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**FACTORS INFLUENCING CHOICE OF URBAN TRANSPORT ALTERNATIVES BY
RESIDENTS OF BURU BURU ESTATE IN NAIROBI COUNTY**

KARIUKI, WAMBUI

**SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF
MASTERS IN PUBLIC POLICY AND MANAGEMENT OF STRATHMORE
UNIVERSITY**

**STRATHMORE BUSINESS SCHOOL,
STRATHMORE UNIVERSITY**

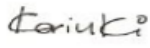
MAY 2020

DECLARATION

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

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APPROVAL

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ABSTRACT

Transport in urban areas is an important and necessary component of a nation's development. The various forms of transportation are broadly categorised globally as either Non- Motorised Transport (NMT) or Motorised Transport (MT). At the core of this study is the examination of the factors that influence the choice of urban transport alternatives by residents of Buru Buru Estate in Nairobi County, Kenya. In doing so, three broad categories of variables have been identified, which are the income and demographic attributes of the users, and the transportation attributes; either accessibility, time factor, financial cost and safety. In this examination, the preferences and attributes of the transport users and the relationship between these variables and the choices they make will be explored through the application of the Utility Theory (UT). This theory, explains the behaviour of choice selection among users of transport modes in Buru Buru Estate.

The research was conducted through quantitative means. Buru Buru as a sample was ideal, as it has access to all the available transport alternatives including; e- hailing services, matatus, train service, motorcycles, regular taxis as well as being within 8 kms walking distance of the Central Business District. The findings reveal that demographic characteristics of the transport user have a significant impact on the transport choices that they make. These include, gender, age, education level and income which seem to have the most significant impact. The marginal effects for the income band of the resident were significant for choice of private and e-hailing transport alternatives, whereas income was non-significant in influencing the choice of the public transport. Additionally, commuter times and financial costs were found to be important factors amongst respondents across the various demographics.

The main recommendations drawn from the data includes policies on: increasing public transport alternatives such as BRT; improved existing train infrastructure, light rail; improved NMT infrastructure; reduction of personal car use; nationalisation of transport; price controls and payment digitisation of public transport. Moreover, there was also a need to carry out larger scale studies with various demographics, taking into account the transport attributes and the demographic characteristics of various populations across Kenya. It also found that there is an increasing need to enforce existing policies as public transport was the most used and most preferred mode of transport.

Key words:

Non-Motorised Transport (NMT), Motorised Transport (MT), e-hailing services, urban transport, alternatives, choice, Utility Theory (UT)

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LIST OF ABBREVIATIONS

AUC- African Union Commission

BRT- Bus Rapid Transit

CBD- Central Business District

KNBS - Kenya National Bureau of Statistics

MT- Motorised Transport

NMT -Non-Motorised Transport

NTSA- National Transport and Safety Authority

OECD- Organisation for Economic Co-operation and Development

PSV- Public Service Vehicle

SACCO- Savings and Credit Cooperative

UT- Utility Theory

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CHAPTER ONE: INTRODUCTION TO THE STUDY

1.1 Introduction

This study sought to determine the factors that affect the choice of urban transport alternatives by residents of Buru Buru Estate in Nairobi County. This Chapter begins with the background to the study and moves to the research problem, followed by the main objective of interest. The specific four specific objectives are detailed in this chapter as well as the corresponding research questions, followed by the research scope and concludes with the significance if the study.

1.2 Background to Study

Transport is an important component towards the development of any urban area. In 2015, Allianz (2015) noted that there were only twenty nine megacities, with over ten million people, and predicted that by the year 2030, there would be an increase of twelve megacities, ten of which would be in Africa and Asia. Megacities are defined by the United Nations (UN) as cities of over 10 million people. Bouton et al., (2013), further predicted that by 2030, 60 percent of the world's population will live in cities, up from about 50 percent in 2013. Githui, Okamura, & Nakamura, (2010) and the World Bank (1986) concur that urban transportation is a critical and important area that needs focus in all mega cities globally due to the dynamism of this movement. An improvement of the public transportation system quality is among the most pressing issues for both private and public transport users towards relieving urban traffic conditions in developing cities.

According to the World Bank Urban Transport Policy Paper (World Bank 1986), efficient transport systems have the ability to maximise a country's economic output, whereas poor systems have the potential to retard economic growth. The Policy Paper further reveals that most developing countries are more inclined to use buses as a mode of urban transport, mainly due to the fact that they are affordable to the poor and are able to ferry large numbers of commuters, oftentimes meeting the demand for different qualities and quantities of transport. Furthermore, through experience, "it has been noted that the public welcomes a wide choice of transport and makes trade-offs between time and discomfort and the amount they are willing to pay for." (World Bank, 1986).

Khisty (1997) and UN (2016), observe that the older global paradigm on transport focused mostly on the maximisation of capacity, speed and mobility, which was mainly provided by Motorised Transport (MT), whereas the new shift is towards efficiency in overall resource utilisation and a shift to incorporate the use of Non-Motorised Transport (NMT), such as cycling and walking. Khisty (1997) notes that efficient and sustainable transport systems offer the selection of various convenient and efficient modes by meeting various demands of users. This often incorporates and offers the use of NMT, which is less polluting and low cost, such as cycling and walking. He further observes the trend of moving away from NMT by developing countries and focusing on the infrastructural development and policy for MT as a mistaken sign of progress.

According to UN-Habitat (2013), NMT is the most commonly used mode of transportation in developing countries especially in Africa and Asia, after walking and cycling. Walking, however, is the main mode of transportation in most developing countries. In developed countries, NMT differs in Northern America and Europe, with walking and cycling being generally low, especially in Canada, America and Australia, whereas cycling in Europe accounts for slightly over 20 percent of transportation modes. In terms of MT, public transport use has been steadily increasing in North America and Europe, in developing countries however NMT in the form of walking remains dominant. Bus Rapid Transit (BRT) is increasingly being introduced in Africa, with Nigeria (Lagos) (AUC/OECD 2018), South Africa (Johannesburg), Tanzania (Dar es Salaam), and Rwanda (Kigali) adopting BRT as a mode of public transport. The use of BRT is also common and growing in Latin America, including Colombia (Bogota) and the use of light rail metro systems in Northern Africa and the Middle East, such as Dubai and Egypt (Cairo). UN-Habitat (2013)

According to Opiyo, (2002) in 1966, the Local Government signed a 20-year franchise agreement with the then Nairobi City Council in which the County Government acquired part of the Kenya Bus Service shares. This arrangement was designed in order to guarantee affordable and regular transport provision for the city, with the Nairobi City Council (NCC) providing and maintaining infrastructures and controlling fares. However, with the population growth of Nairobi City, the oil crisis of the 1970s and the controlled prices, the company was unable to adequately offer services to the city, leading to the rise of the matatus. The term Matatu originates from a local Kikuyu dialect, mang'otore. Matatu which means "thirty cents" this was at the time regular fare for every trip (Aduwo & Obudho, 1992).

Aduwo and Obudho (1992) further explain that in 1973, President Jomo Kenyatta, following petitions from matatu operators, declared that Matatus “were a legal mode of transport and could carry fare paying passengers without obtaining special licenses to do so but had to comply with existing insurance and traffic regulations”. Opiyo (2002) also attributes the influx of the matatus to the de-regulation of the economy and subsequent opening up of the markets in 1992, which made acquisition of foreign exchange and importation of used vehicles easier. This as well as the “golden handshakes” caused by the Structural Adjustment Programme encouraged investment in the matatu sector.

According to Chitere and Kibua, (2009), issues that have plagued the matatus as a desirable mode of transport include violation of traffic rules such as the 80km/h regulation “massive corruption, poor quality equipment and the impracticality of some of the rules such as Section 66 of the Traffic Act, which prohibits continuous driving of PSV vehicles for more than eight hours, yet the police cannot detect how long one has been driving continuously.” Unfortunately, the rapid growth of the matatu industry continues to be synonymous with growing incidents of traffic accidents, which comes as a threat to the safety of Kenyan travellers (Chitere & Kibua, 2009).

According to the Deloitte Index Mobility Index 2019, Nairobi’s journey modal split consists of 46% Public Transit (buses and matatus), 39% walking, 13% Private car and 1% bicycle use. (Dixon, B. S., Irshad, H., Pankratz, D. M., & Bornstein, J. 2018)

According to NTSA (2020), pedestrians continue to be the most vulnerable road users, statistics provided by NTSA indicate that by December 30 2018, a total of 1,202 pedestrians had lost their lives in traffic related accidents out of a total of 3,151 traffic fatalities. This number went up in 2019, with the statistics at 30th December 2019 indicating 1,382 pedestrian deaths out of a total of 3,572 traffic fatalities. The Authority further reports that as at 17 February 2020, a total of 458 persons had lost their lives in traffic accidents nationwide. Mitullah and Opiyo, (2012) as well as NTSA (2020) concur that, though a preferred mode of transport in Nairobi, non-motorised transport modes are oftentimes not given the required attention and concern by policy makers and bureaucrats, as evidenced by the lack of appropriate policies and plans as well as the inadequate infrastructure in many Kenyan urban areas. Walking, though a preferred mode of mobility in Nairobi, is not the safest mode of transport.

Motorcycles are also a new popular mode of transportation in most developing countries. Accordingly, Pieterse and Parnell (2014) observed that the increased use of motorcycles in Nairobi as in most African urban areas was not a policy effect, but an opportunistic market response mostly by young men, caused by the collapse of officially organised transport systems, traffic congestion and the need for faster, affordable transport solutions across various terrain, including rough and narrow slum in-roads. Motorcycles created earning opportunities for many young men outside of the tax office.

In 2007, the Government of Kenya waived the 16% value added tax on the importation of motorcycles below 250cc to incentivise the creation of jobs for the youth (Nyachieo 2015). A steady increase of motorcycle registrations has been noted since with an all-time high of 140,215 registrations in 2011 from only 6,520 in 2006. (KRA 2013). According to the 2019 Economic Survey, “the total number of new motorcycles registered increased by 1.9 per cent to 195,253 units in 2018. Registration of motor and auto cycles rose by 1.4 percent compared with a 21.1per cent increase in registration of three-wheelers during the same period.” (KNBS 2019)

The increase in motorcycles in Nairobi, has led to an increase in crime and road accidents involving riders and pillion passengers. NTSA reports show that in 2017, there were 496 motorcycle driver deaths and 219 pillion passenger deaths, in 2018 the number of motorcycle driver deaths increased to 589 whereas the pillion passenger deaths rose to 245 and in 2019. In March 2020, the NTSA statistics reported 68 motorcycle driver deaths and 138 pillion passenger deaths. (NTSA 2020)

The 2019 Economic Survey further reported a significant rise in the registration of new motor vehicles from 91,071 units in 2017, to 102,036 units in 2018, this is a 12.0 per cent rise. New registration of station wagons also rose for the second consecutive year to 64,179 while panel vans and pick-ups increased by 13.7 per cent in 2018. This trend in registration of motorised transport indicated a constant need to meet the great demand for transport (KNBS 2019). This trend in registration of motorised transport indicated a constant need to meet the great demand for transport.

In 2015, various motorcycle SACCOs went to court to appeal the decision by the Nairobi County Government to ban motorcycles (boda bodas) in the central Business district. On 11th November, 2015, the Nairobi County Secretary issued a Notice in the national newspapers banning the entry of boda bodas in the Central Business District. The increase in motorcycles in the County, the

government argued, had led to the increase in insecurity in addition to motorcycle accidents. The ban still stands as the petition was not successful (eKLR 2016).

Proceedings from the Nairobi County Second Assembly's third session on 25th June 2019 noted that the city was characterised by "inadequate means of mass public transport, rapid increase in private cars, lack of mass public transportation, poor enforcement of traffic regulations and general lack of traffic discipline" and the congestion would cost the County 37 million Kenya shillings in foregone opportunities and lost productivity. The Assembly noted that the reduction of parking fees from Kshs, 300 to Kshs. 200 drastically reduced the County revenue and led to increased congestion in the city, proposing an upward review of the fees. (County. G. N. C 2019)

The Ministry of Lands and Physical Planning (2015), notes that railway transport is second only to road transport in its importance to both freight and passenger services. Currently, Kenya has a 2,778km railway network and operations are managed by Rift Valley Railways and Magadi Railways (MR). The railway serving Nakuru, Nairobi and Mombasa is mainly for freight and not passengers.

There are several policies and institutions in place to address the rising demand for efficient and effective transportation services and infrastructure.

In 2017, the National Government, in response to the growing challenges of transport in the City, established the Nairobi Metropolitan Area Transport Authority (NAMATA). The Agency, according to Dixon et al (2018) is looking into solutions such as integrated transport management and a mass transport system for the region to increase commuters' transport choices.

In a bid to further regulate the rogue matatu industry, a policy was introduced on the licensing procedure under the Transport Licencing Board (TLB) which brought in stricter requirements that Public Service Vehicle (PSV) operators had to meet before getting a TLB license. Under this framework, all PSVs are required to operate under a matatu Savings and Credit Co-operative Society (SACCO) or company. Asingo, (2004), asserts that this is seen as part of the desire by the government to institutionalize the industry. In addition, the establishment of the National Transport and Safety Authority (NTSA), through an Act of Parliament; Act Number 33 on 26th October 2012 is a measure to improve the industry performance. The Authority was mandated to ensure

that key transport departments worked in harmony and to effectively manage the road transport sub-sector while reducing the number of lives lost due to traffic accidents.

The Nairobi Metro 2030, prepared by the Ministry of Nairobi Metropolitan Development and approved in 2008, seeks to develop Nairobi into a world-class economic hub. Among the documents key highlights towards this achievement is through “optimising mobility through effective transportation.” (Nairobi County, (2014).

The Integrated National Transport Policy was launched in Nairobi in the year 2009 with the aim of establishing “appropriate institutional and regulatory frameworks to coordinate and harmonize the management and provision of passenger transport services”. Some of the recommendations included the establishment of independent institutions to manage urban passenger transport services and operations. (Barter 2002). Godrad (2011) further asserts that the NTP envisaged improving transport through the provision of railway infrastructure for Nairobi and its environs. As a result of this, the Syokimau Railway station was opened in 2012. The railway service has led to the reduction of travel time over the 18 km stretch. Furthermore, the system has developed to ensure that the rail is integrated with other transportation forms. Buses have been introduced as a last-mile link to improve commuter train services in the city.

With support from the World Bank, the Kenyan Government launched the National Urban Transport Improvement Project (NUTRIP) to support the development of selected high-capacity public transport corridors. (World Bank, 2002a) to meet the demand for better transport networks in Kenya and ease congestion.

In March 2015, The Nairobi City County, with the help of the United Nations Environmental Program (UNEP), launched the Non-Motorised Transport Policy, with a five-year strategy to improve the transport sector within the city. The key objectives of the policy were to: increase mobility and accessibility; transport safety; recognition and image of NMT in Nairobi County; improve amenities for NMT and to ensure that adequate funding/investment is set-aside for NMT infrastructure. (County, N. C. 2015)

1.3 Research problem

According to the Kenya National Bureau of Statistics (2019), Census Report of 2019, the total population Nairobi is at a total of 4,397,073. The rapid population growth has greatly contributed to the transportation problems in Nairobi City, with the Integrated National Transport Policy (INTP 2009), stating that urban growth in Kenya has been rapidly developing since 1963. Between the census periods of (1969-1989) and (1989 and 1999) the urban population has grown from 8% in the 1980s to over 34% in 2003. Currently, the Kenyan urban population is at 31.1% percent of the total population in Kenya, with Nairobi having the largest share with a population of 4.397 million (KNBS 2019). The Ministry of Metropolitan Development (2008) projected a situation of urban region growth to 7.6 million people (2012), 10.8 million (2022), and 14.3 million (2030). This growth has not been met with proportional development and growth of urban transport infrastructure and services.

There are non-motorized and motorized transport alternatives available in Nairobi County. Also, new forms of transportation exist in Nairobi, such as the *e-hailing* services such as Uber, Taxify, Little Cab, and Mondo. According to Bouton et al. (2015) Uber has surpassed the traditional taxi services in most countries, including Kenya, currently operating in over 300 cities and 58 countries. On demand private shuttles, and minivans have also been around for decades.

Japan International Cooperation Agency (JICA) (2006), reports that Nairobi has seen a significant increase in the use of “private vehicles, (15.30%), school buses takes about 3.10% of the total urban transportation in the city with two wheeled mode i.e bicycles and motorcycles, railway and others taking 1.20%, 0.40% and 0.20% respectively, the largest share goes to *matatus* at 29%”. Kenya railway services are insignificantly felt in the provision of public transportation for the city.

However, even with all the policy framework there is little investigation into the demand side of transportation in Nairobi County. Lee and Hine, (2008) assert that transport services ought to be “delivered in a way that responds to the different and specific needs of users”. Due to the diverse nature of a society, transport policies should be considerate of constraints of the users ranging from women’s mobility, often affected by issues of violence safety, to accessibility for the visually impaired as well as poorer members of society. “A transport strategy for all users should consider issues of urbanization and access to safe and efficient transport services.” This indicates that the supply of transportation modes should factor in the preferences of the demand side.

The study therefore seeks to identify the factors influencing choice of urban transport alternatives by transport users in Nairobi County, and by so, will form a foundation for further study in the area of consumer choice in urban transportation and public policy in the transport sector. Nairobi County is the most populous of the 47 Kenyan counties with a population of 4,397,073. The county is further subdivided into a total of 17 sub counties, the Buru Buru Housing estate is located in Makadara sub-county, which has a population of 189,536 with an average household size of 2.7 and a population density of 16,150 persons per Sq. Km (KNBS 2019). Buru Buru forms part of Kenya's urban landscape, where a large population of lower middle-class residents reside. The Estate, designed in 1974, consisted of bungalows and maisonettes specifically for the middle-income demographic of Nairobi. Construction of the estate was completed in the mid-1980s. Buru Buru Estate is an expansive settlement spread over 85 ha, it is located 8 kms outside the Nairobi Central Business District. (Rukwaro, R & Kieti, R 2019). It was after all a representation of Kenya's ambitious push for urban housing for the emerging new African Middle-class post-independence as it spearheaded the emergence of other urban housing estates in Langata, Southlands, Ngei, Ngumo, Plainsview and the Mugoya Estates, South C and B. The estate has since seen great modifications to the original housing plans, thereby increasing the once homogeneous demographic of middle-income earners and now to lower income earners (Songoro 2015). The heterogeneous nature of the population, comprising the older residents in the original designs as well as newer tenants of the modified units. The residents also benefit from accessing the Kenya Railways Makadara terminus. It also falls within the zone of digital hailing services, such as Uber, Bolt and Little Cabs, located 8 kms from the Central Business district, which is within reasonable walking distance. With this context, and the large population, Buru Buru estate was selected as a suitable case for the study because it exhibits most of the characteristics of interest to the researcher in this study.

1.4 Research Objective

The study sought to identify the factors influencing choice of urban transport alternatives by transport users in Nairobi County and determine the extent of their influence on the choices made in a bid to inform policy that addresses the preferences of citizens.

1.5 Specific objectives

The specific objectives of this study are to:

- i. Establish the effects of demographic characteristics of transport users on the choice of transport modes among the residents of Buru Buru estate.
- ii. Examine the effect of income on the choice of transport modes among the residents of Buru Buru estate.
- iii. Determine the effect of transportation mode attribute factors on the choice of transportation modes among residents of Buru Buru estate.
- iv. To find out the opinions of Buru Buru estate transport users on transportation policies by the Government of Kenya.

1.6 Research Questions

- i. What are the effects of demographic characteristics of transport users on the choice of transport modes among the residents of Buru Buru estate?
- ii. What is the effect of income on the choice of transport modes among the residents of Buru Buru estate?
- iii. What are the effects of attribute factors on the choice of transportation modes among residents of Buru Buru estate?
- iv. What are the opinions of Buru Buru estate residents on transportation policies by the Government of Kenya?

1.7 Scope of Study

The study was quantitative in nature and used the survey method to collect data. This study was focused on the users of various modes of transportation in Nairobi County, focusing on a sample size from Buru Buru Housing Estate, located in Makadara Constituency to determine the preferences of Nairobi Transport users. The Constituency has a population of 189,536 with an average household size of 2.7 and a population density of 16,150 persons per Sq. Km. according to the Kenya 2019 Census report (KNBS 2019). Buru Buru Estate covers an expanse of 85 ha of

land (Rukwaro & Kieti 2019) or 23sq. Km (KNBS 2010). The selection of Buru Buru as the study site is due to its low and middle income demographic (Ogot, Nyang'aya, & Nkatha2018; Rukwaro & Kieti 2019). The area is also selected due to the availability of all motorised and non-motorised transportation modes covered in the study, which include: boda bodas, walking, cycling, train, matatu/ buses and digital hailing services.

Transport modes considered in the study include, both motorised and non-motorised modes of transportation available within Nairobi County. Data collection was through the use of physical and online self-administered questionnaires. Sampling was convenience sampling due to the lack of a sampling frame. The study excluded persons under the age of eighteen years.

1.8 Significance of Study

The study is important in that it provides a better understanding of the preferences of transport users against the alternatives presented to them. With regards to policy making, the data collected creates a clear picture of the demographic and their aspirations, the challenges they face and provides a perfect opportunity to address their needs through policies suited towards the preferences of each demographic. The study further reveals the impact of income on choice of mode of transport as well as the relevance of transport attributes of the various modes when selecting the preferred mode of transport among various demographics. In this study, attributes of the mode of transport reviewed were; accessibility, time factor, financial cost and safety. The demographic characteristics of the users considered were: age, level of education, occupation, license ownership, presence of disability, duration of stay in Nairobi and sex.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature on the topic of urban transport, including theoretical perspectives on how transport is conceptualised and implemented. The chapter begins with a review and analysis of the Utility Theory as is used by various studies, in determining how consumers choose what mode of transport to use when presented with various options.

The chapter further delves into the review of literature on similar studies around the world, on the choice of urban transport. The chapter concludes with a section on the research gaps and the conceptual framework, which guided the study.

2.2 Theoretical Foundation

Most transport studies dealing with human behaviour use the Utility Theory which dominates the transport choice field and is often in the form of random utility maximization (RUM). The Utility Theory is considered one of the best theories in understanding human choice behaviour, it is also commonly used in explaining transport choices (Van de Kaa, 2010). Most travel behaviour models are based on UT which assumes that the preference captures a value, which is referred to as utility, and the decision making is based on the most satisfactory choice (Taniguchi et al., 2014). The Utility Theory postulates that demand is based on the premise that the transport user selects the mode of transport with which there is maximum utility derived by the traveller. (McFadden, 2001). The assumptions of the UT create a limitation due to the fact that the theory assumes that the decision maker indeed takes into account all the variables and has a complete probabilistic comprehension of the alternatives (McFadden, 2001). UT critics and other choice theories assume that it is impossible for the human being to grasp all the complexities and thereby is inclined to make a certain decision. The normative-rational concept of the theory is also rejected citing that it would require impossible computational powers to consider all the alternatives, as evidenced by the limited processing capacity of the conscious mind (Simon 1995; Van de Kaa 2010; Franco 2012).

The UT choice process assumes fundamentally that the decision making process is based on a rational behaviour pattern that can be replicated in order to always maximise the utility at any given time, and that “each individual has a context-independent, temporally stable preference order

for all possible outcomes and maximizes her utility” (Muro-Rodríguez, Perez-Jiménez, & Gutiérrez-Broncano 2017; Van de Kaa 2010).

Van de Kaa (2010) notes that transport choice behaviour is commonly investigated by using discrete choice models that comply with the utility theory (UT) paradigm. According to economist Daniel McFadden, discrete choice models “statistically relate the choice made by each person to the attributes of the person and the attributes of the alternatives available to the person. The models estimate the probability that a person chooses a particular alternative. The models are often used to forecast how people’s choices will change under changes in demographics and/or attributes of the alternatives.” (Dymond, 2015)

Within the UT model, attributes of the alternatives are viewed independently in analysing choice, the model offers a fair explanation of the choice behaviour of groups of travellers. The model with its criticisms, might not be the best in understanding human travel behaviour, but still offers “a fair approximation and prediction of observed behaviour by estimating effective empirical parameters in the utility function” (Van de Kaa, 2010).

The researcher chose to use the UT theory with an inclination to the RUM developed by economist Daniel McFadden, as it employs the use of models of discrete choice, that not only consider the attributes of the user but also the attributes of the choices offered in determining travel behaviour (McFadden 2001). McFadden (1974) uses RUM to determine travel demand for the Bay Area Rapid Transport (BART) before it was built. Muro-Rodríguez (2017) also employed the models of discrete choice based on the Theory of Random Utility to determine consumer behaviour along the the Toledo-Madrid corridor in Spain. The research also employed the multinomial logit as used in the study by Muro-Rodríguez et al., 2017.

2.3 Empirical Review

2.3.1 Effects of the demographic characteristics on transport choice

The study considered age, sex, level of education, license ownership, presence of a disability and the duration of stay in Nairobi as the demographic characteristics.

Moses and Williamson (1963) in their Chicago study on mode of transportation in the Chicago area, did not further look at specific variables of the demographic, but only focused on the

population living within the Chicago area. Notably the reason for travel as well as the income levels are considered factors that would have been valuable and relevant in the evaluation of the choices made by the commuters.

The standard technique in transport modelling uses aggregate models, grouped through income, or other variables, however over the last decades, the focus has shifted towards the individual unit, and desegregation, taking into account the individual (Domencich & McFadden, 1975).

Literature reviewed considered the importance of the demographic characteristics such as: unobserved individual attributes and personal tastes (McFadden 1974) ;age, sex, education, license, number of drivers, income, household size, number of drivers (Huang, Cao, Cao &Yin 2016) and; sex and age (Muro- Rodríguez et al 2017). Huang and Yin (2016) took into consideration the propensity of living near a rail transit in the choice of the use of rail transit transportation. The study observed that the alternative to rail transit in many areas, including the area of study was road transport. The study used propensity scores to capture the influences of various demographics and attitudes. The study is carried out in the province of Xi'an, in central China and limited to persons living by the rail.

Muro-Rodríguez (2017) in her study focused on the age bracket ranged from 18 to over 65 years of age whereas sex was also a demographic variable under review. The demographic of this study was confined to persons using the Toledo-Madrid corridor, which had the availability of high speed train (HST), bus and car, as alternative modes of transport. Román, Martín and Espino (2014), is a study also carried out in Spain but only looked at the attributes of the buses, which was the only mode under review. Other factors of the demographic were not taken into consideration in this particular study.

The global report on car use by OECD (2013), observes that the growth of passenger vehicle travel volumes has considerably decreased over the past 10-15 years in several high- income economies and in some cases, stopped or turned negative. This decline is attributed to the increase in the cost of fuel, decline in population growth, ageing population and the rise of as well as policy intervention in some cases-g geared towards environmental preservation. Rising inequality and higher unemployment in some demographics, such as young men in Europe, has also contributed to this trend. Transportation choices in the West are thereby changing quite rapidly, and in a non-predictable manner due to the myriad of issues including the ones mentioned. The report noted

quite importantly that “urbanisation is associated with less car use because with higher density more destinations are accessible per unit of distance, which leads to shorter driving distances and makes other modes (public transport, walking and cycling) relatively more appealing”.

Transportation is considered a key pillar in the development of Africa, with AUC/OECD (2018) noting that the development of a mass transportation system can not only reduce pollution, but also improve the economy. An example is the Lagos BRT system, which has provided two thousand direct jobs and half a million jobs indirectly and has also reduced the cost of public transportation by 30%.

The current trend, as noted by Gwilliam (2003) and Bouton et al (2015) is use of private vehicles which has been growing at a rapid rate among the middle class, “with ownership growth rates of 15–20% per year not uncommon in developing countries”. According to Gwilliam (2003), this growth can be attributed to the increased occurrences of traffic-related injuries, both safety-related and resulting from criminal behaviour.

The UN (2016) report notes that transport choice is affected by demographic attributes such as gender and age, where the elderly and women prefer not to use public transport at certain times due to insecurity, physical safety and harassment concerns, Gwilliam (2013), also notes these vulnerable groups avoid certain modes such as cycling and walking at certain times. Research into transport dynamics correlates use of transport to various differences such as income, education, and location in the city, other variables include marital status, gender and household composition (Levy 2013). Most cities, both developed and developing also lack infrastructure to protect cyclists and pedestrians. (UN-Habitat 2013; Yakimov (2017)). Pedestrians are accident prone as they have to use roads with no pavements, forcing them to be in constant conflict with road traffic. It is noted however that in most instances, the death rate for men tends to be higher than that of women. For example, in São Paulo, men account for 76 percent of pedestrian fatalities and 86 percent of vehicle fatalities (Vasconcellos 2001). This could be due to the fact that more men travel during peak hours, as compared to women who travel off peak, due to safety concerns especially in places such as India and Egypt during the Arab Spring (Levy 2013).

Studies by the various scholars follow this desegregation to take into account the heterogeneous preferences at an individual level, taking into consideration their socioeconomic characteristics of the decision makers such as age, sex, income and education (Collins and Chambers, 2005).

2.3.2 Effects of income on choice of transport modes

Moses and Williamson (1963), in their Chicago area study on the value of time in choice of mode of transport sought to analyse the correlation between price reduction on public transport modes and patronage of public transport following subsidies. The study concluded that though the automobile non-public transport modes seemed more expensive, these were preferred because they were faster. The authors noted that it was impossible to ascertain “which of these commuters are leisure or income preferred and whether they are subject to a restriction on hours”, thereby leaving out a considerable amount of data. Choice requires affluence, due to the high cost of living in urban areas, hence high speed rail and air travel, as well as car ownership are out of the choice bracket of many. Germany, France, Japan and the United Kingdom have all experienced a decline or stagnation in car use since 1999 (OECD 2013). Hensher, Balbontin Ho and Mulley (2019) in their Australian Study, which they then expanded to include USA, France, Portugal and the UK, also observed that the choices in transport modes were reliant on several attributes, similar to the OECD (2013), one of which was cost, waiting time was also another consideration. Hensher (2019), also found other choice drivers such as the emotional favouring, where light rail transport (LRT) was favoured over bus rapid transit (BRT) in developed countries and developing countries respectively. These preferences, according to AUC/OECD (2018) and Heshner (2019), are primarily based on the cost of infrastructure, where BRT is common in developing countries due to the cheaper infrastructural cost, and LRT are mostly unavailable in Africa, Asia and Latin America.

The OECD (2013) also reports that in the US however, public transit ridership has significantly grown, as well as non-motorised transportation modes among the younger generation, including cycling and walking due to the preference for healthier lifestyles. In developing countries however, Gwilliam (2003), Bouton (2015) and Dargay, Gately, & Sommer (2007) note a correlation between income levels and car ownership, citing a projected growth of car ownership with the growing middle class and industrialisation. This preference is based on the growing income levels and the rise of the middle class.

Kanyama et al, (2004) argues that household income levels in developing countries play a huge role in the quality of utilized public transport. Nairobi is home to a transport system which comprises often 14 sitters, referred to as matatus owned privately and operated by cooperatives.

Matatus and walking make up 80% of all trips according to Campbell, Rising, Klopp, and Mbilo, (2019). According to the Nairobi City County, (2014), walking accounts for 39.7%, private automobiles (including taxis) account for 13.5%, and two-wheelers account for 5.4% of trips.

Kanyama et al (2004) also concur that the income contributes greatly in choice of mode of transportation. Levy (2013) notes that the cost of vehicles in the global south is quite inhibitive, hence very few people especially women have drivers licenses, nor vehicles. Single car households have the man as the default user of the car.

2.3.3 Effects of transport mode attributes on the choice of transportation modes

Litman (2008), defines accessibility as “people’s ability to reach goods, services and activities, which is the ultimate goal of most transport activity”. There are several factors that affect the measure of this variable, including “mobility (physical movement), the quality and affordability of transport options, transport system connectivity, mobility substitutes, and land use patterns.” Access is a key factor in the choice of transport modes, according to UN (2016), there is a need for a paradigm shift in transport towards “people and their quality of life”. The report on sustainable transport for development observes that transport should safeguard safety and personal security of travellers, and also be physically accessible to vulnerable groups. According to Black (2018), modern day importance of transport is associated with accessibility, social inclusion, health and well-being.

Affordability is another significant factor of consideration when selecting transport modes. This variable consists of the monetary value of a single or combined trip, including fares, petrol consumption and tolls as they may apply. Also included is the cost of the mode, such as the cost of acquiring a personal vehicle or a driving licence. OECD (2013), notes that car use in Europe has declined due to the increasing cost of car ownership and insurance in most parts of Europe. Rising inequality and higher unemployment in some demographics, such as young men in Europe, has also contributed to this trend of decreasing car ownership. Age is also a factor taken into consideration, with an ageing population in Europe, there are fewer cars on the road ownership (UN- Habitat 2013). In the USA, health and fitness concerns have led to a younger demographic opting for the use of non-motorised transport such as walking and cycling. Walking in many developing countries is also a preferred mode of transportation due to the lack of affordability of

other modes, such as car ownership (UN- Habitat 2013). In most of Western Europe, policies on the reduction of carbon emissions, have contributed to the choice of modes of transportation, especially in the Netherlands, where cycling is preferred. UN-Habitat (2013). However, by contrast, walking is a norm in developing countries not for health benefits, but more due to the high cost of using formal means such as buses and personal cars. Gwilliam (2003) attributes this to the skewed nature of settlements in most developing countries, where the poorer population live in peripheral areas with little or no access to infrastructure and facilities for transportation.

Safety is a significant concern among users in their choice of transportation modes. Travel time is also a factor that is considered in determining the choice of transport. This variable measures the commuting time for various modes of transport, for in-vehicle travel time, this also includes the transfer times, such as in the use of buses and rail travel. Mitullah and Opiyo (2012) note that walking is preferred in most developing countries due to lack of alternative direct routes, which are more costly. Travel time is also influenced by the frequency of the mode of transportation, such as the number of daily bus or train connections available, along with this, density affects travel time, in that a person may not be able to access parking due to large volumes, minimal resources and high demand. Finally, the commuter distance from their home to the bus or train stop is a factor considered in time (Asensio 2002).

2.3.4 Opinions on transport policies

Consumer choice is an important but oftentimes overlooked aspect of the policy process as many scholars have observed. Most transport models, according to Legacy (2017) remain “a technical exercise characterized by the analysis of cost-benefits, modelling and technocratic decision-making.” This leads to a situation where the public are simply passive citizenry for whom the transport task is undertaken. Legacy and van den Nouwelant, (2015), observe that disruptive behaviour by citizens, in response to transportation policies, is indicative of their interest in participating in the decision of shaping their city. However, the complex structures of transportation governance can make this involvement very difficult. Similarly, Caliskan (2006) mentions local authorities and other users as important stakeholders in urban transportation, Asea and Zak (1999) and Zak and Thiel (2001) identify the passengers and transport operators as

additional stakeholders. Whereas Fierek and Zak (2012) state that the interests of these groups quite often contradict each other.

According to Odhiambo (2019), there are a number of policy documents in Kenya, that seek to improve transport situations; National Transport and Safety Authority Act (NTSA), 2012 plays a crucial role in ensuring the safety of NMT users, who are most vulnerable to traffic accidents, forming 50%-60% of fatalities. The Kenya Climate Change Act of 2016 prioritises development of mass transit options such as bus rapid transit (BRT) and light rail transit (LRT) as multi-modal forms of transport integration, but does not adequately address the most commonly used modes of transport, which remain non-motorised.

The Nairobi County Government Non-Motorised Transport Policy, 2015, aims to make non-motorised transport “the mode of choice as a safe and reliable means of transport”. Nairobi City County Government (2015). Odhiambo (2019) notes that the document however focuses on a study done along the Jogoo road corridor and admits to the lack of updated and adequate statistics on NMT in Nairobi County.

The Kenyan transport system has for a long time been in a wanting state and very disjointed, lacking intermodal interchange. The need for an integrated transport system has been a major issue, highlighted in various policy documents, including the Kenya Vision 2030. Ministry of Lands and Physical Planning. (2015).

Román et al (2014), used discrete choice experiments to gauge the quality of services of public buses in Gran Canaria Spain. The scholars acknowledged that “passengers evaluate the transport services in various ways, using criteria that are not associated with the level of transport usage”. This assertion on an array of aggregate measures in choice selection is shared by Muro-Rodríguez (2017), and McFadden (1974). Román et al (2014) states that the obvious measure of satisfaction of a certain mode of transportation is the number of passengers per kilometre. This assumes that the transport mode chosen creates maximum social welfare and passenger accessibility, but little research is carried out on the perceptions of the passengers with regards to quality of the modes. This is also the view of Hensher and Prioni (2002), that there is no demonstrable correlation between the numbers of passengers per kilometre and the level of satisfaction of passengers.

Lionjanga and Venter, (2018) chip in with the matter of accessibility in terms of the availability of various modes of transportation, focusing on accessibility to transport among the residents of Gauteng Province in South Africa. The study noted that the poor, segregated section of the province is denied access to transport alternatives through what they term as historic spatial exclusion. This brings into perspective the question of factors contributing to preferences, including, accessibility and cost. Walking has been observed as the most common mode of transport in African urban centres, followed by the use of mini buses in various forms. Most African states however, have now introduced the BRT as noted by Lionjanga (2018) and AUC /OECD (2018) as a link to complement the choice of non-motorised transport modes of walking or cycling. Kanyama et al, (2004) also attributes the choices to the socio-economic capabilities of the users in developing countries. UN-Habitat (2013) reports an increase in the use of BRT in Africa, with countries such as Tanzania, Rwanda, South Africa and Ghana implementing the same, due to the affordability in terms of infrastructure, large population, traffic congestion and the demand for public transportation. The Johannesburg BRT is also a preferred choice in South Africa due to the reduced travel time, reduced financial cost and improved road safety. (UN 2016). Literature on the regional trends, indicate that there is a move to improve infrastructure for public commute using the BTR model, though there is also an increase in preference of car ownership due to the growing middle class.

Opiyo and Mitulla (2016) attributed the preference of most Nairobi residents for walking to the directness of routes, for convenience as well as economic factors, noting also concerns of security and safety, as does Gwilliam (2003), who also presents an additional variable of vulnerability, where people tend to avoid modes that increase vulnerability and such as cycling or vulnerable times of travel.

Githui et al (2009), Campbell et al (2019), Opiyo and Mitullah, (2017) and Rajé et al (2018) all identify walking as the most common mode of transport in Nairobi County. Gwilliam (2003) attributes this to the peripheral location of low-income areas only accessible by non-motorised transport modes. Rajé et al (2018) and Campbell et (2019) note that though this is the most commonly used option, there is a lack of adequate infrastructure to ensure the safety of pedestrians who make up the highest road accident fatalities. Nairobi City County Government (2015).

Mitullah, Vanderschuren and Khayesi. (2017), Odhiambo (2019) and Rajé, et al (2018) concur that non-motorised transport constitutes the greater part of transport in Nairobi, yet there is no corresponding infrastructure to ensure the safety and wellbeing of pedestrians and cyclists in terms of policy implementation. Odhiambo (2019) notes that on the contrary, focus has been placed on road expansion and increased motorisation in a manner that does not cater for multi-modal transport.

2.4 Summary and Research Gap

In the literature reviewed very few scholars delve into the detailed demographic attributes of the urban transport user with the exception of Huang et al (2016). The study focuses on the main gap of the study which is the lack demographic attributes as factors considered in establishing travel demand behaviours. The study therefore notes this gap and attempts to review a large variety of demographic data left out in most literature, which include: sex, level of education, presence of a disability, education level, age, duration of stay in Nairobi and occupation. In her study on traffic pollution in Nairobi, Rajé et al (2018) recommends finer research into people's lived transport experiences in Nairobi. This, she suggests, will help improve policy to meet the needs of city commuters, evaluating commuter attributes such as households, daily trips and personal responsibilities. The research concludes that attitudes by various demographics towards various transport modes should be investigated. This is what this study attempts to do.

The second gap noted was the lack of data on transport attributes as a contributing factor to choice. Examined literature noted the importance of individual attributes as well as transport mode attributes in predicting travel demand behaviour (McFadden 1974). Most of the literature on the use of the transport alternatives focuses on the supply side, mentioning a variety of the attributes of alternatives available, the frequency of use, but they leave out the attributes of the demand side (Moses & Williamson 1963; Roman et al 2014; Muro-Rodríguez et al 2017). Literature drew comparisons between two modes of transportation, such as Muro-Rodríguez (2017) on a single corridor analysing the bus and train, as well as Huang (2016) analysing the propensity of the use of the train over the car with increased proximity to the trains. Other scholars, such as McFadden (1974) and Román et al (2014) only looked at one mode. An additional gap noted among the alternatives available was the lack of adequate studies and literature on e-hailing modes of transportation. This is an important component of the available transport alternatives due to their increased popularity in Nairobi among the middle class. These e-hailing ride-share modes, such as

SWVL and Little Shuttle have only recently been launched within Nairobi County. The study will therefore collect and analyses data on the propensity of use of various available modes of transport, as well as demographic attributes of the user of each mode of transport, in order to determine the choice preference and their respective determinants.

In terms of income as a significant factor in transport choice, a gap was noted in that as much as studies do note that income is a significant factor (Moses and Williamson 1963; Kanyama et al 2004, Levy 2013, Huang et al 2016), they do not correlate the income to the choice of various modes of transport. This study seeks to close this gap through the analysis of income against a number of choices of transportation and their respective attributes.

In addition, a gap noted was the lack of studies on opinions of transport users on transport policies, rather only opinion polls in media. In this case, the study attempts to close this gap by collecting public opinions on existing transport policies.

Most studies focused on areas outside Africa, the study seeks to understand the behaviour patterns in the Kenyan context, with hope that it can be expanded outside only one housing estate to inform policy in Kenya and countries with a similar demographic. This study sought to close the gap by analysing multimodal transport against, looking at their attributes and the demographic of the population making the choices

2.5 Conceptual Framework

The study used the Utility Theory and assumes the rationality of choice when selecting the preferred mode of transport by the users. In this case, the study therefore assumed, similarly to UT, that the users have analysed all aspects of the mode of transport thereby selecting the best for them. The questionnaire therefore requires the respondents to select the most preferred.

The independent variable categories are 1) Attribute variables, which refer to the attributes of the mode of transport. The transport attributes in this study are: accessibility; time factor; financial cost and safety. The second category of variables is 2) the demographic variables of the transport user which include; age, sex, level of education, occupation, presence of a disability, licence ownership, duration of stay in Nairobi and 3) income variable which refers to the amount of money the transport user earns monthly. The dependent variable is the choice of urban transportation

modes among Buru Buru estate residents in Nairobi County, which is dependent upon the three independent categories of variables. The table below explains the conceptual framework for identifying the preferred mode of transport of various groups of Nairobi residents using the variables of their demographic attributes, income levels and transport consideration factors made by each individual.

Table 2. 1: Conceptualisation of variables

Variable	Definition	Measurement scale	Source
1. Demographics of transport users	<ol style="list-style-type: none"> 1. Age 2. Level of education 3. Occupation 4. Presence of disability 5. Duration of stay in Nairobi 6. Sex 7. License Ownership 	<ol style="list-style-type: none"> 1. Ratio scale 2. Ordinal scale 3. Nominal scale 4. Dichotomous scale 5. Ordinal scale 6. Dichotomous scale 7. Dichotomous scale 	McFadden (1974); Huang et al (2016); Muro- Rodríguez et al (2017);
2. Mode of transport attributes	<ol style="list-style-type: none"> 1. Accessibility 2. Time Factor 3. Financial Cost 4. Safety 	Ordinal/ Ranking Scale	Román et al (2014); Huang et al (2016); Muro- Rodríguez et al (2017)
3. Income	Gross monthly income	Ratio Scale	Moses and Williamson (1963); Huang et al (2016)

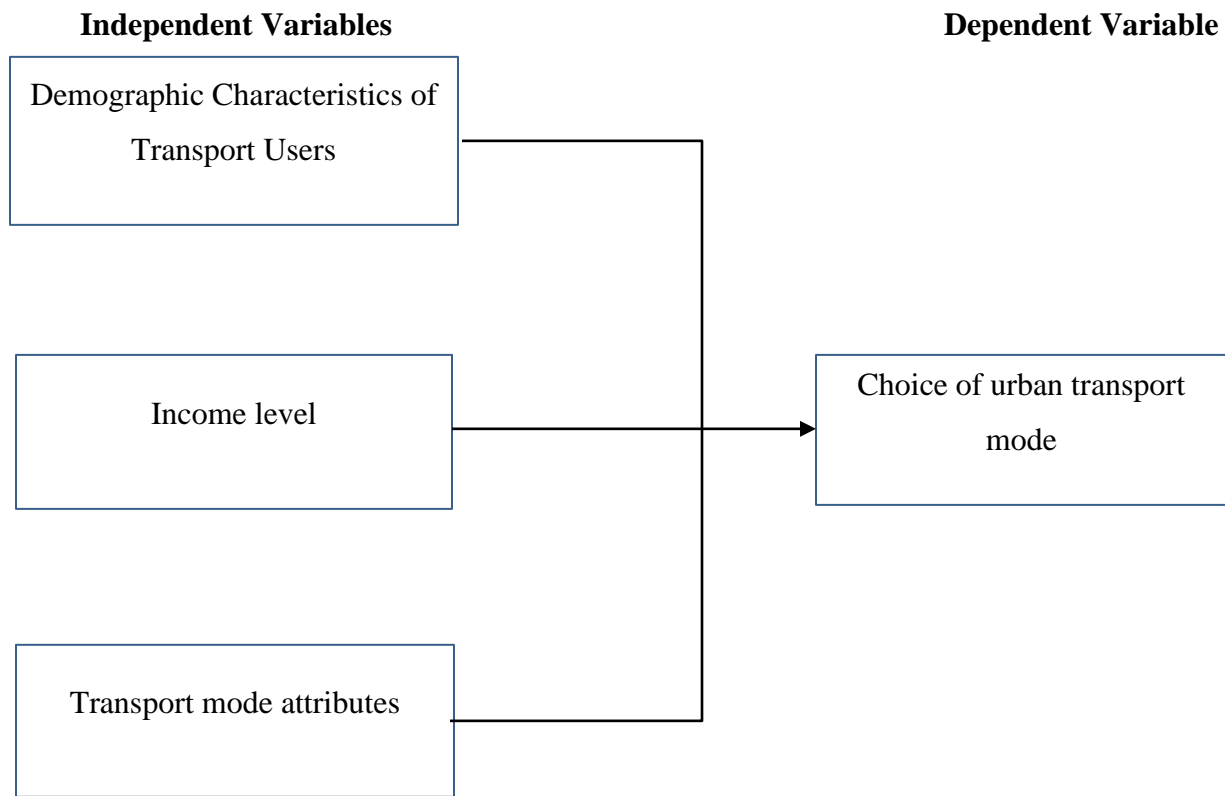


Figure 2. 1: Conceptual Framework

2.5.1 Operationalisation of variables

Demographic characteristics considered in the study include, sex, age, level of education, license ownership, duration of stay in Nairobi, presence of a disability and occupation. These were measured using various measurement scales.

Mode of transport attributes relevant to the study were: accessibility, time factor, financial cost and safety which were measured using an ordinal ranking scale where respondents were to rank the attributes on a scale of importance from 1-4 with 1 being the least important and 4 being the most important.

The income factor was considered as the gross monthly income of a participant, which was measured using a ratio scale of seven income bands

The variables were then run through a logit multinomial model to identify choice patterns by demographic, monthly income and attribute.

As the study also sought to collect opinions on existing transport policies, the respondents were asked open ended questions on their opinions and transport policy recommendations.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter details the research design population and sampling procedures, data collection, data analysis, research quality and ethical.

3.2 Research Design

Kothari, (2004) defines a study design as a detailed plan that guides a researcher. A study design can be defined as the plan for obtaining answers to the questions being studied and addressing any challenges that may arise in the process. The research was quantitative in nature and employed the use of structured questionnaires, with multiple choice questions, dichotomous questions, and scaling questions which were analysed using the quantitative method. The questionnaire also had some open-ended questions for additional information. Questionnaires were self-administered, both physical and online, using SurveyMonkey for the latter.

The questionnaire was divided into four broad categories. The first sought to collect demographic data of the respondents including: Age, level of education, occupation, presence of disability, duration of stay in Nairobi, sex and license ownership. The Second category collected data on the respondents' gross monthly income. The third section collected data on the mode of transport, including preference, frequency and reasons for choice selection. The fourth and final category collected responses of respondents on transport policy and the perceived effectiveness as well as recommendations.

3.3 Study Population

Burns and Grove, (2003) describe a target population as the entire aggregation of respondents that meet the designated set of criteria.

The research design includes a sample from Buru Buru estate in Nairobi County. Buru Buru estate is an expansive settlement spread over 85 ha, it is located 8 kms outside the Nairobi Central Business District (Rukwaro, & Kieti, 2019). The Estate, designed in 1974, consisted of bungalows and maisonettes specifically for the middle-income demographic of Nairobi. Construction of the estate was completed in the mid-1980s. Buru Buru estate was designed in 1974 and construction was completed in the mid-1980s. The estate has since seen great modifications to the original housing plans, thereby increasing the once homogeneous demographic. The heterogeneous nature

of the population, comprising the older residents in the original designs as well as newer tenants of the modified units makes the area of great interest for the study.

Buru Buru area is host to both upper-middle and middle-income earners as well as a lower income demographic (Songoro 2015). The estate lies between Jogoo road to the right and Outer ring road to the left, making it easily accessible to motorized and non-motorized transport. The Kenya Railways Makadara terminus is accessible to the residents of Buru Buru Estate and it also falls within the zone of digital hailing services, such as Uber, Bolt and Little Cabs, located 8 kms from the Central Business district, which is within reasonable walking distance. The area residents in the area thereby have access to all the transport modes under investigation.

It is with these considerations that Buruburu estate was selected as a suitable case for the study because it exhibits most of the characteristics of interest to the researcher in this study.

3.4 Sampling Design

The sample design of the study was non- probability sampling. Convenience sampling was employed in identifying respondents to administer the questionnaire, due to the lack of a sampling frame. Respondents for physical questionnaires were approached at areas with frequent human traffic such as mall parking areas, bus stops, church parking lots, markets and churches within Buru Buru Estate.

As the population in the five estates of Buru Buru was unknown, therefore, the study applied a formula for an unknown population as provided below:

$$\text{Necessary Sample Size} = (Z\text{-score})^2 * P*(1-P) / (\text{margin of error})^2$$

The study will use a 95% confidence level, .5 P (proportion), and a margin of error (confidence interval) of +/- 5%

$$= ((1.96)^2 * .5(.5)) / (.05)^2$$

$$= (3.8416 * .25) / .0025$$

$$= .9604 / .0025$$

$$= 384.16$$

$$= 385$$

3.5 Validity and Reliability Test

Validity refers to the degree to which the research instruments are able to measure what they are designed to measure. The study should be replicable by other researchers under similar conditions (Polit & Hungler 1999). Cohen et al (2000), define reliability as the precision and accuracy of the research instrument. The study ensured that there was no ambiguity or confusion in the questions asked on the questionnaire to ensure reliability of data. The respondents were informed on the purpose of the study in order to give honest and accurate feedback. Research assistants were briefed on the relevance of the study and the understanding. The study ensured internal and external validity, the data collection tools were piloted before the study to ensure that the respondents all understood the question in the same way. The online questionnaire was administered to a group of 20 individuals as a pilot, which allowed the researcher to adjust and the weaknesses of the questionnaire. The questionnaires were analysed on Survey Monkey. Also the researcher used the same interviewers to ensure that the physical questionnaires were administered consistently. The researchers ensured objectivity by allowing for an adequate time frame for data collection which will ensure all relevant respondents are interviewed, to allow for all voices in the data collection. The data collection period took three weekends. The research also employed triangulation of methods to enhance research quality.

3.6 Data Collection

Data were collected using research questionnaires with both closed and open ended questions. The format of the questionnaire was both online and physical self-administered questionnaires, the researcher employed the use of research assistants who were trained on how to administer the questionnaires, to ensure uniformity in the data collection.

The collection was to residents in Buru Buru, in a convenience sampling technique. The research assistants were all provided with a copy of the introduction letter and the research approvals and permits, which they used to identify themselves and seek the permission of respondents to participate in the research.

3.7 Data Analysis and Presentation

The data obtained by use of questionnaires was organized, cleaned, sorted, and analyzed using SPSS Version 25. Qualitative data was aggregated by content analysis and presented in form of themed survey reports. This facilitated the analysis of respondents' opinions on the government transport policies to address objective four of this study. Further, frequency tables and charts were used to depict the aggregated data. This helped to describe and understand the study sample.

The methodology used to analyse the choice selection in this study were the models of discrete choice based on the Theory of Random Utility. The study adopted the logit multinomial model as also used in the study by Muro- Rodríguez et al (2017). The similarity in the studies, establishing travel demand patterns, contributed significantly to the use of the model.

Logit model is preferred due to its ability to capture the behaviour of the probability function and alternatives properly. Discrete choice models are also referred to as disaggregate demand models and are considered discrete due to the qualitative nature of individual responses which allow for a quantification of preferences. These models are based on the definition of preferences through a utility function that is maximized, in this case the utilities with the highest choice probability were analysed. The discrete choice of different transport alternatives the user makes were; travel by public transport or private transport or e-hailing transport. The functional form of the multinomial logistic regression models for the public/private/e-hailing alternatives was represented by:

$$P(a) = P(U_a \geq U_b \geq U_c) = \frac{e^{aV_a}}{e^{cV_a} + e^{bV_a} + e^{aV_a}}$$

Where:

a – public transport; **b** – private transport and **c** – e-hailing transport

U represents utilities; the satisfaction gained by respondent for using a transport means.

U_a – total utility for using public transport

U_b – total utility for using private transport

U_c – total utility for using e-hailing transport

V represents the deterministic utility component

Assuming linearity of **V** with respect to the parameters, therefore:

$$P(a) = \frac{e^{a\beta X_a}}{e^{c\beta X_a} + e^{b\beta X_a} + e^{a\beta X_a}}$$

Where:

β - Represents the vector of coefficients and

X - Represents the vector of explanatory variables

Demographic characteristics and attributes factors of the transport alternatives were considered as the main explanatory variables.

Given the three transport alternatives, the multinomial logit model was:

$$\text{Prob}(Y_i) = \frac{1}{1 + e^{-(\alpha + \beta_k X_{ki})}} = \frac{e^{\alpha + \beta_k X_{ki}}}{1 + e^{\alpha + \beta_k X_{ki}}}$$

Where $i = 1, 2, 3$ and 1- public transport, 2 – Private transport, 3 – e-hailing transport

Using the above equation, we formulated the probabilities of choosing the three alternatives as follows;

$$\text{Prob}(Y_i = 1) = \frac{1}{1 + e^{\alpha_2 + \beta_{12} X_{1i} + \beta_{22} X_{2i}} + e^{\alpha_3 + \beta_{13} X_{1i} + \beta_{23} X_{2i}}}$$

$$\text{Prob}(Y_i = 2) = \frac{e^{\alpha_2 + \beta_{12} X_{1i} + \beta_{22} X_{2i}}}{1 + e^{\alpha_2 + \beta_{12} X_{1i} + \beta_{22} X_{2i}} + e^{\alpha_3 + \beta_{13} X_{1i} + \beta_{23} X_{2i}}}$$

$$\text{Prob}(Y_i = 3) = \frac{e^{\alpha_3 + \beta_{13} X_{1i} + \beta_{23} X_{2i}}}{1 + e^{\alpha_2 + \beta_{12} X_{1i} + \beta_{22} X_{2i}} + e^{\alpha_3 + \beta_{13} X_{1i} + \beta_{23} X_{2i}}}$$

3.8 Ethical Considerations

This research proposal was submitted for consideration to the Strathmore University Ethical Review Board, and subsequently approved, granting the researcher permission to proceed with the data collection. The approval letter is available in Appendix I.

The researcher conducted the study in a manner minimizing any form of harm to the respondents: Consent was voluntarily given and the participants were informed that consent may be withdrawn at any time during the study; potential participants were given full disclosure of all information necessary for making informed decisions to participate in this study; the respondents were not be required to give their names on any of the questionnaires, online data was not collected and confidentiality was highly observed; respondents were informed of the duration of the questionnaire to allow them to plan their schedules accordingly.

The researcher applied for and was granted a research permit from the National Commission for Science, Technology and Innovation (NACOSTI), before embarking on data collection available in Appendix II.

CHAPTER FOUR: PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

The chapter entails the analysis of the data collected using the methodology proposed in the previous chapter and the discussions of the research findings. The chapter is divided into sections which covers the questionnaire response rate, demographics characteristics, income and the attributes factors of the transport alternatives. The last sections present the multinomial logistic regression analysis of the discrete choice of transport alternatives due to influence of demographics characteristics, income and attributes factors.

4.2 Response Rate

The overall response rate was 71.95% which is enough to allow for data analysis. This can be attributed to the piloting of the questionnaires which allowed the researcher to ensure reliability of the tools.

Table 4. 1: The Questionnaire Response Rate

	Issued	Returned	Response rate (%)
Number of Questionnaires	385	277	71.95

Source: (Survey Data, 2020)

4.3 Demographic Characteristics of users

The section analyses the demographic characteristics of the respondents. The demographic characteristics include; the age range, gender, the number of years lived in Nairobi County, education level, disability and possession of the driving license. The economic factors capture; the income band and the employment status of the respondents.

Table 4. 2: Age Range of the Respondent

Age Range	Frequency	Percent
18 - 24	61	22.0
25 - 34	107	38.6
35 - 44	47	17.0
45 - 54	24	8.7
55 - 64	19	6.9
65 and over	19	6.9
Total	277	100.0

Source: (Survey Data, 2020)

From table 4.2, 38.6% of the respondents are aged between 25years to 34years, followed by 22.0% who aged 18-24. Additionally, 17.0% of the respondents aged 35-44 and 8.7% aged 45-54. Further, the 55-64 and 65 and over of the respondents were represented by 6.9% each.

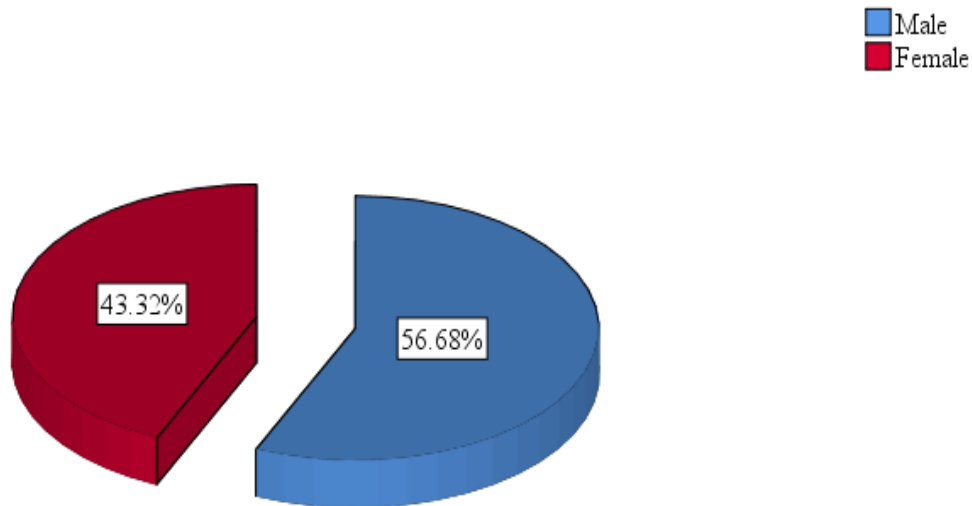


Figure 4. 1: Gender of the Respondent

Source: (Survey Data, 2020)

A proportion of 56.68% of the sampled Buru Buru residents were male while 43.32% were female as depicted in the figure 4.1 above.

Table 4. 3: Range of Years Lived in Buru Buru Estate

Years Lived	Frequency	Percent
1 - 5 years	11	4.0
6 - 10 years	25	9.0
11 - 15 years	26	9.4
16 - 20 years	40	14.4
Above 20 years	175	63.2
Total	277	100.0

Source: (Survey Data, 2020)

Regarding the number of years residents lived in Nairobi County, 63.2% of the Buru Buru residents had lived in the estate for over 20 years. This was followed by 16-20 years at 14.4%, 11-15 years at 9.4%, 6-10 years at 9.0% and 1- 5 years at 4.0% as depicted in table 4.3 above. This signifies that the respondents had witnessed the transformation of the transport sector and advance of e-hailing transport services.

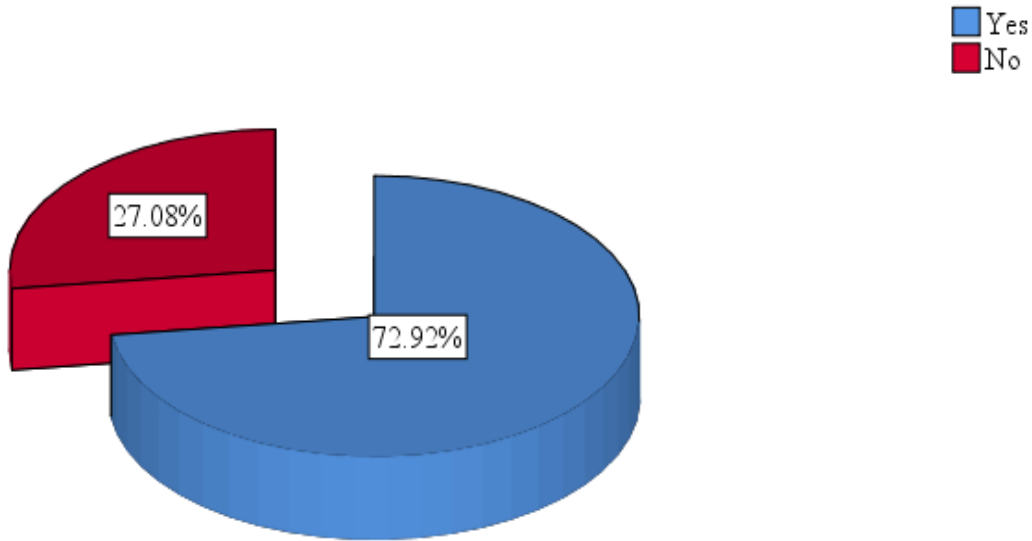


Figure 4. 2: Ownership of Driving License

Source: (Survey Data, 2020)

The sampled residents of Buru Buru Estate reported that 72.92% owned driving licenses while 27.08% did not own a driving license as shown in figure 4.2 above.

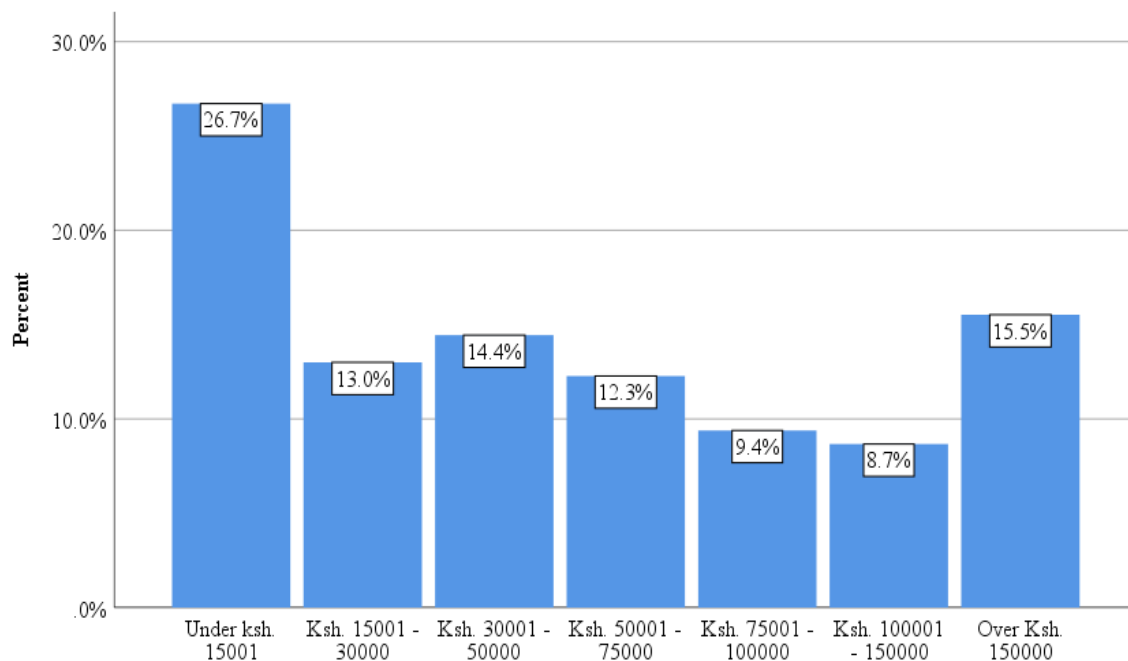


Figure 4. 3: Monthly Income Band of the Respondent

Source: (Survey Data, 2020)

From figure 4.3 above, the findings indicated the majority of the Buru Buru residents represented by 26.7% earned below khs.15001. In contrast, 15.5% of the residents earned over Kshs. 150000. This implies the estate comprises both low- and high-income earners thus, preferred for analysis of the choice of transport alternatives. Additionally, 14.4% of the residents earned Kshs. 30001-50000 and 13.0% earned Kshs. 15001-30000. Moreover, 12.3% earned Kshs. 50001-75000, 9.4% earned Kshs. 75001-100000 and 8.7% earned Kshs. 100001-150000.

Table 4. 4: Respondent has physical/learning disability

	Frequency	Percent
Yes	8	2.9
No	269	97.1
Total	277	100.0

Source: (Survey Data, 2020)

A prompt to the disability revealed that 2.9% of the sampled residents had a disability while 97.1% of the resident did not report any form of disability as shown table 4.4 above.

Table 4. 5: Employment status of Respondent

	Frequency	Percent
Formally employed	108	39.0
Part time/ temporary employee	33	11.9
Consultant	13	4.7
Self- employed	51	18.4
Retired	23	8.3
Student	34	12.3
Unemployed	15	5.4
Total	277	100.0

Source: (Survey Data, 2020)

A proportion of 39.0% of the sampled residents reported to be formally employed followed by 18.4% of the residents who were self- employed. Furthermore, 12.3% of the sampled residents were students and 11.9% were part time and temporary employees. As well, 8.3% had retired, 5.4% were unemployed and 4.7% were consultants as shown in the table 4.5 above.

Table 4. 6: Highest level of Education completed

	Frequency	Percent
None	2	0.7
Primary	10	3.6
Secondary	47	17.0
college	74	26.7
Graduate	113	40.8
Postgraduate	31	11.2
Total	277	100.0

Source: (Survey Data, 2020)

Regarding the level of education of the sampled residents, 40.8% were graduates while 26.7% were college level. A proportion of 11.2% indicated had attained postgraduate level and 17.0% has attained secondary level. Nevertheless; 3.6% of the residents had attained primary level and 0.7% had not attained formal education as shown in the table 4.6 above.

4.4 Transport alternatives preferences

The section analyses the preference of different transport alternatives by the residents of Buru Buru Estate. The preferences of the modes of transport are depicted in table 4.7 below.

Table 4. 7: Preferred Mode of transport

Mode	Frequency	Percent
E - hailing car services	20	7.2
Regular taxi services	1	.4
E- hailing motorcycle services	12	4.3
Regular boda bodas	1	.4
Personal car	92	33.2
Car pooling	4	1.4
Matatus/bus	117	42.2
Walking	7	2.5
Cycling	3	1.1
Personal Motorcycle	5	1.8
Train	15	5.4
Total	277	100.0

Source: (Survey Data, 2020)

From table 4.7 above, the findings indicated that 42.2% of the residents preferred use of matatus and buses, followed by use of personal cars represented by 33.2%. Further, preference of e-hailing car services and trains came third and fourth represented by 7.2% and 5.4% respectively. Moreover, the use of e-hailing motorcycles represented by 4.3% completed the top five preferred modes of transport alternatives by the residents of Buru Buru Estate.

Reasons given by respondents for the preference in use of matatus and buses were consistent with the cost aspect, most respondents chose matatus and buses due to their affordability and availability. One respondent stated the preference was because the matatus were “*cheap, convenient, accessible and available.*” Another respondent stated that matatus were preferred because “*Matatus are cheap and readily available. Use of a personal car is hampered by the challenges of parking- space, costs and security.*” A third respondent stated their preference for matatus was based on the fact that “*You relax and let someone else worry about getting you to your destination safely!!!*”

The second highest preferred mode of transport was the use of personal cars which a large number of respondents attributed to convenience and a few to safety. One respondent stated that the preference was due to “*convenience, it’s clean, no crowding and bad smells, no queues for PSV*”, while another stated that the reason for personal car preference was “*to avoid bad behaviour of makanga.*” A third respondent stated that the choice preference was for the “*safety of my possessions*”.

The five preferred modes of transport alternatives informed the analysis of this study. Therefore, the five alternatives were collapsed into three; public transport represented by use of matatus, buses and train, private transport represented by use of personal cars and e-hailing transport represented by the use of e-hailing car and motorcycles services. Therefore, the next section presents the analysis of the three transport alternatives among the residents of Buru Buru.

Respondents were asked to express the challenges that they faced with their preferred modes of transport. Those with buses and matatus as their preferred mode, raised concerns about traffic congestion and arbitrary hiking of fares as the two main concerns. Additional challenges of loud music, rude transport operators, reckless driving and a lack of personal space were also raised. One respondent stated that matatus have the challenge of *“unpredictability with regard to timings, and prone to traffic jam delays”*. Similarly, another respondent wrote *“fare fluctuates with weather and time”* and a third wrote *“careless driving, lack of timing schedules, unfair fares”*.

On the other hand, respondents who preferred using their personal cars also had challenges with this mode of transport. Top on the list of challenges in this category were concerns on traffic jams and high cost of fuel. One respondent wrote *“rise of fuel prices, parking availability and general traffic on the road”*, and another *“traffic, tiring to always drive in Nairobi, uncourteous/rude public transport drivers in the road”*, while a third simply stated *“fuel prices, parking cost”*.

4.5 Multinomial logistic regression

In order to determine the effect of demographic characteristics of transport users, income and attributes factors on the choice of three common transport alternatives in Buru Buru, a multinomial logistic regression model was estimated. The dependent variable was transport alternatives. It was measured by **1** if the resident used public transport, **2** if the resident used private transport and **3** if the resident used e-hailing transport. The explanatory variables were the identified demographics characteristics; age range, gender, duration lived in Buru Buru, possession of driving license, occupation, education level; income and identified attribute factors; accessibility, time factor, financial cost and safety. The demographic characteristics of the transport users and attributes factors were identified according to the literature review.

To facilitate interpretation of the model, the marginal effects for the three alternatives were computed and depicted in the table 4.8, 4.9 and 4.10 below. The marginal effects are usually computed for probabilistic models from the coefficients and are interpreted as probabilities. The

robust standard errors are captured in parenthesis while *, ** and *** represents the level of significance at 10%, 5% and 1% respectively. The Likelihood Ratio (LR) is used to test for the significance of the probabilistic model. For this case, LR test was strongly significant, thus multinomial regression model is significant and fit for analysis of the transport alternative choices.

In order to address the second objective of the study, the demographic characteristics were regressed on the three transport alternatives and presented in the table below.

Table 4. 8: Multinomial logistic regression for Demographics characteristics

Characteristic	Public Transport Model (Marginal Effects)	Private Transport Model (Marginal Effects)	E-hailing Transport Model (Marginal Effects)
Age			
18 - 24	0.44 (5.211)	0.41*** (0.093)	0.20*** (0.072)
25 - 34	0.54 (5.218)	0.37*** (0.049)	0.17*** (0.038)
35 - 44	0.62 (4.823)	0.35*** (0.063)	0.12** (0.051)
45 - 54	0.44 (5.074)	0.44*** (0.086)	0.18** (0.089)
55 - 64	0.62 (5.059)	0.32*** (0.105)	0.16 (0.112)
65 and over	0.86 (2.255)	0.20* (0.106)	0.00 (0.00)
Gender			
Male	0.49*** (0.037)	0.34*** (0.033)	0.17*** (0.030)
Female	0.55*** (0.454)	0.40*** (0.041)	0.15*** (0.030)

Source: (Survey Data, 2020)

Age range of the resident was found to be significant in influencing the choice of private and e-hailing transport alternative while insignificant for public transport. Those aged 45-54 years were found to prefer private transport when the three alternatives were available with a probability of 0.44. Additionally, those aged 65 years and over had a low probability of 0.20 to choose private transport and did not prefer the e-hailing transport at all. This is attributed to their resistance to technological changes. Interestingly, the residents aged 18-24 had the highest probability of 0.20

to use the e-hailing transport. This can be linked to their acquaintance with mobile technology and advancement. Further, those aged 45-54 years, 25-34 years had a probability of 0.18 and 0.17 to use e-hailing transport given the three alternatives.

Moreover, the marginal effects for the gender were significant in determining the choice of transport alternatives. The ladies were found to have the highest probability of 0.55 and 0.40 for the public and private alternatives. Men scored a lower probability however it established that given the three alternatives, men would prefer public, private and e-hailing transport represented by probabilities of 0.49, 0.34 and 0.17 respectively. Additionally, men had the highest probability of using e-hailing transport compared to their female counterparts with a probability of 0.15. Nevertheless, females aged 45-54 years had the highest probability of 0.44 to use private transport while men aged 18-24 years had the highest probability of 0.20 to use the e-hailing transport alternative.

Characteristic	Public Transport Model (Marginal Effects)	Private Transport Model (Marginal Effects)	E-hailing Transport Model (Marginal Effects)
Duration of stay in Nairobi			
1 - 5 years	0.84 (2.718)	0.19 (0.145)	0.08 (0.075)
6 - 10 years	0.77 (4.880)	0.19** (0.091)	0.23*** (0.083)
11 - 15 years	0.69 (4.482)	0.29*** (0.078)	0.15** (0.069)
16 - 20 years	0.64 (4.649)	0.34*** (0.071)	0.13** (0.052)
Above 20 years	0.51 (5.052)	0.41*** (0.034)	0.17*** (0.028)
Driving License			
Yes	0.48 (4.927)	0.49 (4.674)	0.03 (1.815)
No	0.78 (5.590)	0.13 (2.099)	0.09 (5.426)

Source: (Survey Data, 2020)

The number of years lived in Nairobi county was significant in the choice of private and e-hailing transport alternatives. The residents who had lived for over 20 years had the highest probability of 0.41 to use private transport followed by those who had lived for 16-20 years at 0.34 and then 11-

15 years with a probability of 0.29. Consequently, the results revealed that the residents who lived for 6-10 years preferred the e-hailing transport with a probability of 0.23. This is attributed to the onset of the recent surge of technology embraced by the e-hailing transport alternative. Intuitively, those who had lived for above 20 years were believed to have harnessed enough savings to afford personal cars for their private transport.

The ownership of driving licenses was found to be insignificant in prioritizing the mode of transport alternative chosen. This was expected since from the figure 4.3 it established that 72.92% of the resident owned driving license.

Characteristic	Public Transport Model (Marginal Effects)	Private Transport Model (Marginal Effects)	E-hailing Transport Model (Marginal Effects)
Occupation			
Formally employed	0.55 (4.936)	0.40*** (0.054)	0.13*** (0.037)
Part time/ temporary employed	0.56 (4.823)	0.43 (0.101)	0.07* (0.037)
Consultant	0.65 (6.550)	0.24** (0.118)	0.32** (0.151)
Self- employed	0.57 (5.356)	0.35*** (0.064)	0.22*** (0.065)
Retired	0.63 (4.800)	0.34** (0.134)	0.16 (0.156)
Student	0.56 (5.697)	0.33*** (0.116)	0.26** (0.107)
Unemployed	0.82 (3.427)	0.19 (0.124)	0.15 (0.126)
Education			
None	0.00 (0.00)	0.97 (1.818)	0.16 (0.281)
Primary	0.18 (0.131)	0.82*** (0.131)	0.00 (0.00)
Secondary	0.57 (0.831)	0.40 (0.594)	0.07** (0.036)
college	0.55 (1.041)	0.41 (0.780)	0.09 (0.032)
Graduate	0.67 (4.956)	0.20 (1.47)	0.27*** (0.044)
Postgraduate	0.51 (2.359)	0.41 (1.909)	0.18 (0.104)

Source: (Survey Data, 2020)

The marginal effects of the occupation status were significant for the private and e-hailing transport alternatives. The findings indicated that the formally employed residents had the highest probability of 0.40 to use the private transport alternative. Further, the self-employed residents followed in choosing private transport alternatives with a probability of 0.35. As well, the consultants had the highest probability to choose e-hailing transport followed by students with a probability of 0.32 and 0.26 respectively.

The self-employed and formally employed came third and fourth in choosing e-hailing transport alternatives with a probability of 0.22 and 0.13 respectively.

The marginal effects of the education level were significant for the private and the e-hailing transport alternatives. The results indicate that the residents who had a primary level of education had the highest probability of 0.82 to use a private transport alternative. Further, the graduate level of education had the highest probability of 0.27 to use the e-hailing transport alternative followed by secondary level with a probability of 0.07.

In order to address the third objective of the study, the income variable was regressed on the three transport alternatives and presented in the table 4.10 below

Table 4. 9: Multinomial logistic regression for Income Variable

Income Variable	Public Transport Model (Marginal Effects)	Private Transport Model (Marginal Effects)	E-hailing Transport Model (Marginal Effects)
Under Kshs. 15001	0.58 (4.846)	0.37*** (0.084)	0.12** (0.054)
Kshs. 15001 - 30000	0.84 (5.545)	0.08* (0.046)	0.29*** (0.091)
Kshs. 30001 - 50000	0.70 (4.480)	0.26*** (0.073)	0.16*** (0.059)
Kshs. 50001 - 75000	0.41 (4.995)	0.43*** (0.078)	0.23** (0.074)
Kshs. 75001 - 100000	0.60 (5.224)	0.31*** (0.089)	0.22** (0.086)
Kshs. 100001 - 150000	0.36 (4.468)	0.55*** (0.103)	0.09 (0.061)
Over Kshs. 150000	0.37 (4.580)	0.53*** (0.084)	0.11* (0.058)

Source: (Survey Data, 2020)

The marginal effects for the income band of the resident were significant for choice of private and e-hailing transport alternatives. The results established that the residents earning Kshs. 100,001-150,000 preferred private transport followed closely by those earning over Kshs. 150,000 with a probability of 0.53. Furthermore, those earning Kshs. 15,001-30,000 had the highest probability of 0.29 to choose e-hailing transport followed by the resident earning Kshs. 50,001-75,000 with a probability of 0.23. The income band of the resident was non-significant in influencing the choice of the public transport. This can be attributed to the fact regardless of the resident’s income band, they obliged to use the public transport alternative.

In order to address the fourth objective of the study, the attribute factors were regressed on the three transport alternatives and presented in the table 4.10 below

4.6 Transport mode attributes factors

This section presents the analysis of the mode of transport attribute factors of transport alternatives and frequencies of the preferred mode transport among the residents of Buru Buru Estate. The attributes factors considered were accessibility, affordability, time, and safety of the mode of transport alternatives.

Table 4. 10: Mode of transport attribute for the choice

	Frequency	Percent
Accessibility	42	15.2
Time factor	105	37.9
Financial Cost	82	29.6
Safety	48	17.3
Total	277	100.0

Source: (Survey Data, 2020)

The findings indicated that 37.9% of the residents considered time factor as the most determinant attribute of the transport alternative. A proportion of 29.6% considered affordability of the transport alternative was a key attribute in choice of mode. A further, 17.3% of the residents preferred safety of the transport alternative while 15.2% valued the accessibility of the mode of transport alternative as shown in the table 4.7 above.

Table 4. 11: Multinomial logistic regression for Attribute Factors

Attribute	Public Transport Model (Marginal Effects)	Private Transport Model (Marginal Effects)	E-hailing Transport Model (Marginal Effects)
Accessibility	0.58 (4.881)	0.38*** (0.073)	0.13*** (0.052)
Time factor	0.52 (5.156)	0.40*** (0.042)	0.19*** (0.037)
Financial Cost	0.66 (4.552)	0.33*** (0.045)	0.13*** (0.035)
Safety	0.62 (4.941)	0.34*** (0.061)	0.17*** (0.054)

Source: (Survey Data, 2020)

The marginal effects of the attribute factors of the transport alternative were significant for the private and e-hailing transport alternatives. The time factor stood out as the key attribute factor to consider when choosing to make a choice with a probability of 0.40 for private and 0.19 for the e-hailing transport alternatives. The accessibility of the alternative came second for the private transport with a probability of 0.38 while safety attribute came second consideration for the e-hailing alternative with a probability of 0.17. The affordability attribute ranked last for both private transport and e-hailing transport alternatives.

4.7 Public Opinion on Transport Policy

Respondents were asked whether the existing transport policies allowed them to frequently and easily use their preferred modes of transport. They were also asked to give reasons for their answers and suggest policy recommendations.

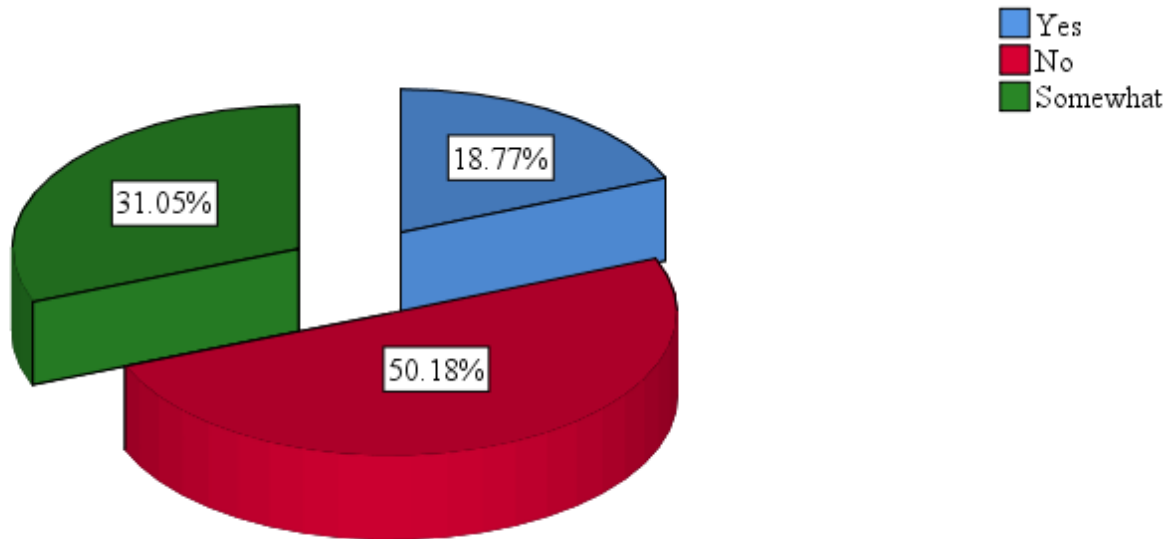


Figure 4. 4: Opinion on effectiveness of government policy

Source: (Survey Data, 2020)

50.18% of the respondents were of the opinion the government did not have policies that allowed them to frequently and easily use their preferred transport modes, followed by 31.05% who responded that the government somewhat had effective policies. Further, 18.77% of the surveyed population were of the opinion that the government policies allowed them to enjoy and access their preferred modes of transportation.

A respondent to select the option somewhat indicated that *“there is a current ban on E-hailing motorcycle services prohibiting them from entering the Central Business District. Other than that, the current regulations are effective to the best of my knowledge.”*

Another respondent who selected somewhat explained that *“policies are in place but not being executed. Road network hasn't been expanded to cater population growth of the city especially Eastland's and public transport could be better managed by a government authority overseeing the private investors.”*

A third respondent who selected somewhat shared that *“rules aren't being implemented even though they're available”*.

Of those who selected no, gave various reasons with the underlying theme that the policies are in existence, but they seemed to note that there is an enforcement issue. Some of the responses received were:

“No good will”;

“Government only talks but takes no action”;

“They leave us to the mercies of SACCOS who don't adhere necessarily to their SACCOS prescribed conduct”;

“I feel that transport policies are either insufficient or are implemented in an ad hoc manner “;

“I feel like they simply don't care about the daily commute of a low-income earner like myself”;

“There is no good infrastructure to support the most effective mode of transport that we all desire. The roads are still congested.”

“They do not consider the public”

“It has been left to cartels”

Respondents were also generally unaware of specific policies, and mostly gave their opinions on the state of transport as it affects them on their daily commute.

4.8 Key Recommendations from respondents on Transport Policy

Respondents were asked to indicate transport policies that they would recommend for implementation by the government. Several of the respondents gave varying responses with a few consistencies.

The recommendations were clustered based on their similarities and a total of six categories emerged which were related to the variables of study:

The first category was that of fare regulation in public transport, notable is the importance of the cost transport attribute. Numerous respondents were of the opinion that the government should cap public transport fares to ensure consistency. Respondents cited that matatus were in the habit of arbitrarily changing fares based on numerous factors such as weather changes and traffic. Some sampled responses include:

“Government should regulate the fares charged very strictly” and “Policies to ensure that matatus don't hike their fares irregularly.”

The second category of responses on policy recommendations was on the accessibility attribute of the transportation mode. In particular respondents noted that most transport modes were inaccessible to persons living with disabilities. This category also touched on the fact that the cost of transportation was out of reach for a number of persons living with disabilities. Some of the sampled responses were: *“Free or subsidized access for persons with disability”* and *“Most people with disabilities cannot afford 1\$ a day. Now they should come up with a law that all public transport vehicles should have at least two reserved seats for disable persons”*

Thirdly, respondents recommended policies on the nationalisation of public transport in Nairobi County. Respondents stated that transport provision should be a mandate of the government and should not be privatised as commercialisation made the sector chaotic and ignorant to the needs of the public. This policy recommendations indicates that the public would choose government run transportation services over private ones. Responses sampled included: *“Public transport management should be a preserve of the Government, not private individuals/companies. Commercialising it makes it messy.”*, *“Introduce government run transport system”* and *“Nationalization of public transport sector (state owned and controlled)”*

The fourth category of policy recommendations was the encouragement of public transportation use in Nairobi Country. Respondents suggested that this was achievable through the improvement of existing options and introduction of alternatives such as light rail and BRT. Respondents noted that this would thereby reduce the use of private vehicles in the County of Nairobi. One respondent suggested: *“The reduction of the current 8 year age limit on manufactured cars for importation to around 5 or 3 years. This would increase the buying price of cars which would reduce importation and therefore reduce traffic due to a decrease in number of cars. Introduction of the BRT/ Light Rail/ Metro would provide enough substitutes that would prevent an exploitative increase in prices by Matatus due to the decrease in the number of personal cars.”* This recommendation is indicative of a preference of public transport over private transport as well as the need for diversified transport modes. Respondents also noted the limited options of public transportation to only matatus and buses, recommending the introduction of faster alternatives with less traffic, such as: *“Government should urgently look into improving railway transport as this would enable faster movement of passengers, as opposed to road which is frequently swayed by traffic snarl-ups”* and *“Matatus should be abolished, we need an organized transport system that is efficient”*, also *“BRT system*

to be in place. Ban on 14-seater Matatus.” Respondents also noted the poor quality of existing public transport options: *“Do away with 14-seater matatus especially over short distances. Most if not all 14 seaters are in extremely poor conditions, yet the government claims they all passed”*

The fifth category of responses was the recommendation to increase and improvement of NMT infrastructure to encourage safety while walking and cycling. Respondents noted a lack of attention to NMT as an alternative for selection, stating that there should be more cycling lanes, better pedestrian paths and the construction of foot bridges to reduce pedestrian deaths. Respondents also recommended the implementation of no-car sessions where individuals are encouraged to leave their cars at home and use NMT means such as walking, cycling etc. Some sampled responses in this category included: *“Construction of more foot bridges to reduce road accidents and time wasted when allowing people to cross”, “Make more cyclists and pedestrians lanes”* and *“Once in a while no car on the road to encourage people to either cycle, walk or use train services where such services are available.”*

Lastly, the final category of recommendations touched on the implementation of existing policies as well as the digitisation of the transport sector processes, including fare collection. Respondents noted that there are already existing policies that are not well implemented: *“Transport rules to be followed to the letter and Ministry to be more involved in regulating the sector”* and *“Strict adherence to those already laid down.”* Quite notable was the regulation of the motorcycle transport sector, with respondents noting that this was a much unregulated area of transportation: *“Regulating boda boda which have become a mess in Nairobi.”* And *“Regulation of motorbikes and non-motorized vehicles.”* In addition, the respondents noted that there should be a digitisation on the payment systems in public transportation and better use of technology as opposed to police who oftentimes take bribes: *“Less police on the road too much bribes”, “The government needs to exploit the digital resources currently available thus reducing corruption and unnecessary squabbles on the roads”* and *“Traffic lights with cameras and follow up on traffic rules consistently and disciplinary action followed. Example traffic rules in the US. Broken taillights, infractions, u-turns and other rules.”*

The recommendations revealed the importance of public opinions in reviewing or designing policy: *“Engage the public and talk to property developers to really take advantage of transit-oriented development. Also borrow a leaf from properly planned cities such as London, New*

York, Singapore and develop a long-term integrated transport strategy.” Most respondents, as reflected in their recommendations preferred the use of public transportation and would therefore like an improvement in the policies governing the sector.

CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The purpose of this chapter is to show how the findings of this study add to the body of knowledge around the topic of transport choice behaviour. This chapter puts together the findings of the study while drawing comparisons from previous similar studies to find areas of agreement and areas in which the research differs with those carried out by other researchers. The chapter also includes conclusions and recommendations as well as limitations that the researcher incurred, and areas proposed for further research in the field.

5.2 Discussions

The main objective of this study was to identify the factors influencing choice of urban transport alternatives by transport users in Nairobi County and determine the extent of their influence on the choices made in a bid to inform policy that addresses the preferences of citizens.

The specific objectives were to: identify the demographic characteristics of users of various modes of transport among residents of Buru Buru estate; establish the effects of demographic characteristics of transport users on the choice of transport modes among the residents of Buru Buru estate; examine the effect of income on the choice of transport modes among the residents of Buru Buru estate; determine the effect of transportation mode attribute factors on the choice of transportation modes among residents of Buru Buru estate; and to find out the opinions of Buru Buru estate transport users on transportation policies by the Government of Kenya.

5.2.1 Effects of Demographic characteristics of transport users on transport choice

The study explored various demographic characteristics; the age, gender, the number of years lived in Nairobi County, education level, disability and possession of the driving license.

In terms of age as a factor in choice of transport, the population of the respondents largely fell in the youth bracket of 18-34 years and this group was the largest user of e-hailing services attributed to the lack of access to finances for car ownership and maintenance. Also attributable to the use of e-hailing services is the cost and risk factor in using motorcycle e-hailing services. The motorcycle

e-hailing services are significantly cheaper than motor vehicle e-hailing services and considered higher risk, with NHTSA (2020) reporting an increase in million passenger deaths. Those in the older age bracket of 45-54 years of age were the largest users of private cars as the choice of transport, which is attributed to the access to finances for the purchase and maintenance of vehicles. E-hailing modes in this category included the cheaper options such as e-hailing motorcycles, not only Uber and Taxify which are more expensive.

Women aged 45-54 years had the highest probability of private transport usage, this can be attributed to concerns of safety and avoidance of the use of public service vehicles during peak hours as a safety concern. Women in general were also more likely to take e-hailing services than men overall, e-hailing services such as Uber and Taxify are generally more comfortable and considered safer alternatives to public transportation. Scholars note that women, more than men, are concerned about safety and therefore have different travel patterns with most men traveling during peak hours. (Vasconcellos 2001; Levy 2013). However, in general more women were seen to use public transport and this could be due to the fact that in homes with one car, the car is oftentimes used by the man (Levy 2013).

Residents of Bubu Buru who had lived in Nairobi for over 20 years as well as those who had lived in the city for over 16 years, had a higher likelihood to use private cars, as compared to individuals who had lived there for a shorter period. This could be attributed to age and income levels based on years worked and access to finances to purchase and maintain a vehicle. This could also be attributed to the opportunity to have, over the years, sampled various modes of transport and selected the most convenient for them.

Most of the respondents owned licenses, and this could be due to the youthful demographic of Bubu Buru. It is quite common for the youth to enrol in driving school right after high school. The findings indicated a significant effect of demographic characteristics on choice of transport with the exception of license ownership which was not significant, similar to the study by Huang et al (2016).

Respondents with graduate level of education were most likely to use e-hailing services, which can be attributed to access of information and perhaps interest in contributing towards traffic congestion and environmental impact as compared to their counterparts with primary level education who may see car ownership as a status symbol. Literature shows that there is an increase

in car ownership in developing countries due to the growing middle class (Gwilliam 2003; Bouton et al 2015)

The findings showed that formally employed and self-employed respondents were more likely to use their own private vehicles. This can be due to the fact that employed persons and self-employed persons are more likely to have a regular income that can afford them the expenses of car ownership including maintenance, insurance and fuel. Whereas consultants and students who were the most likely to use e-hailing services are less likely to have the income to sustain private vehicle ownership. Also, the former groups are more likely to have consistent working hours with less flexibility than the latter groups, hence opting for convenience that private car ownership provides.

Literature reviewed in the study highlighted the importance of analysing data on the characteristics of the transport user in establishing the preferences (McFadden 1974; Huang 2016; Muro-Rodríguez et al 2017). Rajé et al (2018) recommended a study with more in-depth analysis on demographics of individuals from various backgrounds following her study on Nairobi's traffic pollution.

5.2.2 Effects of income on choice of transport modes

The study found that income is a significant variable in terms of choice selection of some transportation modes. Private transport was a preferred choice among respondents in the highest two income brackets. Vehicle ownership is seen as more convenient but expensive when compared to other modes of transport, and directly corresponds with income levels. (Moses and Williamson 1963; Gwilliam 2003; Kanyama et al 2004). Reviewed literature reveals that income has a significant effect on travel choices, with scholars noting that the growth of the middle class has a direct effect on the increased purchase and use of personal vehicles, especially in developing countries (Gwilliam 2003; Bouton et al 2015).

The transport variable was regressed on three groups of transport, public, private and e-hailing. Public included buses and matatus, private included personal vehicles and e-hailing services included both motorcycle and car services. Respondents in the income bracket of Kshs. 15,001-30,000 had the highest probability of e-hailing services selection followed by the respondents in the Kshs. 50,001-75,000. This could be attributed to the fact that e-hailing motorcycle services are significantly cheaper than e-hailing car services on average. With regards to public transportation, the study found that the income band of the resident was non-significant in

influencing their choice. This could be attributed to the fact that public transportation, in this case matatus and buses were the most commonly available and affordable form of transportation available to the general public. The findings were consistent with the assertions presented by other researchers on the significance of income on the mode of transportation (Kanyama et al 2004; Levy 2013).

5.2.3 Effects of transport mode attributes on the choice of transportation modes

The study found that travel time and affordability were the two major attributes considered when selecting transportation modes in general. Specific to public transportation, the two attributes remained the most important attribute factors, whereas convenience and safety were the primary attributes in the choice of private transportation. The findings were consistent with literature reviewed and was that travel time and financial cost were the most common attributes considered (Asensio 2002; Kanyama et al 2004; Mitullah and Opiyo 2012).

The study sought to investigate the effects of transport attributes of various modes on the choice selection by respondents. Various researchers and scholars ascertain the importance of the mode attributes in understanding transport behaviour (Litman 2001; Román et al 2014; Huang et al 2016; Muro- Rodríguez et al 2017). This particular study assessed four transport mode attributes, which were accessibility, affordability, safety and travel time.

5.2.4 Opinions on transport policies

The study findings revealed that 50% of the respondents were of the opinion that the government policies did not allow them to frequently and easily use their preferred modes of transportation. Of the respondents who selected NO and somewhat, a consistent opinion was that policies were in existence but the challenge was the implementation of these policies. Respondents also expressed concerns that the government does not regard or consider the public's interest in transport. And the sector had been abandoned to cartels. Most respondents did not mention policies in place with the exception of the SACCOs implementation as well as the ban on motorcycles in the Nairobi Central Business District.

The study was interested in finding out the opinions of respondents with regards to the existing policies on transport. Literature reviewed in the study highlights the importance of policies in addressing the transport needs of citizens such as with motorcycles (Pierterse & Parnell 2016) as well as Lee and Hines (2008) in their assertion that public interests must be considered in transport policy formulation. Policy implementation in terms of infrastructure to enable the transport users to enjoy their preferred modes of NMT transport, such as walkways is also oftentimes lacking (Mitullah et al. 2017; Odhiambo 2019; Rajé, et al 2018).

5.3 Conclusions

The researcher addressed the four research objectives that had been identified. Based on both the literature, data collected and the analysis of the data, the researcher can conclude that understanding of the demographic characteristics is an important aspect in transport behavioural analysis and demographic characteristics do indeed have an effect on the choice selection of transport. Furthermore, the research concludes that income is a significant determinant of choice alternative selection, though proves to be insignificant in terms of selecting the most available mode of transportation, which is the use of matatus and buses. An interesting aspect of the findings was that there population of persons who walk to and from work on a daily basis was not as significant as anticipated at the beginning of the study, as well as the literature reviewed on the prevalence of walking as a mode of transport in developing countries (Mitullah and Opiyo 2012; UN-Habitat 2013; NCC 2014). This could be attributed to the demographic surveyed, which was mostly in the middle-income bracket, with access to other alternatives. The findings were however consistent with the assertion that matatus were among the most used modes of transport in Kenya (Dixon et al 2018; Campbell et al 2019). With regards to the objective on transport attributes, the findings reveal that the attributes of each mode are significant in selection of transportation mode, with the majority concern being time factor and affordability. In terms of policy opinions, the researcher did not list the existing transport policies for the respondents to select which they were familiar with, as a result, some respondents may not have been clear in their responses as they may have been unaware of the existing policies. However, concerns on the current situation of their preferred modes of transport were noted and clearly highlighted in their responses.

5.4 Recommendations

The researcher, based on the literature and subsequent responses from the study has a number of recommendations. The first recommendation from the study is that there is a need to carry out detailed and thorough studies into the transport sector, with regards to the demand side against the supply side in order to better serve the transport users. The second recommendation is the increase of transport alternatives such as the BRT, light rail and an improvement of train services in Nairobi County. A third recommendation is the improvement of the existing public transport services available in the city. Public transport is the most common mode of used transport, respondents recommended a nationalisation of transport services so that they are provided solely by the government making it more consistent and affordable, through fare controls and use of technology for digitised payments and monitoring. The fourth recommendation is to have inclusive transport that caters for the disabled users and other vulnerable groups. A fifth recommendation is the improvement of NMT such as provision of walking and cycling lanes, foot bridges for pedestrian crossing and incentivising car free days and use of NMT in the city.

5.5 Limitations

The study suffered a number of challenges including the data collection which was initially designed to be completely online. The challenge was realised when the respondents were all of the younger and more tech-savvy demographic. This challenge was mitigated through the use of physical questionnaires that were distributed and self-administered in various neighbourhoods of the Buru Buru estate. These were then manually uploaded onto the data analysis software tool.

A second limitation was in the design of the questionnaire, with regards to the opinion on policy, the researcher did not list the existing policies to request the respondents to identify those that they were familiar with. This challenge limited the study's ability to understand the competency of the population on existing policies. However, the researcher factored in the narratives given by the respondents on their policy recommendations.

5.6 Areas for further research

The study focused on one small section of Nairobi County and recommends that further research expands the study to the general Nairobi Metropolitan Area. With its diverse populations. There is a dire need to collect data on the detailed demographic characteristics of the population, the existing modes of transportation as well as their respective attributes. An important aspect of this research would also encompass the new modes of transportation being proposed such as the BRT as well as the emergent modes growing in popularity, such as SWVL and Little Shuttle. This data is important for the planning of the city as it continues to rapidly grow and expand.

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NAIROBI CITY COUNTY ASSEMBLY VOTES AND PROCEEDINGS TUESDAY, JUNE
25, 2019*
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APPENDIX I: ETHICAL APPROVAL LETTER



25th April 2019

Ms. Karuki, Wambui
sulmetpr@gmail.com
P.O. Box 60531, 00200
Nairobi.

Dear Ms. Karuki,

REF Protocol ID: SU-IERC0367/19

**DETERMINING THE DESIRABLE URBAN TRANSPORT ALTERNATIVES IN
NAIROBI COUNTY- A CONSUMER PERSPECTIVE ON URBAN TRANSPORT**

We acknowledge receipt of your application documents to the Strathmore University
Institutional Ethics Review Committee (SU-IERC) which includes:

1. Study Protocol submitted 23rd March 2019
2. Cover letter listing all submitted documents 23rd March 2019
3. Proposal declaration Page signed by supervisors 23rd March 2019

The committee has reviewed your application, and your study "*Determining the Desirable Urban Alternatives in Nairobi County- a Consumer perspective on Urban Transport*" has been granted approval.

This approval is valid for one year beginning **25th April 2019** until **25th April 2020**

In case the study extends beyond one year, you are required to seek an extension of the Ethics approval prior to its expiry. You are required to submit any proposed changes to this proposal to SU-IERC for review and approval prior to implementation of any change.

SU-IERC should be notified when your study is complete.

Thank you

Sincerely,

Prof. Florence Oloo
Secretary

Strathmore University Institutional Ethics Review Committee



APPENDIX II: NACOSTI RESEARCH PERMIT



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: 254-20-2213471,
2541349,3310371,3214120
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When replying please quote

NACOSTI, Upper Kabete
Off Waigwa Way
P. O. Box 50033-00100
NAIROBI-KENYA

Ref No **NACOSTI/P/19/48245/30374**

Date: **27th May, 2019**

Wambui Kariuki
Strathmore University
P.O. Box 59857-00200
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Determining the desirable urban transport alternatives in Nairobi County- A consumer perspective on urban transport”* I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **23rd May, 2020**.

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a copy of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

**DR/ STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

APPENDIX III: INTRODUCTION LETTER



Strathmore Business School

Friday, 10th May 2019

To whom it may concern

RE: FACILITATION OF RESEARCH - WAMBUI KARIUKI

This is to introduce Wambui Kariuki, who is an MPPM student at Strathmore University Business School, Admission Number – MPPM/96442/16. As part of our Masters program, Wambui is expected to do applied research and to undertake a project. This is in partial fulfillment of the requirements of the Master of Public Policy and Management. The outcome would be of immediate benefit to the organizations she is researching on. To this effect, she would like to request for appropriate data from your organization.

Wambui is undertaking a research paper on ‘**Factors Influencing Choice of Urban Transport Alternatives by Transport users in Nairobi County**’. The information obtained from your organization shall be treated confidentially and shall be used for academic purposes only.

Our MPPM seeks to establish links with industry, and one of these ways is by directing our research areas that would be of direct usefulness 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, if not of practical value to your organization.

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

Regards

Caroline Tiura
For Caroline Tiura
Manager – Masters’ Programs
Strathmore University Business School



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APPENDIX IV: RESEARCH QUESTIONNAIRE

Dear respondent, I invite you to participate in my research study on urban transport in Nairobi. Please read the information below carefully and ask any questions you may have before participating in the study.

The study is being conducted by Wambui Kariuki, a student of Strathmore University Business School, pursuing a Master's degree in Public Policy and Management. The faculty supervisor for this project is Dr. Thomas Kibua.

The survey will take about 10 minutes to complete, and your participation in this study is voluntary. You can choose not to participate or answer any question at any time. All responses are anonymous and you do not need to reveal your name. All records pertaining to this study will be securely stored.

If you have any questions about this study or your rights as a participant at any time, please contact me, Wambui Kariuki, at wkariuki@strathmore.edu.

Part 1: Demographics/ Social Attributes

1. What is your age?

- Under 17
- 18-25
- 26-33
- 34-41
- 41-48
- 49-56
- 57- 64
- 65 and over

2. Are you male or female?

- Male
- Female

3. What is the highest level of education you have achieved?

- Did not complete KCPE/primary school
- KCPE
- Did not complete KCSE/high school
- KCSE
- Certificate
- Diploma
- Higher Diploma
- Degree
- Master's Degree
- PhD

4. Do you have any physical or learning disability?

- Yes
- No

If yes, please indicate the nature of your disability: _____

5. What is your occupation?

- Upper Management
- Middle management
- Junior management
- Administrative staff
- Support staff
- Student
- Trained professional
- Skilled labourer
- Consultant
- Temporary employee
- Researcher
- Self – employed/Partner
- Retired
- Other: _____

Do you own a driving license?

- Yes
- No

6. Are you currently employed?

- Yes
- No

If yes, kindly select your appropriate monthly income band:

- Below Kshs. 15,000
- Kshs. 15,001- Kshs. 30,000
- Kshs. 30,001- Kshs. 45,000
- Kshs. 45,001- Kshs. 60,000
- Kshs. 60,001- Kshs. 75,000
- Kshs. 75,001- Kshs. 90,000
- Kshs. 90,001- Kshs. 105,000
- Kshs. 105,001- Kshs. 120,000
- Above Kshs. 120,000

7. For how many years have you lived in Nairobi?

- Below 1 year
- 1year - 5 years
- 6years- 10 years
- 11years - 15 years
- 16 years – 20 years
- Above 21 years

Part 2: Transport Preferences

1. What mode of transport do you presently use frequently? Tick the mode that you mostly use.

- E-hailing car services (Uber, Taxify, Mondo, Little cab, etc.)
- Regular taxi services
- e-hailing motorcycle services (Safeboda, Taxify, Uber etc)
- Regular boda bodas
- Personal car
- Car pooling
- Matatus/bus

- Walking
- Cycling
- Personal motorcycle
- Train
- Other: _____

2. From the alternatives listed above, indicate the frequency of use for each mode of transportation by ticking the appropriate box. (daily, more than once a week, once a week, monthly, yearly, never)

	Daily	More than once a week	Weekly	Monthly	Yearly	Never
E-hailing car services (Uber, Taxify, Mondo, Little cab, etc.)						
Regular taxi services						
e-hailing motorcycle services (Safeboda, Taxify, Uber etc)						
Regular boda bodas						
Personal car						
Car pooling						
Matatu/Bus						
Walking						
Cycling						
Personal Motor cycle						
Train						

Other: _____

- Daily
- More than once a week
- Once a week
- Monthly
- Yearly
- Never

3. Of the above listed modes, what is your one personal preference?

4. What factors determine your choice of mode of transport? Rate your preference on a scale of 1-4, with 1 being the most preferred and 4 being the least

- Accessibility
- Time factor
- Financial cost
- Safety

5. Are there any other factors that you consider while selecting your preferred mode of transport not listed above? List all that apply

6. What are the challenges you experience with your preferred mode of transportation?

7. What alternatives would you prefer that are not available in Nairobi County?

8. Do you feel that the government has policies that allow you to frequently and easily use your most preferred mode of urban transport?

- Yes
- No

a. Kindly explain your answer above

9. What other transport policies would you recommend to be implemented by the government?

Thank you for your time!