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The Factors affecting adoption of electric vehicles by public service vehicle matatu SACCOS in Nairobi City County, Kenya.

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THE FACTORS AFFECTING ADOPTION OF ELECTRIC VEHICLES BY PUBLIC SERVICE VEHICLE MATATU SACCOS IN NAIROBI CITY COUNTY, KENYA

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DECLARATION

This is my original dissertation and has not been submitted before for approval for the award of a degree in this University or any other University.

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DEDICATION

Special thanks to my family for their unwavering social and emotional support. They have always inspired me to pursue academic excellence. I am also incredibly grateful for the invaluable help and advice from my supervisor throughout this project. Their guidance was instrumental in my success. Finally, a big thank you to a close friend and classmates for their support.

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ABSTRACT

The adoption of electric vehicle innovation is something whose time has come given the rising climate and environmental concerns. Its adoption, however, faces numerous challenges, especially in Kenya and other developing countries. The study investigated the variables that impact Kenya's adoption of electric vehicles. The study purposed to establish the influence of cost of electric vehicles, infrastructure development, and knowledge on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi. The technological acceptance model and diffusion of innovation theories underpinned the study. The study made use of the descriptive cross-sectional survey approach to achieve this. The study targeted 272 PSV matatu SACCOs in Nairobi City County. The data was gathered using a structured questionnaire which was administered at the offices of PSV matatu SACCOs within Nairobi. Data analysis involved descriptive statistics in form of means and standard deviation and inferential statistics in form of correlation, simple and multiple linear regression analyses. Spearman's correlation revealed that infrastructure development had a strong and positive correlation with the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi ($r=0.463$, $p=0.000<0.05$), moderate correlation between knowledge and adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi ($r=0.376$, $p=0.000<0.05$). The cost of electric vehicles had a negative correlation with adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi ($r=-0.459$, $p=0.000<0.05$). Multiple linear regression results showed that knowledge, infrastructure development, cost of electric vehicles explain 53.3 percent adoption of electric vehicles by public service vehicle matatu SACCOs. Regression coefficients showed that infrastructure development has a positive and statistically significant relationship with the adoption of electric vehicles by public service vehicle matatu SACCOs ($\beta=0.157$, $p=0.000<0.05$), knowledge also showed a positive and statistically significant relationship with the adoption of electric vehicles by public service vehicle matatu SACCOs ($\beta=0.233$, $p=0.000<0.05$). The cost of electric vehicles ($\beta=-0.075$, $p=0.002<0.05$) indicated a negative and statistically significant relationship between cost of electric vehicles and the adoption of electric vehicles. The study concludes that cost of electric vehicles, knowledge and infrastructure development are crucial determinants in the adoption of adoption of electric vehicles by public service vehicle matatu SACCOs. The study recommends government intervention to reduce costs, improve infrastructure, and create more awareness through policy development. The study recommends further studies examine other factors apart from the three identified factors; cost, infrastructure development, and knowledge that might influence the adoption of electric vehicles. A study should also be done to examine the influence of policies and rules on the adoption of electric vehicles.

Key words: *knowledge, infrastructure development, cost of electric vehicles, public service vehicle matatu SACCOS, Nairobi City County*

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Globally, the adoption of electric vehicles (EVs) is experiencing significant growth and momentum. Governments, private companies, and individuals are increasingly recognizing the environmental, economic, and technological benefits of EVs, leading to a surge in their adoption (Amedokpo & Boutueil, 2023). Many countries have implemented ambitious targets and policies to promote the transition to electric mobility, including incentives like tax exemptions, financial subsidies, development of electric vehicle charging facilities. Automakers are also expanding their electric vehicle offerings, with a growing number of models available to consumers (Van den bergh et al., 2023). This expansion, coupled with advancements in battery technology, has resulted in improved vehicle range and performance, addressing concerns about range anxiety and charging time. Furthermore, the increasing focus on sustainability and the reduction of carbon emissions into the atmosphere have propelled EV adoption as a key strategy to mitigate climate change.

The global electric vehicle market is witnessing rapid growth, with rising consumer demand, technological advancements, and supportive policies influencing the transition into a cleaner and more sustainable transportation future (Krishnan & Koshy, 2021). Kenya like any other developing country has started to embrace electric vehicles though its adoption is still low. By December 2023, electric vehicles in Kenya had reached 3.753 representing 1.62% of the registered vehicles (Muthomi, 2024). It is projected that adoption of electric vehicles in Kenya will reach 5% by 2025 (Huaxia, 2024). Though adoption of electric vehicles in Kenya is promising, little has been done to understand adoption of electric vehicles in the Kenyan context. The effect of cost of electric vehicles, infrastructure development and knowledge, in particular, have not been explored in Kenyan context to promote understanding of adoption of electric vehicles.

In Africa, electric vehicles are gradually gaining traction, although it is still in the early stages compared to other regions. Several African countries are showing increasing interest in EVs as a means to address environmental challenges, reduce dependence on fossil fuels, and promote sustainable transportation (Ajao & Sadeeq, 2023). Governments in countries like South Africa, Kenya, Rwanda, and Morocco have put incentives and policies in place to encourage the deployment of EVs in the market, including tax exemptions, import duty waivers, and

investment in charging infrastructure (Ayetor et al., 2023). De Abreu et al. (2023) noted local startups and international companies are also beginning to introduce electric vehicle models and charging solutions specifically designed for African markets. However, challenges such as limited charging infrastructure, high upfront costs, and concerns about range anxiety still need to be addressed to accelerate EV adoption in Africa. Efforts are being made to overcome these barriers through partnerships, pilot projects, and awareness campaigns aimed at showcasing the benefits of EVs and fostering a supportive ecosystem (Galuszka et al., 2021).

Kenya emitted 17.45 million tonnes of carbon in 2022 produced by oil (Ritchie & Roser, 2024). Kenya has committed to reducing carbon emissions by 32% by 2030 through the adoption of green energy which makes the adoption of electric vehicles an important strategy (U.S. Agency for International Development, 2024). Currently, there are 350 registered electric vehicles in Kenya according to Renewable Energy Kenya (2024). The Finance Act 2023 proposed zero-rating for electric vehicles to motivate Kenyans to buy and use electric vehicles which in the long run can help to reduce carbon emissions (The Kenya Institute for Public Policy Research and Analysis, 2023). Kenya has recently shown commendable progress in the adoption of EVs. The country has made significant progress in promoting the use of EVs as a means to address environmental concerns, reduce dependence on fossil fuels, and foster sustainable transportation (Opiyo & Njenga, 2023). The Kenyan government has adopted various policy measures and initiatives to incentivize EV adoption, including tax incentives, import duty exemptions, and lower registration fees for electric vehicles.

Additionally, Kenya has made strides in developing their charging infrastructure, with the installation of public and private charging stations in major urban centres. Several local and international companies have also introduced electric vehicles into the Kenyan market, particularly in the public transportation sector (Longe, 2022). However, problems for instance limited or unavailable charging facilities, especially in rural areas, and high upfront costs and range anxiety still need to be addressed to further accelerate the adoption of electric vehicles across the country (Odhiambo et al., 2021). People also do not have enough knowledge about electric vehicles. Researching the impact of cost of electric vehicles, infrastructure development, and knowledge on the adoption of electric vehicles, therefore, was important to come up with information that will enable stakeholders to make informed decisions.

1.1.1 Adoption of Innovation

Innovation simply refers introduction of novel ideas, methods, products, services, or technologies that create significant value and bring about positive change in various fields or industries (Singh et al., 2020). It involves the generation, creation, development, and deployment of novel concepts or ideas to solve some existing societal problems, improve efficiency, enhance performance, or meet evolving needs and demands (Oelrichs, 2023). Innovation often results from creativity, research, and experimentation, and it can lead to advancements, breakthroughs, or disruptive transformations that shape the way societies, businesses, and individuals operate. Whether in science, technology, business, or any other domain, innovation plays a fundamental role in driving progress, fostering competitiveness, and driving positive societal impact (Kumar & Alok, 2020).

Adoption refers to the process of accepting, integrating, and actively using a new idea, practice, product, or technology within a particular context or by specific individuals or groups (Tarei et al., 2021). It entails the shift from awareness or understanding of the idea to its regular use and practical implementation. The adoption of innovation specifically alludes to the acceptance and incorporation of new ideas, practices, products, services, processes, or technologies into an individual's or organization's daily operations, routines, or behaviours (Asadi et al., 2021). It is the stage where innovation becomes a part of regular functioning and becomes integrated into existing systems or processes, leading to the transformation of how things are done (Setiawan et al., 2022).

The concept of the adoption of innovation is an important aspect studied in various theories of adoption. In 1992, Rogers proposed diffusion of innovation, a theory that has gained prominence over the years. The theory highlights the importance of communication channels and social networks in spreading novel ideas, processes, services, or products. Adopting any innovation is more likely to occur when individuals receive information about the innovation through trusted channels and when they observe others within their social networks adopting and benefiting from the innovation (Gouda & Tiwari, 2022). The IDT states that the success of innovation depends on five qualities, including relative advantage, compatibility with existing values and practices, trialability, simplicity, and ease of use, and should have visible results (Rogers, 1962).

Another influential theory that was proposed by Davis and Bagozzi (1989) is the Model of Technology Acceptance (TAM). The TAM emphasizes the role of individual beliefs and perceptions in the adoption of technology or innovation. According to the TAM, individuals' intention to adopt an innovation is determined by two primary factors: perceived utility (usefulness) and usability (Davis & Bagozzi, 1989). The degree to which people feel that implementing the innovation would improve their performance or productivity is known as perceived utility (usefulness), while the perceived simplicity and convenience of learning and applying the innovation is known as perceived usability (Nurqamarani et al., 2021). These beliefs are influenced by various external and internal factors, including personal experiences, social influence, and facilitating conditions. The TAM sheds light on the cognitive mechanisms that underlie people's decisions to adopt new technologies and emphasizes the role that perceived advantages and usability play in encouraging adoption (Toraman, 2022).

One can determine that the adoption of innovation has taken place by observing observable changes in behaviour, routines, or practices. This could include the consistent use of the innovation, the integration of the new technology into existing workflows, the replacement or modification of traditional practices with innovative ones, and the attainment of the desired outcomes or benefits associated with the innovation (Bryła et al., 2022).

Electric vehicles are innovations as they represent a revolutionary shift in transportation technology, moving away from traditional internal combustion engine (ICE) vehicles to cleaner and more sustainable electric-powered alternatives (Huang & Qian, 2021). EVs utilize advanced battery and electric motor technology, reducing or eliminating tailpipe emissions, which makes them environmentally friendly in contrast to traditional automobiles. Their adoption entails the integration of these electric-powered vehicles into various transportation systems, including public and private fleets, as well as individual ownership (Sahoo et al., 2022). Adopting EVs involves the purchasing and use of EVs as viable alternatives to traditional vehicles, incorporating charging infrastructure to support EV operations, and making the necessary changes in operational practices, maintenance procedures, and user behaviours to fully embrace the potential benefits of these innovative vehicles (Moeletsi, 2021).

Cost of electric vehicles has been found to play a significant role in the adoption of electric vehicles (Yeboah, 2023). With the increase concerns about environmental conservation and sustainability there is need to examine the cost of adopting electric vehicles especially in the

Kenyan context. According to Kwoba (2022) adopt of electric vehicles comes with risks and costs. Adoption requires time and resources and this should be explored to promote better understanding of adoption especially in developing country like Kenya. Affordable costs can motivate people to adopt electric vehicles.

Infrastructure ensures efficiency and effectiveness of operating electric vehicles. Without proper infrastructure in place, people will not be motivated to adopt electric vehicles (Jones, 2020). Examining infrastructural development for electric vehicles is important as it will promote a better understanding of where Kenya is in its bid to promote adoption of electric vehicles and ensure sustainability. Without proper infrastructure, people will see no need to adopt electric vehicles. Infrastructure for electric vehicles is complex and requires lots of money to set up (Hotchkiss, 2023). It requires strong commitment to ensure that it achieves success.

Knowledge about electric vehicles enables one to have a good understanding of pros and cons of adopting electric vehicle. Knowledge can motivate one to develop interest and adopt electric vehicle (Castaneda & Cuellar, 2020). People have mixed feelings about electric vehicles. Mixed feelings can be eliminated by ensuring that people are well-informed about electric vehicles. Knowledge enables one to know whether they are going to gain by adopting electric vehicles or not.

In the context of this study, the concept of adoption referred to the decision and process by which public service vehicle matatu SACCOs in Nairobi, Kenya embrace and integrate electric vehicles into their operations. It involved the acceptance and utilization of EVs as a viable alternative to traditional automobiles. The operationalization of adoption in this study included measuring the relative advantage, compatibility, complexity and observability of the adoption of the electric vehicles. Understanding the number of public service vehicle matatu SACCOs who have adopted EVs in their fleet helped to understand the cost implications of adopting electric vehicles. The number of electric vehicles in operation helped to promote understanding of maintenance costs and challenges. The frequency of EV utilization for transportation services also helped in understanding the electric vehicles' infrastructure and use. Also, the infrastructural development and knowledge helps to promoting understanding of adoption of electric vehicles.

1.1.2 Factors Influencing Adoption of Innovation

Numerous factors influence the adoption of innovation, drawing from theories of adoption and empirical studies. The theory of Diffusion of Innovations, proposed by Rogers (1995), identifies several key factors. Relative advantage refers to the perceived benefits of adopting an innovation compared to existing alternatives (Faqih, 2022). Compatibility focuses on the alignment of the innovation with the existing values, systems, and infrastructure. Complexity refers to the perceived difficulty of understanding and using the innovation. Observability emphasizes the visibility of the innovation and whether the innovation's benefits can be observed by others. Trialability involves the opportunity for individuals to experiment with the innovation before committing.

The model of Technology Acceptance emphasizes individual beliefs and perceptions in the adoption of technology or innovation. Perceived usefulness refers to the extent the individuals believe that adopting the innovation shall enhance their performance or productivity (Xia et al., 2022). Perceived usability relates to the perceived simplicity and ease of learning and using the innovation. Social influence considers the influence of others, such as opinions and recommendations from peers or influential figures, on individuals' adoption decisions. Facilitating conditions involve the presence of supportive infrastructure, resources, and technical assistance that make the adoption process smoother.

Empirical studies further highlight additional variables that impact the adoption of innovation. These factors may include cost considerations, such as the upfront investment required and the potential for long-term cost savings (Xia et al., 2022). Infrastructure development, specifically the availability and accessibility of necessary supporting infrastructure, as per Ravi and Aziz (2022) is another influential factor. Knowledge and awareness of the innovation, including its features, benefits, and potential drawbacks, play a crucial role in adoption decisions.

For this research on the adoption of EVs by public service vehicle matatu SACCOs in Nairobi, Kenya, key factors to consider include cost, infrastructure development, and knowledge as they have been determined to be some of the main determinants of EV adoption in other contexts (Xia et al., 2022; Ravi & Aziz, 2022). Little has been done to promote understanding of cost, infrastructure development, and knowledge effect on the adoption of electric vehicles in the Kenyan context. Cost should be considered when embracing EVs yet this has not been explored in the Kenyan context holistically. Studies have explored costs in terms of incentives and

subsidies leaving other factors like operational costs and upfront costs that was the focus of this study. High upfront costs of EVs, including the purchase price and potential charging infrastructure investments, can pose a significant barrier to adoption (Ravi & Aziz, 2022). Additionally, the cost of battery replacement and maintenance may impact the perceived affordability and feasibility of electric vehicles. Understanding the cost implications and potential financial incentives or support mechanisms available for public service vehicle matatu SACCOs in Nairobi, Kenya is crucial in assessing the economic viability of adopting EVs.

Infrastructural access like charging points and maintenance points are seen to be critical in the adoption of electric vehicles. The availability and accessibility of charging infrastructure significantly influence the feasibility and practicality of EV adoption (Anastasiadou & Gavanas, 2022). Adequate and strategically located charging stations are necessary to address range anxiety concerns and ensure convenient charging options for public service vehicle matatu SACCOs. Assessing the existing charging infrastructure in Nairobi, Kenya, identifying gaps, and exploring potential strategies for expanding and improving infrastructure are essential considerations for this study.

Knowledge is another influential factor. Public service vehicle matatu SACCOs' awareness, knowledge, and understanding of electric vehicles can shape their attitudes and intentions toward adoption (Secinaro et al., 2022). Identifying knowledge gaps, misconceptions, and informational needs regarding EVs among vehicle matatu SACCOs in Kenya is important for designing effective awareness campaigns, training programs, and educational initiatives. Adoption decisions can be significantly impacted by increasing understanding and awareness of the advantages, characteristics, and operation of EVs. For this research the factors to be considered are cost of adoption of electric vehicles, infrastructure development, and knowledge.

There are other significant determinants that influence the adoption of innovation as advanced by theory of diffusion innovation and technology acceptance model. However, based on literature review, cost of electric vehicles, infrastructure development, and knowledge have been cited most to be crucial in the adoption of electric vehicles though not in the context of Kenya. This study therefore was limited to cost of electric vehicles, infrastructure development, and knowledge and how they influence adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi.

1.1.3 Public Service Vehicles matatu SACCOs in Nairobi County

The Public Service Vehicles (PSVs) is a common system of transportation for goods and people in Kenya. The PSV is regulated by the National transport and safety authority under the ministry of Transport and infrastructure. Commonly known as *"matatu"* is the commonly used form of public transport in Kenya, estimated to be used by 80% of the daily commuters (Okwako, 2017). Public service vehicle (PSV) matatu SACCOs play a crucial role in providing transportation services within Nairobi County, the capital city of Kenya.

Nairobi County is a vibrant urban centre with a high population density and a bustling transportation system (Wamwea & Moi, 2023). PSV matatu SACCOs form an essential part of the public transportation network, catering to the diverse needs of residents, commuters, and tourists. The PSV sector in Nairobi County is regulated by various government bodies and agencies to ensure safety, efficiency, and quality of service (Plano, 2022). The main regulatory body overseeing PSV operations is the National Transport and Safety Authority (NTSA), which is responsible for licensing and regulating public transport matatu SACCOs. NTSA enforces compliance with rules and regulations regarding vehicle inspection, driver qualifications, and adherence to traffic laws. They also monitor fare structures, passenger safety, and vehicle roadworthiness to maintain a standardized and reliable public transportation system (Mwanzia, 2023).

PSV sector like any other sector is becoming competitive daily. Providing a cheap transport system is key for PSV matatu SACCOs to remain competitive (Muthomi, 2024). Adoption of electric vehicles may provide an opportunity for PSV matatu SACCOs to provide cheap transport which shows the importance of researching the factors influencing the adoption of electric vehicles. The adoption of electric vehicles nonetheless is still low in Kenya, 1.62% of the 165,913 registered vehicles in Kenya (Muthomi, 2024). Given the environmental and sustainability concerns, it is expected that adoption of electric vehicles should be significantly high, yet it is expected to reach 5% only by 2025 in Kenya (Huaxia, 2024). Examining factors such as cost of electric vehicles, infrastructure development and knowledge helped to promoting a better understanding of the adoption of electric vehicles in Kenya.

The PSV sector in Nairobi County comprises a wide range of vehicles, including minibuses (known as matatus), buses, taxis, and motorcycles (known as boda bodas). Matatus are the most common form of PSVs and are known for their vibrant and artistic designs (Nyamai &

Schramm, 2023). They operate along specific routes, picking up and dropping off passengers at designated stages. Buses, both large and small, serve longer distances and transport larger groups of passengers. Taxis, including traditional yellow cabs and app-based ride-hailing services, offer a more personalized transportation experience. Boda bodas, on the other hand, provide quick and affordable motorbike transport primarily for short distances (Onyango et al., 2023).

In terms of the number of PSV matatu SACCOs in Nairobi County, there are 12,240 Public Service Vehicle (PSV) operators in Nairobi County as per NTSA statistics (NTSA, 2023). This number includes both matatu SACCOs and individual operators. However, this study included 272 PSV SACCOs registered matatu SACCOs in Nairobi (NTSA, 2023). Matatus alone is known to be a significant part of Nairobi's transport system, with numerous matatu SACCOs running different routes and serving various neighbourhoods and suburbs (Kinyanjui, 2022). The number of matatu SACCOs reflects the demand for public transportation services within Nairobi County, which is driven by the city's population and its status as a major economic and commercial hub.

The regulation and oversight of the PSV sector in Nairobi County aim to ensure the safety, reliability, and efficiency of public transportation services. By implementing and enforcing regulations, the government and regulatory bodies strive to maintain order on the roads and provide a convenient and accessible transport system for residents and visitors. The presence of a diverse range of PSV matatu SACCOs reflects the varied transportation needs and preferences of Nairobi County's population, contributing to the overall mobility and connectivity of the city (Onyango et al., 2023). However, the study focused on 272 PSV matatu SACCOs in Nairobi (Kinyanjui, 2022).

Public service vehicle matatu SACCOs in Nairobi, Kenya are vital in providing public means of transport, contributing to the socio-economic growth of the country (Kamau & Mitullah, 2022). Nevertheless, the public transport sector still faces numerous problems, like environmental pollution, rising fuel costs, and the high maintenance costs of ICE-powered vehicles. Electric vehicles (EVs) present a promising solution to these challenges, offering lower operating costs, reduced emissions, and the potential to enhance sustainability (Adjei-Ampomah, 2020). Despite the potential benefits, public service vehicle matatu SACCOs in Kenya are facing significant obstacles in adopting electric vehicles.

1.2 Statement of the Problem

Public service vehicle matatu SACCOs in Nairobi, Kenya are vital in providing public means of transport, contributing to the socio-economic growth of the country (Kamau & Mitullah, 2022). Nevertheless, the public transport sector still faces numerous problems, like environmental pollution, rising fuel costs, and the high maintenance costs of ICE-powered vehicles. Electric vehicles (EVs) present a promising solution to these challenges, offering lower operating costs, reduced emissions, and the potential to enhance sustainability (Adjei-Ampomah, 2020). Despite the potential benefits, public service vehicle matatu SACCOs in Kenya are facing significant obstacles in adopting electric vehicles. Examples of setbacks include high purchase costs compared to conventional ICE vehicles, limited or unavailable charging infrastructural facilities, questions about range anxiety, and ignorance about the importance and feasibility of EVs (Opiyo & Njenga, 2023). To speed up the shift to greener and more sustainable modes of transportation, it is important to look into and comprehend the variables driving public transportation matatu SACCOs in Kenya's adoption of EVs.

Several empirical studies have been conducted in this area, shedding light on the existing challenges and potential benefits to be derived from adopting EVs by public service vehicle matatu SACCOs. Javanmardi et al. (2023) examined the factors that influence EV adoption concerning sustainable development. The findings revealed that high upfront costs and limited charging infrastructure were the primary obstacles, while financial incentives and improved awareness positively influenced the intention to adopt electric vehicles. The study focuses much on cost leaving other factors like infrastructural development and knowledge that was the focus of this study. Focusing on Greece, Mpoi et al. (2023) investigated the factors and incentives that influence the adoption of EVs; demonstrating that electric buses exhibited cost savings and environmental benefits compared to conventional buses. Mpoi et al. (2023) focused on incentives leaving other costs like operational costs and upfront costs that was the focus of the study. Yang et al. (2023) explored electric vehicle adoption in Norway, indicating that supportive government policies, such as subsidies and infrastructure development, played a crucial role in promoting EV adoption. Yang et al. (2023) focused on government policies failing to look into specific factors like knowledge, cost and infrastructure development that as was the focus of study.

Regionally, Agunbiade and Siyan (2020) explored the prospects and challenges of EV adoption in Nigeria. The research identified factors such as government policy support, public

awareness, and charging infrastructure availability as crucial drivers of EV adoption. However, government regulations and incentives on adoption of electric vehicles may differ from country to country hence presence of contextual gap. Meszaros et al. (2021) investigated the variables affecting the deployment of EVs in Ethiopia's capital, Addis Ababa. The research examined the attitudes and perceptions of potential adopters towards electric vehicles, as well as the barriers and facilitators to adoption. The findings revealed that cost considerations, particularly the high cost of EVs, were significant barriers to their adoption. However, the study did not pinpoint the role of other factors like infrastructure development and knowledge on the adoption of electric vehicles hence existence of conceptual gap.

Ackaah et al. (2022) investigated the determinants of consumer objectives to adopt EVs in Accra, Ghana. The study identified several factors influencing consumer adoption, including environmental concerns, economic benefits (such as reduced fuel costs), and the influence of peers. Regionally, the studies have touched on the aspects of knowledge, cost, and infrastructure. The studies, however, brings out contextual gaps and Kenya differs significantly from countries in the region based on policy, operations, and even economic capability.

Locally, Opiyo and Njenga (2023) investigated the variables influencing the use of electric motorcycles (e-motos) as a mode of transportation in Nairobi, Kenya. The research highlighted the importance of cost considerations, including the upfront price of e-motos and operating costs compared to traditional motorcycles. The study found that reduced fuel and maintenance costs associated with *e-motos* were significant factors driving adoption. However, challenges such as limited charging infrastructure and concerns about battery range were identified as barriers but did not establish the exact impact of infrastructure adoption of e-motos hence methodological gap. In addition, the study focuses on electric motorcycles contrasting this study that focuses on matatu PSVs. The infrastructural requirement and cost of electric vehicles is much higher for matatu PSVs than electric motorcycles hence contextual gap. The study focused on electric motorcycles, thus bringing about contextual and conceptual gaps. The adoption of electric motorcycles may differ significantly given the study focused on public service vehicles.

Despite the existing empirical studies, contextual and conceptual gaps have been identified that necessitated further investigation in the context of public service vehicle matatu SACCOs in Kenya. While previous studies have identified key barriers and facilitators of EV adoption, there was limited research specifically focusing on the Kenyan context. Kenya has its own

unique socio-economic, infrastructural, and policy landscape that may influence the use of electric automobiles. Also, little had been done to examine in detail the impact of cost, infrastructure development, and knowledge impact on the adoption of electric vehicles in the Kenyan context. Therefore, a study was needed to comprehend the specific challenges that confront public service vehicle matatu SACCOs in Nairobi and develop tailored strategies for effective adoption. The study focused on the adoption of electric vehicles in public transport in the Kenyan context.

1.3 Objectives of the Study

The broad objective of this research was to determine the factors that affect the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi City County.

1.3.2 Specific Objectives

i. To investigate the effect of cost of electric vehicles on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi City County.
ii. To establish the effect of infrastructure development on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi City County.
iii. To determine the effect of knowledge on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi City County.

1.4 Research Questions

The study sought to address these research questions:

i. What is the influence of cost of electric vehicles on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi City County?
ii. What is the influence of infrastructure development on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi City County?
iii. What is the influence of knowledge on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi City County?

1.6 Significance of the Study

1.6.1 Public Service Vehicle Matatu SACCOs in Kenya

The study results offer critical insights to public service vehicle matatu SACCOs in Kenya. By identifying the factors that determine the use of EVs, matatu SACCOs can make informed

decisions regarding the integration of EVs into their fleets. Understanding the challenges and barriers specific to the Kenyan context can help matatu SACCOs develop strategies to overcome these obstacles, such as exploring financing options, leveraging available incentives, and collaborating with relevant stakeholders to address charging infrastructure concerns.

1.6.2 Policymakers in Kenya

The study will inform policymaking in Kenya about the specific needs and requirements of public service vehicle matatu SACCOs in the context of EV adoption. Policymakers can utilize the study results to formulate policies to promote more deployment of EVs, such as financial support programs, charging infrastructure development plans, and regulatory frameworks that encourage the incorporation of EVs into the network of public transportation.

1.6.3 Research

This study contributes to the broader understanding of innovation adoption particularly in the transportation industry. This study contributes to the subject of innovation adoption by analyzing the aspects that public service vehicle matatu SACCOs consider while adopting electric vehicles. It extends the application of theoretical postulation like the Diffusion of Innovations and the TAM by exploring their relevance and contextual adaptations in the specific domain of electric vehicle adoption in Kenya.

1.7 Scope of the Study

The research focused on determining the factors affecting the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi. There are other significant determinants that influence the adoption of innovation as advanced by theory of diffusion innovation and technology acceptance model. However, based on literature review, cost of electric vehicles, infrastructure development, and knowledge have been cited most to be crucial in the adoption of electric vehicles though not in the context of Kenya. This study therefore was limited to cost of electric vehicles, infrastructure development, and knowledge and how they influence adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi.

The unit of observation for the study was public service vehicle matatu SACCOs in Nairobi. The target population was 272 PSV SACCOs registered PSV SACCOs in Nairobi (NTSA, 2023). Focusing on the PSV matatu SACCOs was important since they are major players in decision-making in the adoption of electric vehicles. They are also the major matatu SACCOs

in offering public transport in Kenya compared to private vehicles. The study adopted a descriptive cross-sectional survey approach and relied on primary data collected using questionnaires. In terms of theoretical scope, the study was anchored on technological acceptance model and diffusion of innovation theories. The study was conducted for the period between March and May 2024 to provide humble time for reliable and accurate data to be collected.

1.8 Chapter Summary

The chapter began by providing the study background by introducing the study concepts. It brought out the problem and the gaps that exist in the literature that have been identified and reviewed. The chapter also highlighted the general and the specific objectives. The study's significance was also examined with a focus on how it may benefit transport industry players, policymakers, and researchers. What the research covered was also highlighted. Chapter Two comprises a review of existing literature concerning the three research objectives.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The chapter outlines and discusses the relevance of the theories that guided the study. Further, in-depth synthesis analyses of past studies were undertaken as guided by the study objectives and study gaps identified. The chapter ends by presenting a conceptual framework and operationalization of study variables.

2.2 Theoretical Framework

The technological acceptance model and diffusion of innovation theories underpinned the study.

2.2.1 Theory of Diffusion of Innovation

The theory of Diffusion of Innovation refers to a theory that aims to explain how ideas, behaviours, and technologies spread slowly through society. The theory of Diffusion of innovation was formulated by Rodgers (1962) and looks into how to move from the origin to areas that are still in need of these ideas through different levels of adoption. This theory is mainly concerned with understanding how, why, and how quickly new concepts and technology proliferate throughout social structures and the corporate sector (Rogers, 1962). Adoption of innovation relies on the strength of the innovation, compatibility, complexity, and ease of adoption.

The theory focuses on technological changes to suit individual needs since people are not supposed to alter their ways to suit a given innovation (Les Robinson, 2009). Diffusion occurs across time ideas or processes spread through the social system (Rogers, 2009). Diffusion, as noted by Fichman (2000), is the process via which technology spreads throughout the organization. Diffusion theory is divided into four major areas which include communication, time, innovation, and societal system (Sahin, 2006). The theory posited a communication system that can pass information to many people within a very short period, an interpersonal channel was preferred to divulge information. Society is a segmented unit that has different degrees of adopting new ideas. The theory has been criticized for overemphasis on the technological factors. It is also difficult to predict the accuracy using the theory (Sahin, 2006).

It also focuses on individual adoption consequently overlooking the influence of social networks.

The innovation of electric vehicles is a new idea that originated from manufacturers and requires user acceptance. The manufacturer needs to create an avenue that the user may find easier to adopt. The marketing of its adoption by manufacturers requires channels and procedures that can reach individuals timely. This theory postulates that such technology should flow from the manufacturers to the consumers effectively. The adoption of electric vehicles will require different strategies and engagement at different levels for successful adoption.

2.2.2 The Model of Technological Acceptance (TAM)

The model of Technology Acceptance is a theory that explains how people accept and use technology. The model of Technology Acceptance, created by Davis in 1989, is based on the idea that a technology's ease of use and potential benefits should be taken into consideration when deciding whether or not to adopt it. The theory is premised on the beliefs that influence attitude, which result in intention and eventually generate behaviour. The usefulness of a given technology will generate an attitude among potential users which ultimately will be critical in the acceptance and adoption.

Several scholars have supported this theory since it was developed (Mathieson 1991; Taylor & Todd, 1995; Gefen, 2000) which accepted the application of this theory to articulate various technological processes such as email, word processor, spreadsheet, and World Wide Web. There is a consensus among several researchers that TAM is a valid and robust model to explain technological acceptability by a set of individuals' behaviours. This model has been designed in a way that it does not measure success but it can be used to predict users' intentions and ability to use technology.

Digital marketing channels are improvised technological systems that are prone to generate a certain behaviour among users. The relevance of this theory is the essence that digital marketing borrows much from information technology. Its success largely depends on the ability of the users to adapt and apply the new technology. According to TAM, perceived usability and utility motivate the adoption of technology (Dai & Kauffman, 2001). The feelings or perceptions firms and people have about the adoption of EVs and the ease of the strategies

to adopt them determine the uptake and adoption of EVs. The theory nonetheless has been criticized for focusing on individual perceptions consequently overlooking societal or organizational factors (Dai & Kauffman, 2001). The theory also is limited to two variables; perceived usefulness and perceived ease of use.

Through the creation of a favourable view of the cost of EVs, and the availability of infrastructure, and knowledge that may prevent their adoption, the theory plays a crucial role in fostering behaviour that supports the adoption of EVs. This consistent behaviour will be critical adoption of this technology in persuading users of the importance of adopting EVs. Adoption of EVs requires a consistent behaviour of accepting their usage and eventually embracing it as the new means of transport that is more effective and efficient. This is because all the players in the global are combating the emission of carbon gases to the environment. As such, adopting EVs is regarded as significant in combating climate change and damage to the earth.

2.3 Empirical Review

This section presents an empirical inquiry into the literature about factors in the adoption of EVs. The sections present the conceptualization of the adoption of EVs. The critique of the studies was undertaken to reveal research gaps.

2.3.1 Cost of electric vehicles and Adoption of Innovation

Cost refers to the expenses that are incurred to adopt electric vehicle innovation (Yeboah, 2023). With the concerns about environmental conservation and sustainability, there is a need to adopt innovations that will promote conservation and sustainability. In Kenya, 571 electric vehicles had been registered as of 2020 (Kwoba, 2022). Adoption of innovation comes with risks and costs (Yeboah, 2023). Adoption of innovation requires time and resources which might not be readily available. Innovation also disrupts the norm and culture and, as a result, people might be reluctant to support its implementation (Yeboah, 2023). Electric vehicle implementation is expected to face numerous given that it is something new to people. People are expected to adopt a “wait and see” approach as electric vehicle innovation is being implemented.

While investigating policy incentives in the adoption of EVs across the world, Langbroek et al. (2016) adopted a survey design. Creating incentives to attract the adoption of EVs has been

laid down by countries as an avenue of decreasing costs for instance lowering parking fees and more access to public transport lanes. Offering the incentives will no doubt reduce the general cost of the adoption and use of EVs consequently encouraging its use and adoption. The study focused on the policy incentive cost only and did not focus on other important component costs such as production and operational costs which this study will focus on.

Assessing the benefits and challenges faced when adopting EVs globally, Alanazi (2023) adopted a correlation research design. The adoption of EVs experiences scarcity of charging stations that add more costs to the consumers and more anxieties regarding the time a charged battery may last. The government has introduced more incentives for increased adoption of electric vehicles through tax credits or subsidies and establishing supporting infrastructure such as the charging unit. The study adopted a correlational design while the current investigation employs a descriptive cross-sectional survey.

Challenges and risks in the adoption of EVs have been common in smart cities globally and Potdar et al. (2018) undertook a desktop survey to assess the risk. Even though the use of EVs has increased, the aspect of cost remains a challenge to many users for instance integration of electric vehicles into the grid is an additional cost that users bear indirectly, and high cost of investment especially integrating V2G technology into the system. The study only relied on the desktop survey limiting itself effectively to secondary sources while the proposed study focuses on primary sources creating a methodological gap.

While examining the long-term ownership and comparative analysis of EVs and ICE vehicles, Weldon et al. (2018) reviewed existing literature. It was established that adopting EVs is cost-competitive after a long period which stretches for over ten years. However, this competitiveness is subject to payback periods which is essential in the cost component matrix. This is defined by the energy cost of electricity as compared to the prices of oil that always experience shocks thus fluctuating from time to time. The study did not highlight the significance of government incentives in reducing the cost of adopting electric vehicles amounting to a conceptual gap.

Examining the new business model of adopting electric vehicles with a case study of Singapore, Nian et al. (2019) employed a descriptive research approach. It was found that electric vehicles are characterized by high upfront costs or capital costs. This is accelerated by additional levy-based costs on the price. Cost sharing between the seller and purchaser is essential in creating

incentives that lower the burden on the purchaser. The proposed study employs a descriptive cross-sectional survey, whereas the study by Nian et al. (2019) descriptive research design. A descriptive cross-sectional survey helps explain the association between study variables whereas descriptive research does not.

2.3.2 Infrastructure Development and Adoption of Innovation

Infrastructure refers to the systems that help a country to ensure economic efficiency and social equity. Infrastructure development refers to the improvement and expansion of systems that allow transportation and delivery of services in a particular place (Jones, 2020). Infrastructure development and the adoption of innovation go hand in hand. Infrastructure development allows for better adoption of innovation (Jones, 2020). The adoption of innovation, on the other hand, challenges the country and people to improve infrastructure to meet the needs of the innovation that has been adopted.

When evaluating the effects of supporting the infrastructure for electric vehicles in Brazil and China Li (2016) reviewed available data about these countries. It was found that electric vehicles require a complex and critical infrastructure starting from charging points since there are very few trials showing the effectiveness of battery swapping. A charging point requires adequate electricity from the grid thus government full support through the provision of various incentives is critical. Charging time of these vehicles is also essential to avert crowding in the grid which may fluctuate and cause unnecessary power outages. Moreover, the Chinese government offered necessary support by creating a new infrastructure for electric vehicles which their counterparts in Brazil failed and adoption of electric vehicles in Brazil remained insignificant while in China it was on the rise. The study did not highlight the implication of adopting electric vehicles on physical infrastructure especially roads and other vehicles.

Examination of the implication of adopting electric vehicles was undertaken by Burns, and Hotchkiss, (2023) in the United States by adopting GSL. The adoption of electric vehicles has eaten tax generated by the government from gasoline threatening financing of road infrastructure, especially road users who cannot afford electric vehicles and this has made governments think of alternative revenue streams to balance these deficits. The study did not highlight the charging system as one of the critical infrastructures in adopting electric vehicles thus creating a conceptual gap.

Evaluating how Americans' choice for EVs is affected by the existence of charging infrastructure Zou et al. (2020) made use of the logit regression model. The study found that an increased number of charging spots encouraged more people to adopt electric cars. Slow and fast charging have a complimentary effect in enhancing the adoption and use of EVs where its combination can compensate unavailability of home charging. Old and new cars have different sensitivity on home and fast charging. The study adopted a logit regression model while this study adopts a multiple regression model resulting in a methodological gap.

Examining the architecture of public charging stations for electric cars in Norway Schulz, and Rode, (2022) adopted the OLS method. It was established that public charging systems infrastructure is an accelerator of the diffusion of battery EVs. Decentralizing fast charging to rural areas reduces demand for public infrastructure. This also increases the adoption of electric automobiles among private motorists. The study narrowed the infrastructure of electric vehicles to only the charging system and failed to highlight another important component of the infrastructure of electric vehicle adoption for instance electricity component.

Assessing the optimal deployment of EVs, charging infrastructural facilities, and future trends Gupta, et al. (2021) adopted a survey research design. Increased adoption of electric vehicles has induced adverse impacts on the existing grid infrastructure, especially disruptions. The increased demand from charging stations on electricity has necessitated countermeasures to avert these adverse effects. A survey design was employed by Gupta et al. (2021) while the proposed study adopts a descriptive cross-sectional survey.

2.3.4 Knowledge and Adoption of Innovation

Knowledge refers to awareness or understanding of something. Knowing innovation enables one to use the innovation efficiently and effectively (Castaneda & Cuellar, 2020). Knowledge enables one to know about the innovation and develop an interest in having it or using it. adoption of electric vehicle innovation is affected significantly by the knowledge people have about them. Lack of adequate knowledge makes people have mixed feelings about its adoption (Castaneda & Cuellar, 2020). Knowledge gives people the confidence to adopt technology since they will have an understanding of its advantages and disadvantages.

Examining the factors that influence the adoption of electric vehicles under the subsidy program in China, Zhang et al. (2022) adopted a structural equation model. Product recognition is critical in its adoption and knowledge plays a key role in recognizing products. Inadequate knowledge and experience create an impediment to adopting electric vehicles. The cognitive ability of the potential user of electric vehicles is instrumental in choosing whether to use an electric vehicle or not. This also creates the perception of how effective are the EVs. The study did not highlight the importance of availing information in creating knowledge but rather focused on product recognition as an indicator of adopting electric vehicles.

Undertaking the stock of factors that affect intentions of using electric vehicles in India Higueras-Castillo et al. (2023) adopted structural equation modelling. The study sampled 378 participants from Spain and 265 from India. The study found that environmental knowledge before adopting EVs is important since it enhances its acceptability. Technological knowledge of the usability among the consumers of electric vehicles is key in its adoption. The study adopted SEM while this study adopts a multiple regression model.

Huang, et al., (2021) using the TAM found that knowledge management impacts the adoption of EVs. As per the study by Huang et al. (2021), there is no clear and substantial correlation between the technical knowledge dimension of readiness to embrace electric vehicles and how enjoyable they are to use. Insufficient knowledge about the immature industry of electric vehicles has created a stumbling block in the progress of the adoption of EVs. When government policies change, the public's intention to use electric vehicles may be jeopardized by their lack of awareness.

Governments have employed several strategies across the globe as they upscale the adoption of EVs. According to Masiero et al. (2016), users of electric vehicles can only be knowledgeable if there is constant interaction which can make them reach a high cognitive level and thus become easier to persuasion. Customers will also strengthen ties with electric vehicle usage if the psychological needs of the adopters are satisfied. The study viewed the government as a single provider of knowledge yet players in the sector have a fair share of roles in the adoption of electric vehicles.

2.4 Research Gaps

There isn't much research on the adoption of electric vehicles at the local level. Langbroek et al. (2016) observed that government support through incentive programs lowered costs. Alanazi (2023) and Potdar et al. (2018) argued that the scarcity of charging centres increased the cost of adoption of EVs. Weldon et al. (2018) noted that the adoption of electric vehicles is mostly cost-competitive. Nian et al. (2019) noted that electric vehicles are characterized by high upfront costs or capital costs. Examining the impact on the cost of the adoption of electric vehicles at the local level, therefore, will promote a better understanding of electric vehicles in Kenya.

Li (2016) found out that electric vehicles require a complex and critical infrastructure but did not highlight the implication of adopting electric vehicles on physical infrastructure especially roads and other vehicles. Burns and Hotchkiss (2023) found out that electric vehicles have eaten tax generated by the government but did not highlight the charging system as one of the critical infrastructures in electric vehicle adoption. Zou, et al., (2020) used a logit regression model while this study adopts a multiple regression model. Norway Schulz, and Rode, (2022) narrowed the infrastructure of electric vehicles to only a charging system and failed to highlight other important components of the infrastructure of electric vehicle adoption. Little has been done to examine the level of infrastructural development to aid the adoption of electric vehicles in Kenya.

Zhang, et al., (2022) only focused on product recognition as the critical pillar while the importance of availing information as a source of knowledge was not explored. Huang, et al., (2021) and Ackaah et al. (2022) indicated that there is no meaningful correlation between the desire to adopt electric vehicles and the joy or fun that comes with operating them. While failing to look at other aspects of knowledge that have an impact on the adoption of electric vehicles Masiero, et al., (2016) observed that the government is the main creator of knowledge yet many players in the sector have a fair share of roles in the adoption of electric vehicles.

Table 2.1: Summary of Research Gaps

Author	Title	Finding	Research gaps
Langbroek et al. (2016)	Policy incentives and EV adoption	Creating incentives to attract the adoption of EVs has been laid down by countries as an avenue of decreasing costs for instance lowering parking fees and more access to public transport lanes.	The study focused on the policy incentive cost only and did not focus on other important components such as production and operational costs which this study focuses on.
Alanazi, (2023)	Benefits and challenges facing the adoption of electric vehicles	The adoption of electric vehicles experiences scarcity of charging stations that add more costs to the consumers and more anxieties regarding the time a charged battery may last.	The study adopted a correlational design while the current investigation employed a descriptive cross-sectional survey.
Potdar et al. (2018)	Risks and challenges associated with the adoption of EVs	Integration of EVs into the grid is an additional cost that users bear indirectly. Integration of V2G technology into the system is costly.	The study only relied on the desktop survey limiting itself effectively to secondary sources while the proposed study focused on primary sources creating a methodological gap

Weldon et al. (2018)	Long-term ownership and comparative analysis of EVs and ICE vehicles	Adopting EVs is cost-competitive after a long period which stretches for over ten years.	The study did not highlight the significance of government incentives in reducing the cost of adopting electric vehicles amounting to a conceptual gap.
Li, (2016)	Impact of facilitating infrastructure of EVs in China and Brazil	As per the findings, EVs require a complex and critical infrastructure starting from charging points.	The study did not highlight the implication of adopting electric vehicles on physical infrastructure especially roads and other vehicles.
Burns and Hotchkiss (2023)	the implication of adopting electric vehicle	Adoption of electric vehicles eats tax generated by the government from gasoline threatening financing of road infrastructure.	The study did not highlight the charging system as one of the critical infrastructures in adopting electric vehicles thus creating a conceptual gap
Zou, et al. (2020)	effect of charging infrastructure on electric vehicle preference	The increased number of charging spots encouraged more people to adopt electric cars.	The study adopted a logit regression model while this study adopted a multiple regression model resulting in a methodological gap.

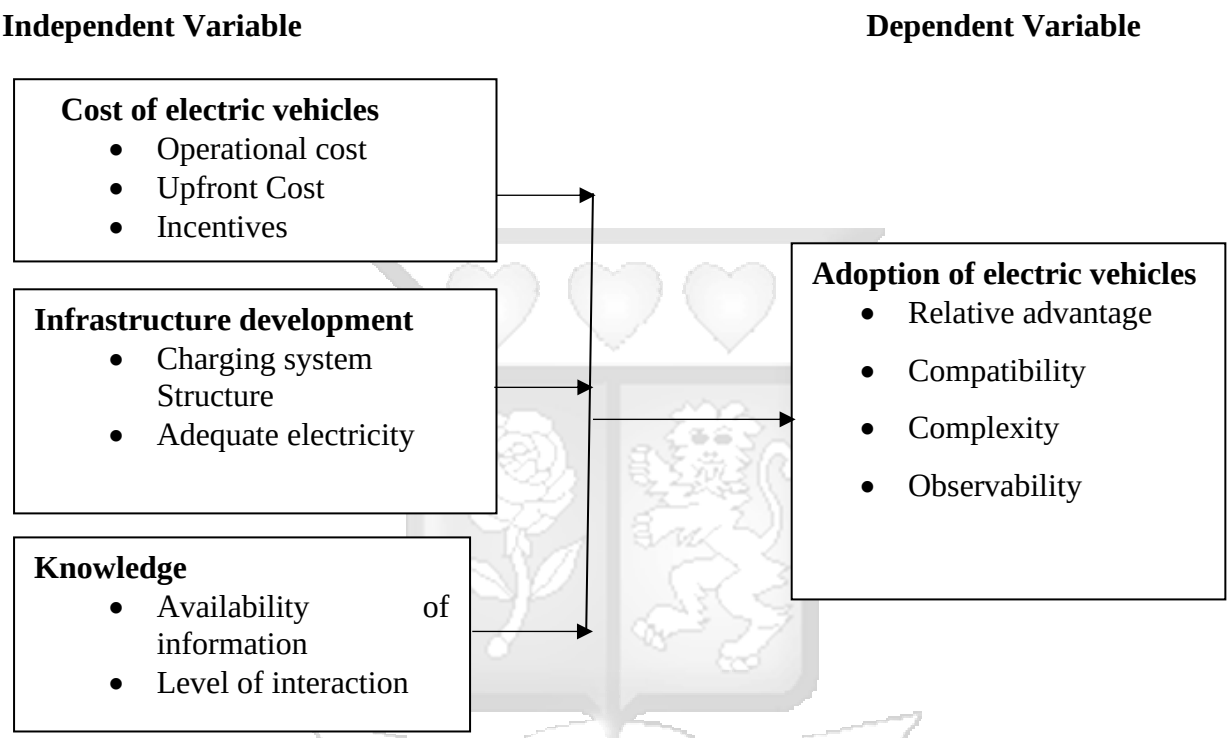
Norway et al. (2022)	Role of public charging systems infrastructure in the adoption of EVs	It was found that public charging infrastructure accelerates the diffusion of battery EVs.	The study narrowed the infrastructure of EVs to only the charging system and failed to highlight another important component of the infrastructure of EV adoption for example electricity component
Zhang, et al. (2022)	Factors influencing the adoption of electric vehicle	Product recognition is critical in its adoption and knowledge plays a key role in recognizing products.	The study did not highlight the importance of availing information in creating knowledge but rather focused on product recognition as an indicator of adopting electric vehicles.
Higueras-Castillo et al. (2023)	the stock of factors that affect intentions of using electric vehicles	The study found that environmental knowledge on the adoption of EVs is important since it enhances its acceptability.	The study adopted SEM while this study adopted a multiple regression model.
Masiero et al. (2016)	Adoption of electric vehicles in China	Users of EVs can only be knowledgeable if there is constant interaction which can make them reach a high cognitive level and thus become easy to persuade.	The study viewed the government as a single provider of knowledge yet players in the sector have a fair share of roles in the adoption of EVs.

Source: Researcher (2024)

2.7 Conceptual Framework

Figure 2.1 shows the conceptual framework of factors identified that may influence the adoption of EVs. It is hypothesized that cost of electric vehicles, infrastructure, and knowledge affect the adoption of EVs and innovation in Kenya.

Figure 2.1 Conceptual Framework



Source: Researcher (2024)

2.8 Operationalization of Variables

Operationalization of the study variables enables the study to reduce abstract concepts into characteristics that can be measured explicitly. Each construct was measured based on the indicators that have been identified. The summary of each indicator and measurement indicator that was used are shown in Table 2.2.

Table 2.2 Operationalization of Variables

Independent Variable	Constructs	Operational Definition	Measurement Scales	Source
	Cost of electric vehicles	It is the capital incurred in the entire production cycle of electric vehicles.	Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5=strongly agree	Yeboah (2023) and Opiyo and Njenga (2023)
	Infrastructure development	It is the system integrated into the existing road network to support electric vehicles.	Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5=strongly agree	Jones (2020) and Agunbiade and Siyan (2020)
	Knowledge	It is the adequacy of the information that is available to road users on the importance of embracing electric vehicles.	Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5=strongly agree	Castaneda and Cuellar (2020)
Dependent Variable	Adoption of electric vehicles	It is the implementation of EVs in the public passenger system.	Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5=strongly agree	Singh et al. (2020) and Oelrichs (2023)

Source: Researcher (2024)

2.8 Chapter Summary

The chapter examines theories that anchored the study. It also examined the empirical literature that has studied factors affecting the adoption of EVs. Research gaps from the examined literature are also summarized. The conceptual framework was also examined to show the relationship. The operationalization of variables also was summarized to show variables and how they can be measured.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The chapter outlines the methodology that shall be adopted in answering the research questions. It highlights the research design, the population that the study focuses on, and the sampling methods that was employed. In addition, the chapter outlines the methods that should be employed in collecting data, analysing it, and how the researcher ensured quality and ethical conduct during the research.

3.2 Research Philosophy

Research philosophy, according to Creswell (2013), is a set of ideas about the processes in the study design process that should be followed when gathering and analysing data. It serves as the basis of information for a study and helps to identify, comprehend, and reduce research biases (Sekaran & Bougie, 2013). This study adopted a positivist philosophical school of thought. Positivism emphasizes the importance of empirical evidence and scientific methods to gain knowledge.

According to positivism observer is independent of the variables understudy. Observation should be done objectively to come up with facts. Positivism emphasizes the use of quantitative data and objective techniques to better understand a phenomenon. The use of objective techniques is important since it enables the researcher to come up with findings that can be empirically and logically verified. Through the determination of cause and effect, positivism enables one to gain predictive and explanatory knowledge. The study adopted positivism was important since the study sought to get factual knowledge. Factual knowledge is trustworthy and promotes a better comprehension of the research topic. Positivism enabled the study to generate verifiable results.

3.3 Research Design

Research design comprises methods and procedures the researcher will use to answer the research questions (McCombes, 2023). The study adopted a descriptive cross-sectional survey design. The design was useful in determining factors affecting the adoption of EVs by public service vehicle matatu SACCOs in Nairobi, Kenya. The design enabled the study to better examine variables and describe their characteristics. A survey using a structured questionnaire

was conducted to get data which was analysed using SPSS version 29. The study did descriptive and inferential analysis to better understand the variables under study.

3.4 Population

Population is an aggregate of subjects to be studied in a universe. It is from these subjects that a conclusion about the population is drawn (Stillwell & Clarke, 2011). The target population is the community of interest (Acharya, 2010). The study population was 272 PSV SACCOs registered matatu SACCOs in Nairobi (NTSA, 2023). The unit of observation was the PSV operations manager. PSV operations manager was selected due to their overall mandate of running these businesses and has more insights into how this business is run. This is important as it enabled the study to get insights that are important in making a conclusion that can be relied upon.

3.5 Sampling Design

Sampling is a process where a portion of the target group is selected to represent a given study (Blumberg, et al., 2014). The study made use of judgemental sampling to come up with the sample. Judgmental sampling is appropriate in situation where the researcher believes some respondents have crucial knowledge or information than others, and requires an expert to use their judgment in selecting the appropriate respondents (Olaf College, 2023). In this study, the principal researcher employed judgmental sampling to identify one operation manager from each of the matatu SACCO. This is because matatu SACCOs' operation managers have crucial information pertaining adoption of electric vehicles by PSV matatu SACCOs. Also, the study had access to the list of PSV matatu SACCOs which made judgemental sampling convenient (Aransiola, 2023). Judgemental sampling also enabled the research to gain deeper understanding of the variables that were the focus of the study. It also enabled the study to get respondents who met the required characteristics (Aransiola, 2023). Only one PSV operations manager was selected from the matatu SACCOs that were selected.

3.5.1 Study Sample Size

Judgmental sampling of the PSV matatu SACCOs was employed in selecting the sample size. Judgemental sampling was convenient has the study had the list of the PSV matatu SACCOs. The sample size is computed by employing Slovin's Formula;

$n = N / (1 + Ne2)$

where:

n = sample size

N = population size

e = acceptable margin of error

the sample size n= 272/ $(1+272*(0.05)^2)$

=161.905

=162

The sample size, therefore, was 162 PSV SACCOs.

3.6 Data Collection

A standardized questionnaire was used to collect primary data from PSV SACCO matatu SACCOs. The research objectives informed the development of the questionnaire. The questionnaire was structured into three sections. Section A focused on the general information of the study participants. Section B had questions on the cost of the adoption of EVs, the effect of infrastructure development on the adoption of electric vehicles, and the effect of knowledge on the adoption of electric vehicles, while Section C was about the adoption of EVs in Nairobi. The questionnaire was on a 5-point Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5=strongly agree.

The researcher administered the questionnaire with the assistance of two research assistants who were trained accordingly to issue the questionnaires to the respondents and help them capture data. The questionnaires were accompanied by a transmittal letter detailing the aim of the data to be collected and how it will be used. In administering the questionnaires, the drop-and-pick-later technique was used in cases where respondents could give responses without much assistance. This applied to the respondents who were educated and could give responses with ease (Junod & Jacquet, 2022). Follow-up was done to enable the study to increase the response rate. The support system was also put in place to help respondents answer questions and increase the response rates.

3.7 Data Analysis

After data had been collected, it was edited accordingly to ensure consistency. This was a requirement for data to be said to be complete. Editing, tabulation, and coding were done to eliminate abnormal replies. SPSS Version 29 was employed in analysing the data, which involved both descriptive and inferential statistics. The mean, standard deviation, percentages, and frequencies made up the descriptive statistics. The multiple-regression model below was

used to test effect of cost of electric vehicles, infrastructure development and knowledge on adoption of electric vehicles.

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$

Where;

Y– Adoption of electric vehicles by matatu PSVs in Nairobi

X_1 – cost of electric vehicles

X_2 – infrastructure development

X_3 – Knowledge

Є= Error term

β_0 = constant term

In the model, $\beta_i = 1 \ldots 3$ measures the sensitivity of the dependent variable (Y) to unit changes in the predictor variables X_1, X_2 and X_3. Є captures the unexplained variations in the model.

Factor analysis was conducted using the dimension reduction method to separate the valid factors that affect the adoption of electric vehicles in Nairobi County. It is also used to examine the underlying constructs that the research questions intend to measure consequently ensuring the validity and reliability of the questionnaire. A factor loading of 0.7 indicates that variables can be considered valid, according to Cooper and Schindler (2011). However, as recommended by Bagozzi and Yi (2012), a factor loading value of at least 0.5 is permitted. Similarly, Kilic (2020), argued that factor loading of 0.5 and above is acceptable. With an ordinal logistic regression model, the study sought to investigate the significant factors that affect the adoption of EVs by public service vehicle matatu SACCOs in Nairobi. Thus, the ordinal logistic regression model was the most suitable to determine the factors impacting the adoption of EVs by public service vehicle matatu SACCOs in Nairobi, Kenya. The factors included the cost of adopting EVs and the level of infrastructure and knowledge that impact the adoption of EVs.

The model assumption tests to be included that include normality test, multicollinearity, autocorrelation, linearity test and heteroscedasticity.

Normality tests checks if collected data are normally distributed (Yazici & Yolacan, 2007). Normality test will be checked using Kolmogorov Smirnov test. Under null hypothesis, data is not normally distributed. A calculated p value <0.05, implies data is not normally distributed whereas p value> 0.05 implies data is normally distributed. Parametric test will be employed if

data is no normally distributed while non-parametric tests shall be employed in case the study fails the normality test.

In this study, multicollinearity was checked sung Variance Inflation Factor (VIF). As per Montgomery *et al.*, (2015) and Alin (2010), multicollinearity depicts a phenomenon where the correlation level between research variables is highly correlated. Severe multicollinearity results to inflated standard errors in the model that affect the accuracy and reliability of the regression coefficients. A VIF more than 5 signifies presence of sever collinearity while VIF less than 5 implies minimal collinearity (Alin, 2010). Severe collinearity will be corrected by increasing sample size of the study or by collapsing the variables that are correlated into one.

The measure of error terms in the data is termed as serial correlation. In this study, there is tendency of serial correlation since the data is cross sectional. To check for serial correlation, Durbin Watson (DW) shall be adapted. A DW ranges from 0-4 where DW of 2.0 implies no autocorrelation, 0-2 signifies positive correlation while 2-4 implies negative autocorrelation (Ali, 1987).

3.8 Research Quality

3.8.1 Pilot Testing of Research Instruments

A pilot study was done in Machakos County using 38 questionnaires. 38 questionnaires which represent 14% of the sample size were administered to the PSV matatu SACCOs in Machakos County. According to Kothari (2004), 10% of the sample size is good to provide a good picture of the intended study. The pilot study results were utilized to refine the questionnaire and the overall research, but they were not incorporated into the final study. The questionnaire was improved using the feedback from the pilot trial.

3.8.2 Reliability

The consistency of the data collection tool to produce the same findings upon several trials is known as reliability (Orodho & Kombo, 2002). Following the pilot study, the collected data was examined. The Cronbach alpha coefficient was employed to evaluate the instruments' reliability and ascertain the items' internal consistency. The ideal statements for the study are those in the questionnaire with reliability coefficients of 0.7 or higher. The study will adopt the test instruments if it yields a reliability coefficient of 0.7 and above since it will enable the study to get consistent and accurate results. According to Gliem and Gliem (2003) Cronbach alpha coefficient of 0.7 shows that items in the study are consistent and, as a result, are reliable. Asikhia (2009) is of the view that the reliability test coefficient should not go below 0.6.

Bagozzi and Yi (2012), on the other hand, consider the value of 0.5 and above to be reliable. The study, therefore, adopted 0.7 as reliable and satisfactory to enable it to get results that can be relied upon.

The reliability was tested using the Cronbach alpha coefficient where Excellent was taken as 0.7 or above. Table 4.2 displays the findings of the constructs employed to characterize each of the independent variables.

Table 3.1:Reliability Results

Constructs	Alpha Score	No. of Items	Comments
Cost of electric vehicles	0.765	6	Accepted
Infrastructure Development	0.754	6	Accepted
Knowledge	0.744	6	Accepted
Adoption of electric vehicles	0.813	7	Accepted

Source: Researcher (2024)

The Cronbach Alpha values for cost of electric vehicles, infrastructure development, and knowledge were 0.767, 0.754, and 0.744 respectively. The Cronbach Alpha value for the adoption of electric vehicles was 0.813. From the results, Cronbach Alpha scores were more than 0.7 and, as a result, data were retained for further analysis.

3.8.3 Validity

The degree to which an instrument measures what it is intended to measure is known as its validity (Franklin & Ballan, 2001). It is the most accurate estimate now available of whether a particular inference, claim, or conclusion is true or false. Content, face, and construct validity can be used to measure validity. Both aspects of validity were ascertained through expert judgment. The supervisor was given the questionnaire to go through and give recommendations about the areas that needed improvement and improved accordingly.

3.9 Ethical Issues in Research

To deliver on the demands of the legal and ethical parameters, the researcher sought permission and authority from the National Council for Science Technology and Innovations (NACOSTI) and Strathmore University ethics committee to conduct the study. Secondly, the participants were, among other measures, given an introductory letter and all the details about the research and how the information was used to facilitate informed consent. The responders were made

aware of this and given the assurance that the data they submit will only be used for the specified reasons. Thirdly, because the participants were not asked to provide their names or any other personally identifiable information in the questionnaires, the researcher guaranteed respondents' confidentiality and anonymity.

3.10 Chapter Summary

This chapter discusses research philosophy, research design, population and sampling, and data collection. It also examines the research quality i.e. validity and reliability as well as ethical issues in research.

CHAPTER FOUR
RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This chapter shows the outcomes of the data analysis and discusses them in light of the study's objectives. Tables of percentages and frequencies are used to present what was found in the study. The chapter also includes the results of from the collected quantitative data.

4.2 Response Rate

162 questionnaires were administered to the respondents. 135 filled and returned the questionnaires while 27 failed to return the questionnaires as shown in table 4.1 below.

Table 4.1: Response rate of questionnaires

Questionnaire Responses	Frequency	Percentage
Returned Questionnaires	135	83.33%
Questionnaires that were not returned	27	16.67%
Total	**162**	**100.00%**

Source: Researcher (2024)

135 out of the 162 questionnaires which represent 83.33% were duly completed and returned. A response rate of 83.33% is enough to conclude the study. According to Bramm (2024), a response rate of 50% and above is appropriate to make a good conclusion about the study. 83.33% response rate, therefore, is excellent to conclude the study. The high response rate was due to a brief introduction before a questionnaire was given. The introduction aimed to make the respondents understand the importance of the response to motivate them to participate. Respondents were also assured of confidentiality. They were also sent reminder text messages, which enabled them to complete the questionnaires in time.

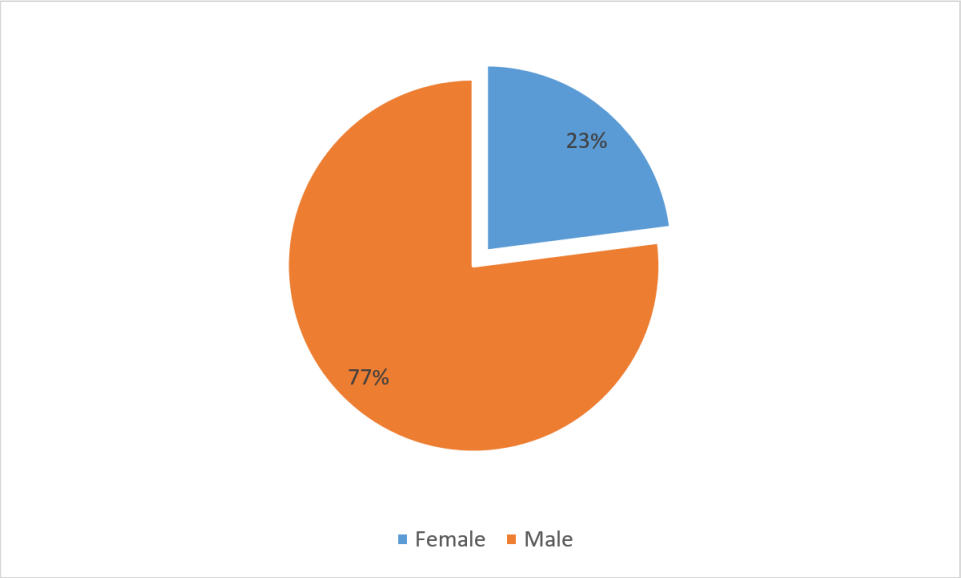
4.3 Demographic Characteristics

The demographic characteristics of the respondents were classified into gender, age, level of education, work experience, and time of service of matatu SACCO and SACCO license. The findings of each category are presented and discussed.

4.3.1 Gender of the Respondents

The finding on gender disaggregation of respondents is presented in Figure 4.1.

Figure 4. 1: Gender of the respondents



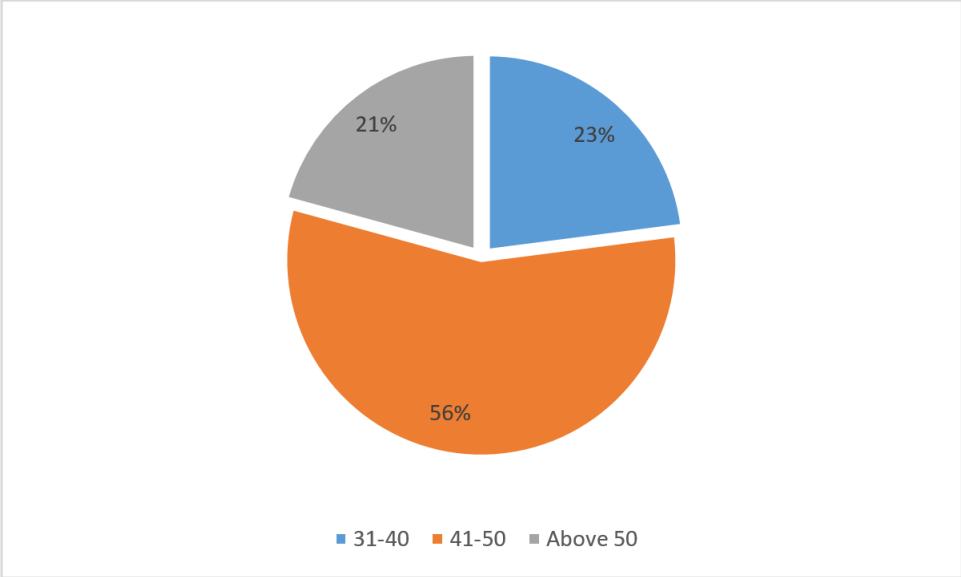
Source: Researcher (2024)

From table 4.1, the majority of the respondents, 77% are male while 33% of the respondents are female. Traditionally, PSV operations have been a preserve for men in Kenya. Gender inequality in the PSV sector is still high as women see it as the preserve of men. 33% responses nonetheless show that women are taking up the PSV sector and things are expected to change in the future.

4.3.2 Age of the Respondents

The finding on the age distribution of respondents is presented in Figure 4.2.

Figure 4. 2: Age of the respondents

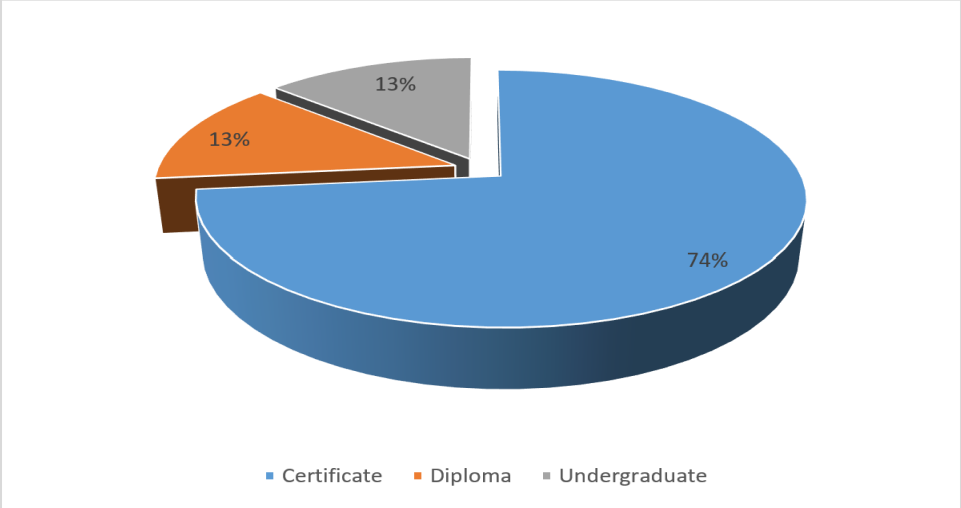


The study showed that 21% of the respondents were between the ages of 31 and 40, 56% of the respondents were between the ages of 41 and 50 and 23% of the respondents were 50 years and above old. From the study, most of the respondents, 79%, were above 41 years old and old enough to give reliable responses. The study aimed to get reliable and accurate findings. The age distribution of the respondents, therefore, enabled the study to get different perspectives on the variables under study (Pickering, 2017). Notably, age comes with experience of life and work issues and this was important to enable the study to get results that could be relied upon.

4.3.3 Education Level

The finding on the level of education of respondents is presented in Figure 4.3.

Figure 4. 3: Level of education



Source: Researcher (2024)

The study indicated that 74% of respondents had a certificate, 13% had a diploma and 13% had an undergraduate. The findings demonstrate that the vast majority of respondents were literate, i.e. could read and write. The respondents, therefore, required no support during the filling of the questionnaires. Their level of education meant that they were knowledgeable about the issues the study intended to answer (Goldberg et al., 2015).

4.3.4 Work Experience

The finding on the work experience of respondents is presented in Table 4.3.

Table 4.2: Work Experience

Category	Frequency	Percent (%)
4 -7 years	28	20.7
8-11 years	58	43.0
12-15 years	26	19.3
Over 15 years	23	17.0
Total	135	100.0

Source: Researcher (2024)

From Table 4.2, 20.7% of the respondents have served as PSV matatu SACCOs for 4-7 years, 43.0% have served 8-11 years, 19.3% have served 12-15 and 17.0% have served over 15 years. The year of service shows the experience a person has with PSV operation. Experience with the company is important during the research (Trung, 2021). From the study, most of the respondents had the needed experience to answer the questions appropriately based on the number of years they have worked as PSV matatu SACCOs. Respondents who have worked as PSV matatu SACCOs for a good number of years have a good understanding of the functioning of the PSV sector and the opportunities and challenges the sector is facing (Trung, 2021). As a result, they can give invaluable responses which is important to come up with the findings that can be relied upon (Trung, 2021). The fact that most respondents had worked long as PSV matatu SACCOs means the responses that were gotten could be relied upon to come up with reliable findings.

4.3.5 Time of service of matatu SACCO

The finding on the time of service of matatu SACCO of respondents is presented in Table 4.3.

Table 4.3: Time the Matatu SACCO has been in operation

Category	Frequency	Percent (%)
4 -7 years	19	14.1
8-11 years	47	34.8
12-15 years	30	22.2
Over 15 years	39	28.9
Total	135	100.0

Source: Researcher (2024)

From the study, 14.1% of the matatu SACCOs have been in operation for 4-7 years, 34.8% of the matatu SACCOs have been in operation for 8-11 years, 22.2% of the matatu SACCOs have

been in operation for 12-15 years while 28.9% of the matatu SACCOs have been in operation for over 15 years. The study shows that matatu SACCOs have been in operation for a good period. Being in operation for a good period shows that the matatu SACCO has a good understanding of the sector and can give invaluable responses which is important to come up with findings that can be relied upon (Trung, 2021).

4.3.6 SACCO Licence

From the study, all the SACCOs that were studied have licences. This, therefore, means they were allowed to operate. This is important because it means the respondents were confident to give responses that could be relied upon.

4.4 Descriptive Statistics Results

The descriptive statistics were discussed under each objective. The study utilized two main indicators; the mean score and standard deviation. The mean scores ranged from 1-5 corresponding to the 5 scores on the Likert Scale. With; 0-1.00 strongly disagree, 2 to 2.6 disagree, close to 3 moderate/neutral and close to 4 agree, and a score of 4.5-5.00 strongly agree

4.4.1. Cost of electric vehicles

The study sought to establish the effect of the cost of electric vehicles on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi. The finding is presented in Table 4.4.

Table 4.4: Cost of electric vehicles

	Mean	S D
The government has provided incentives which has lowered the cost of adopting electric vehicles	3.96	0.75
The operational costs associated with engine combustion public service matatu vehicles have been reduced to a manageable level with the adoption of electric vehicles.	4.07	0.55
The scarcity of charging systems has increased the operational expenses of electric cars making PSV matatu SACCOs just remain with the oil-powered vehicles.	4.03	0.57
Integration of electric vehicles into the power grid has attracted extra cost and this resulted in the costly adoption of electric vehicles.	4.13	0.57

Payback period costs for the adoption of electric vehicles are more favourable than the previous vehicles.	4.01	0.66
Adoption of electric vehicles attracts huge upfront costs or capital as compared to previous matatu vehicles powered by oil.	3.94	0.69
Average	**4.02**	**0.63**

Source: Researcher (2024)

From Table 4.4, the respondents agree that the government has provided incentives that have lowered the cost of adopting electric vehicles with a mean of 3.96, the operational costs associated with engine combustion public service matatu vehicles have been reduced to a manageable level with the adoption of electric vehicles with a mean of 4.07, scarcity of charging systems have increased operational expenses of electric cars making PSV matatu SACCOs to just remained with the oil-powered vehicles with a mean of 4.03, integration of electric vehicles into the power grid has attracted extra cost and this resulted to costly adoption of an electric vehicle with a mean of 4.13, payback period costs for the adoption of electric vehicles is more favourable than the previous vehicles with a mean of 4.01 and that adoption of electric vehicles attract huge upfront costs or capital as compared to previous Matatu vehicles powered by oil with a mean of 3.94.The cost variable had a mean of 4.02, which is strong enough conclude that cost has an influence on the adoption of electric vehicles. The average standard deviation 0.63 which was less than one showing that values are close to the mean and, as a result, responses are consistent.

4.4.2. Infrastructure Development

The study sought to establish the effect of infrastructural development on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi. The finding is presented in

Table 4.5: Infrastructure Development

	Mean	SD
The presence of adequate charging points for electric vehicles across the routes in Nairobi has made us contemplate acquiring electric PSV	2.38	0.63
The existence of adequate power in the grid enables faster recharging of electric vehicles anytime without causing outages whenever there is crowding out.	2.36	0.74
The presence of cost-effective charging solutions for electric-powered PSV vehicles is readily available.	2.27	0.58

The persistence of fast charging systems for electric vehicles has made this matatu SACCO rethink the adoption of electric PSV SACCOs.	2.37	0.73
The presence of frequent power disruptions and outages has made PSV matatu SACCO not consider adopting electric vehicles.	2.33	0.69
A charging system that is not decentralized makes it challenging to access charging systems for electric vehicles.	3.84	0.74
Average	**2.59**	**0.69**

Source: Researcher (2024)

From table 4.5, the respondents do not agree that the presence of adequate charging points for electric vehicles across the routes in Nairobi has made us contemplate acquiring electric PSV with mean of 2.38, the existence of adequate power in the grid to enable faster recharging of electric vehicles anytime without causing outage whenever there is crowding out with mean of 2.36, the presence of cost-effective charging solution for the electrically powered PSV vehicles are readily available with mean of 2.27, the persistence of fast charging systems for the electric vehicles has made this matatu SACCO to rethink about the adoption of the electric PSV SACCOs with mean of 2.37 and the presence of frequent power disruption and outages has made this PSV SACCO not to consider adopting the electric with a mean of 2.33

On the other hand, the respondents agreed that vehicles and charging systems that are not decentralized make it challenging to access charging systems for electric vehicles with a mean of 3.84. The infrastructure development variable had a mean of 2.59. Which means the respondents agreed to some extent that infrastructure development had an effect on the adoption of electric vehicles. The average standard deviation 0.69 which was less than one showing that values are close to the mean and, as a result, responses are consistent.

4.4.3. Knowledge

The study sought to establish the effect of knowledge on the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi. The finding is presented in Table 4.6.

Table 4.6: Knowledge

	Mean	SD
Public road users can recognize electric vehicles and express their preferences instantly.	4.09	0.62
Many road users are informed on the merits of using electric vehicles over oil-powered vehicles.	2.24	0.52
Stakeholders of public vehicles have adequate knowledge of the importance of adopting electric vehicles in mitigating environmental impacts	3.9	0.68
The knowledge that `electric powered PSVs are cost-effective in terms of energy consumption compared to oil-powered PSVs	3.89	0.79
The PSV matatu SACCOs aspiring to acquire electric PSVs are not aware of where to purchase them here in Kenya	2.27	0.61
A lack of knowledge among PSV matatu SACCOs on how to operate electric PSVs.	2.22	0.56
Average	**3.1**	**0.63**

Source: Researcher (2024)

From Table 4.6, respondents agreed that public road users can recognize electric vehicles and express their preferences instantly with a mean of 4.09, stakeholders of public vehicles have adequate knowledge on the importance of adopting electric vehicles in mitigating environment impacts with a mean of 3.89 and that the knowledge that electric powered PSVs are cost-effective in terms of energy consumption compared to oil-powered PSVs with a mean of 3.89.

On the other hand, the respondents did not agree on the idea that many of the road users are informed on the merits of using electric vehicles over oil-powered vehicles with a mean of 2.24, the PSV matatu SACCOs aspiring to acquire electric PSV are not aware on where to purchase them here in Kenya with a mean of 2.27 and that lack of knowledge among PSV matatu SACCOs on how to operate electric PSVs with a mean of 2.22. The knowledge variable had a mean of 3.1. Which means the respondents agreed to some extent that knowledge had an effect on the adoption of electric vehicles. The average standard deviation 0.63 which was less than one showing that values are close to the mean and, as a result, responses are consistent.

Normality tests are carried out to ascertain the consistency in the distribution of data (Yazici & Yolacan, 2007). To carry out single or joint hypothesis tests of the model, the normality assumption should be in place (Brooks & Condori, 2018). This study employed Kolmogorov Smirnov test to check normality tests. For a p-value <0.05, it means the data is not normally distributed and for a p value >0.05, the data follows normal distribution. Normality tests were also carried out in the study using Q-Q plots to ascertain the relationship between the observed value and the expected normal for the variables under review. The normality test results for the study are outlined in Table 4.23 and other subsequent sections outlining the Q-Q plots for the variables.

4.5 Diagnostic Tests

Table 4. 7: Normality Test Results

	Kolmogorov-Smirnova		
	Statistic	**df**	**Sig.**
Adoption of electric vehicles	0.092	214	0.063
Cost of electric vehicles	0.085	214	0.329
Infrastructure development	0.076	214	0.115
Knowledge	0.066	214	0.092

From the results tabulated in Table 4.7, the normality test results for the study indicate that all the significance values for the variable in the study are .063>0.05, 0.329>0.05, 0.115>0.05 and 0.092>0.05. Thus, the study makes the conclusion that the data follows a normal distribution and hence can be used for further analysis to give reliable inferences.

The study employed Variance Inflation Factor (VIF) to measure multicollinearity (Alin, 2010). Multicollinearity represents a condition where two or more predictor variables are found to be highly linearly related (Montgomery *et al.*, 2015). Perfect multicollinearity results in indeterminate regression coefficients and infinite standard errors. Imperfect multicollinearity results into large standard errors, which affect the precision and accuracy of rejection or failure to reject the null hypothesis. The scales of Variance Inflation Factor used are VIF <5; there is no multicollinearity; when VIF ≥ 5 there is presence of multicollinearity.

Table 4. 8: Multicollinearity Test Results

	Tolerance	VIF
(Constant)		
Cost of electric vehicles	0.748	1.337
Infrastructure development	0.834	1.200
Knowledge	0.848	1.179

From the results in Table 4.8, the VIF value for cost of electric vehicles 1.337<5, for infrastructure development 1.2000<5 and for knowledge 1.179<5. The study thus concludes that, based on the results for testing for multicollinearity, a conclusion was made that the data do not suffer from issues of multicollinearity. This is because the VIF values for all the variables in the study are <5 as illustrated. Thus, all the variables are retained for further analysis.

Autocorrelation is performed to test whether observations or responses are correlated with each other. If the model has autocorrelation, then the results from the model are not reliable. Table 4.9 presents the autocorrelation results of the model.

Table 4. 9: Autocorrelation Results

Durbin-Watson
2.009

From the results presented in Table 4.9, the Durbin-Watson value was 2.009. This indicated that there was no autocorrelation in the data, and therefore, the data was suitable for running multiple linear regression. This is in line with Durbin-Watson who noted that a value of 2.0 shows no autocorrelation, >2.0 shows negative autocorrelation and < 2.0 shows positive autocorrelation.

4.6 Inferential Analysis

4.6.1 Correlation between cost, infrastructure development, knowledge and adoption of EVs

Correlation analysis presented the association between variables used in the study. The correlation results are presented in Table 4.7.

Table 4.10: Correlations between cost, infrastructure development, knowledge and adoption of EVs

			Adoption	Cost of electric vehicles	Infrastructure development	Knowledge
Spearman's rho	Adoption of EVs	Correlation Coefficient	1.000	-.459**	.463**	.376**
		Sig. (2-tailed)		.000	.000	.000
		N	135	135	135	135
	Cost of electric vehicles	Correlation Coefficient	-.459**	1.000	-.312**	-.233**
		Sig. (2-tailed)	.000		.000	.007
		N	135	135	135	135
	infrastructure development	Correlation Coefficient	.463**	-.312**	1.000	.205*
		Sig. (2-tailed)	.000	.000		.017
		N	135	135	135	135
	Knowledge	Correlation Coefficient	.376**	-.233**	.205*	1.000
		Sig. (2-tailed)	.000	.007	.017	
		N	135	135	135	135

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

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Researcher (2024)

Values between 0 and 0.3 show that there is a weak positive relationship between variables, values between 0.4 and 0.6 show moderate positive relationship, values between 0.7 and 1 show a strong positive relationship, 0 and -0.3 shows that there is a weak negative relationship between variables, values between -0.4 and -0.6 show moderate negative relationship, while the values between -0.7 and -1 show a strong negative relationship. From the results in Table 4.10, the values for infrastructure development and knowledge are 0.463 and 0.376, which

indicated that there was a moderate positive relationship with adoption of the electric vehicles as indicated by positive values. The cost had a moderate negative relationship with the value of -0.459, as indicated by a negative value of approximately 40%.

4.7 Regression coefficients

4.7.1 Effect of cost on the adoption of electric vehicles by public service vehicle matatu SACCOs

Table 4.11: Regression analysis of cost and adoption of electric vehicles

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.393[a]	.154	.148	.30095

a. Predictors: (Constant), Cost

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.198	1	2.198	24.270	.000[b]
	Residual	12.046	133	.091		
	Total	14.244	134			

a. Dependent Variable: Adoption

b. Predictors: (Constant), Cost

Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.273	.084		51.131	.000
	Cost of electric vehicles	-.124	.025	-.393	-4.926	.000

a. Dependent Variable: Adoption

Source: Researcher (2024)

Adoption of electric vehicles by PSV matatu SACCOs= $4.273 - 0.124X_1$

Where;

X_1 – cost of electric vehicles

The results in Table 4.11 the R^2 is 0.154 which means the cost of electric vehicles explains 15.4% of the adoption of the electric vehicles. The analysis of variance found the F statistic to be 24.270 and the p-value to be 0.000 which indicates that the overall regression model is statistically significant. A P-value that is lower than 0.05 suggests that the F statistic is significant and that cost of electric vehicles had a significant effect on the adoption of electric vehicles. In the regression model cost of electric vehicles had a negative value β=-0.075. This means when cost of the electric vehicles is increased its adoption reduces and vice versa.

4.7.2 Effect of infrastructure development on the adoption of electric vehicles by public service vehicle matatu SACCOs

Table 4.12: Regression analysis of infrastructure development and adoption of electric vehicles

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.424[a]	.180	.173	.29642

a. Predictors: (Constant), infrastructure development

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.558	1	2.558	29.109	.000[b]
	Residual	11.686	133	.088		
	Total	14.244	134			

a. Dependent Variable: Adoption

b. Predictors: (Constant), infrastructure development

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.131	.141		22.143	.000

infrastructure development	.230	.043	.424	5.395	.000

a. Dependent Variable: Adoption

Source: Researcher (2024)

The results in Table 4.12 the R^2 is 0.18 which means the infrastructure development explains 18% of the adoption of the electric vehicles. The analysis of variance found the F statistic to be 29.109 and the p-value to be 0.000 which indicates that the overall regression model is statistically significant. A P-value that is lower than 0.05 suggests that the F statistic is significant and that infrastructure development had a significant effect on the adoption of electric vehicles. In the regression model infrastructure development had a positive value β=0.230 which means infrastructure development had a positive relationship with the adoption of electric vehicles. This implied that 18% of variation in adoption of electric vehicles is as a result of infrastructural development. The significance of the regression model was tested using Analysis of Variance (ANOVA). F=19.109, and p=0.000 which is less than 0.05 thus the model is statistically significant in predicting how infrastructure development affects adoption of electric vehicles Nairobi City County.

4.7.3 Effect of knowledge on the adoption of electric vehicles by public service vehicle matatu SACCOs

Table 4.13: Regression analysis of knowledge and adoption of electric vehicles

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.406[a]	.165	.158	.29912

a. Predictors: (Constant), Knowledge

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.344	1	2.344	26.193	.000[b]
	Residual	11.900	133	.089		
	Total	14.244	134			

a. Dependent Variable: Adoption

b. Predictors: (Constant), Knowledge

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.778	.217		12.793	.000
	Knowledge	.327	.064	.406	5.118	.000

a. Dependent Variable: Adoption

Source: Researcher (2024)

The results in Table 4.13 the R^2 is 0.165 which means the knowledge explains 16.5% of the adoption of the electric vehicles. The analysis of variance found the F statistic to be 26.193 and the p-value to be 0.000 which indicates that the overall regression model is statistically significant. A P-value that is lower than 0.05 suggests that the F statistic is significant and that knowledge had a significant effect on the adoption of electric vehicles. In the regression model knowledge had a positive value β=0.327 which means knowledge had a positive relationship with the adoption of electric vehicles. The significance of the regression model was tested using Analysis of Variance (ANOVA). F=26.193, and p=0.000 which is less than 0.05 thus the model is statistically significant in predicting how knowledge affects adoption of electric vehicles Nairobi City County.

4.7.4 Factors that Affect the Adoption of Electric Vehicles by Public Service Vehicle Matatu SACCOs in Nairobi

Regression analysis was done to understand the linear relationship between variables. The interpretation of the result was based on regression coefficients, ANOVA, and model summaries. The results were presented in Table 4.14.

Table 4. 14: Overall Model Summary

Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.730[a]	.533	.518	.26923

a. Predictors: (Constant), Knowledge, infrastructure development, Cost of electric vehicles

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.748	3	1.583	21.833	.000[b]
	Residual	9.496	131	.072		
	Total	14.244	134			

a. Dependent Variable: Adoption

b. Predictors: (Constant), Knowledge, infrastructure development, Cost of electric vehicles

Regression coefficient

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.821	.260		10.870	.000
	Cost of electric vehicles	-.075	.024	-.239	-3.136	.002
	infrastructure development	.157	.041	.288	3.794	.000
	Knowledge	.233	.060	.290	3.907	.000

a. Dependent Variable: Adoption of electric vehicles

Source: Researcher (2024)

Adoption of electric vehicles by PSV matatu SACCOs= $2.821 - 0.075X_1 + 0.157X_2 + 0.233X_3$

Where;

X_1 – cost of electric vehicles

X_2 – infrastructure development

X_3 – Knowledge

The results in Table 4.14 indicated that there was a correlation between the factors considered (Knowledge, infrastructure development, cost of electric vehicles) and the adoption of electric vehicles with R^2 being 0.533. This implied that 53.3% of changes in the adoption of electric

vehicles would be explained by Knowledge, infrastructure development, and cost of electric vehicles.

The analysis of the variance shows that the overall model is statistically significant. As a result, knowledge, infrastructure development, and cost of electric vehicles significantly influence the adoption of electric vehicles. The analysis of variance found the F statistic to be 21.833 and the p-value to be 0.000 which indicates that the overall regression model is statistically significant. A P-value that is lower than 0.05 suggests that the F statistic is significant. It means that at least one variable among the three variables namely; knowledge, infrastructure development, and cost of electric vehicles had a significant effect on the adoption of electric vehicles. The P-value is less than the conventional probability of 0.05 significance level which confirms the influence of knowledge, infrastructure development, and cost of electric vehicles on the adoption of electric vehicles.

In the regression model, the predictive variables infrastructure development and knowledge had positive beta values while the predictive variable, cost of electric vehicles had a negative value. For the cost of electric vehicles β=-0.075, infrastructure development the β=0.157, and knowledge the β=*0*.233. The P-values for cost of electric vehicles, infrastructure development, and knowledge were 0.002, 0.000, and 0.000 respectively which is lower than 0.05 consequently confirming that the variables are predictors of the adoption of electric vehicles and that the relationship between predictor variables and adoption of electric vehicles is not by random chance.

Results of the cost of electric vehicles (β=-0.075, p=0.002<0.05) show that there is a negative and statistically significant relationship between cost of electric vehicles and the adoption of electric vehicles. It implies that when the cost of electric vehicles is decreased by one unit, the adoption of electric vehicles is increased by 0.075 units. P-value= 0.002 which is lower than 0.05 consequently showing that the relationship between customer switching and performance is not by random chance.

Results of infrastructure development (β=0.157, p=0.000<0.05) show that there is a positive and statistically significant relationship between infrastructure development and the adoption of electric vehicles. From the regression model, when the infrastructure development is increased by one unit, the adoption of electric vehicles increases by 0.157 units. P-value= 0.000

which is lower than 0.05 consequently showing that the relationship between infrastructural development and adoption of electric vehicles is not by random chance.

Results of knowledge (β=0.233, p=0.000<0.05) show that there is a positive and statistically significant relationship between knowledge and adoption of electric vehicles. From the regression model, when the knowledge is increased by one unit, the adoption of electric vehicles increases by 0.233 units. P-value= 0.000 which is lower than 0.05 consequently showing that the relationship between knowledge and adoption of electric vehicles is not by random chance.

4.8 Chapter Summary

The chapter presented results of the data collected that was collected that include descriptive statistics, regression analysis and correlation. The means and standard deviations result of every variable have also included. The results and findings of the study have been displayed on tables and explained accordingly.

CHAPTER FIVE
DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter presents summarized results related to factors that affect the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi. Further, the study presents conclusion, recommendations and limitations of the study.

5.2 Discussion of Findings

This section presents the discussion of findings. The discussion of finding involves comparison and masters' studies with past findings. The discussion has been done as guided by the study objectives.

5.2.1 Cost of electric vehicles and Adoption of Innovation

From the study to examine the effect of cost of electric vehicles on the adoption of electric vehicles in Nairobi, there is a negative and statistically significant relationship between cost of electric vehicles and the adoption of electric vehicles. Ensuring that the costs associated with electric vehicles are affordable will increase the adoption of electric vehicles which is in line with Technological Acceptance Model (TAM). The cost of electric vehicles has been gradually reducing over the years. The adoption of electric vehicles, however, has been slow. Efforts has been done to make people aware of electric vehicles but the adoption has been slow.

The government is doing well in ensuring that incentives are provided for electric vehicles. The government nonetheless needs to do more. The operational costs of electric vehicles are low as confirmed by the study. People, however, view scarcity of the charging points as a hindrance to the adoption of electric vehicles. According to Senyapar et al. (2023) deliberate efforts should be made to increase the number of charging points to motivate people to adopt electric vehicles. The cost-benefit analysis shows that in terms of cost, electric vehicles can be beneficial in the long run. Electric vehicles can enable electric vehicles to increase their profits significantly.

Building the needed charging infrastructure can be costly. This, however, should be seen in terms of long-term benefits as it is a lot to ensure sustainability (Kennedy & Philbin, 2019). Adoption of electric vehicles can enable matatu SACCOs to get back their money within a

short time and this is important, and it will promote their growth and development. Dispelling their worries about the charging stations by ensuring that there is a robust infrastructure, however, is important as it will motivate them to adopt electric vehicles (Senyapar et al., 2023). Upfront costs for the adoption of electric vehicles are high but the motivating thing is the long-term benefits that come with it.

According to Bryła et al. (2022), the cost of electric vehicles has been gradually reducing over the years due to the advancement in technology and increased production. Global policies also have favoured cost reduction for producing electric vehicles as global communities have emphasized the importance of adopting clean energy. Governments across the world are keen on green energy and have adopted policies that encourage the adoption of electric vehicles (Bryła et al., 2022). Governments have been offering incentives and subsidies to make electric vehicles more affordable to people. The Kenyan government has been improving its strategies to encourage the adoption of electric vehicles. The government of Kenya, for instance, offers 20% import duty for electric vehicles compared to 30% for gasoline and diesel vehicles (ABDAS, 2021). With the increasing use of social media and the internet, people are becoming environmentally conscious day by day and, as a result, the adoption of electric vehicles is expected to increase going forward. People are ready to adopt electric vehicles but they still face challenges.

5.2.2 Infrastructure Development and Adoption of Innovation

From the study to examine the effect of cost on the adoption of electric vehicles in Nairobi, the descriptive statistics show that infrastructure development influences the adoption of electric vehicles. The correlation analysis and regression analysis show that there is a moderate relationship between infrastructure development and the adoption of electric vehicles. From the study there was a positive and statistically significant relationship between infrastructure development and adoption of electric vehicles. Good infrastructure motivates people to adopt electric vehicles and this is in line with the diffusion of innovation theory. More needs to be done to ensure that the infrastructure is well developed. People are willing to adopt electric vehicles but charging points is still a challenge. There are not enough charging points which makes people fear investing in electric vehicles. There is a need to ensure that a network of charging points is in place to make it convenient for the drivers of electric vehicles thus alleviating their anxiety and this will encourage matatu SACCOs to adopt electric vehicles.

According to the study, the infrastructure for the adoption of electric vehicles has not been well developed in Nairobi. There is a need to ensure that the correct infrastructure is in place. Government should ensure that correct policies have been put in place to encourage people to invest in adequate charging points as it will motivate people to adopt electric vehicles (Kumar et al., 2021). The government should also ensure that charging points are well supplied with power. Accordingly, people should be assured of consistency of power as it will enable them to be confident in investing in electric vehicles. Cost-effective solutions also have not been developed in Kenya. There is a need for the government to explore this to make the overall operation costs cheaper (Kumar et al., 2021). Fast charging systems should also be put in place to save time and encourage matatu SACCOs to adopt electric vehicles. Also, charging systems should be well-decentralized as it will give assurance to the drivers that they can recharge at any point.

According to the study, infrastructure development and the adoption of electric vehicles are inseparable. People cannot adopt electric vehicles without proper infrastructure in place. Ensuring that the correct infrastructure is in place is important as it will motivate people to adopt electric vehicles. The government needs to ensure that a robust network of charging points is in place (Kumar & Alok, 2020). The infrastructure should be placed strategically for the public service vehicles. This is important to make it convenient for the drivers of electric vehicles thus alleviating their anxiety and this will encourage matatu SACCOs to adopt electric vehicles (Kumar & Alok, 2020). Governments also should ensure that correct policies are in place to foster the transition to electric vehicles.

5.2.3 Knowledge and Adoption of Innovation

From the study to examine the effect of knowledge on the adoption of electric vehicles in Nairobi, the descriptive statistics show that knowledge influences the adoption of electric vehicles. The correlation analysis and regression analysis show that there is a moderate relationship between knowledge and the adoption of electric vehicles. Accordingly, there is a positive and statistically significant relationship between knowledge and adoption of electric vehicles. The findings agree with the theory of diffusion which argues that knowledge is important for diffusion to occur. Most of the people know the importance of adopting electric vehicles but they haven't adopted them. More, however, needs to be done to ensure that many people understand the importance of adopting electric vehicles. Most people base their knowledge on the cost. There is a need to ensure that they understand the environmental

implications of adopting electric vehicles. Dispelling the notion that electric vehicles are for Western countries is also important.

According to the study, knowledge plays an important for the adoption of electric vehicles. Also, the study finds that people are knowledgeable about electric vehicles. There is need, however, to ensure that this knowledge is increased to ensure that more people are informed (Bryła et al., 2022). According to the study, not all people understand the importance of adopting electric vehicles. Creating more awareness to ensure that people have a good understanding of electric vehicles is, therefore, important.

Developing countries like Kenya have been slow in adopting electric vehicles but users can recognize them since they have started becoming common (Bryła et al., 2022). Users, however, do not know the merits that come with electric vehicles. There is a need, therefore, to ensure that awareness about electric vehicles is created across the country. This is important to illicit debate that will encourage the adoption of electric vehicles (Bryła et al., 2022). Stakeholders of public vehicles have an understanding of the importance of adopting electric vehicles. Knowledge should, however, be increased to enable them to have a holistic understanding of the adoption of electric vehicles. Electric vehicles are not complex to operate as per the findings. People should be made aware that electric vehicles are like any other vehicle (Bryła et al., 2022). This is important to dispel misconceptions and perceptions that might be hindering the adoption of electric vehicles.

Adoption of electric vehicles in Kenya requires a holistic approach that ensures that people how knowledge about electric vehicles. Creating awareness should focus on dispelling perceptions and misconceptions about electric vehicles (Li et al., 2020). People believe electric vehicles are not powerful. As a result, should be educated about the benefits that come with electric vehicles. Accordingly, people should be taught based on cost-benefit analysis (Li et al., 2020). They should be convinced that the benefits of electric vehicles outweigh their disadvantages.

Ensuring that people know about electric vehicles, that the costs of adopting electric vehicles are low, and that there is correct infrastructure in place helps a lot to encourage the adoption of electric vehicles (Adjei-Ampomah, 2020). The government of Kenya should have a strategy that focuses on ensuring that people are well-informed about electric vehicles. This is important as it will enable them to know the importance of adopting electric vehicles (Adjei-Ampomah,

2020). People should also be made aware of the incentives that have been put in place to encourage the adoption of electric vehicles.

5.3 Conclusion

From the findings, the study concludes that cost negatively affects the adoption of electric vehicles. The cost of adopting electric vehicles, therefore, should be significantly reduced. Ensuring that proper policies are in place to significantly reduce costs is important. Incentives and subsidies should be further reduced to encourage to adoption of electric vehicles. The government should be committed to ensuring that the costs of the adoption of electric vehicles are reduced significantly.

It also concludes that infrastructure development positively affects the adoption of electric vehicles. Infrastructure development is key for the adoption of electric vehicles. Without the right infrastructure, it will not be possible to adopt electric vehicles. The government should ensure that infrastructure for the adoption of electric vehicles is in place. This is important to make it easy for people to adopt electric vehicles.

Lastly, the study concluded that knowledge positively affects the adoption of electric vehicles. People should be made aware of the importance of adopting electric vehicles in all aspects. Knowledge will enable people to make necessary adjustments and adopt electric vehicles which is important to promote sustainability.

5.4 Recommendations of the Study

5.4.1 Policy

The study recommends that the government should develop policies that can further reduce the cost of adopting electric vehicle and ensure that correct infrastructure is in place. Though the government has reduced the costs of electric vehicles by introducing incentives and subsidies, the study recommends that costs should be further reduced to encourage people to adopt electric vehicles. The government should remove the import duty for electric vehicles. This will enable people to import them for free, thus increasing the adoption of electric vehicles. The government should also ensure that a robust infrastructural network is in place. Charging stations, in particular, should be distributed across the country. The government should put strategies in place to ensure that charging stations are well-distributed across the country.

5.4.2 Practice

The matatu industry is encouraged to adopt electric vehicles and they do not provide much benefits compared to traditional vehicles but also helps to promotes sustainability that is important to conserve our environment. Matatu industry can start with few vehicles and grow progressively until the traditional vehicles are eliminated from our roads.

5.4.3 Theory

From the study, it is recommended theory of diffusion of innovation and technological acceptance model should be further improved to meet the changing needs. Diffusion theory focuses on communication, time, innovation, and societal system while technological acceptance model focuses on perceived usefulness and ease of use. The two theories should be revised to include cost and knowledge as they have been indemnified to play an important role in the adoption.

5.5 Suggestion for Further Study

The study focused on cost of electric vehicles, infrastructure development, and knowledge influence on the adoption of electric vehicles in Nairobi Kenya. There is a need to examine other factors like government policy and people's perception of electric vehicles that might be influencing the adoption of electric vehicles. This is important to promote a good understanding of the adoption of electric vehicles in Kenya.

The study focused only in the matatu industry. There is need to examine other organizations including individuals to get a better perspective of the adoption of electric vehicles. Other research designs particularly qualitative research could be used to examine factors affecting adoption of electric vehicles as it will provide a better perspective of factors like perceptions and attitudes towards adoption of electric vehicles in Kenya.

5.6 Limitations of the Study

The study was carried out with limitations, one limitation is that the study was conceptualized based on three factors that include; cost of electric vehicles, knowledge and infrastructural development. There are other factors that may influence adoption of electric vehicles that were identified in the literature review that include government policy, technological attributes and physical attributes among others.

The study was also limited by the measurement of adoption of electric vehicles to four metrics; relative advantage, compatibility, complexity and observability. There are other measures of adoption of electric vehicles such the use of convenience and trialability which has been adopted by other scholars.

The response rate was largely affected by unwillingness of the respondents to participate irrespective of having agreed earlier. A good number of respondents were very sceptical about the study irrespective of the assurance the researcher gave about confidentiality of the study.

5.7 Chapter Summary

The chapter presented discussion of the findings and conclusion. It also gives the recommendation of the study, suggestions for further study and limitations of the study.

REFERENCES

ABDAS. (2021, April 6). *Kenya has timely power strategy for electric vehicles*. ABDAS - Africa Information and Business Directory | Africa Information and Business Directory. https://abdas.org/2021/04/06/kenya-has-timely-power-strategy-for-electric-vehicles/

Ackaah, W., Kanton, A. T., & Osei, K. K. (2022). Factors influencing consumers' intentions to purchase electric vehicles in Ghana. *Transportation Letters, 14*(9), 1031-1042.

Adjei-Ampomah, F. (2020). *Electric vehicles transition in developing countries: A case study of Nairobi-Kenya* (Master's thesis, University of Stavanger, Norway).

Adjei-Ampomah, F. (2020). *Electric vehicles transition in developing countries: A case study of Nairobi-Kenya*. https://uis.brage.unit.no/uis-xmlui/handle/11250/2728390.

Agunbiade, O., & Siyan, P. (2020). Prospects of electric vehicles in the automotive industry in Nigeria. *European Scientific Journal, 16*(7), 1857-7431.

Ajao, Q., & Sadeeq, L. (2023). An Approximate Feasibility Assessment of Electric Vehicles Adoption in Nigeria: Forecast 2030. *arXiv preprint arXiv:2305.17844*.

Alanazi, F. (2023). Electric Vehicles: Benefits, Challenges, and Potential Solutions for Widespread Adaptation. *Applied Sciences, 13*(10), 6016.

Alin, A. (2010). Multicollinearity: *Computational Statistics, Wiley Interdisciplinary Reviews: 2*(3), 370-374.

Amedokpo, Y. T., & Boutueil, V. (2023). What place for electric vehicles as a research object and a practical alternative to internal combustion engine vehicles in africa? toward a research agenda based on a systematic literature review and a census of electromobility projects. *Transportation Research Record, 2677*(3), 639-651.

Anastasiadou, K., & Gavanas, N. (2022). State-of-the-art review of the key factors affecting electric vehicle adoption by consumers. *Energies, 15*(24), 9409-9423.

Aransiola, O. J. (2023, March 7). Judgmental Sampling: Definition, Examples, and Advantages. *Formplus*. https://www.formpl.us/blog/judgmental-sampling-definition-examples-and-

advantages#:~:text=In%20judgmental%20sampling%2C%20participants%20are%20selected%20based%20on,are%20selected%20based%20on%20their%20availability%20or%20accessibility.

Asadi, S., Nilashi, M., Samad, S., Abdullah, R., Mahmoud, M., Alkinani, M. H., & Yadegaridehkordi, E. (2021). Factors impacting consumers' intention toward adoption of electric vehicles in Malaysia. *Journal of Cleaner Production*, *282*, 124474.

Asikhia, O.U. (2009). The Moderating Role of E-Marketing on the Consequences of Market Orientation in Nigerian Farms. *International Journal of Business and Information,* 4(2), 243-270

Ayetor, G. K., Mashele, J., & Mbonigaba, I. (2023). The progress toward the transition to electromobility in Africa. *Renewable and Sustainable Energy Reviews*, *18*(3);113-133.

Bagozzi, R.P., & Yi, Y. (2012). Specification, Evaluation and Interpretation of Structural Equation Models. *Journal of the Academy of Marketing Science*, 40, 8-34

Bramm, G. (2024). *The importance of response rates*. Bramm Research. https://www.brammresearch.com/Blog/ArticleID/19/The-Importance-of-Response-Rates

Bryła, P., Chatterjee, S., & Ciabiada-Bryła, B. (2022). Consumer Adoption of Electric Vehicles: A Systematic Literature Review. *Energies*, *16*(1), 205. https://doi.org/10.3390/en16010205

Bryła, P., Chatterjee, S., & Ciabiada-Bryła, B. (2022). Consumer adoption of electric vehicles: A systematic literature review. *Energies*, *16*(1), 205.

Burns, K., & Hotchkiss, J. L. (2023). Growing Electric Vehicle Adoption: Implications for Infrastructure Maintenance and the Tax Burden on Families of Different Funding Policies. *Federal Reserve Bank of Atlanta*. doi.org/10.29338/wp2023-04

Castaneda, D. I., & Cuellar, S. (2020). Knowledge sharing and innovation: A systematic review. *Knowledge and Process Management*, *27*(3), 159-173. https://doi.org/10.1002/kpm.1637

Connelly, R., Gayle, V., & Lambert, P. (2016). A review of educational attainment measures for social survey research. *Methodological Innovations*, *9*, 205979911663800. https://doi.org/10.1177/2059799116638001

Davis, F. D. & Bagozzi, R. P. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management science*, *35*(8), 982-1003.

De Abreu, V. H. S., D'Agosto, M. D. A., Angelo, A. C. M., Marujo, L. G., & Carneiro, P. J. P. (2023). Action plan focused on electric mobility (APOEM): a tool for assessment of the potential environmental benefits of urban mobility. *Sustainability*, *15*(13), 10218-10223.

Faqih, K. M. (2022). Factors influencing the behavioral intention to adopt a technological innovation from a developing country context: The case of mobile augmented reality games. *Technology in Society*, *69*(8); 101-118.

Galuszka, J., Martin, E., Nkurunziza, A., Achieng'Oginga, J., Senyagwa, J., Teko, E., & Lah, O. (2021). East Africa's policy and stakeholder integration of informal matatu SACCOs in electric mobility transitions—Kigali, Nairobi, Kisumu and Dar es Salaam. *Sustainability*, *13*(4), 1703-1719.

Goldberg, L. R., Bell, E., C, K., O'Mara, C., McInerney, F., Robinson, A., & Vickers, J. C. (2015). Relationship between participants' level of education and engagement in their completion of the Understanding Dementia Massive Open Online Course. *BMC Medical Education*, *15*(1). https://doi.org/10.1186/s12909-015-0344-z

Golzar, J. & Tajik, O. & Noor, S. (2022). Convenience Sampling. 1. 72-77. 10.22034/ijels.2022.162981.

Gouda, G. K., & Tiwari, B. (2022). Talent agility, innovation adoption and sustainable business performance: empirical evidences from Indian automobile industry. *International Journal of Productivity and Performance Management*, *71*(6), 2582-2604.

Gupta, R. S., Tyagi, A., & Anand, S. (2021). Optimal allocation of electric vehicles charging infrastructure, policies and future trends. *Journal of Energy Storage*, *43*, 103291. https://doi.org/10.1016/j.est.2021.103291

Higueras-Castillo, E., Singh, V., Singh, V., & Liébana-Cabanillas, F. (2023). Factors affecting adoption intention of electric vehicle: A cross-cultural study. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-023-03865-y

Huang, Y., & Qian, L. (2021). Consumer adoption of electric vehicles in alternative business models. *Energy Policy*, *155*, 112338.

Huang, X., Lin, Y., Lim, M. K., Tseng, M., & Zhou, F. (2021). The influence of knowledge management on adoption intention of electric vehicles: Perspective on technological

knowledge. *Industrial Management & Data Systems*, *121*(7), 1481-1495. https://doi.org/10.1108/imds-07-2020-0411

Huaxia, H. (2024). Kenya to invest 1.9 mln USD to boost EV adoption in 3 years. https://english.news.cn/20240423/04e2dc2fbc6740b09dd98bb51866556a/c.html#:~:text=According%20to%20the%20Energy%20and,reach%205%20percent%20by%202025.

Javanmardi, E., Hoque, M., Tauheed, A., & Umar, M. (2023). Evaluating the Factors Affecting Electric Vehicles Adoption Considering the Sustainable Development Level. *World Electric Vehicle Journal*, *14*(5), 120-129.

Jones, H. (2020). Sustainable infrastructure project evaluation. *Industry, Innovation and Infrastructure*, 1-13. https://doi.org/10.1007/978-3-319-71059-4_60-1

Kamau, A., & Mitullah, W. V. (2022). 10. Women entrepreneurs creating value in informal public transport enterprises in Kenya. *Research Handbook of Women's Entrepreneurship and Value Creation*, 164.

Kennedy, D., & Philbin, S. P. (2019). Techno-economic analysis of the adoption of electric vehicles. *Frontiers of Engineering Management/Frontiers of Engineering Management*, *6*(4), 538–550. https://doi.org/10.1007/s42524-019-0048-x

Kinyanjui, M. (2022, November 21). *City hall starts five-day verification process for matatu*. The Star. https://www.the-star.co.ke/counties/nairobi/2022-11-21-city-hall-starts-five-day-verification-process-for-matatu/

Krishnan, V. V., & Koshy, B. I. (2021). Evaluating the factors influencing purchase intention of electric vehicles in households owning conventional vehicles. *Case Studies on Transport Policy*, *9*(3), 1122-1129.

Kumar, R. R., & Alok, K. (2020). Adoption of electric vehicle: A literature review and prospects for sustainability. *Journal of Cleaner Production*, *253*, 119911. https://doi.org/10.1016/j.jclepro.2019.119911

Kumar, R. R., & Alok, K. (2020). Adoption of electric vehicle: A literature review and prospects for sustainability. *Journal of Cleaner Production*, *253*, 119911.

Kumar, R. R., Chakraborty, A., & Mandal, P. (2021). Promoting electric vehicle adoption: Who should invest in charging infrastructure? *Transportation Research. Part E, Logistics and Transportation Review*, *149*, 102295. https://doi.org/10.1016/j.tre.2021.102295

Langbroek, J. H., Franklin, J. P., & Susilo, Y. O. (2016). The effect of policy incentives on electric vehicle adoption. *Energy Policy*, *94*, 94-103. https://doi.org/10.1016/j.enpol.2016.03.050

Li, X., Tan, Y., Liu, X., Liao, Q., Sun, B., Cao, G., Cheng, L., Yang, X., & Wang, Z. (2020). A cost-benefit analysis of V2G electric vehicles supporting peak shaving in Shanghai. *Electric Power Systems Research*, *179*, 106058. https://doi.org/10.1016/j.epsr.2019.106058

Li, Y. (2016). Infrastructure to facilitate usage of electric vehicles and its impact. *Transportation Research Procedia*, *14*, 2537-2543. https://doi.org/10.1016/j.trpro.2016.05.337

Longe, O. M. (2022). An expository comparison of electric vehicles and internal combustion engine vehicles in Africa-motivations, challenges and adoption strategies. In *2022 IEEE PES/IAS PowerAfrica* (pp. 1-5). IEEE.

Masiero, G., Ogasavara, M. H., Jussani, A. C., & Risso, M. L. (2016). Electric vehicles in China: Byd strategies and government subsidies. *Review of Administration and Innovation - RAI*, *13*(1), 03. https://doi.org/10.11606/rai.v13i1.110227

McCombes, S. (2023, March 20). *Research design | step-by-step guide with examples*. Scribbr. https://www.scribbr.co.uk/research-methods/research-design/

Meszaros, F., Shatanawi, M., & Ogunkunbi, G. A. (2021). Challenges of the electric vehicle markets in emerging economies. *Periodica Polytechnica Transportation Engineering*, *49*(1), 93-101.

Moeletsi, M. E. (2021). Socio-economic barriers to adoption of electric vehicles in South Africa: Case study of the gauteng province. *World Electric Vehicle Journal*, *12*(4), 167.

Montgomery, D. C., Peck, E. A., & Vining, G. G. (2015). *Introduction to linear regression analysis*. John Wiley & Sons: New Jersey.

Mpoi, G., Milioti, C., & Mitropoulos, L. (2023). Factors and incentives that affect electric vehicle adoption in Greece. *International Journal of Transportation Science and Technology*.

Muthomi, K. (2024). It is a bumpy ride for e-mobility firms in bid to move past start-up phase. https://www.standardmedia.co.ke/business/enterprise/article/2001494211/its-a-bumpy-ride-for-e-mobility-firms-in-bid-to-move-past-start-up-phase

Mwanzia K. M. (2023). The Matatu Industry in Nairobi. In *the Palgrave Handbook of Contemporary Kenya* (pp. 87-95). Cham: Springer International Publishing.

Nian, V., Hari, M. P., & Yuan, J. (2019). A new business model for encouraging the adoption of electric vehicles in the absence of policy support. *Applied energy*, *235*, 1106-1117.

NTSA. (2023). *National Transport and Safety Authority*. National Transport and Safety Authority official website. https://ntsa.go.ke/

Nurqamarani, A. S., Sogiarto, E., & Nurlaeli, N. (2021). Technology adoption in small-medium enterprises based on technology acceptance model: a critical review. *Journal of Information Systems Engineering and Business Intelligence*, *7*(2), 162-172.

Nyamai, D. N., & Schramm, S. (2023). Accessibility, mobility, and spatial justice in Nairobi, Kenya. *Journal of Urban Affairs*, *45*(3), 367-389.

Odhiambo, E., Kipkoech, D., Hegazy, M. M., Manuel, M., Schalekamp, H., & Abdelrahman, H. (2021). The potential for minibus electrification in three African cities: Cairo, Nairobi, and Cape Town. *Volvo Research and Educational Foundations*.

Oelrichs, I. (2023). Adoption of innovations in digital sports journalism: The use of Twitter by German sports journalists. *Communication & Sport*, *11*(2), 288-312.

Okwako, A. (2017). *Factors affecting the performance of the public service vehicles (PSV) sector in the Nairobi County* (Masters Dissertation, United States International University-Africa).

Olaf College (2023). Non-probability sampling. https://wp.stolaf.edu/iea/nonprobability-sampling/#:~:text=Purposive%20or%20judgmental%20sampling%3A%20This,with%20that%20purpose%20in%20mind.

Onyango, V., Olowosegun, A., & Moyo, D. (2023). Varied perceptions of environmental impacts from informal public transport hubs in two sub-Saharan African cities (Nairobi and Ibadan). *International Journal of Environment and Sustainable Development*, *22*(2), 113-133.

Opiyo, R., & Njenga, P. (2023). Transitioning to Electric Mobility: Low Hanging Fruits in the Two and Three-Wheeler Public Transport Market in Kenya. *European Business Law Review*, *34*(1).

Pickering, R. (2017). Describing the participants in a study. *Age And Ageing*, *46*(4), 576–581. https://doi.org/10.1093/ageing/afx054

Plano, C. (2022). Improving paratransit service: Lessons from transport management companies in Nairobi, Kenya and their transferability. *Case Studies on Transport Policy*, *10*(1), 156-165.

Potdar, V., Batool, S., & Krishna, A. (2018). Risks and challenges of adopting electric vehicles in smart cities. *Smart Cities: Development and Governance Frameworks*, 207-240.

Ravi, S. S., & Aziz, M. (2022). Utilization of electric vehicles for vehicle-to-grid services: Progress and perspectives. *Energies*, *15*(2), 589-593.

Renewable Energy Kenya. (2024). *Electric mobility*. Renewable Energy Portal. https://renewableenergy.go.ke/electric-mobility/

Ritchie, H., & Roser, M. (2024). *Kenya: CO2 country profile*. Our World in Data. https://ourworldindata.org/co2/country/kenya

Rogers, E. M. (1995). Diffusion of Innovations: modifications of a model for telecommunications. *Die diffusion von innovationen in der telekommunikation*,*3*(7); 25-38.

Sahoo, D., Harichandan, S., Kar, S. K., & Sreejesh, S. (2022). An empirical study on consumer motives and attitude towards adoption of electric vehicles in India: Policy implications for stakeholders. *Energy Policy*, *165*, 112941.

Schulz, F., & Rode, J. (2022). Public charging infrastructure and electric vehicles in Norway. *Energy Policy*, *160*, 112660.

Secinaro, S., Calandra, D., Lanzalonga, F., & Ferraris, A. (2022). Electric vehicles' consumer behaviours: Mapping the field and providing a research agenda. *Journal of Business Research*, *150*(7); 399-416.

Senyapar, H. N. D., Akil, M., & Dokur, E. (2023). Adoption of electric Vehicles: Purchase Intentions and Consumer Behaviors Research in Turkey. *SAGE Open*, *13*(2). https://doi.org/10.1177/21582440231180586

Setiawan, A. D., Zahari, T. N., Purba, F. J., Moeis, A. O., & Hidayatno, A. (2022). Investigating policies on increasing the adoption of electric vehicles in Indonesia. *Journal of Cleaner Production*, *380*, 135097.

Singh, V., Singh, V., & Vaibhav, S. (2020). A review and simple meta-analysis of factors influencing adoption of electric vehicles. *Transportation Research Part D: Transport and Environment*, *86*, 102436.

Tarei, P. K., Chand, P., & Gupta, H. (2021). Barriers to the adoption of electric vehicles: Evidence from India. *Journal of Cleaner Production*, *291*, 125847.

The Kenya Institute for Public Policy Research and Analysis. (2023, July 5). *Accelerating E-mobility to remedy greenhouse gas emissions in Kenya*. KIPPRA – The Kenya Institute for Public Policy Research and Analysis. https://kippra.or.ke/accelerating-e-mobility-to-remedy-greenhouse-gas-emissions-in-kenya/#:

Toraman, Y. (2022). User acceptance of metaverse: Insights from technology acceptance model (TAM) and planned behavior theory (PBT). *EMAJ: Emerging Markets Journal*, *12*(1), 67-75.

Trung, T. (2021). *The respondent Experience*. https://www.greenbook.org/insights/respondent-experience

Turney, S. (2024, February 10). *Pearson Correlation Coefficient (r) | Guide & Examples*. Scribbr. https://www.scribbr.com/statistics/pearson-correlation-coefficient/

U.S. Agency for International Development. (2024). *Kenya climate change country profile*. https://www.usaid.gov/climate/country-profiles/kenya#:~:text=Although%20Kenya%20contributes%20less%20than,usual%20scenario%20and%20in%20line

Van den bergh, O., Weekx, S., De Cauwer, C., & Vanhaverbeke, L. (2023). Locating charging infrastructure for shared autonomous electric vehicles and for vehicle-to-grid strategy: a systematic review and research agenda from an energy and mobility perspective. *World Electric Vehicle Journal*, *14*(3), 56.

Wamwea, C. N., & Moi, E. (2023). Influence of transport sector reforms on performance of public transport sector, a case study of Nairobi city county. *International Journal of Public Administration and Management Research*, *8*(5), 17-29.

Weldon, P., Morrissey, P., & O'Mahony, M. (2018). Long-term cost of ownership comparative analysis between electric vehicles and internal combustion engine vehicles. *Sustainable Cities and Society*, *39*, 578-591.

Xia, Z., Wu, D., & Zhang, L. (2022). Economic, functional, and social factors influencing electric vehicles' adoption: An empirical study based on the diffusion of innovation theory. *Sustainability*, *14*(10), 6283.

Yang, A., Liu, C., Yang, D., & Lu, C. (2023). Electric vehicle adoption in a mature market: A case study of Norway. *Journal of Transport Geography*, *106*, 103489.

Yazici, B., & Yolacan, S. (2007). A comparison of various tests of normality. *Journal of statistical computation and simulation*, *77*(2), 175-183.

Yeboah, A. (2023). Innovation process model: An integration of innovation costs, benefits and core competence. *Cogent Business & Management*, *10*(1). https://doi.org/10.1080/23311975.2023.2176445

Zhang, J., Xu, S., He, Z., Li, C., & Meng, X. (2022). Factors Influencing Adoption Intention for Electric Vehicles under a Subsidy Deduction: From Different City-Level Perspectives. *Sustainability*, *14*(10), 5777.

Zou, T., Khaloei, M., & MacKenzie, D. (2020). Effects of charging infrastructure characteristics on electric vehicle preferences of new and used car buyers in the United States. *Transportation Research Record*, *2674*(12), 165-175.

APPENDICES

Appendix I: Letter of Introduction

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Cell: +254 703 414/6/7, Twitter: @SBSKenya
Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu

Strathmore UNIVERSITY
BUSINESS SCHOOL

27th February 2024

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – VICTOR OMONDI

This is to introduce Victor Omondi who is a Master of Commerce (MCOM) Student at Strathmore University Business School, admission number MCOM/152656. As part of our MCOM Programme, Victor is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MCOM course. To this effect, Victor would like to request appropriate data from your organization.

Victor is undertaking a research paper on "**Factors affecting the adoption of electric vehicles by public service operators in Nairobi County, Kenya.**" The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MCOM Programme seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if required.

Yours sincerely,

Njoki Kiagiri
Manager – Graduate Programmes
Strathmore University Business School.

Appendix II: SU Ethical Committee Permission

Strathmore UNIVERSITY

9th April 2024

Mr Omondi Victor,
victor.odhiambo1@strathmore.edu

Dear Mr Omondi,

RE: The Factors affecting the Adoption of Electric Vehicles by Public Service Vehicle Operators 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-ISERC2082 /24.** The approval period is from **9th April 2024 to 8th 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,

Mr Ambrose Rachier,
Chairperson; SU-ISERC

STRATHMORE UNIVERSITY INSTITUTIONAL SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
(SU-ISERC)
09-Apr-2024
Email:ethicsreview@strathmore.edu
P.O BOX 59857-00200
NAIROBI-KENYA

Appendix III: Questionnaire for PSV Matatu SACCOs

The questionnaire will be aiming gathering data to determine the factors affecting the adoption of electric vehicles by public service vehicle matatu SACCOs in Nairobi. Please note that the information gathered will only be used for purpose of academic research only.

INSTRUCTIONS

By ticking (√) where best suits your answer, please fill the attached questionnaire.

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender of the respondent;

Male [ ] Female [ ]

2. Age

21-30 [ ]

31-40 [ ]

41-50 [ ]

Above 50 [ ]

3. Highest level of education attained;

Certificate [ ] Diploma [ ]

Undergraduate[ ] Masters [ ]

PhD [ ]

Other (specify) [ ]……

4. How long have you been working in the industry?

Less than 3 years [ ] 4 -7 years [ ]

8-11 years [ ] 12-15 years [ ]

Over 15 years [ ]

5. How long has your matatu SACCO been in service?

Less than 3 years [ ] 4 -7 years [ ]

8-11 years [ ] 12-15 years [ ]

Over 15 years [ ]

6. Is Your matatu SACCO licenced?

Yes [ ] No [ ]

SECTION B:

Cost on the adoption of electric vehicles by public service vehicle matatu SACCOs

In the Table, kindly fill it by indicating ticking (√) the most appropriate response in the cells using a 5-point Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5=strongly agree.

No	Statement	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
a.	The government have provided incentives which has lowered the cost of adopting electric vehicles					
b.	The operational costs associated with engine combustion public service vehicles has reduced to manageable level with the adoption of electric vehicles.					
c.	Scarcity of charging systems have increased operational expenses of electric cars making PSV matatu SACCOs to just remained with the oil powered vehicles.					
d.	Integration of electric vehicles into the power grid has attracted extra cost and this resulted to					

	costly adoption of electric vehicle.					
e.	Payback period costs for adoption of electric vehicles is more favourable than the previous vehicles.					
f.	Adoption of electric vehicles attract huge upfront costs or capital as compared to previous matatu vehicles powered by oil.					

Infrastructure development on the adoption of electric vehicles by public service vehicle matatu SACCOs

In the Table, kindly fill it by indicating ticking (√) the most appropriate response in the cells using a 5 point Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5=strongly agree.

No	**Statement**	**Strongly disagree (1)**	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly Agree (5)**
a.	The presence of adequate charging points for electric vehicles across the routes in Nairobi has made us contemplate in acquiring electric PSV					
b.	The existence of adequate power in the grid to enable					

	faster recharging of electric vehicle anytime without causing outage whenever there is crowding out.					
c.	The presence of cost-effective charging solution for the electric powered PSV vehicles are readily available.					
d.	The persistence of fast charging systems for the electric vehicles has made this matatu SACCO to rethink about the adoption of the electric PSV SACCOs.					
e.	The presence of frequent power disruption and outages has made this PSV SACCO not to consider adopting the electric vehicles.					
f.	Charging system that is not decentralized makes it challenging to access charging systems for the electric vehicles.					

Knowledge on the adoption of electric vehicles by public service vehicle SACCO matatu SACCOs

In the Table, kindly fill it by indicating ticking (√) the most appropriate response in the cells using a 5-point Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5=strongly agree.

No	Statement	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
a.	Public road users are able to recognize electric vehicles and express their preferences instantly.					
b.	Many of the road users are informed on the merits of using electric vehicle over oil powered vehicles.					
c.	Stakeholders of public vehicles have adequate knowledge on the importance of adopting electric vehicles in mitigating environment impacts					
d.	The knowledge that electric powered PSVs are cost effective in terms of energy consumption compared to oil powered PSVs					
e.	The PSV matatu SACCOs aspiring to acquire electric PSV are not aware on where					

	to purchase them here in Kenya					
f.	The lack of knowledge among PSV matatu SACCOs on how to operate electric PSVs.					

SECTION C:

Adoption of electric vehicles by public service vehicle SACCO matatu SACCOs

In the Table, kindly fill it by indicating ticking (√) the most appropriate response in the cells using a 5-point Likert scale of 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5=strongly agree.

No	**Statement**	**Strongly disagree (1)**	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly Agree (5)**
a.	We are ready as the matatu SACCO to adopt electric vehicles because they readily available in the market.					
b.	The adoption of electric vehicles industry in the PSV has significantly rises because of their perceived comfortability					
c.	Government have rationalized policies to promote the adoption of electric vehicle through incentives					

d.	We are ready to adopt electric PSVs because of their potential to minimize air pollution in Nairobi					
e.	We are ready to adopt electric PSVs because they produce less noise in Nairobi					
f.	We are willing to adopt electric PSVs because their utility costs are less compared to engine combustion PSVs					
g.	The matatu PSVs are willing to adopt the electric vehicles because they are easy to maintain compared to engine combustion PSVs					

Appendix IV: List of PSV matatu SACCOs in Nairobi

1. 12C TRANSPORT SACCO LTD
2. 2B TRAVELLERS SACCO LTD
3. 2K-NN SAVINGS AND CREDIT CO-OPERATIVE SOCIETY LIMITED
4. NGORIKA LINE TRAVELLERS COMPANY LIMITED
5. 2KR ROUTE 105 MULTIPURPOSE COOPERATIVE SOCIETY LIMITED
6. 2KW SAVINGS AND CREDIT CO-OPERATIVE SOCIETY LTD
7. 8B SACCO SAVINGS AND CREDIT COOPERATIVE SOCIETY LTD
8. AKILLA TRANSPORTERS COMPANY LIMITED
9. ALDANA TRAVELLERS SACCO
10. ALSOPS TRAVELLERS SERVICE LTD
11. ARRIVA COACH LTD
12. BABA DOGO 25 TRAVELLERS
13. BANANA HILL MATATU SACCO
14. BLUELINE SAFARIS SHUTTLE
15. BURETI EXPRESS SACCO LTD
16. BURUBURU 58 TRAVELLERS
17. CBET SACCO
18. CITY HOPPER LIMITED/FANAKA
19. CITY STAR SHUTTLE LIMITED
20. CITY TRAVELLERS SAVINGS
21. CLASSIC LUXURY SHUTTLE
22. CLASSIC PELICAN SACCO LIMITED
23. 2TS SAVINGS AND CREDIT COOPERATIVE SOCIETY LIMITED
24. COMLINES SACCO LIMITED
25. COSY TRAVELLERS LTD
26. CROWN BUS SERVICE LTD
27. DABUMATO COMMUTER
28. DAIMA CONNECTIONS LTD
29. DAKIKA MATATU OWNERS
30. 3KEN SAVINGS AND CREDIT CO-OPERATIVE SOCIETY LIMITED

31. DANDORA USAFIRI
32. DIX-HULT MATATU OWNER SACCO
33. EASTERN BYPASS TRAVELLERSCOMPANY LIMITED
34. EASTLANDS EAGLES LIMITED
35. EASTLEIGH COMMUTER SERVICES LIMITED
36. EASTLEIGH ROUTE SACCO
37. EASY COACH LTD
38. ECOSA TRAVELLERS SACCO
39. EGESA SHUTTLE SACCO
40. EMBASSAVA COOPERATIVE SAVINGS AND CREDIT SOCIETY LTD
41. AJAWAAB TRANS SAVINGS AND CREDIT CO-OPERATIVE SOCIETY LIMITED
42. ESTATES CONNECTION LIMITED
43. EXPRESS CONNECTIONS LTD
44. FIG KOMBA
45. FORWARD TRAVELLERS SACCO LTD
46. FOURTY FOUR SACCO
47. FREESTYLE CONNECTION LTD
48. GANAKI MULTI PURPOSE COOP SOCIETY
49. GARISSA COACH LIMITED
50. GITHURAI 45 SACCO
51. HANNOVER COMMERCIAL ENTERPRISES LTD
52. HIGHRISE KIBERA SACCO
53. HIMOSA TRAVELLERS SACC0
54. HURUMA 46 SAVINGS AND CREDIT CO-OP SOCIETY LTD
55. HURUMA MINI-BUS SACCO LTD
56. IMPACT SHUTTLE LIMITED
57. INDIMA (NJE) SACCO
58. INTER COUNTIES TRAVELLERS SACCO
59. INTER COUNTY EXPRESS LTD

60. JESMAT TRAVELLERS CO-OPRATIVE
61. KADANA TRAVELLERS INVESTMENTS COMPANY LIMITED
62. KANGEMI MATATU OWNERS
63. KANI TRANSPORT SACCO
64. KARIOBANGI MATATU OWNERS
65. KAWANGWARE MATATU SAVINGS AND CREDIT CO-OPERATIVE SOCIETY LIMITED
66. KAYO-LINE GROUP COMPANY
67. KENYA BUS MANAGEMENT LIMITED
68. KIBERA MATATU OWNERS
69. KIGUMO TRAVELLERS CO-OPERATIVE SAVINGS & CREDIT SOCIETY LIMITED
70. KIJABE LINE SACCO
71. KILLETON COMMUTERS
72. KINATHI SAVINGS AND CREDIT CO-OPERATIVE SOCIETY LIMITED
73. KIRAGI TRAVELLERS SAVINGS AND CREDIT CO-OPERATIVE SOCIETY LIMITED
74. LANKANA SACCO SOCIETY LIMITED
75. LATEMA 22 TRAVELLERS SACCO
76. LOPHA MULTIPURPOSE CO-OPERATIVE SOCIETY
77. LUCKY BABA DOGO TRAVELLERS SACCO LTD
78. LUCKY TRANSPORTERS COMPANY
79. MACHAKOS PUBLIC TRANSPORTERS SACCO SOCIETY LTD
80. MADIWA MATATU OWNERS SACCO
81. MARIMBA INVESTMENT LIMITED
82. MATUNDA(FRUITS) BUS SERVICES
83. MAVEROUS SHUTTLE LIMITED
84. MENYA SERVICES SACCO LIMITED
85. MERU NISSAN OPERATORS COOPERATIVE SAVINGS AND CREDIT SOCIETY LIMITED
86. METROTRANS EAST AFRICA LIMITED

87. MNK SACCO SOCIETY LTD
88. MOLO CLASSIC SACCO SOCIETY LTD
89. MOLO GROUP SERVICES SAVINGS AND CREDIT CO-OPERATIVE SOCIETY LIMITED
90. MOLOLINE SERVICES LIMITED
91. MOONLIGHT COACH COMPANY LTD
92. MOYALE RAHA TRANSPORTERS COMPANY LIMITED
93. MUNA SUPREME SHUTTLE
94. MWAMBA TRAVELLERS SACCO
95. MWIKI PSV SACCO
96. MWINGI TRAVELLERS
97. NABOKA TRAVELLERS SACCO
98. NAGIRU 145 SACCO
99. NAIROBI FRIENDS TRAVELLERS SOCIETY
100. NAIROBI KIRU LINE SERVICES LTD
101. NAIROBI PRESTIGE BUS SHUTTLE LTD
102. NAIROBI-WESTERN-CLASSIC
103. NAKASKI TRANSORT SAVINGS CREDIT SACCO LTD
104. NAKATHI TRAVELLERS SACCO LIMITED
105. NAKIMU CLASSIC TRAVELLERS SACCO
106. NAKINDUKA MATATU SACCO
107. NAKISA SACCO SOCIETY LTD
108. NAKWE TRAVELLERS SACCO SOCIETY LTD
109. NANGKIS MATATU SACCO
110. NAROK LINE SERVICE
111. NEEMA TRAVELLERS AGENCY LTD
112. NEW CLASSIC TRAVELLERS SACCO LIMITED
113. NGONG TRAVELLERS SACCO
114. NJORO LINE SERVICES LIMITED

115. NKIKAN SACCO SOCIETY LIMITED
116. NUCLEUR INVESTMENTS LTD
117. NYAMAKIMALINE SERVICES LIMITED
118. OBAMANA TRAVELLERS SACCO
119. OROKISE SACCO LTD
120. PEJA TRAVELLERS LIMITED
121. PRIME TRANSCITY LIMITED
122. RASASI INVSETMENT LIMITED
123. REMBO SHUTTLE SAVINGS AND CREDIT SACCO LTD
124. RIVERNILE TRAVELLERS LTD
125. ROG TRAVELLERS SACCO
126. RONGAILINE SACCO
127. ROYAL SWIFT EXPRESS LTD
128. RUKAGINA 44 SACCO
129. RUNA TRAVELLERS SACCO
130. RWAKEN INVESTMENTS LIMITED
131. SABRIN BUS SERVICES LIMITED
132. SAFARI LUXURY SHUTTLES LIMITED
133. SASALINE CLASSIC SHUTTLE LIMITED
134. SATIMA SACCO SOCIETY LTD
135. SIMBA TRANSPORT SERVICES EAST AFRICA LTD.
136. SISIBO LUXURY SHUTTLE LIMITED
137. SONY TRADING COMPANY LIMITED
138. SOUTH B MATATU OWNERS SACCO SOCIETY LTD
139. ST. MARYS TRANSPORT SACCO SOCIETY
140. STAHITO COMMUTER SERVICES CO. LIMITED
141. STARBUS COMPANY (K) LTD
142. SUPER HIGHWAY 45 SACCO SOCIETY LTD
143. SUPER METRO LIMITED
144. SUPREME SHUTTLE LIMITED

145. T.W.N TRAVELLERS SACCO LTD
146. TEACHERS TRANSPORTERS AND AGENCY LIMITED
147. TELAVIV TRANSPORTERS LIMITED
148. THE GUARDIAN COACH CO.LTD
149. THIKA ROAD TRANSPORTERS SACCO LTD
150. TRANSAFARIS SACCO LTD
151. TRANSLINE CLASSIC LTD
152. TRINITY TRANSPORTERS AND LOGISTICS LIMITED
153. UMOINNER SACCO LTD
154. UMOJA INNERCORE TENA MATATU OWNERS SACCO LTD
155. UNIFIED INTERNATIONAL LIMITED.
156. WALOKANA
157. WAMASAA TRAVELLERS LIMITED
158. WEST MADARAKA ROUTE 14 COOPERATIVE SACCO.
159. ZURI GENESIS COMPANY LIMITED
160. NAWAKU SACCO
161. NAWASUKU SACCO
162. NAZIGI SACCO

Appendix V: NACOSTI Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **242961**

Date of Issue: **25/April/2024**

RESEARCH LICENSE

This is to Certify that Mr.. Victor Odhiambo Omondi 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: The Factors affecting the Adoption of Electric Vehicles by Public Service Vehicle Operators in Nairobi County, Kenya for the period ending : 25/April/2025.

License No: **NACOSTI/P/24/34940**

242961

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

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