	Theories used	Research methodology used	Factors (independent variable)	How Adoption of EV was measured	Findings	Research Gaps
							impact on motorcyclists' willingness to adopt electric motorcycles"	
Limon et al.	2023	Bangladesh	TPB	Quantitative	"Performance and system, government and consumer, economic and service, social and environmental factors"	Driver of EV adoption	EV adoption is craven by fuel efficiency, policy measures to incentivize consumers, and no requirement for a charging station	Scope, conceptual, and contextual
Van Tuan et al.	2022	Vietnam	TPB and TRA	Quantitative	"Government support, performance, environmental concern, infrastructure attributes, price perception"	Purchase intention towards EVs	"Government support, price perception, environmental perception, infrastructure attributes and performance factors had a positive effect on subjective and attitude norms that positively impacted purchase intention"	Scope, conceptual, and contextual
Brian	2023	United States	None	Quantitative	infrastructure	Rate of EV adoption	Complementary infrastructure had a positive impact on rate of EV adoption	Scope, conceptual, and contextual
Higuera-Castillo et al.	2020	Spain	Innovation theory, rational choice theory, and TPB	Quantitative	"Demographic characteristics (income, gender and age), green moral obligation and EV attributes (driving range and price)"	Intention to adopt	"Driving range was the important factor influencing intention to adopt, followed by green moral obligation and price"	Scope, conceptual, and contextual

Authors	Year	Country of study	Theories used	Research methodology used	Factors (independent variable)	How Adoption of EV was measured	Findings	Research Gaps
Ostorp	2022	Norway and Italy	TPB	Quantitative	“Attitudes, subjective norms and perceived behavioral control and personal moral norms”	Intention to adopt	“The results revealed significant differences between the determinants of intention to adopt between Norwegians and Italians, underscoring the importance of context in EV intention to adopt”	Scope, conceptual, and contextual
Kim and Heo	2019	Korea	None	Quantitative	Technology-push factors (range, diversity and price) and demand-pull factors (fuel-cost saving, charging infrastructure, tax reduction and purchase subsidy and income).	Intention to switch from ICE to EVs, and annual sales of EVs	Driving range was the most important factor. All the factors had a significant effect on the intention to switch from ICE to EVs	Scope, conceptual, and contextual
Oleksy	2016	Norway	Diffusion of Innovation Theory	Quantitative	Gender, employment status, household size, age, education, living size area, ability to take advantage of incentives, environmentalism, income, a person’s interest in new technology, popularity of EV and relative advantage of EV	Intention to purchase EV	Environmental friendliness of EVs was a more important factor influencing the purchase decision. Early adopters are not concerned with the relative advantage of EVs. The purchase decision varies across people with different socio-demographic characteristics	Scope, conceptual, and contextual
Abu-Alkeir et al.	2020	Amman	TAM	Quantitative	Price, manufacturer’s reputation, fuel economy, brand image, safety rating	Purchase decision	Manufacturer reputation, price, fuel economy had a positive effect on purchase intention while	Scope, conceptual, and contextual

Authors	Year	Country of study	Theories used	Research methodology used	Factors (independent variable)	How Adoption of EV was measured	Findings	Research Gaps
							safety rating and brand image had a negative effect	
Geny	2020	Sweden	Diffusion of Innovation Theory and TPB	Quantitative	“Socio-demographics, technical factors, economic factors and behavioral factors”	EV adoption interest	Psychological, situational and socio-demographic factors influenced EV adoption interest	Scope, conceptual, and contextual
Ali and Naushad		India	TPB	Quantitative	“Financial incentive, charging infrastructure, social reinforcement, environmental concern, price”	Intent to adopt EV	“Price was the most important factor when making a decision to purchase EVs. Other factors had an insignificant effect on EV purchase intention”	Scope, conceptual, and contextual
Mpoi et al.	2023	Greece	TPB and UTAUT	Quantitative	“Purchase cost, operating and maintenance cost, engine performance, charging time, environmental impact, driving range and intelligent transport systems”	Intention to purchase EV	Charging infrastructure, environmental awareness, charging time and financial incentives significantly influenced the intention to purchase EVs	Scope and conceptual
Saputra and Andajani	2024	Indonesia	TPB	Quantitative	“Attitude, subjective norm, perceived behavioral norms, environmental concerns, financial incentive policy and perceived risk”	Intention to purchase EV	Subjective norms and attitudes did not have a significant influence on the intention to adopt EVs. Perceived behavioral controls, financial incentives, environmental concerns and moral norms had a positive impact on the	Scope and conceptual

Authors	Year	Country of study	Theories used	Research methodology used	Factors (independent variable)	How Adoption of EV was measured	Findings	Research Gaps
							intentions to adopt EVs. Perceived risks had a negative effect on adoption of EV	
Manutworakit and Choocharukul	2022	Thailand	UTAUT	Quantitative	“Performance expectancy, effort expectancy, social influence, facilitating condition, hedonic motivation, price value, environmental concern and policy measures”	Purchase intention for EVs	“Environmental concern, hedonic motivation, social influence, effort expectancy, and performance expectancy had a significant positive effect on purchase intention. Policy and price did not influence purchase intention”	Scope and conceptual
Abbasi et al.	2021	Malaysia	UTAUT	Quantitative	“Performance expectancy, effort expectancy, social influence, technophilia and perceived environmental knowledge”	Purchase intention for EVs	“Environmental knowledge, technophilia, social influence and effort expectancy had a positive impact on purchase intention”	Scope and conceptual
ÖZ	2017	Netherlands	UTAUT, TPB and TRA	Quantitative	Ecological factors, monetary factors, car-technology factors, geodemographic factors, socio-cultural factors, car dealer factors, after-sale actors, and political factors	Purchase intention for EVs	Technologic factors were found to be significant determinants of purchase intention for EVs. EV purchase behavior was also influenced by socio-cultural factors (like technology enthusiasm and environmental awareness) and monetary	Scope and conceptual

Authors	Year	Country of study	Theories used	Research methodology used	Factors (independent variable)	How Adoption of EV was measured	Findings	Research Gaps
							factors (such as initial price)	
Hamed	2022	Egypt	TPB and Rational Choice Theory	Quantitative	“Attitude, subjective norms, perceived behavioral control, environmental knowledge, government support and policies”	Purchase intention for EVs	“Government support and policies were the most important factor for explaining purchase intention, followed by attitudes and perceived behavioral control”	Scope and conceptual
Barisa	2022	Sweden	None	Quantitative	Fuel taxes, education, average distance travelled, and education	Purchase intention for EVs	Fuel taxes and average distance travelled were significant predictors of the purchase intention for EVs	Scope and conceptual
Khazaei	2019	Malaysia	UTAUT and Diffusion of Innovation Theory	Quantitative	Facilitating conditions, social influence, perceived enjoyment, range anxiety and environmental concern	Intention to use EVs	“All the factors had a significant effect on the intention to use EVs in the future”	Scope and conceptual
Anastasia dou and Gavanas	2022	Greece	Diffusion of Innovation Theory	Quantitative	Political, environmental, technological, legal, and socio-demographic factors	Intention to purchase EVs	All the determinants were significant in influencing purchase intention	Scope and conceptual
Lee et al.	2021	Pakistan	TAM, TPB and TRA	Quantitative	“Performance expectancy, effort expectancy, facilitating conditions, social influence and environmental conditions”	Use intention for EVs	“Effort expectancy, perceived ease of use and environmental concerns positively influenced the intention to use EVs”	Scope and conceptual
Yeğın and Ikram	2022	Turkey	TPB	Quantitative	“Attitude, subjective norm, perceived behavioral control, and green trust”	Purchase intention for EV	“Attitude, subjective norm, perceived behavioral control, and	Scope and conceptual

Authors	Year	Country of study	Theories used	Research methodology used	Factors (independent variable)	How Adoption of EV was measured	Findings	Research Gaps
							green trust had a positive correlation with EV purchase intention”	

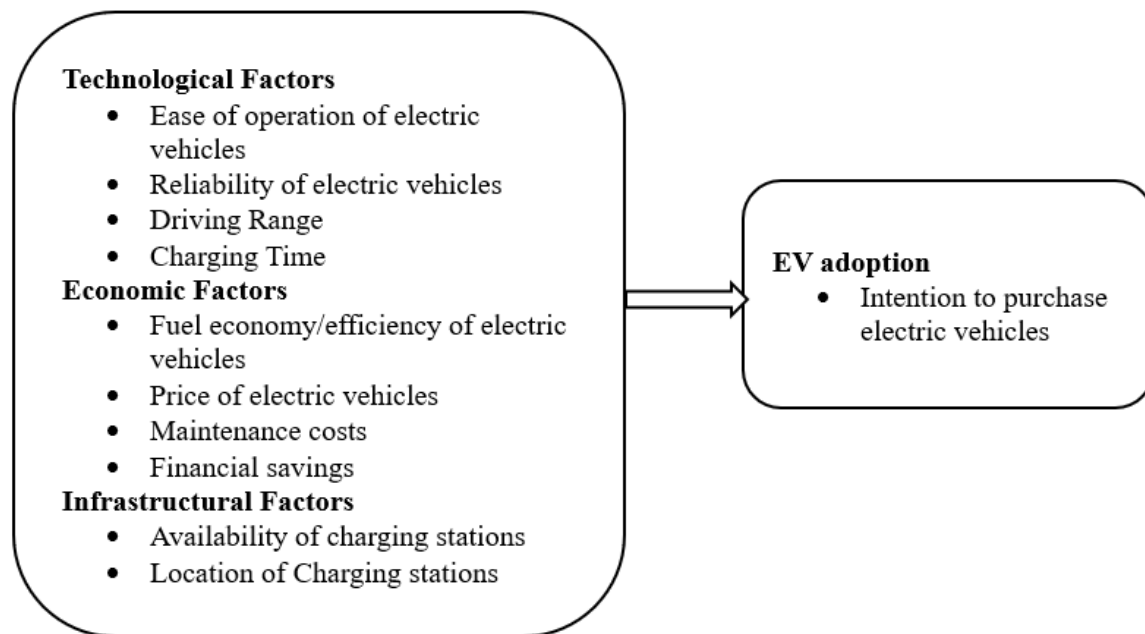
Source: (Author, 2024)



## 2.5 Conceptual Framework

The independent variables in this study are technological factors, economic factors, personal characteristics, and infrastructure. Technological factors have been operationalized using four constructs, including ease of operation, reliability, driving range, and charging time. Economic factors was measured using five constructs: fuel economy, purchase price, operational costs, maintenance costs, and overall financial savings. Infrastructure was measured using the availability of charging stations. The dependent variable is the intent to purchase EVs in the future. The conceptual framework is depicted in Figure 2.1.

**Figure 2. 1 Conceptual framework**



**Source: (Author, 2024)**

## 2.6 Operationalization of Study Variables

Table 2.1 shows the operationalization of the indicators for the variables.

Table 2.1 Operationalization of variables

Variable	Specific variable name	Variable type	Measurement	Literature source
<b>Dependent Variable</b>				
EV adoption	Intention to Purchase EV	Ordinal	Five-point Likert scale	(Mpoi et al., 2023)
<b>Independent Variables</b>				
Technological Factors	<ul style="list-style-type: none"> <li>• Ease of Operation</li> <li>• Reliability</li> <li>• Driving range</li> <li>• Charging time</li> </ul>	Ordinal	Five-point Likert scale	(Ackaah et al., 2022; Shareeda et al., 2021; Higuera-Castillo et al., 2023; Ling et al., 2021)
Economic Factors	<ul style="list-style-type: none"> <li>• Fuel economy</li> <li>• Price</li> <li>• Maintenance cost</li> <li>• Financial savings</li> </ul>	Ordinal	Five-point Likert scale	(Wahab & Jiang, 2019; Limon et al., 2023; Van Tuan et al., 2022; Kim & Heo, 2019)
Infrastructural factors	<ul style="list-style-type: none"> <li>• Charging stations availability</li> <li>• Location of charging stations</li> </ul>	Ordinal	Five-point Likert scale	(Geny, 2020; Mpoi et al., 2023)

Source: (Author, 2024)

## 2.7 Chapter Summary

This chapter has reviewed theoretical and empirical literature. The research gaps have also been identified. Lastly, the conceptual framework has been presented.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter is organized as follows: section 3.2 discusses the research philosophy, section 3.3 discusses the research design, section 3.4 describes the population and sampling, section 3.5 discusses sample design and technique, section 3.6 describes the data collection methods, section 3.7 outlines the data collection procedures, section 3.8 describes the research quality, section 3.9 discusses data analysis and section 3.10 describes ethical considerations.

#### 3.2 Research Philosophy

Saunders and Lewis (2017) defined research philosophy as “the set of assumptions and beliefs that the study draws upon.” The adopted research philosophy influences how the entire methodology is framed, including how data is collected and analyzed. The philosophical bases for research can be positivism, interpretivism, realism and pragmatism. In this research, positivism was adopted because it was aligned with the objectives of this research. Positivism is grounded on the assumption it is possible to objectively measure and observe social reality. As a result, researchers are expected to demonstrate neutrality and objectivity. Furthermore, positivism entails using structured quantitative methods in order to produce findings that can be generalized to the wider context of the research. Positivism was also suited for research that sought to predict and explain a phenomenon (Creswell, 2021).

The attributes of positivism are consistent with the nature of this research. For instance, the goal of this research was to explain EV adoption using technological, economic, personal, and infrastructural factors. Also, the researcher intends to come up with findings that can be generalized to the wider Kenyan context. Interpretivism, realism and pragmatism were deemed unsuitable to guide this research. Interpretivism was disregarded on the grounds that it does not allow for objective research that can produce generalizable results; rather, it calls for subjective, in-depth investigations. While realism allows for objective research, it requires researchers to consider the historical contexts and trends when interpreting findings, which was not an important consideration in this research. Lastly, pragmatism was considered unsuitable for this research

because it calls for action research, which is neither appropriate nor practical for this research's topic.

### **3.3 Research Design**

According to Saunders and Lewis (2017), “the research design is the plan for answering the research question.” The research design details the overall plan for collecting and analyzing data, which is based on a number of aspects, including “the purpose of the research, data collection method, manipulation of variables, time dimension of the research, scope/breadth of the study, and the unit of analysis” (Creswell, 2021). The descriptive cross-sectional survey was used in the study. “This design is used to describe a phenomenon of interest in a given population” (Creswell, 2021). The descriptive design describes the study variables in order to make objective conclusions that can be applied to the study population. The use of the survey helped explore the characteristics of the population using a sample by administering questionnaires. In this study, the descriptive design was used to examine the relationship between EV adoption and three factors – technological, economic, and infrastructural factors. This design has been employed in other similar research studies (Mpoi et al., 2023; Oleksy, 2016)

### **3.4 Population of the Study**

Saunders and Lewis (2017) defined research population as the collection of cases (people or objects) from which a sample is obtained. For this research, the population consisted of vehicle owners and drivers. It is important to note that drivers and owners of conventional vehicles are mutually exclusive groups. In Kenya, there are an estimated five million registered drivers (World Bank, 2021).

### **3.5 Sample Design and Technique**

Purposive sampling was used to access respondents from the study population for this research. In purposive sampling, the researcher chooses respondents who meet the criteria needed to answer the research objectives (Creswell, 2021). This means that only vehicle owners and drivers were sampled in this research. An advantage of purposive sampling is that the sample is uniquely tailored to meet the research objectives, leading to an accurate and representative sample (Creswell, 2021).

The sample size needed for this research was based on Yamane’s formula:

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

Where N represents the population and e represents the sampling error. Using a population of 5 million and a sampling error of 5%, as recommended by Dawson (2019), the sample size was:

$$= \frac{5,000,000}{1+5,000,000(0.05)^2}$$

$$= 399.99 \approx 400$$

The study targeted all the seventeen sub-counties, with the exception of Kibra, Kamukunji, and Mathare which are known to have car owners/drivers as a negligible proportion of the entire population. Sample selection was distributed equally for the select sub-counties with the exception of Starehe and Roysambu which were adjusted slightly in order to achieve the 400 required sample size, as illustrated in Table 3.1.

**Table 3. 1: Sample Size**

Sub-County	Research Site	Sample size
Dagoretti	The Junction Mall	30
Embakasi East	Mihango	30
Kasarani	Kamulu Shopping Centre	30
Roysambu	Thika Road Mall	35
Embakasi West	Greenspan Shopping Mall	30
Ruaka	Rosslyn Riviera Mall	30
Lang’ata	The Hub Karen	30
Makadara	The Point Mall, Buruburu	30
Njiru	Njiru Shopping Centre	30
Starehe	Central Business District	35
Westlands	Sarit Centre	30
Embakasi Central	Shujaa Mall	30
Embakasi South	Southfield Mall	30
<b>Total</b>		<b>400</b>

### 3.6 Data Collection Methods

Primary data was gathered using a structured questionnaire, which comprised standardized questions with fixed (closed-ended) responses. Questionnaires were appropriate for this research

because they can be administered easily, are economical, and are effective when collecting data from a large sample (Creswell & Creswell, 2017). Questionnaires can also ensure the anonymity of respondents, which is crucial in enhancing their honesty.

The questionnaires were physically distributed to respondents using the street intercept method. Physical distribution of questionnaires was performed at strategic and centralized areas (malls and shopping centers) with public parking lots of the sub-counties, as demonstrated in Table 3.1. Trained research assistants were used for feasibility reasons and to increase the chances of meeting the target sample size. The research assistants were stationed at the designated research sites of each sub county. They approached car owners/drivers at those parking lots, introduced themselves, described the study and its purpose, and requested their participation. Consenting respondents were given the questionnaire to fill out.

The questionnaire was designed to collect information on respondents' demographics, technological factors, economic factors, infrastructural factors, and intention to purchase/adopt EVs (Appendix 2). Demographic information in the questionnaire included age, gender, and driving experience. Technological factors comprised four items (ease of operation, reliability, driving range, charging time) on a five-point Likert scale to assess the level of agreement from strongly disagree to strongly agree. Likewise, economic factors comprised four items (fuel economy, price, maintenance cost, and financial savings) on a five-point Likert scale; infrastructural factors were assessed using two questions focusing on availability and location of charging stations. EV adoption was measured using a single item based on the intent to buy an EV in the future.

### **3.7 Research Quality**

This section presented the steps that were taken to ensure the validity and reliability of the study.

#### **3.7.1 Validity**

Internal validity is defined as “the extent to which the findings of the study reflect the population, which is determined by how well the research was conducted” (Creswell & Creswell, 2017). In this research, the questionnaire was developed under the guidance of a supervisor at Strathmore University, which enhanced the content validity of the questionnaire. It was also developed using

constructs derived from empirical literature and theory, which ensured construct validity. Additionally, a sample questionnaire was given to a pilot sample of 40 vehicle owners and drivers selected from the researcher's contacts to evaluate its clarity and relevance and was amended based on the feedback from the survey (Dawson, 2019). Creswell (2021) recommended 10% of the final sample for a pilot survey.

### **3.7.2 Reliability**

Reliability denotes the extent to which research methods yield consistent and stable findings (Creswell & Creswell, 2017). Reliability can be improved by calculating the internal consistency of the research instrument after collecting data and making adjustments by eliminating items depending on their effect on the overall reliability. According to Creswell (2021), "a Cronbach's alpha of at least 0.7 is considered acceptable, and a cutoff of 0.06 is recommended." Additionally, using clear and simple wording in questions can minimize confusion among respondents, which can, in turn, improve reliability.

### **3.8 Data Analysis**

Quantitative data analysis was performed using Statistical Package for Social Sciences (SPSS). Descriptive and inferential statistics were used. Descriptive summaries of variables were presented using means and standard deviation (Creswell, 2021). To examine the association between variables, inferential statistics, especially the linear regression model, were applied with EV adoption intent as the dependent variable and technological, economic, and infrastructural factors as the independent variables.

Regression diagnostics was used to evaluate if the data collected meets the assumptions needed to perform a multiple linear regression. These diagnostics include linear relationships between the dependent and independent variables, homoscedasticity (the variance of residual is equal for any value of the independent variable; independence of observations, and normality of distributions (Chatterjee & Simonoff, 2013). The remedy for violations of linearity is applying a non-linear transformation to the dependent and independent variables. Violation of independence can be remedied by adding lags of the dependent and independent variables. Homoscedasticity violations can be remedied by a log transformation of the dependent variables. Normality violations can be remedied by non-linear transformation of variables (Chatterjee & Simonoff, 2013).

Figures and tables were used to visually present the findings. The following regression equation model was applied to predict EV adoption using the independent variables.

$$EVA = \beta_0 + \beta_1TF + \beta_2EF + \beta_3IF + \epsilon$$

Where;

EVA = EV adoption intent

TF = Technological Factors

EF = Economic Factors

IF = Infrastructural Factors

$\epsilon$  = Error function

### 3.9 Ethical Considerations

First, approval from Strathmore University Ethical Review Committee (SU-ERC) and the National Commission for Science, Technology, and Innovation (NACOSTI) was obtained prior to collecting data. Another important ethical issue that was addressed in this research is informed consent, meaning respondents participated in the research voluntarily after being provided with adequate information regarding what it entailed to participate. Respondents provided consent before participating (Creswell, 2021). When administering questionnaires, potential respondents were informed of the purpose of the research as well as the nature of their participation. Another key ethical issue is the confidentiality and privacy of respondents. Confidentiality means that the identity of participants, their personal data and responses is not revealed to others under any circumstance (Creswell, 2021). The data collected in this research was kept securely in a password-locked computer that was only accessible by the researcher. To protect respondents' privacy, information that could potentially reveal respondents' identity, such as names, addresses and contacts, was not collected in the survey. Furthermore, the findings of the study were disseminated to relevant stakeholders, practitioners and scholars.

### 3.10 Chapter Summary

This chapter has discussed the research methodology that were adopted for the research. The elements discussed in this chapter are research philosophy, design, population, sample design and

technique, data collection methods, data collection procedures, research quality, data analysis, and ethical considerations.



## CHAPTER FOUR

### PRESENTATION OF FINDINGS

#### 4.1 Introduction

The goal of the study was to determine factors influencing the adoption of EVs in Nairobi City County. Following a rigorous process of data collection and analysis, this chapter focuses on the most important part of the study – the presentation of findings. The results are presented in a systematic manner using tables and figures. The chapter begins by outlining the response rate and delves into respondents’ demographic information, descriptive statistics, and inferential statistics.

#### 4.2 Response Rate

The survey targeted a cohort of 400 registered drivers and car owners in Nairobi City County who were furnished with questionnaires to complete. Out of the targeted respondents, 367 participated in the survey. After a thorough cleaning process, 63 questionnaires were excluded from analysis due to errors and noncompletion. This means that 304 respondents participated in the study in its entirety, translating to a 76% response rate, as illustrated in Table 4.1.

**Table 4. 1 Response Rate**

Category	Frequency	Percentage
Responded	304	76.0%
Non-response	96	24.0%
<b>Total</b>	<b>400</b>	<b>100.0%</b>

Source: (Author, 2024)

#### 4.3 Demographic Information

Respondents’ demographic data was collected and analyzed. As illustrated in Table 4.2, most respondents were aged 26-35 years (34.5%), male (59.9%), had 6-10 years of driving experience (40.8%), and were college graduates (39.8%).

**Table 4. 2 Demographic Information (n=304)**

Characteristics	Distribution	Frequency	Percentage
Indicate your age	18-25 years	58	19.1%
	26-35 years	105	34.5%
	36-45 years	68	22.4%
	46-55 years	39	12.8%
	56-65 years	24	7.9%
	>65 years	10	3.3%
Indicate your gender	Male	182	59.9%
	Female	122	40.1%
Indicate your driving experience	<5 years	75	24.7%
	6-10 years	124	40.8%
	11-15 years	57	18.8%
	16-20 years	30	9.9%
	>20 years	18	5.9%
Indicate your level of education	Primary school	27	8.9%
	Secondary school	47	15.5%
	College	121	39.8%
	University	65	21.4%
	Masters	32	10.5%
	PhD	12	3.9%

**Source: (Author, 2024)**

Demographic data presented above indicate that, in general, all the age groups were represented with almost an equal gender representation observed. They also had sufficient driving experience, with only 24.7% having driven or owned a car for less than five years. Additionally, all the participants had educational qualifications to participate in the study and provide quality and valuable data about the topic under investigation. Essentially, there was a significant level of diversity in respondents' demographic profile. Having a participant group of various background is associated with numerous benefits: increased generalizability, comprehensive insights as a result of varied perspectives and experiences, and enhanced validity.

## 4.4 Descriptive Statistics

Descriptive statistics – measures of central tendency, measures of distribution, and measures of frequency – were employed and used to summarize, organize, and describe the main attributes of the dataset.

### 4.4.1 Technological Factors

The study aimed to gather data on technological factors influencing the adoption of EVs in Nairobi City County. Respondents rated the degree to which they agreed with the statements regarding technological factors on a five-point Likert scale where 1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree. Table 4.3 shows the summary of the main characteristics of the responses.

**Table 4. 3 Technological Factors**

	<b>N</b>	<b>Mean</b>	<b>SD</b>
It is easy to operate/drive electric vehicles	304	3.1414	.9049
Electric vehicles are very reliable	304	3.0362	.9043
The driving range/distance for an electric vehicle is limited when fully charged	304	3.6184	.6328
Charging an electric vehicle takes a lot of time	304	3.6908	.8486
<b>Overall Mean</b>		3.3717	.8227

**Source: (Author, 2024)**

The analysis produced a composite mean of 3.3717 at a .8227 standard deviation for the technological factors' variable. This implies that, in general, respondents' views on technological factors influencing the adoption of EVs were neutral, however, the value indicates that respondents leaned more towards agreeing with the statement. A standard deviation of .8227 suggests a moderate spread or variability of responses around the mean value. The item, "Charging an electric vehicle takes a lot of time", had the highest mean of 3.6908 at a .8486 standard deviation, meaning respondents were neutral on the duration of charging EVs, but responses leaned more towards agreement. The item "Electric vehicles are very reliable" had the lowest mean of 3.0362 with

moderate variability of responses as indicated by a standard deviation of a .9043. This implies that, overall, respondents were neutral on the notion that EVs are very reliable.

#### 4.4.2 Economic Factors

The study aimed to collect data on economic factors influencing the adoption of EVs in Nairobi City County. Respondents were asked to indicate the degree to which they agreed with the statements regarding economic factors on a five-point Likert scale. Table 4.4 shows the summary of the main characteristics of the responses.

**Table 4. 4 Economic Factors**

	<b>N</b>	<b>Mean</b>	<b>SD</b>
Electric vehicles are more efficient than gasoline vehicles	304	3.8487	.7002
The price of electric vehicles is very high	304	3.8651	.6676
The cost of maintaining an electric vehicle is low	304	2.3750	.8722
By driving an electric vehicle, I could save a lot of money	304	3.8125	.8036
<b>Overall Mean</b>		3.4753	.7609

**Source: (Author, 2024)**

The analysis revealed an overall mean of 3.4753 at a .7609 standard deviation for economic factors. This means that, overall, respondents remained neutral on economic factors influencing the adoption of EVs. A standard deviation value of .7609 confirms a moderate spread of data points around the mean value. A similar trend was noted in most of the individual items. The item, “The price of electric vehicles is very high”, had the highest mean of 3.8651 at a .6676 standard deviation, meaning respondents were neutral on the affordability of EVs, but responses leaned more towards agreement. The item “The cost of maintaining an electric vehicle is low” had the lowest mean of 2.3750 at a .8722 standard deviation, implying that, overall, respondents were in disagreement about the idea that the cost of maintaining EVs was low.

### 4.4.3 Infrastructural Factors

The study aimed to gather data on infrastructural factors influencing the adoption of EVs in Nairobi City County. Respondents rated the degree to which they agreed with the statements regarding infrastructural factors on a five-point Likert scale. Table 4.5 shows the summary of the main characteristics of the responses.

**Table 4. 5 Infrastructural Factors**

	<b>N</b>	<b>Mean</b>	<b>SD</b>
There are few charging stations for electric vehicles in Nairobi County.	304	3.9112	.8042
The charging stations for electric vehicles are located far from where I live	304	3.8520	.7171
<b>Overall Mean</b>		3.8816	.7607

**Source: (Author, 2024)**

The overall mean for infrastructural factors was 3.8816 at a .7607 standard deviation, implying that, overall, the views on infrastructural factors influencing the adoption of EVs were neutral with a positive level of agreeability among the respondents. Also, a .7607 standard deviation suggests that data points were moderately clustered around the mean. This was also shown in each of the items, “There are few charging stations for electric vehicles in Kenya” (M=3.9112, SD=.8042) and “The charging stations for electric vehicles are located far from where I live” (M=3.8520, SD=.7171). This means that responses leaned more towards agreement on there being few charging stations for EVs and these stations being located far from where respondents resided.

### 4.4.4 Adoption of EVs

The study aimed to collect data on the intention to adopt EVs in Nairobi City County. Respondents were asked to indicate the degree to which they agreed with the statements regarding the preference of EVs over traditional vehicles on a five-point Likert scale. Table 4.6 shows the summary of the main characteristics of the responses.

**Table 4. 6 Adoption of EVs**

	N	Mean	SD
I prefer an electric vehicle over traditional gasoline vehicles	304	4.2171	.6581

**Source: (Author, 2024)**

The analysis revealed a mean of 4.2171 at a .6581 standard deviation. This means that, overall, respondents were in agreement about preferring EVs over traditional internal combustion engine vehicles. A value of .6581 for standard deviation revealed a low variability of responses, meaning responses were clustered around the mean value. This also signified a high degree of consistency among the responses, further confirming that respondents shared the same views on the preference for EVs over ICE alternatives. The greater preference for EVs indicated an intention among the respondents to adopt them.

#### 4.5 Inferential Statistics

After summarizing and understanding the main attributes of the dataset, the study conducted inferential statistics to make inferences and draw conclusions about the target population based on the sample data. Specifically, correlational and regression analyses were performed.

##### 4.5.1 Normality Test

The initial step of the inferential statistics involved computing correlational analysis. Prior to this, a normality test was carried out to decide between parametric or nonparametric tests for correlation analysis. Given the sample size, the Kolmogorov-Smirnov (K-S) test was used. Findings, as shown in Table 4.7, confirm that all the constructs are not normally distributed ( $p < .05$ ).

**Table 4. 7 One-Sample Kolmogorov-Smirnov Test**

	N	Mean	Std. Deviation	Skewness	Kurtosis	K-S	Asmp. Sig.
Technological factors	304	3.3717	.56689	-.676	-.219	.191	.000
Economic factors	304	3.4753	.56160	-.291	.237	.129	.000
Infrastructural factors	304	3.8816	.60590	-.702	-.065	.235	.000
Adoption of EVs	304	4.2171	.65921	-.265	-.749	.280	.000

**Source: (Author, 2024)**

Further analysis revealed negative skewness values for all the constructs, further confirming that distribution was skewed towards the right (or had longer left tail). Additionally, high kurtosis values for the technological factors (-.219), economic factors (-.237), and EV adoption (-.749) variables suggest peaked distribution with heavy tails. Consequently, nonparametric tests were employed.

#### 4.5.2 Correlation Analysis

The study carried out a Spearman’s rank correlation analysis, a nonparametric test, to determine how each independent variable (i.e., technological factors, economic factors, and infrastructural factors) correlates with the dependent variable (i.e., adoption of EVs). Findings were published in Table 4.8.

**Table 4. 8 Correlation Analysis**

			Technological factors	Economic factors	Infrastructural factors
Spearman's rho	Adoption of EVs	Correlation Coefficients	.500**	.600**	.869**
		Sig. (2-tailed)	.000	.000	.000
		N	304	304	304

\*\* . Correlation is significant at the 0.01 level (2-tailed)

**Source: (Author, 2024)**

Results from correlational analysis, as presented above, indicate a moderate, significant positive correlation between technological factors and the adoption of EVs in Nairobi City County ( $r=.500$ ,  $p<.05$ ). The statistical relationship between the two variables suggests that improvements in EV technology tend to result in an increase in the adoption of EVs. In other words, as technology improves, more people are likely to choose EVs.

Findings also indicate a strong, significant positive correlation was observed between economic factors and EV adoption in Nairobi City County, as proven by ( $r=.600$ ,  $p<.05$ ). The positive statistical correlation suggests that an improvement in economic factors would lead to an increase in the adoption of EVs. Put simply, as economic conditions become more favorable, more people will opt for EVs.

Lastly, a very strong, significant positive correlation was observed between infrastructural factors and EV adoption in Nairobi City County, as proven by ( $r=.800, p<.05$ ). The statistical association means that an improvement in infrastructural landscape tends to lead to an increase in the adoption of EVs.

### 4.5.3 Diagnostic Tests

Before conducting regression analysis, diagnostic tests were performed to assess the validity of the regression model. The tests aimed to verify whether the underlying assumptions for regression analysis were satisfied. Specifically, the diagnostic tests performed include autocorrelation and multicollinearity.

#### 4.5.3.1 Test for Autocorrelation

The assumption of the regression model posits that the error terms (residuals) in a regression model are independent. A Durbin-Watson (DW) test was performed to detect autocorrelation in the residuals. The DW statistic ranges from 0 to 4; values from 0-2 denote a positive autocorrelation, 2 indicates zero autocorrelation, and 2-4 denotes a negative autocorrelation. However, according to Bollen et al. (2016), a value between 1.5 and 2.5 suggests autocorrelation is likely not a cause for concern.

**Table 4. 9 Test for Autocorrelation**

U	2.023
p-value	0.000
Alpha	.05

**Source: (Author, 2024)**

The DW value of 2.023, as shown above, falls within the acceptable range of 1.5-2.5, indicating that autocorrelation is not a likely concern. There, this assumption was not violated.

#### 4.5.3.2 Test for Multicollinearity

Multicollinearity occurs when two or more independent/predictor variables are highly correlated with each other. This can cause problems during model fitting in regression analysis. The variance inflation factor (VIF) test was conducted to detect if one or more of the predictor variables were highly correlated. Results are presented in Table 4.10.

**Table 4. 10 Test for Multicollinearity**

Model	Collinearity Statistics	
	Tolerance	VIF
1 (Constance)		
Technological factors	.535	1.868
Economic factors	.632	1.582
Infrastructural factors	.432	2.312

a. Dependent Variable: Adoption of EVs

**Source: (Author, 2024)**

According to Sarstedt et al. (2019), VIF assess strength of correlation between predictor variables. Usually, high VIF values indicate strong multicollinearity. As Sarstedt et al. (2019) further explain, a VIF of 1 denotes no multicollinearity whereas a VIF above 5 is considered problematic. Therefore, as shown in Table 4.10, multicollinearity was not a concern.

#### 4.5.4 Regression Analysis

After confirming that the underlying assumptions of the regression model were satisfied, a linear regression analysis was performed to determine the relationship between each independent variable (i.e., technological factors, economic factors, and infrastructural factors) and the outcome variable (i.e., EV adoption).

##### 4.5.4.1 Technological Factors and EV Adoption

The first objective of the study was to determine the effect of technological factors on the adoption of EVs in Nairobi City County. The study computed regression analysis to assess the relationship between the two variables. First, a model summary was produced to gain insights into the fitted regression model. Results are presented in Table 4.11.

**Table 4. 11 Model Summary: Technological factors and EV adoption**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.580 <sup>a</sup>	.337	.335	.53771

a. Predictors: (Constant), Technological factors

**Source: (Author, 2024)**

The results revealed that the predictor variable, technological factor, reflect positively on the dependent variable, EV adoption, as indicated by  $R=.580$ , “which indicates the direction and strength of the relationship between the variables” (Anderson, 2022). The coefficient of determination value,  $R\text{ Square}=.337$ , suggests that the regression model explains 33.7% of the variance in the dependent variable. This implies that technological factors explain up to 33.7% of the variability in the adoption of EVs in Nairobi City County. Even when adjusted to the number of predictors (Adjusted R Square), which in this case is one, technological factors still account for 33.5% of EV adoption with a standard error of estimate value of .53771 suggesting that the model if a good fit.

Besides the model summary, the study conducted the analysis of variance (ANOVA) to assess the overall statistical significance of the regression model. Results are shown in Table 4.13.

**Table 4. 12 ANOVA: Technological factors and EV adoption**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	44.353	1	44.353	153.401	.000 <sup>b</sup>
	Residual	87.318	302	.289		
	Total	131.671	303			

a. Dependent Variable: EV adoption

b. Predictors: (Constant), technological factors

**Source: (Author, 2024)**

From the findings shown in Table 4.12, it is clear that the variation explained by the model is statistically significant, as denoted by ( $F(1,302) = 153.401, P=.000$ ). The results of the F-test confirm that the overall regression model is statistically significant. In other words, the model in its entirety is a good fit for the data and has a predictor power. Therefore, the study concluded that technological factors are reliable predictors of EV adoption in Nairobi City County.

Furthermore, a regression coefficient was calculated to predict the value of the dependent variable based on the value of the independent value. Findings were published in Table 4.13.

**Table 4. 13 Coefficients: Technological factors and EV adoption**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.942	.186		10.421	.000
	Technological factors	.675	.054	.580	12.386	.000

a. Dependent Variable: EV adoption

Source: (Author, 2024)

The study found that the technological factors variable has a significant positive effect on EV adoption as denoted by (B=.675, p=.000). The results suggest that a unit improvement in technological factors would result in an increase in the adoption of EVs by 0.675 units.

#### 4.5.4.2 Economic Factors and EV Adoption

The second objective of the study was to determine the effect of economic factors on the adoption of EVs in Nairobi City County. The study conducted a regression analysis to assess the relationship between the two variables. A model summary was generated to gain insights into the fitted regression model. Results are presented in Table 4.14.

**Table 4. 14 Model Summary: Economic factors and EV adoption**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.636 <sup>a</sup>	.405	.403	.50938

a. Predictors: (Constant), Economic factors

Source: (Author, 2024)

The results revealed that the predictor variable, economic factors, reflect positively on the dependent variable, EV adoption, as indicated by R=.636. According to the coefficient of determination value, R Square=.405, the regression model explains 40.5% of the variance in the dependent variable. This implies that economic factors explain up to 40.5% of the variability in the adoption of EVs in Nairobi City County. Even when adjusted to the number of predictors (Adjusted R Square), economic factors still account for 40.3% of EV adoption with a standard error of estimate value of .50938 suggesting that the model is a good fit.

ANOVA was performed to assess the overall statistical significance of the regression model. Results are shown in Table 4.15.

**Table 4. 15 ANOVA: Economic factors and EV adoption**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	53.313	1	53.313	205.474	.000 <sup>b</sup>
	Residual	78.358	302	.259		
	Total	131.671	303			

a. Dependent Variable: EV adoption

b. Predictors: (Constant), Economic factors

**Source: (Author, 2024)**

From the findings shown in Table 4.15, it is clear that the variation explained by the model is statistically significant, as denoted by ( $F(1,302) = 205.474, P=.000$ ). The results of the F-test confirm that the overall regression model is statistically significant. In other words, the model in its entirety is a good fit for the data and has a predictor power. Therefore, the study concluded that economic factors are reliable predictors of EV adoption in Nairobi City County.

A regression coefficient was calculated to predict the value of the dependent variable based on the value of the independent value. Findings were published in Table 4.16.

**Table 4. 16 Coefficients: Economic factors and EV adoption**

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.621	.183		8.839	.000
	Economic factors	.747	.052	.636	14.334	.000

a. Dependent Variable: EV adoption

**Source: (Author, 2024)**

The study found that the economic factors variable has a significant positive effect on EV adoption as denoted by (B=.747, p=.000). The results suggest that a unit improvement in technological factors would result in an increase in the adoption of EVs by 0.747 units.

#### 4.5.4.3 Infrastructural Factors and EV Adoption

The third objective of the study was to determine the effect of infrastructural factors on the adoption of EVs in Nairobi City County. The study conducted a regression analysis to assess the relationship between the two variables. A model summary was generated to gain insights into the fitted regression model. Results are presented in Table 4.17.

**Table 4. 17 Model Summary: Infrastructural factors and EV adoption**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.837 <sup>a</sup>	.701	.700	.36116

a. Predictors: (Constant), Infrastructural factors

**Source: (Author, 2024)**

The results revealed that the predictor variable, infrastructural factors, reflect positively on the dependent variable, EV adoption, as indicated by R=.837. According to the coefficient of determination value, R Square=.701, the regression model explains 70.1% of the variance in the dependent variable. This implies that infrastructural factors explain up to 70.1% of the variability in the adoption of EVs in Nairobi City County. Even when adjusted to the number of predictors (Adjusted R Square), infrastructural factors still account for 70.0% of EV adoption with a standard error of estimate value of .36116 suggesting that the model is a good fit.

ANOVA was carried out to assess the overall statistical significance of the regression model. Results are shown in Table 4.18.

**Table 4. 18 ANOVA: Economic factors and EV adoption**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	92.280	1	92.280	707.474	.000 <sup>b</sup>
	Residual	39.391	302	.130		

Total	131.671	303
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- a. Dependent Variable: EV adoption
- b. Predictors: (Constant), Infrastructural factors

Source: (Author, 2024)

From the findings shown in Table 4.18, it is clear that the variation explained by the model is statistically significant, as denoted by ( $F(1,302) = 707.474, P=.000$ ). The results of the F-test confirm that the overall regression model is statistically significant. In other words, the model in its entirety is a good fit for the data and has a predictor power. Therefore, the study concluded that infrastructural factors are reliable predictors of EV adoption in Nairobi City County.

A regression coefficient was calculated to predict the value of the dependent variable based on the value of the independent value. Findings were published in Table 4.16.

**Table 4. 19 Coefficients: Infrastructural factors and EV adoption**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	.682	.135		5.068	.000
Infrastructural factors	.911	.034	.837	26.598	.000

- a. Dependent Variable: EV adoption

Source: (Author, 2024)

The study found that the infrastructural factors variable has a significant positive effect on EV adoption as denoted by ( $B=.911, p=.000$ ). The results suggest that a unit improvement in technological factors would result in an increase in the adoption of EVs by 0.911 units.

#### 4.5.5 Multiple Regression Analysis

The main objective of the study was to examine the factors influencing the adoption of EVs in Nairobi City County. Therefore, multiple regression analysis was undertaken to determine the combined effect of the predictor variables (i.e., technological factors, economic factors, and infrastructural factors) on the outcome variable (i.e., EV adoption).

A model summary was produced to assess the extent to which the three independent variables explain the variance in the dependent variables. Results are presented in Table 4.20.

**Table 4. 20 Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.853 <sup>a</sup>	.728	.725	.34540

a. Predictors: (Constant), Technological factors, Economic factors, Infrastructural factors

**Source: (Author, 2024)**

The results revealed that the predictor variables – technological, economic, and infrastructural factors – reflect positively on the dependent variable, EV adoption, as indicated by  $R=.636$ . The coefficient of determination value,  $R\text{ Square}=.853$ , confirms that the regression model explains 72.8% of the variance in the dependent variable. This implies that the three sets of factors explain up to 72.8% of the variability in the adoption of EVs in Nairobi City County. Even when adjusted to the number of predictors (Adjusted R Square), in this case three, the factors still account for 72.5% of EV adoption with a standard error of estimate value of .34540 suggesting that the model is a good fit.

ANOVA was undertaken to assess the overall statistical significance of the regression model. Results are shown in Table 4.21.

**Table 4. 21 ANOVA**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	95.881	1	31.960	267.898	.000 <sup>b</sup>
	Residual	35.790	300	.119		
	Total	131.671	303			

a. Dependent Variable: EV adoption

b. Predictors: (Constant), Technological factors, Economic factors, Infrastructural factors

**Source: (Author, 2024)**

The findings, as shown in Table 4.21, confirm that it is clear that the variation explained by the model is statistically significant, as denoted by  $(F(1,300) = 267.898, P=.000)$ . The results of the

F-test confirm that the overall regression model is statistically significant. In other words, the model in its entirety is a good fit for the data and has a predictor power. Therefore, the study concluded that combined, technological, economic, and infrastructural factors are reliable predictors of EV adoption in Nairobi City County.

Regression coefficients were calculated to predict the values of the dependent variables based on the value of the independent value. Findings were published in Table 4.22.

**Table 4. 22 Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	.361	.146		2.467	.014
Technological factors	.004	.048	.003	.076	.939
Economic factors	.243	.044	.207	5.466	.000
Infrastructural factors	.773	.050	.710	15.520	.000

a. Dependent Variable: EV adoption

**Source: (Author, 2024)**

The beta coefficients and significance levels, as demonstrated above, indicate varying effects of the factors of EV adoption in Nairobi City County. For instance, the study found that technological factors do not have a significant effect on the adoption of EVs in Nairobi City County (B=.004,  $p=.939$ ). On the other hand, both economic factors (B=.243,  $p=.000$ ) and infrastructural factors (B=.243,  $p=.000$ ) have significant positive effects on the adoption of EVs in Nairobi City County.

Therefore, the final regression equation for the study is as follows:

$$EV\ adoption = .361 + .004TF + .243EF + .773IF + \epsilon$$

Where;

TF = Technological Factors

EF = Economic Factors

IF = Infrastructural Factors

$\epsilon$  = Error function

The results above suggest that with a one-unit increase in technological factors, economic factors, and technological factors, the adoption of EVs in Nairobi City County is expected to increase by 1.020 (.004 + .243 + .773) units. The constant term (or intercept) is .361, representing the expected EV adoption when all independent variables are zero.

#### **4.6 Chapter Summary**

The chapter has delved into the main part of the research – the presentation of findings. It highlights the study’s response rate and respondents’ demographic information. The chapter further outlines the descriptive and inferential findings of the study.



## CHAPTER FIVE

### SUMMARY, DISCUSSION, CONCLUSION, AND RECOMMENDATION

#### 5.1 Introduction

This chapter provides a detailed interpretation and discussion of the findings presented in the previous chapter, along with the overall conclusion of the study. This section also includes an overview of the study, its implications, and recommendations for further research.

#### 5.2 Summary of the Study

The goal of the study was to explore factors influencing the adoption of EVs in Nairobi City County. Specifically, the study examined technological, economic, and infrastructural factors and how they influence EV adoption. The study was grounded in the principles of UTAUT, which is the anchoring theory, and the theory of planned behavior, which is the supporting theory. The population of the study constituted registered drivers in Nairobi City County, from whom a cohort of 400 drivers across the county were targeted and surveyed using structured questionnaires.

A sufficient response rate was achieved from the targeted respondent. Most of them were 26-35, male, had 6-10 years driving experience, and were college graduates. Descriptive statistics indicate that respondents remained neutral on all the three factors – technological, economic, and infrastructural factors. This could suggest that, generally, respondents did not have strong opinions about the prevalence of these factors. However, it is worth pointing out that responses leaned more towards agreement for the infrastructural factors. Findings also indicate that respondents were in agreement with the adoption of EVs in Nairobi City County, suggesting acceptability of EVs.

The results of inferential statistics indicated that all the three variables have a positive effect on EV adoption. However, while the effect of economic factors and infrastructural factors were significant, technological factors did not have significant influence.

#### 5.3 Discussion of Findings

The discussion of the findings is presented according to the specific objectives of the research study.

### 5.3.1 Technological Factors and EV Adoption

The first objective of the study was to determine the effect of technological factors on the adoption of EVs in Nairobi City County. The interaction between these two variables was tested using inferential statistics. Findings from regression analysis indicate that technological factors have a significant positive effect on EV adoption in Nairobi City County. This means that the variations in technological advancements would lead to higher adoption rates of electric vehicles in Nairobi County. The study, therefore, rejected the null hypothesis. At the same time, the findings support the principles of UTAUT and the theory of planned behavior. In other words, improving the technological landscape would result in a noticeable behavioral intention towards purchasing electric vehicles among drivers in Nairobi City County.

In addition, the findings corroborate those of previous empirical literature (Fedeyi et al., 2022; Hull, 2024; Ali et al., 2020; Geny, 2021; Chen et al., 2020; Munguti & Opiyo, 2018; Kim & Heo, 2019). Several reasons could contribute to this significance. However, as Chen et al. (2020), Ali et al. (2020), and Geny (2021) point out, technological progress plays a pivotal role in shaping the future of EV adoption. In particular, enhancements in the following areas: the perceived ease of use, regenerative braking, smart navigation, reliability, performance, autonomous driving, safety, range, and so on, the intention to purchase EVs over traditional ICE vehicles would greatly improve. As Singh et al. (2020) put it more simply, the advancements in EVs' perceived value (innovative features), performance, and reduced anxiety (as a result of improved range and reliability) encourage more people to adopt EVs.

However, the findings are inconsistent with Toolib et al.'s (2022) study which observed that technological factors were not among the top four most important drivers of EV adoption. According to the study, the four consistent factors towards EV adoption from the extensive literature reviewed were environmental concerns, government policy, government incentives, and charging infrastructure. This study advances the argument that while technological factors matter, the influences of other factors, such as the aforementioned, are more profound. Another explanation is provided by Zaino et al. (2024) who cite that the EV technology is already mature, well-developed, and reliable. Therefore, it might not be distinguished as a critical factor in certain markets, especially the developed world.

### **5.3.2 Economic Factors and EV Adoption**

The second objective of the study was to examine the effect of economic factors on the adoption of EVs in Nairobi City County. Findings from inferential analysis indicated that economic factors have a significant positive effect on the adoption of EVs. Therefore, this research rejects the null hypothesis. This means that economic conditions reflect positively on the adoption of EVs in Nairobi. In other words, the more the economic conditions become favorable, the more intention there is among drivers to purchase EVs. In this context, the research supports the core principles of UTAUT and the theory of planned behavior in that, transforming economic determinants of EVs for the better, there would be a noticeable intention towards the adoption of EVs.

The findings are also consistent with those of previous research (Chen et al., 2020; Coffman et al., 2017; Malima & Moyo, 2023; Cui et al., 2021; Geny, 2021; Kumar & Alok, 2020; Dey et al., 2016; Ali et al., 2020; Kumar & Alok, 2020). Multiple researchers have put forth possible explanations for the observation. Key themes that stand out in rationalizing the significance of economic factors as a predictor of EV adoption revolve around affordability and the total cost of ownership (Cui et al., 2021; Coffman et al., 2017; Dey et al., 2016; Ali et al., 2020). Findings from this study's descriptive statistics indicate that respondents believe the prices of and cost of maintaining EVs are extremely high. Therefore, as Cui et al. (2021) and Ali et al. (2020) point out, addressing economic factors such as affordability and cost of ownership, coupled with increased supply (overall accessibility) would lead to more people choosing EVs.

However, the findings are in contrast with Dumortier et al. (2015) who holds the view that economic factors are a significant determinant of EV adoption. This is because the researchers observed that “when provided with information about long-term costs of ownership in terms of fuel versus charging, insurance, maintenance, etc., consumers did not significantly respond to the cost savings in their preference rankings of EVs.”

### **5.3.3 Infrastructural Factors and EV Adoption**

The third objective of the study was to evaluate the effect of infrastructural factors on the adoption of EVs in Nairobi City County. The results of inferential statistics indicate that infrastructural factors have a significant positive effect on the adoption of EVs in Nairobi City County. Therefore, the study rejects the null hypothesis. The findings highlight the critical role of infrastructure in

promoting the purchase and usage of EVs in Kenya. In other words, the advancement of e-mobility infrastructure would likely see a great improvement in the adoption of EVs. Therefore, this research supports UTAUT and the theory of planned behavior. These two theories allow us to view favorable infrastructural factors as facilitating conditions for the acceptance, purchase, and usage of EVs.

Furthermore, the findings also corroborate results of great deal of previous body of empirical literature (Chakraborty et al., 2019; Javid & Nejat, 2017; Kim et al., 2017; Coffman et al., 2017; Narassimhan & Johnson, 2018; Sriram et al., 2022; Wongsunopparat & Cherian, 2023; Ling et al., 2021; Van Tuan et al., 2022; Limon et al., 2023; Dioha et al., 2022). These studies demonstrate that the availability of charging networks is a significant predictor of EV adoption. As Van Tuan et al. (2022) and Sriram et al. (2022) explain, a well-developed network of quality and convenient charging stations reduces range anxiety, thereby encouraging the uptake of EVs. Not only that, but reliable electricity supply and efficient grid management are also essential in enhancing the intention to purchase EVs.

On the other hand, evidence from other studies, such as Brinkmann and Bhatiasevi (2021) are inconsistent with the results of this study. According to the researchers above, the insufficiency of charging infrastructure do not have a significant effect on the willingness to buy EVs. They explain that “EV customers often use home-charging (overnight) because of its convenience. Thus, the public charging infrastructure may have limited influence on purchasing intentions and therefore home charging is the preferred option for daily charging demands.”

#### **5.3.4 Combined Effect on EV Adoption**

The overall objective of the study was to explore factors influencing the adoption of EVs in Nairobi City County. Findings indicate that respondents expressed willingness to adopt EVs, but they also raised concerns about the technological, economic, and infrastructural aspects of the decision. Results of inferential statistics confirmed this to be true. Combined, technological, economic, and infrastructural factors account for 72.8% of EV adoption in Nairobi City County. However, whereas economic and infrastructural factors are significant predictors of EV adoption, technological factors are not. In other words, addressing economic and infrastructural factors would encourage the willingness the uptake of EVs. In light of the above, this research supports

UTAUT and the theory of planned behavior in that enhanced economic and infrastructural landscapes serve as facilitating conditions (UTAUT) for calculated decisions (reasoned action) to adopt EVs. The lack of significance of technological factors could be that technological factors do not reflect as strongly as the other two sets of factors on EV adoption. In other words, technological factors are overshadowed by economic and infrastructural factors as far as EV adoption is concerned.

## **5.4 Conclusion**

The study sought to determine the influences of technological, economic, and infrastructural factors on the implementation of EVs in Nairobi City County. Using a descriptive cross-sectional research design and UTAUT and theory of planned behavior as underpinning theories, this research underscores the importance of technological, economic, and infrastructural factors in driving the adoption of EVs in Nairobi.

### **5.4.1 Technological Factors and EV adoption**

The results of the regression analysis confirm that technological factor have a positive significant effect on EV adoption. This finding underscores the importance of technology and technology-related determinants in driving the willingness for the acceptance of EVs in Nairobi. This means that enhancing the county's technological landscape by continuously addressing technological limitations would significantly influence consumers' confidence and their willingness to purchase EVs. Therefore, this research concludes that technological factors are a significant determinant of EV adoption in Nairobi County.

### **5.4.2 Economic Factors and EV Adoption**

The study discovered that economic factors have a positive significant effect on EV adoption. It, therefore, highlights the profound impact of economic considerations on EV adoption in Nairobi. In particular, initial purchase price, maintenance cost, efficiency, and cost-savings are pivotal in swaying consumers towards purchasing EVs. In other words, the economic viability of buying, owning, and maintaining an EV can make a substantial difference in the adoption rates. Therefore, this research concludes that economic factors are a significant predictors of EV adoption in Nairobi County.

### **5.4.3 Infrastructural Factors and EV Adoption**

The study found a significant positive relationship between infrastructural determinants and EV adoption. In this regard, having sufficient infrastructure emerges as a cornerstone for the widespread adoption of EVs. In this case, the availability and accessibility of charging stations, both public and private, are essential to alleviate range anxiety and ensure convenient recharging options for users. In light of this, this research concludes that infrastructural factors are a significant predictors of EV adoption in Nairobi County.

## **5.5 Implications**

The policy, practical, and theoretical implications of this research are as follows:

### **5.5.1 Policy Implications**

The findings of this research have significant policy implications. EVs have been touted as a key solution to the challenges of climate change and global warming. Yet, the adoption of these vehicles in Kenya remains incredibly low. This has been attributed to insufficient government efforts aimed at promoting EV adoption. This research highlights areas that demand deliberate government actions to achieve a desirable level of EV adoption in Nairobi City County. The study recommends that the government establish clear guidelines and standards for promoting EV adoption. Developing an integrated policy and regulatory framework for economic, technological, and infrastructural dimensions of EV adoption would create certainty and confidence among stakeholders. Also, policies aimed at enhancing e-mobility infrastructure (charging networks and reliable electricity supply), affordability, accessibility, and performance would encourage more people to choose EVs.

### **5.5.2 Practical Implications**

The research also holds significant practical implications for the entire automotive industry, particularly for manufacturers, dealers, and other stakeholders involved in marketing and selling EVs in Kenya. It specifically identifies areas within the EV value chain that require attention to accelerate adoption in the local market. For instance, foreign producers such as Tesla, Rivian, BYD, Volvo, Mercedes, etc., should collaborate with local stakeholders to enhance the affordability and accessibility of these vehicles while also improving the charging infrastructure.

The likes of Tesla and BYD can extend their robust network of global charging systems in Kenya to promote the adoption of their EVs.

### **5.5.3 Theoretical Implications**

The study is also not without theoretical contributions. It sheds more light on the economics of and consumer behavior regarding EV adoption in Kenya. In particular, this research produces three themes related to EV adoption in Kenya – technological, economic, and infrastructural factors and how they interact with the adoption of EVs in Nairobi City County. More broadly, this research theorizes that the ease of operation, reliability, driving range, charging duration, affordability, efficiency, cost of ownership, and charging infrastructure influence the adoption of EVs.

### **5.6 Areas for Further Research**

The study paid attention to only three factors - technological, economic, and infrastructural factors – and their influence on the adoption of EVs. Although the three factors explain up to 72.8% of EV adoption, there is a need to explore other factors not examined in this study—for example, regulations, awareness and education, demographic factors, consumer preferences, and barriers. In addition, this research was geographically limited to Nairobi City County. The research area may not represent Kenya in its entirety because of the differences in the dynamics of economic, technological, and infrastructural factors. Therefore, future researchers are encouraged to conduct studies in other regions in Kenya or the country in its entirety.

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## APPENDICES

### Appendix 1: Letter of Introduction

This is an invitation to participate in a research study titled, “Factors influencing the adoption of electric vehicles in Nairobi County, Kenya.” Ashish Harishchandra Narandass, a student at Strathmore University, is the researcher. Your participation will provide useful information that can help to better understand the adoption of electric vehicles in Nairobi County. You can contact the research center at Strathmore Business School to clarify anything regarding the study

If you consent to take part in the research, you will complete a questionnaire for 10 minutes. Your choice to take part in the study is totally voluntary and you are free to stop participation at any time.



## Appendix 2: Ethical Approval



18<sup>th</sup> April 2024

Mr Narandass Ashish,  
ashish.narandass@strathmore.edu

Dear Mr Narandass,

**RE: Factors Influencing the Adoption of Electric Vehicles in Nairobi County, Kenya**

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** research proposal. Your application reference number is **SU-ISERC2083/24**. The approval period is from **18<sup>th</sup> April 2024 to 17<sup>th</sup> April 2025**.

This approval is subject to compliance with the following requirements:

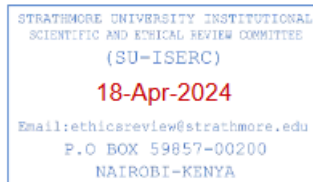
- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
- iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 72 hours of notification.
- iv. Any changes anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 72 hours.
- v. Clearance for the export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to the expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days of completion of the study to SU-ISERC.

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke/> and obtain other clearances needed.

Yours sincerely,


A handwritten signature in blue ink, appearing to read "Ambrose Rachier".

**Mr Ambrose Rachier,**  
**Chairperson; SU-ISERC**




**Appendix 3: Research License**

  
**REPUBLIC OF KENYA**

  
**NATIONAL COMMISSION FOR  
SCIENCE, TECHNOLOGY & INNOVATION**

Ref No: **623263** Date of Issue: **31/May/2024**


**RESEARCH LICENSE**




**This is to Certify that Mr. ASHISH HARISHCHANDRA NARANDASS of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: FACTORS INFLUENCING THE ADOPTION OF ELECTRIC VEHICLES IN NAIROBI COUNTY, KENY for the period ending : 31/May/2025.**

License No: **NACOSTI/P/24/36177**

**623263**  
Applicant Identification Number

  
Director General  
**NATIONAL COMMISSION FOR  
SCIENCE, TECHNOLOGY &  
INNOVATION**

Verification QR Code



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Scan the QR Code using QR scanner application.**

**See overleaf for conditions**

## Appendix 4: Questionnaire

### Section A: Basic Information (Please mark the appropriate box)

1. Indicate your age in years.

18-25       26-35       36-45       46-55       56-65       65+

2. Indicate your gender

Male       Female

3. Indicate your driving experience

0-5 years       6-10 years       11-15 years

16-20 years       21 years and above

4. Indicate your level of education

Primary school       Secondary School       College

University Degree       Masters       PhD

### Section B: Technological Factors (Please mark the appropriate box)

*Please indicate extent to which you agree with the following statements (If you feel you strongly disagree with the statement, select 5, if you strongly agree, mark in box 1. If you are not sure, mark 3. (Strongly disagree = 1, disagree = 2, neither = 3, agree = 4, strongly agree = 5)*

	1	2	3	4	5
It is easy to operate/drive electric vehicles					
Electric vehicles are very reliable					
The driving range/distance for an electric vehicle is limited when fully charged					
Charging an electric vehicle takes a lot of time					

### Section C: Economic Factors

*Please indicate extent to which you agree with the following statements (If you feel you strongly disagree with the statement, select 5, if you strongly agree, mark in box 1. If you are not sure, mark 3. (Strongly disagree = 1, disagree = 2, neither = 3, agree = 4, strongly agree = 5)*

	1	2	3	4	5
Electric vehicles are more efficient than gasoline vehicles					
The price of electric vehicles is very high					
The cost of maintaining and electric vehicle is low					
By driving an electric vehicle, I could save a lot of money					

#### **Section D: Infrastructural Factors**

*Please indicate extent to which you agree with the following statements (If you feel you strongly disagree with the statement, select 5, if you strongly agree, mark in box 1. If you are not sure, mark 3. (Strongly disagree = 1, disagree = 2, neither = 3, agree = 4, strongly agree = 5)*

	1	2	3	4	5
There are few charging stations for electric vehicles in Kenya.					
The charging stations for electric vehicles are located far from where I live					

#### **Section E: Adoption of Electric Vehicles**

*Please indicate extent to which you agree with the following statements (If you feel you strongly disagree with the statement, select 5, if you strongly agree, mark in box 1. If you are not sure, mark 3. (Strongly disagree = 1, disagree = 2, neither = 3, agree = 4, strongly agree = 5)*

	1	2	3	4	5
I prefer an electric vehicle over traditional gasoline vehicles					

Your participation is appreciated.