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ASSESSMENT OF COMMUTER PREFERENCES OF 14-SEATER PUBLIC SERVICE VEHICLES VERSUS ALTERNATIVE MODES OF PUBLIC SERVICE TRANSPORT IN NAIROBI CITY

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ABSTRACT

In the year 2010, the Kenya government announced that 14-seater vans, commonly referred to as "*matatus"*, were to be phased out so as to reduce traffic congestion on the roads and also to ensure efficient commuter movement. Travelers on Kenyan roads have not experienced public transport system without 14-seater PSVs. Little is known about the perception of commuters concerning the relative efficiency of 14-seater vehicles in the city of Nairobi over the alternative PSV modes. It is therefore needful to establish whether or not the phasing out of 14-seater PSVs would lead to the realization of the intended objective of decongesting motorized traffic in the city's roads. The population was low-cadre employees at the headquarters of government ministries in Nairobi and random sampling method was used to select the ministries. Departments in the ministries were also identified through random sampling. Desired data was collected through the administration of a questionnaire. The data was analyzed using χ^2-test, linear regression model with respect to time and fare charged and analysis of variance. The study established that: travel time from house to workplace; the existence of alternative routes, and; fare charged, influenced choice of 14-seater PSV over the other alternative PSV modes. It is recommended that a comparative policy analysis should be undertaken to come up with a hybrid PSV policy that can serve the Kenyan commuter. Also, the government should not phase out 14-seater PSVs by force but increase taxes and levies on 14-seater PSVs which would by extension make fare high and hence make commuters shy away from the 14-seater PSVs.

[1] This refers to the mode of public passenger travel that is liked by a high number of commuters.
[2] Employees of the Government of Kenya earning salaries that are less than thirty thousand shillings per month.
[3] Refers to a means of public passenger transport vehicle which ferries passengers who randomly board it at the bus stops on the route it operates. The passengers disembark at their various destinations after paying a fee to the conductor. Such vehicles are of different passenger capacities ranging from 7 – 26-seater PSV.
[4] This refers to the capacity of vehicle used by commuters. They are in six categories namely; one passenger motorized two-wheelers, 2-3 motorized three-wheelers, 4-7-seater taxis, 8-14 seaters,14-seater, 15-32-seaters and 33-seater and above.
[5] This refers to public passenger vehicles which are licensed to carry pay-to-board passengers on Kenya's roads. They carry a minimum of one passenger.

1. INTRODUCTION

Nairobi is the capital of Kenya and the city's central business district has many modern buildings. It serves as the commercial hub as well as the country's administrative headquarters (World Book, Inc., 2001). The transport sector is served by road, rail and air. Many of Nairobi's people live in large, low-cost apartment complexes called estates. Other residents occupy single-family homes (Ibid). Motorized public service transport in Kenya dates back to the day when the first motor vehicle was used to ferry passengers for a fee from one point to another. At first, the business of transporting people commercially was a preserve of buses owned either by individuals or by passenger transport companies. *Matatu* is "a crowded taxi" (World Book, Inc., 2001).

Use of "crowded taxis" in Kenya started in the 1950s (Graeff, 2009). Those who used the "crowded taxis" at that time say that the owners of station wagon type of the Ford model cars individually started ferrying passengers from Nairobi's City centre to Lungalunga residential estate also in Nairobi at a fee of three ten cents coins. Due to the thirty cents fare charged, Kikuyu speaking people coined the phrase *"mang otore matatu"* meaning "thirty cents", was used in reference to the vehicles offering public passenger service to an extent that land public passenger transport vehicles were named *matatus* (Chitere and Kibua, 2004). From then on, other models of vehicles joined the business with Nissan becoming the ultimate choice for the job. In some cases the Toyota models were in use but the general populace kept and still keeps referring to them as Nissan *matatu* (Matatu Welfare Associatioin, 2010). A majority of Kenyans use public passenger service vehicles to commute to and from their respective workplaces and for intra-city or inter-town travel. An ever increasing population used the service so much so that there was an increase in the number of the 14-seater PSVs. Indeed Matatu Welfare Associatioin (2010) provides an estimate of over 80,000 PSV vehicles in Kenya and 85% of these are 14-seater PSVs operating in the urban and rural areas. The Matatu Welfare Association further estimates that there are 15,000 matatus on about 50 routes in Nairobi, and about 80 per cent of them – 12,000 – are the 14-seaters (Kenya Confidential, 2010).

14-seater PSVs operated illegally in Kenya until 1973 when then President Jomo Kenyatta issued a decree officially recognizing matatus as a legal mode of public transport. The decree allowed matatus to operate without obtaining any form of licensing (Mutongi, 2006). The public passenger transport service grew by leaps to such an extent that regulations governing operations in the industry were not followed and even seemed non-existent. The industry was so chaotic that when the National Rainbow Coalition government took the reigns of power from Kenya African National Union in January 2003 it appointed J. N. Michuki the Minister in charge of the Transport docket. The Minister brought to prominence the rules that ought to have governed the sector but had not been enforced by the previous holders of the office. Legal Notice 161, which is commonly referred to as the Michuki Rules, after then transport Minister Michuki, was adopted in 2004 (Graeff, 2009). He went further to introduce others which were meant to ensure that the sector operated in tandem with the current needs of passengers.

They included the requirements that all PSVs must be fitted with a first aid kit, a speed governor and safety belts for each passenger, drivers and their assistants wore uniforms that clearly distinguished their roles and each PSV had to have a yellow line drawn on its sides. Since then, subsequent Ministers of Transport through Legal notice; 165 of 2005, 118 of 2007 and 173 of 2009 have tried to introduce changes that could significantly alter the management practices in the sector (www.kenyalaw.org, 2011). Some of the floated proposals for inclusion in the industry's activities included: the need for each PSV to have a waste bin, the requirement that individual PSV owners should register with SACCOs, or join a company, and; that 14-seater PSVs were to be phased out while retaining those with higher passenger capacity to continue with the business (Ibid). The implementation of the later policy proposal was scheduled to kick off in Nairobi in January, 2011 (www.matatu.co.ke., 2010). The policy was to be rolled out to other parts of the country at a later date. The reasons given by 14-seater PSV operators for rejecting the proposed policy change are diametrically opposite to the scenario envisaged by the policy makers at the Ministry of Transport. The Ministry's idea of policy change to the proposed phasing out of 14-seater PSVs was driven by the need to decongest vehicular traffic in the city of Nairobi hence reduced motor vehicle accidents (G.o.K, 2010). It was also in the opinion of the policy makers in government that the use of vehicles with higher passenger capacity in transporting people would greatly increase the rate at which commuters would move in and out of the city.

The rationale behind the plan to phase out the 14-seater PSVs as offered by the Ministry of Transport technocrats was that the targeted PSVs contributed to the problem of chronic traffic jam experienced by motorists in Nairobi. They also argued that the PSVs with higher capacities would move a higher number of commuters at a time compared to the 14-seaters hence an improved efficiency in both vehicular and passenger traffic. Furthermore, road safety would improve while the cost of transportation is expected to reduce (G.o.K, 2010). The arguments floated by the government and implementers in the parent Ministry on the phasing out of the 14-seater PSVs were propositions that were made without the backing of empirically tested data that capture the perceptions of commuters. Graeff (2009) stated that it was and still is problematic that there is no consistent data available regarding PSVs. Indeed, it is this state of affairs, particularly, the missing views of consumers of the service that need to be investigated.

The overriding concern of every stakeholder in the transport industry is the need to have an efficient public transport system. Indeed, such a system should move a high number of commuters, decongest traffic, take less time for a commuter to travel from departure point to destination and enable people to travel at an affordable price. Commuters' perception of a mode of transport dictates their demand for it and thus their preference. In the event that 14-seater PSVs are phased out, commuters may have a preference for other modes of transport other than the bus as suggested by policy makers in government. These other modes include motorized two-wheelers, three-wheelers (tuk-tuk), four-seater taxi just to name a few of the options available. This was likely to make the management of vehicular and human traffic more complex hence new problems in the industry.

It was not known whether the perception of commuters about the efficiency of 14-seater vehicles in the city of Nairobi is higher than for the alternative PSV modes and hence the possibility of the policy not being effective in increasing efficiency in the PSV transport industry. What was the likelihood that passengers perceived 14-seater PSVs as a better mode of transport due to its capacity and consequently time taken or convenience when travelling? Similarly, in the absence of 14-seater PSVs, what was the likelihood that passengers would opt for vehicles whose capacity is less than 14? Phasing out 14-seater PSVs might therefore not solve the problem of traffic congestion. This study sought to investigate whether the implementation of the policy would lead to improved efficiency of vehicular and passenger traffic. The general objective of the study was to establish factors that determine the commuter preference of 14-seater PSVs over the other alternative PSV modes in Nairobi city in terms of travel time, fare charged, distance walked, number of alternative routes and time taken to have the vehicle fully boarded at the initial boarding point. The significance of this study is due to the fact that, experimentation of new ideas in the actual management of public affairs can be a sure recipe for disorder in the society. Studies have been done on urban traffic management but were not adequately addressing the commuters' preferences. There was a likelihood that in the absence of 14-seater PSVs commuters may prefer using two-wheelers or tricycles thereby causing more traffic congestion. This study was intended to scientifically establish whether the presence of the 14-seater PSVs on Nairobi city roads has an influence on commuter traffic. The findings of the study would provide insights on the efficiency or lack thereof in the management of vehicular and human traffic in the city. The data that was used in the study was collected from low-cadre government employees who commute using PSVs and work at the headquarters of ministries in the city of Nairobi between May and June, 2012. At the time of data collection, the government had stopped licensing new 14-seater PSVs. The effect of the action might have affected the results. To address the limitation above, the collection of data was conducted before 14-seater PSVs were completely phased out from Nairobi CBD.

2. LITERATURE REVIEW

Public Passenger Transport in Global North and Global South

Őrn (2005) stated that the institutional structure of urban public transport systems in the Global North and Global South typically differ along two axes:-market structure and system organization. This line of argument was picked up by other scholars. Alexander et al (2007) in their paper titled Rethinking Privatization: The Case of Urban Transportation in Nairobi, Kenya, stated that systems in the Global North were characterized by monopolistic operations, publicly regulated fare structures and clearly delineated, fixed and coordinated route systems regardless of whether they were based on bus service, light rail or metro service. In the Global South on the other hand, there tend to be a wide range of variations on systems that border between para-transit and semi-fixed route operation. These include minibuses, three-wheeled vehicles, and motorized and non-motorized rickshaws.

They further argue that the market structure is typically characterized by low barriers to market entry when no effective legal or extra-legal impediments are set in place for potential service suppliers and hence results in a highly competitive system in which individual owner-drivers compete with one another along a mix of uncoordinated and informally designated routes. Although owner-drivers were the norm, small fleets of vehicles in which a single owner supplied vehicles to several drivers in something akin to fleet operation was also common. According to Belwal and Belwal (2010) many countries in the Middle East have turned their attention towards developing and improving their public transport systems, as problems such as traffic congestions in cities, low mobility, high individual costs of transport, and a rural-urban divide in services have arisen. The objectives of the study were; to assess the needs and perceptions of people towards the establishment of an effective public transportation system in Oman and to study resident characteristics such as usage behavior, experience, sharing habits, and other behavioral aspects about public transportation in Oman. Their study titled Public Transportation Services in Oman: A Study of Public Perceptions found that public transport services in Oman are minimal and do not match demand, and there is an excessive reliance on private cars which are costly to maintain. They observed that public transport services have not met its purpose despite its existence for a significant period in Oman. People prefer to travel by their own cars and are sufficiently convinced of the merit of this mode of travel even if the price of oil doubles in Oman. They continued to argue that in order to offer any solution; the needs and expectations of the people have foremost to be taken into account (Ibid).

In Ikorodu, Lagos, Nigeria, Agunloye (2011) did an analysis of the travels of public transport passengers (road). His variables were: time spent per daily trip, trip distance of respondents; purpose of the respondents' trip; waiting time of passengers; travel times per week; unexpected breakdown of vehicles; fuelling difficulties in a month; occurrence of minor accidents in a month; long journey time and frequent stops. He concluded in his study that there was need for a special planning by the transport planners for the travel distance and passengers' waiting time, as they were revealed to be the major contributors to passengers' travel demands. The paper gave a policy suggestion that additional cabs were required in order to eliminate passengers' unnecessary wait time in the study area. He further stated that there was need for government policy statement on public transportation that addresses passengers' travel demands that encompass passengers' travel-friendly rules for an efficient system. Friman and Fellesson (2009) in their study titled Service Supply and Customer Satisfaction in Public Transportation: The Quality Paradox opined that understanding—rather than taking for granted—the links between satisfaction and an objective service supply is a key management challenge that requires a genuine understanding of how the transport system functions, from the point of view of both the customer and production. Such a dual understanding will provide an indispensible foundation for developing the public transport systems of tomorrow. Once the subjective and partly independent nature of the satisfaction measures is acknowledged, their potential value to managers and policymakers can be realized. They further noted that satisfaction is pivotal for understanding public transport from the customer's perspective.

A high level of satisfaction does not necessarily indicate an objectively "better" system and vice versa. The study sought to analyze the relationship between the objective performance measures of public transport services and the satisfaction perceived by travelers. Sclar (2008), in the work he did in Nairobi titled Engaging Complexity: A Prologue to Creating Effective Urban Transport and Land Use Planning for Metropolitan Nairobi argued that planning means the conscious attempt, by state actors, to rationally control the size, shape and growth rate of city-regions via the exercise of state power over infrastructure placement, public transport service supply and land use control. This formulation of the role of the state in the planning process was derived directly from the planning experience that evolved over the course of the 19th and 20th centuries in the industrializing cities of the HICs of Europe and North America. Basing his research on land use and transportation situation, Sclar (2008) further argued that attempts to transplant this planning methodology with its implicit assumptions about the role and competency of the state (often proved wrong even in the HICs themselves) to the rapidly urbanizing city-regions of former colonies in sub-Saharan Africa and South East Asia in the early 21st century were proving to be illusive and frustrating. Going by the afore-stated, it is imperative to devise approaches to urban transport planning rooted in the experience of the LMICs as they are, and not of the HICs as they were or hope to be.

It was however noted that there were other authors whose views on public passenger transport were divergent from those mentioned above. One such author is Vuchic (1999) who in his paper Urban Public Transportation Systems argued that in developing countries, transit had an even more important role than in industrialized countries because its economic efficiency was vital for large volumes of non-car owners, while its capacity was needed to serve the high-density, rapidly growing cities. The subject of discussion was the same but the discussants differed considerably on the way forward concerning the appropriate system of public passenger transport in LMICs. Kenya is classified under the LMICs. It is necessary to mention here that in the United States of America, it has been noted that longer and heavier trucks tend to disrupt traffic flow on roadways more than conventional vehicles. However, more trucks of any size or weight would also disrupt traffic. Disruption occurs in the through traffic lanes, at roadway intersections (FHWA-Office of Policy, 1999). It is worth noting that some countries have tried to develop their own solutions to the public transport problems that they experience. A case in point is Malaysia. In a presentation titled GTP Roadmap: Improving Urban Public Transport (2009), Dato Sri Ong Tee Keat, Minister of Transport in the government of Malaysia says "Our historical approach to urban transport has been to try to build our way out of congestion, relying on more roads and more cars as a solution to increasing demand for travel. Mature cities cannot escape the problem of congestion by simply building more roads. We need to shift from emphasizing the efficient and cost-effective movement of vehicles to the movement of people." The suggestion put forward by the policy makers in Malaysia makes sense except that it is short on giving direction on specific course(s) of action that needs to be taken in order to attain desired level of efficiency and effectiveness in the management of passenger and vehicular movement.

Public passenger transport in Kenya is currently of the mixed traffic type. It is noted in the reviewed literature that the opinion held by FHWA-Office of Policy, 1999 concurred with what Vuchic (1999) stated concerning mixed traffic. In mixed traffic, the speed and reliability of bus service depend on traffic conditions. Their average speed is lower than average speed of cars because they stop to pick up and drop off passengers. Buses are therefore not very competitive with car travel in the same corridor with respect to speed and reliability (Vuchic, 1999).

Theoretical Studies

In their paper titled User satisfaction with paratransit in competition with motorization in Indonesia: anticipation of future implications where they sought to establish important factors and attributes explaining user perceptions and priorities regarding the service, Joewono and Kubota (2007) stated 12-14-seater PSVs is an efficient road user in Bandung, Indonesia, contributing only 18% of traffic flow while being able to transport more than 50% of passenger trips. However, they create congestion, as the units stop for access and egress anywhere, wait for passengers, and make circular movements in dense areas. Performance is one important aspect influencing the future of public transport modes. In that connection, useful analysis needs to be done so as to determine whether urban transit operators are working in technically efficient ways (Ibid). In addition to concerns for the profitability and sustainability of transport services, national authorities should also consider such outcomes as mobility, accessibility, and environmental impact, as well as how the urban population perceives the outcomes of public policies and measures (Ibid). Information gathered from the public is important in evaluating public transport, as the exclusion of customers from improvement efforts to date has created difficulties (Ibid). The measurement of public perceptions of urban transport performance and policy can reveal problems and priorities the public perceives broadly, and is necessary for assessing the quality of policies and what urban populations actually perceive the problems, priorities, and issues to be (Ibid).

Travel time is a major factor in a traveler's decision on which mode of transportation to take. Components of travel time consist of more than average speed of travel. For road travel, frequency of departure, wait times, security, travel to the station and potential for delay also are included in total travel time (Oster et al, 2011). A salient feature in the transportation sector is that passenger transportation becomes more and more focused on road transportation as opposed to air, sea or rail (Panayotis et al, 2003). Fitzpatrick Associates (2004) did a study in Ireland titled Transportation and the Effects on the Consumer: Consumer Efficiency and Effectiveness**.** The areas of interest in the study were**:** choice of service; frequency of service; pricing; information, advice and support; safeguard and redress; and other relevant consumer issues. It was noted that when considering passenger transport (infrastructure and services) from a consumer perspective, it is important to recognize that it has a distinct nature and context that makes it different from most other infrastructure or services used by the consumer in Ireland. There are a number of important points to note in this respect. First, transport as an "Enabler":

Passenger transport is not only a service that the consumer buys or uses, but also an enabler that allows the consumer to access other goods and services. For example, most consumers who wish to buy goods at major retail centres need transport, whether by private car or by some other form, in order to get them to where they want to shop. Not only does transport give access to goods and services, however, but it also allows people to do many other things that are essential to day-to-day life – getting to/from work, getting to/from hospitals or medical facilities, attending recreational and leisure events and activities etc. Transport is therefore something that affects virtually everybody in society and which has an important bearing on every person's quality of life. Secondly, Transport Serves Different Needs: Transport is probably unusual compared to most consumer goods and services in that there are many different types of transport service with many different types of uses. Levels of usage for passenger transport, for example, vary depending on the mode involved and the purpose for which the consumer uses each. Thirdly, Transport Coverage Varies: The scope of transport infrastructure and services in Ireland varies, but especially depending on the type of transport involved. For example, Ireland's relatively low population density and its spatially dispersed population (in both urban and rural areas) has major implications for public transport service provision in Ireland – this means, for example, that not all parts of the country can support high frequency bus and rail services and that the private car is the dominant form of transport in most areas. It also means that there are actual and potential bus and rail connections that may be noncommercial but socially desirable (Fitzpatrick Associates, 2004).

The State both as a regulator and a provider of infrastructure and services significantly influences the nature of the passenger transport sector (Ibid). While there is no comprehensive data available on patronage for either private bus services or taxi/hackney services in Ireland, increases in fleet size would suggest that their use has expanded. The number of small public service vehicles in operation (including taxis and hackneys) has grown by 52% between 1999 and 2003, while the number of large public service vehicles in operation has grown by 13% in the same period (Ibid). In consumer-oriented criteria, the overall rating of different types of transport/service is viewed according to, in order of priority, choice of provider; choice of routes; service frequency; price competition; pricing options; availability of information and advice; access to safeguards and redress (Fitzpatrick Associates, 2004).

The Theory of Consumer Choice and Consumer Choice Model

Evidence on mode choice for the journey to and from work among a cross-section of workers in the formal sector of Accra (Ghana) suggests that travel-to-work behaviour of employees in the sector is influenced mainly by perceived service quality of the commercial commuter vehicles as well as employees' personal circumstances rather than by conventional transport characteristics such as access, waiting or in-vehicle times (Abane, 2002). Gender roles, age differences, disposable incomes relative to travel costs as well as the reliability of schedules by the individual modes are the most important factors workers take into consideration in choosing their modes (Ibid).

Individuals attach value to savings in travel time hence behavioural models of travelers' modal choice have been built on the theory of consumer choice (Hensher, 1976). Given a sample of travelers who are assumed each to have alternative methods of transport to choose from, one of which is his actual method for the journey and the others are alternatives which he may or may not have used on any previous occasion, the theory reveals that the acceptance of one means of transport and the rejection of the others is an indication of preference (Ibid). The choice of mode is related to a few of the characteristics of the available modes of transport. The characteristics include perceived efficiency of the mode as viewed by the traveler (Ibid).

A point of potential substitution in choice begins when an individual considers the relative advantages of alternative modal options. If one had his usually chosen mode and he is faced with alternative modes of transport, the individual will enter his decision space and commences a search and learning procedure in order to decide whether to maintain his habitual mode or select an alternative mode. The decisions are based on the underlying attitudes of individuals towards modal characteristics such as price, time, comfort, etc. In so doing, an individual gains knowledge on the level of the combination of relevant characteristics that places him/her in a position where he/she can trade –off alternative combinations of quantities of the given set of characteristics and hence modal options (Ibid).

Hensher (1976) studied the value of commuter travel time savings in the Transport Studies Unit, University of Oxford and Commuter Bureau of Roads in Australia. He found that if the potential transfer price is expressed in terms of a money outlay rather than time outlay, a model consistent to this situation would be:-

$C = a_0 + a_1x_1 + a_2x_2 + \ldots + a_nx_n$ where $C =$ the net monetary benefit of mode of choice, equal to $Cu - Ca + TPc$; $Cu \rightarrow$ usual cost, $Ca \rightarrow$ alternative cost while TPc is the transfer price; $x_1 =$ the reported time difference between the usual and the alternative modesand $x_2, \ldots, x_n =$ all other variables which are measurable as significant contributions to the perceived net benefit of the chosen mode.

3. METHODOLOGY AND DATA

In a bid to bring about insights and a better understanding of the contribution of 14-seater PSVs to PSV commuters in government institutions within Nairobi's central business district, a survey research design under descriptive design was used. Questionnaires were given to some employees of the sampled ministries. A survey was used since the answers given by respondents to questions asked about a situation describe the respondents' perception of the situation. Reality is what the respondents generally perceive it to be.

The study was carried out in Nairobi City, Kenya, since it was the town earmarked for initial implementation of the phase out of 14-seater PSVs. Nairobi was also considered due the high number of motor vehicles providing passenger transport service in the city. *Data on every road in Nairobi needed not be taken since the information on travel experience on any road in the city could be obtained by interviewing the commuters who use the said roads. The key concern of the study was the efficiency of road passenger travel from a passenger's perspective. The study made use of incisive questions targeting efficiency to an extent that there was no need to literally take measurements at intersections or bus stops.*

Roads in the City Council of Nairobi allow mixed passenger transport to operate and the road infrastructure has busy intersections and bus stops - an attribute which lacks in most other major towns in Kenya. Vehicular and passenger traffic in the city of Nairobi operate twenty-four hours a day. There are times when both types of traffic are heavy. Such times commonly referred to as peak time occur in the morning hours of 6.30a.m to 9.00a.m and in the afternoon between 3.30p.m and 7.00 p.m. Conversely, off-peak time referred to the duration when the roads are with light traffic. This situation obtains between 9.30a.m and 3.00p.m during day time and as from 7.00p.m in the evening till 6.30a.m of the following day. All the roads used by commuters in Nairobi city made up the desired location. Target population comprised government low-cadre employees working at the ministries' headquarters in Nairobi. This ensured homogeneity of the respondents. The PSVs formed the unit of observation whereas government low-cadre employees (commuters) were the unit of enumeration. Employees in government offices within the central business district of Nairobi including Upper Hill/Community area and who used public passenger transport to commute were targeted as respondents to a questionnaire that was used in this study.

In social science research, where there is no estimate available of the proportion of the target population assumed to have the same characteristics of interest, the following formula can be used to determine the sample size (Mugenda and Mugenda, 1999).

$$n = \frac{z^2 pq}{d^2}$$

Where

$\mathrm{n} =$ the desired sample size

$\mathrm{Z} =$ the standard normal deviate at the required confidence level

$\mathrm{p} =$ the proportion in the target population estimated to have characteristics being measured

$\mathrm{q} = 1 - \mathrm{p}$

$\mathrm{d} =$ the level of statisticalsignificance test

If there is no estimate available of the proportion of the target population assumed to have the characteristics of interest, 50% should be used (Ibid).

Going by the afore-stated, the study used $\mathrm{p} = 0.50$. In that case the Z-statistic was 1.96. The desired level of accuracy in this study was 0.05. The formula shown above, for determining sample size was therefore used to obtain the sample size that was accessed.

That is: $n = \frac{z^2 pq}{d^2}$

$$n = \frac{(1.96)^2(0.50)(0.50)}{0.05^2}$$

$$n = 384$$

It is from the calculation above that the study targeted a sample of 384 respondents.

Multi-stage random sampling was used to pick out respondents from the sampling frame of the study. Sampling frame constituted the headquarters of government ministries located within Nairobi's central business district. The Kenya government had 42 ministries (www.communications.go.ke, 2008). A third of the ministries provided sufficient number of respondents in the study. The ministries were listed alphabetically. Random sampling was used to select the first ministry to be visited. Systematic sampling where two ministries were skipped was then used to identify subsequent ministries until 14 of them were selected. Thirty respondents per ministry were selected randomly. This way, the sample size of 384 respondents was attained.

Once the government ministries had been identified, random sampling was again used to identify departments where respondents worked in. The respondents from each department were selected randomly. Questionnaires were given to low-cadre employees working at the headquarters of government ministries located within Nairobi's central business district. This was informed by the fact that the identified persons used roads which experienced mixed traffic in Nairobi city while at the same time the roads were the backbone of public passenger transport for vehicles operating within the city. Furthermore government offices had a large number of employees who commuted by public transport for lack of staff buses or self- driven private cars. They also spent their weekdays commuting to and from the workplace. Specifically targeted were lower cadre employees who (i) are not entitled to an official car and (ii) earn salaries which do not permit them to own and maintain own car.

4. RESULTS AND DISCUSSIONS

The study established that the majority of the respondents 74.2% were male compared to 24.8% who were female. this finding showed a serious skew of the male gender that was overwhelmingly more in number than the female. There is a need to implement the spirit and letter of the newly enacted constitution which advocates for gender balance in the civil service. 51.0% of the respondents were within 18-30 years age bracket, 38.0% were 31-40 years age bracket, 15.1% were within 36-50 years and 4.1% were over 50 years of age. This finding showed that the civil service had energetic workforce which will take a long period of time before their retirement age. This is a good age balance at work place practice which can enhance service delivery in the civil service.

A majority of the respondents, 30.4%, use Ngong Road, 21.7% use Muthurwa area and the surrounding roads, 20.0% use Thika Road, 11.3% use Waiyaki Way, 8.4% use Mombasa Road and 8.1% use Valley Road. This finding directly corresponded to the population distribution in Nairobi City. The majority of the population stays in Eastlands, Kibera and Kawangware. Residents of the later two places pass through Ngong Road when travelling to and from the city.

Time and the choice of 14-seater PSVs over the other alternative PSV modes

The study established that the shortest distance covered by the respondents from house to pick-up point was 100 metres whereas the longest was 1000 metres. It was found out that the respondents covered the shortest distance 390 metres from their houses to the stage where they picked 22-32-seater PSV, for 14-seater and 33 and above seater, they covered 422 and 421 metres respectively. This finding showed that although the 22-32-seater PSV were most accessible to the commuters compared to 14 and 33 and above seaters in terms of distance covered, there was no significant difference in the distance covered by the commuters to the pick-up place.

The shortest time taken by the respondents from house to pick-up point was 5 minutes whereas the longest was 45 minutes. The respondents took the shortest time of 10.96 minutes from their houses to the stage where they picked 22-32-seater PSV whereas for 14-seater and 33 and above seater, they took 11.5 and 11.65 minutes respectively. This finding showed that the 22-32-seater PSV were most accessible to the commuters compared to 14 and 33 and above seaters in terms of time it took them from their houses to the pick-up points.

The hypothesis of the study was stated as time taken to fully board a PSV at initial pick-up point has no influence on the choice of 14-seater PSV over the other alternative PSV modes. Because the nature of data on the time variable was quantitative, the study used linear regression analysis to test this hypothesis. The study at its design used the regression below with its detail variable explanation.

The regression models are;

$$\mathrm{y_i} = \beta_1 \mathrm{F} + \beta_2 \mathrm{Tv} + \beta_3(\mathrm{Tw1} + \mathrm{Tw2}) + \beta_4 \mathrm{Cn} + \beta_5 \mathrm{Alt} + \beta_6 \mathrm{TF} + \mathrm{e}\ , i = 1,2,3,4,5,6$$

Where

$y =$ Frequency of use of mode per month

$i = 1 - passenger\ two - wheeler, 2 - 3\ passenger\ three - wheeler, 4 - 7\ seater\ taxi, 14 - seater, 22 - 32\ seater, 33\ seats\ and\ above.$

The vehicle capacities provided modes of transport from which passengers would prefer to board.

$F =$ Fare charged, $D =$ Distance travelled for fare charged,
$F_A =$ Fare charged by alternative mode

$T_v =$ Time taken travelling in the PSV boarded

T_{w1} = Time taken to walk from house to PSV boarding place,
T_{w2} = Time taken to walk from the last stage to workplace,
C_n = the number of vehicles boarded from house to workplace,
Alt = the number of alternative routes used by the PSV in the past,
T_F = Time taken to fully board a PSV at the boarding place, $S_i = \frac{\mathrm{DIST_i}}{\mathrm{T_i}}$

e is the error term

$DIST_i$ = Distance from home to workplace in kilometers,
T_i = Total time taken from home to workplace by given mode (Tv + Tw1 + Tw2 + TF) and y_i and D_i represent preference of mode.

Table 1: Analysis of Variance of choice of 14-Seater

Model	Sum of square	Degree of freedom	Mean Square	F-Value
Regression	1622.9	7	231.9	11.33
Residual	6896.4	337	20.5	
Total	8519.3	344		

Source: Field data (2012)
Table 4.18 is the ANOVA results of the regression of 14-seater choice against the chosen explanatory variables that is given in table 4.19.

Table 2: Regression Results for choice of 14-seater

Model	Standardized Coefficient	t	Sig(p-value)
F	-0.412**	-8.29	0.031
Tv	0.077	0.945	0.341
Tw1	0.095	1.866	0.633
Tw2	-0.01	-0.205	0.842
Cn	-0.036	-0.400	0.691
Alt	-0.079	-1.176	0.242
TF	-0.011	-0.192	0.841

Source: Field data (2012) – Dependent variable is frequency of use of 14-seater
** Significant at 5% level

In the model, choice mode was the dependent variable whereas the independent variables as per the model were; Fare charged, Fare charged by alternative mode, Time taken travelling in the PSV boarded, Time taken to walk from house to PSV boarding place, Time taken to walk from the last stage to workplace, the number of vehicles boarded from house to workplace, the number of alternative routes used by the PSV in the past and Time taken to fully board a PSV at the boarding place.

The study obtained a coefficient of -0.412 of fare charged by the mode of transport used was statistically significant at 5%. Hence fare charged by the 14-seater explained the choice of the 14-seater. This finding implied that there is an inverse relationship between fare charged and choice of the 14-seater in that an increase in fare charged will result in less likelihood of the mode being chosen and vice versa. The other factors were not statistically significant in explaining the choice of the mode.

The hypothesis that travel time from house to workplace has no influence on choice of 14-seater PSV over the other alternative PSV modes was accepted since there was a strong correlation between times taken from house to pick-up point of 14-seater PSV. The same finding obtained for the 22-32-seater and 33 and above seater PSVs. This showed that the preference for a 14-seater is not related to the time they take from their houses to the PSV pick-up points. Instead, it is fare charged which determined its choice over the other modes.

It was realized that there was evidence to reject the hypothesis that the existence of alternative routes has no influence on commuter choice of 14-seater PSV over the other alternative PSV modes. This finding confirmed that all the modes made use of alternative routes and that the ability to use the said alternative routes influenced the commuters' choice of the PSV vehicle they would wish to use. This finding favored the 14-seater and 22-32-seaters and not the 33 and above seaters.

5. CONCLUSION

PSV is very important in the economic development in Kenya as a means of transporting citizens to different work places where they are involved actively in economic development and wealth creation. The conclusion on the factors influencing choice of 14-seater public service vehicles and alternative modes of public service transport in Nairobi city is as summarized; travel time from house to workplace had influence on choice of 14-seater PSV over the other alternative PSV modes. There was a higher correlation between 14-seater and 22-32 seater meaning that the commuters would rather choose 22-32 seater over 33 seaters and above; the existence of alternative routes had influence on commuter choice of 14-seater PSV over the other alternative PSV modes; fare charged had effect on commuter choice of 14-seater PSV over the other alternative PSV modes; the fare charges during the off-peak hours influenced the commuters' choice of the PSV vehicle they would wish to use; and lastly, the time taken to walk by a commuter had no influence on choice of 14-seater PSV over the other alternative PSV modes.

The regression results established that fare charged influenced commuters' choice of 14-seater PSVs. The choice of 22-32-seater PSVs was mainly influenced by fare charged, time taken to walk from drop-off point to the workplace, the existence of alternative routes and the time it takes for it to fully board passengers at the initial boarding place.

The 33 and above seater was considered based on fare charged, travel time in the PSV, time taken to walk from the house to the PSV pick-up point, usage of more than one vehicle to get to the workplace, the existence of alternative routes and lastly, time taken for it to be fully boarded at the initial boarding place.

From the findings and conclusion of this study, it is recommended that a comparative policy analysis should be undertaken to come up with a hybrid PSV policy that can serve the Kenyan commuter. The process of coming up with alternative type of PSV should be based on more consultation and sector wide considerations. It is clear from the analysis that in the absence of the 14-seater PSVs on the roads most commuters would opt for 22-32-seater PSVs. Holistic factors should therefore be considered by the government and all stakeholders when coming up with alternative type of PSV because there could be other underlying factors that were not captured in this study and yet they are important in determining a commuter's choice of a PSV to use.

The government should not phase out 14-seater PSVs by force but increase taxes and levies on anybody who may want to buy a 14-seater which would by extension make fare high and hence make commuters shy away from the 14-seater. Indeed, such a move would result in commuters considering other modes of transport suitable to them without feeling coerced.

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