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Analysis of Modal Choices and Behaviors of Commuters on Ikorodu- Lagos Island Axis, Lagos, Nigeria

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Abstract

Public travelers apparently act as rational beings in their choices of transport modes based on the value obtainable for their travel experiences. The study comparatively evaluated passengers' preferences considering the public transport options namely the yellow bus, BRT and ferry on the Ikorodu - Lagos Island axis with a view to determining the factors influencing travelers' choices and assessing the performance of public transport systems. Using quantitative research method, information on the respondents' socio-economic characteristics, public transport accessibility and experiences were obtained through field survey. Commuters were interviewed with the aid of structured questionnaire at selected terminals during the morning peak period using incidental sampling technique and 124 of the 143 questionnaires were duly completed and returned for data analysis. Findings revealed significant differences in the level of accessibility to public transport. The level of accessibility was measured using the mode, cost and time of travel to transport terminals and the analysis of variance revealed a highly significant difference in the travel cost to terminals. The linear regression revealed that the delay time at the terminals, travel time and travel cost to destinations accounted for about 55.8% of the total variance obtained in the preferred modes of travel. The performance of these public transport modes as perceived by the respondents were evaluated using the Relative Performance Analysis (RPA) on the utility functions of waiting time, users' friendliness, the fare, time, safety, convenience and efficiency of public travel in the study area. Mean Performance Indexes (MPIs) of 3.72, 3.01 and 2.62 were rated on the BRT, ferry and yellow buses respectively. This implied that the BRT is the most satisfactory mode followed by the ferry and the yellow buses sequentially. Based on these findings, the study recommended the provision of more BRT buses to reduce the waiting time at terminals and the enhancement of the ferry services to adequately put safety and convenient measures in place to improve performance and increase patronage.

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1. Introduction

Mobility has been identified as an essential component of the life every human being, forming an integral part of the daily round of activities (Albalate and Bel, 2010). In recent times and most cities, people's need to move has been adequately met by the public modes of transport (Sam et al., 2014), highlighting the services provided by these modes as specific and germane (Polat, 2012). As a very basic instrument of mobility for larger proportion of the population in almost all countries, public transport now stand among the very basics of peoples' lives and this explains why they are not only demanded but also required in modern times.

Globally and in Africa, public transport forms one of the driving forces of economic and social life as it defines the behaviors and living standards of public travelers. Implicitly, public travel refers to the movement of passengers from a point of origin to another point of destination by group transport systems available for use by the general public and operated on established routes with attached financial cost (Schofer, 2018). It could be inferred that public travelers are people who exhibits the main characteristics inherent in this definition of public travel. This includes journeying from one place to another, use of systems/modes of group/public transport and the use of established routes for trips. Public travelers find themselves in a public transport environment that is dynamic and even interactive. This environment is characterized by a combination of alternative transport modes, various types of passengers (such as students, workers and leisure travelers) with different travel purposes, different travel frequencies and different travel times (Polat, 2012). This situation is typical of what exist in cities of developed and developing countries of the world, including nations in sub-Saharan Africa, and Nigeria is no exception. The demand and patronage in such environment as this is often dynamic and volatile as the existence of various transport modes makes transition between these modes possible for passengers. Public travelers/trip makers are perceived to act as rational beings, making their choices of travel modes on the based on the maximum utility derivable from each mode.

Travelers satisfaction as a product of derived utility, has been identified as an important measure of performance on public transport modes. It is also seen as a determining factor on modal choices as well as a vital means of analyzing travelers' behavior in the aspect of choice of mode (Mintesnot and Shin-ei, 2007). Travel behavior as an associate of choices of public transport and travelers' satisfaction is described as what people do over space, and how people make use of transport. Without a proper understanding of the system dynamics of and more importantly the behaviors of public travelers, accurate forecasts and knowledge required for planning and policy making in public transportation would be very difficult (Taylor and Camille, 2012). The analysis and understanding of the performance of public transport, and the factors influencing modal choice and travel behaviors is highly required in attaining efficient and effective public transport systems in cities with a high rate of population growth like Lagos.

This study therefore seeks to analyze the public transport preferences of trip makers/commuters on the Ikorodu-Lagos Island transport axis as well as what they do during their journey and how they use available modes of transport in the study area. This was done with a view to highlight the factors influencing their choices and value obtainable by public travelers on the available transport modes based on their performance. In order to achieve this, the study identified the socio-economic attributes of public travelers in the study area, examined their access to public transport and their travel experiences, and also evaluated the performance of the selected public transport modes using some variables of assessment. The information provided in this study can be used to improve the performance of the available modes of public transport so as to increase demand and patronage as well as to make public transport systems effective in the study area.

2. Determinants of Commuters' Choices of Public Transport and Travel Behaviours

The preference of one mode of public transport over the other is unarguable dependent on a wide range of factors as public travelers/commuters are often described as reasonable beings, choosing travel modes most likely to offer them maximum utility. As identified by Polat (2012) the factors of fare, travel time (walk access time and accessibility of transport, waiting time, in-vehicle (journey) time), service quality, comfort, reliability, availability and costs of

alternative travel modes, time of travel, purpose of travel and lastly the level of public transport dependency are the demand determinants of public transport. There other factors aside these ones earlier mentioned that play significant roles in determining the choices and behavior of passengers. Researchers have purported that perceived safety and security orientation of a transport service provider by travelers may also play active role in the decision of which service provider to patronize (Sam et al., 2014).

Transport fares are critical to the supply of public transport services since they serve as the main source of income for operators. Bresson et al., (2004) stated that the relationship between fares and public transport patronage tend to be inverse, where higher fares seem to be associated with decreased patronage and vice versa. It is however noted that the effect of fares on patronage is not similar in all modes of public transport and in all time frames. For instance, Crotte (2008) examined the factors that characterized travel demand in Mexico City and discovered that changes in fares did not explain changes in Metro demand in Mexico City. The study detected that rather service improvements had a more significant effect on patronage than changes in Metro fares or gasoline prices (Polat, 2012).

Travel time has been seen as one of the significant factors that influence both the choice and use of one public transport mode to the other. The fact that travelers cannot increase their travel time indefinitely emphasizes its importance (Golob et al., 1972). There are several components of travel time within the frame of public transport (Polat, 2012). Walk (or access) time, waiting time and journey (in-vehicle) time are the three main components of travel time and the value attached to each of these components vary from one traveler to the other. For a typical public traveler, the price includes many of these cost components including access times to service points and final destinations, waiting times at stops and interchanges and travel times at vehicles which in its entirety influence the travelers' assessment of public transport services (Horn, 2003).

The quality of service delivery on each public travel by each mode of public transport is another variable with a direct and powerful influence on the choice and patronage of public travelers (FitzRoy and Smith, 1998). Service quality includes but not limited to waiting time, service frequency, operating speed, reliability and comfort (Sam et al., 2014). In spite of the difference in the level of importance attached to comfort from one group of passengers to another based on the journey time, journey purpose and passenger type, comfort is a quality factor that should be taken into account. Comfort is expected to positively affect demand on a particular mode of transport (Polat, 2012) and determine the pattern exhibited by travelers on their trip. Another point to consider is the degree of overcrowding in vehicles as this is expected to affect comfort and invariably create unpleasant and uncomfortable travel experiences for commuters.

Seating arrangements in the vehicle and leg- room space as well as general vehicle cleanliness are other aspects of comfort a vehicle and other modes of public transport should provide (Sam et al., 2014). Koppelman and Lyon (1981) emphasized that people's perceptions about convenience and comfort as well as their normative beliefs associate positively with preference and hence the choice for a given mode of transportation. It is even thought that elements with the most physiological importance to comfort are those which affect quality of a ride as well as the effort of driving such as noise, vibration, ventilation, glare, odour and seating arrangement (Neumann et al., 1978). Scholars have suggested that choice of mode for various trips is either directly or indirectly influenced by people's personal circumstances including their age, gender, household size, educational attainment and income (Buchanan et al., 2006).

Perceptions of safety as well as travel experience with a particular mode of transport are likely to influence travel decisions, behaviors and preference for one mode from the other (Ankomah, Crompton, and Baker 1996). The degree of reliability of the services on a mode of public transport is another important determinant of preference, patronage and travel behavior. Reliability on a transport mode refers to the degree of dependability on and trust-ability of passengers in the services provided. It includes features such as accessibility and confidence because the passengers should be able to depend on those services and be able to see that they are obtainable on regular basis and are long termed. Longer waiting times due to late arrival of buses and excessive in-vehicle times due to traffic or system problems reduce reliability, one of the clearest measures of which is the degree of those services' following time schedules announced (Sam et al., 2014). Other factors such as service frequency and service capacity also determine the usability of public transport services and thus also affect the reliability. If the service capacity available is insufficient to meet the current demand, travelers are less likely to find those services reliable".

3. Methodology

The study made use of both quantitative and qualitative research approach to achieve its goal of comparing and analyzing the choices and travel behaviors of passengers on the Ikorodu-Lagos Island axis. Four sets of primary data were obtained for this study. These are Socio-economic status of passengers/public travelers, Travelers access to public transport (travel mode, time and cost to terminals), Travel experiences of passengers (travel time and cost to destination, delay at terminals etc.), and, Commuters' assessment of public transport options e.g. fare, reliability, safety etc.

The information was obtained using structured questionnaires that were administered to commuters that ply Ikorodu/Lagos island route on road and passengers that make use of the ferry service along the same route. Relevant information was also obtained from some secondary sources such as LAMATA (Lagos Metropolitan Area Transport Authority), Lagos State Transport Management Authority (LASTMA), the World Bank's Lagos Urban Transport Project (LUTP) as well as LASWA (Lagos State Waterways Authority) who gave information on the activities that are being carried out to ensure that the waterways are fully utilized. Due to the nature of the research, selection of sample size is usually difficult since sampling frame cannot be easily determined. The morning peak period was chosen as the time to obtain data at selected terminals. Consequently, incidental sampling method was adopted for the study. This is a method where all passengers met at the terminals were purposively selected and sampled as respondents. From the 150 questionnaires administered to the respondents, a total of 124 questionnaire were duly completed and returned for analysis. Further, participant's observation was also adopted, using the three means of transportation to fully understand, analyze and compare between the road and water modes of transportation.

The study adopted both descriptive and inferential techniques of data analysis to bring out relevant, findings, observations and analysis. Each of the variables used in identifying the socio-economic characteristics of the respondents, examining their level of accessibility, appraising the travel experiences of the passengers with public transport and evaluating the performance of selected modes of public transport were subjected to descriptive statistics using frequency distributions and means where necessary. Other techniques of data analysis such as the analysis of variance, linear regression, Pearson correlations and the Relative Performance Analysis (RPA) were also employed where necessary.

4.0 Data Analysis and Discussion

The analysis of data obtained from the field survey was carried out under four main categories. These categories are the central issues examined in the study, namely, the socio-economic attributes of respondents (public travelers), users access to public transport, travelers' experiences with public transport and the performance of the selected modes of public transport in the study area.

4.1 Socio-Economic Attributes of Respondents

The analysis of the socio-economic characteristics of public travelers as compared among the preferred mode of travel of the respondents, present variations in the demographic attributes of the users. Considering the gender distribution of these public travelers, it was noted that there was an even distribution of the male and female users of the yellow buses, a slight variation in the gender distribution among the BRT users and a much wider disparity among users of the ferry services. There were more proportion of male users of the BRT and ferry modes of public transport in the study area. This is expressed in the percentage distribution of the respondents as 50%, 59.1% and 70% of the user respondents of the yellow buses, BRT and ferry services were male.

Similarly, most of the users of the yellow buses and BRT were single while for the ferry services, most of them were married. The percentage distribution of the marital status of the yellow buses' users presents that 57.5% were single, 35% married, 2.5% were divorced and 5% were widowed. For the BRT users, 63.6% were single, 34.1% were married and 2.3% were divorced while for the users of the ferry about 30% of the respondents were single, 65% were married and the remaining 5% were equally divorced and widowed. This could be attributed to the fact that the rate of car ownership is higher among the currently and once married populace of the study area than what exist among the single residents of the area. Also, the higher proportion of the married ferry users could possibly be linked to their occupation and nature of their daily means of livelihood.

Table 1: Socio-economic attributes of the public travelers used in the study

DEMOGRAPHIC ATTRIBUTES		YELLOW BUS (N=40)		BRT (N=44)		FERRY (N=40)	
		Freq	**%**	**Freq**	**%**	**Freq**	**%**
Gender	Male	20	50.0	26	59.1	28	70.0
	Female	20	50.0	18	40.9	12	30.0
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Marital Status	Single	23	57.5	28	63.6	12	30.0
	Married	14	35.0	15	34.1	26	65.0
	Divorced	1	2.5	1	2.3	1	2.5
	Widowed	2	5.0	-	-	1	2.5
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Age (years)	16 - 25	11	27.5	11	25.0	2	5.0
	26 - 35	15	37.5	21	47.7	12	30.0
	36 - 45	8	20.0	9	20.5	20	50.0
	46 - 55	5	12.5	2	4.5	5	12.5
	56 - 65	1	2.5	1	2.3	1	2.5
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Educational Qualifications	None	3	7.5	-	-	-	-
	Primary	3	7.5	1	2.3	-	-
	Secondary	16	40.0	17	38.6	9	22.5
	Tertiary	18	45.0	26	59.1	31	77.5
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Employment Status	Employed (formal)	9	22.5	13	29.5	23	57.5
	Employed (informal)	21	52.5	16	36.4	12	30.0
	Unemployed	3	7.5	3	6.8	1	2.5
	Student	7	17.5	12	27.3	4	10.0
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Average monthly income	₦1,000 - ₦50,000	10	25.0	16	35.5	2	5.9
	₦50,001 - ₦100,000	12	30.0	25	54.8	11	26.5
	₦100,001 - ₦150,000	7	17.5	1	3.2	8	20.6
	₦150,001 - ₦200,000	1	2.5	1	3.2	6	14.7
	Above ₦200,000	-	-	1	3.2	13	32.4
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**

The analysis of the age distribution of the respondents' modal choice of transportation indicates that more than half of the users of road as a means of transportation were between the ages of 16 and 35 years. The age distribution of the users of water as a means of transportation had the larger share falling to respondents between ages 26 years and 40 years. The percentage variations among the users of the yellow buses indicated that about 27.5% were in the 16-25 years age group, 37.5% belonged to the 26-35 years group, 20% were between ages 36-45 years, 12.5% between ages 46-55 years and about 2.5% were within ages 56-65 years of age. It is evident that most public travelers within the study area irrespective of their modal choice were young adults between the age of 18 and 45 years, this is also known as the active age group.

The modal choices of the respondents were also observed to have varied based on their educational attainment and employment status. It was noted that public travelers by ferry had a minimum of secondary school education with over 80% of them been employed either formally or informally. Likewise, the public travelers by BRT were also

noticed to have a minimum of basic primary education with about 65% of them employed formally and informally, while a reasonable amount of the unemployed were students. The users of the yellow buses were observed to be a mixture of literates and illiterates, however, more than 90% of these public travelers were literates with a minimum of basis primary education. More than 70% of these users were employed either formally or informally while the remain users than are less than 30% of the respondents were students and an insignificant proportion of the unemployed. The public travelers across the three identified modal choices that were sampled for the study were observed to be predominantly literates and employed. This is in line with the nature of the metropolitan area that has been identified as a city of high level of commerce and employment opportunities for skilled, semi-skilled and unskilled labour.

The average monthly income of the users of the yellow buses indicated that the respondents earned ₦100,000 and below monthly (that is, about 75%), while the remaining 25% had an average monthly income slightly above ₦100,000 and ₦200,000. Similarly, about 90% of the users of the BRT were earning ₦100,000 and below, 6.4% were earning between ₦100,001 and ₦200,000, and a much insignificant proportion of about 3% earned above ₦200,000. Public travelers by ferry were however have a different average monthly earning from the road users as it was noticed that over 65% of these users earned more that ₦100,000 monthly. About 26.5% of these respondents who travelled by the ferry earned between ₦50,000 and ₦100,000, while there were only less than 10% of the user respondents earning less than ₦50,000. Evidently, the occupation and monthly income of public travelers influence their preferences on the modes of public transport.

4.2 Commuters' Access to Public Transport

The examination of the travelers' access to public transport was analyzed considering their travel mode, travel time and the cost of travel to the respective terminals. The various modes of travel to respective terminal considered include walking, motorcycle, bus, taxi and cars. The percentage distribution of the respondents' access to the yellow buses showed that about 40% of these respondent users accessed them by walking, 30% by motorcycle, 25% by buses and about 5% accessed these buses by cars and taxis. The BRT buses were accessed by about 15.9% of the respondent users by walking, about 47.7% made use of motorcycle, 29.5% accessed them by bus and 6.8% of these respondents accessed them by car. For the ferry, only about 10% of the user respondents accessed the terminal by walking the remaining 90% access the terminal by other modes public transport. The percentage variation in the access by other modes of public transport presents about 30% of the user respondents making use of the motorcycle, 7.5% used taxis, 37.5% made use of cars and 15% made use of buses. This analysis corresponds with the result of the average monthly income of the users because most these users access the terminal by cars either private or hired and their average monthly income indicates most of earning above ₦100,000.

The analysis of the travel time to the various terminals of public transport examined in this study showed that the yellow buses are the most accessible in terms of travel time. It was observed that more than 90% of the yellow bus public travelers access the terminals in 15 minutes and less, a little below 80% of the BRT users and about 75% of the users of the ferry travelers accessed their respective terminals within this time frame. About 10% of the ferry users spends more than 30 minutes to get to the ferry terminals and about 6.8% of the BRT users spends almost the same time to get to the BRT terminals while none of the respondents using the yellow buses spends more than 30 minutes as the travelling time.

Table 2: Respondents' level of access to public transport in the study area

ACCESSIBILITY VARIABLES		**YELLOW BUS (N=40)**		**BRT (N=44)**		**FERRY (N=40)**	
		Freq	**%**	**Freq**	**%**	**Freq**	**%**
Travel mode to terminal	Walk	16	40.0	7	15.9	4	10.0
	Motocycle	12	30.0	21	47.7	12	30.0
	Taxi	1	2.5	-	-	3	7.5
	Car	1	2.5	3	6.8	15	37.5
	Bus	10	25.0	13	29.5	6	15.0
	Total	**40**	**97.5**	**44**	**100.0**	**40**	**100.0**
Travel time to	1 - 5 min	3	7.5	5	11.4	7	17.5

terminal	6 - 10 min	26	65.0	19	43.2	13	32.5
	11 - 15 min	9	22.5	11	25.0	10	25.0
	19 - 30 min	2	5.0	6	13.6	6	15.0
	Above 30 min	-	-	3	6.8	4	10.0
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Travel cost to terminal	₦1 - ₦50	7	18.5	11	25.0	3	7.7
	₦51 - ₦100	27	66.7	21	47.2	17	42.3
	₦101 - ₦150	2	3.7	9	19.4	6	15.4
	₦151 - ₦200	4	11.1	2	5.6	8	19.2
	Above ₦200	-	-	1	2.8	6	15.4
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**

The percentage distribution of the travel cost to terminals also shows that over 85% of the public travelers by the yellow buses spend ₦100 and below while the remaining 14.8% spend between ₦101 and ₦200 as the travel cost. For the BRT users, about 72.2% of the respondents had a travel cost of ₦100 and below, about 25% had travel costs ranging between ₦101 and ₦200, while the travel cost for about 2.8% of these respondents was above ₦200. Considering the mode, time and cost of travel to the terminals, it would be deduced that the yellow buses are the most accessible public transport mode available to travelers in the study area. This could be attributed to the long-term duration of operations they have had in the study area and how residents of the area have been used to them. However, with consistency and constant improvement of the BRT and ferry services in the study area, it is expected that the patronage of these public modes of travel would increase over time.

Table 2: Analysis of Variance to examine differences in accessibility of various public transport modes

ANOVA

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Cost of travel to terminal	Between Groups	12.199	2	6.099	5.828	.004
	Within Groups	90.004	86	1.047		
	Total	102.202	88			
Time of travel to terminal	Between Groups	4.056	2	2.028	1.922	.151
	Within Groups	126.643	120	1.055		
	Total	130.699	122			

The analysis of variance test was conducted to check if there are significant differences between the variables used to measure the travelers' access to public transport modes in the study area. The analysis examined the cost and time of travel to the various terminal of public transport using the null and alternative hypotheses.

H_0 = There is no significant difference between the cost and time of travel to the terminals of selected modes of public transport

H_1 = There is significant difference between the cost and time of travel to the terminals of selected modes of public transport

The analysis of variance presented a level of significance that has a f-value that is greater than 0.001, both on the cost and time of travel to various terminals. This implies that the null hypothesis (H_0) was rejected, meaning that, a significant difference between the level of access to the modes of public transport was observed using the variables of cost and time. The degree of freedom the test of variance was also noticed to be significant as the results was based on analysis of more than 70% of the respondents' view on travel cost (total df=88), and more than 95% of the respondents' view on travel time to the terminals (total df=122).

The outcome of this analysis could be linked to the variance in location of the yellow buses, BRT and ferry terminal. Terminals and bus-stops for these modes of public transport is observed to be available in varying numbers and places. While the yellow buses have the highest number of bus-stops and pick-and-drop points, the BRT has a fewer number of bus-stops and terminals compared to that of the yellow buses along the road transport corridor from Ikorodu-Lagos Island. However, there is only one ferry terminal located at Ikorodu and just a few jetty points on Lagos Island. This make the ferry mode of public transport, the least accessible among the selected modes as it takes time and money to access these terminal and jetty points.

4.3 Commuters' Experiences with Public Transport

Users' experiences with the identified modes of travel for this study was conducted examining variables like the boarding delay, delay time, travel cost and time to the destination. It was noticed that boarding delay at terminals were most experienced by the BRT bus users, followed by the travelers by the yellow buses while most of the ferry users opined that they don't experience travel delay at the terminal. The analysis of the delay time at the terminals indicated that more than 95% of the yellow bus users don't experience delays at the terminals exceeding 30 minutes, while at rare cases for few of the respondents, the maximum delay time was 40 minutes. Similarly, about 95% of the ferry had the terminal delay time of 30 minutes and below while at most the respondents experienced the delay time of 40 minutes at the ferry terminal. The experience of the BRT users was observed to be the worst among these public travelers as some the respondents do experience terminals' delay time as much as an hour. About 32.4% of the respondents had delay time of more than 30 minutes but not exceeding an hour while the remaining 67.6% of these users had delay time of 30 minutes and below at the terminals.

Table 3: Public travel experiences of the respondents

VARIABLES INDICATING TRAVEL EXPERIENCE		**YELLOW BUS (N=40)**		**BRT (N=44)**		**FERRY (N=40)**	
		Freq	**%**	**Freq**	**%**	**Freq**	**%**
Boarding delay at terminal	Yes	23	57.5	38	86.4	19	47.5
	No	17	42.5	6	13.6	21	52.5
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Delay time at the terminal	1-10 min	19	47.8	1	2.7	26	65.0
	11-20 min	9	21.7	14	32.4	8	20.0
	21-30 min	10	26.1	14	32.4	4	10.0
	31-40 min	2	4.3	6	13.5	2	5.0
	41-50 min	-	-	4	8.1	-	-
	51-60 min	-	-	5	10.8	-	-
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Travel cost to destination	₦101-₦200	2	5.0	38	86.4	-	-
	₦201-₦300	35	87.5	6	13.6	-	-
	₦301-₦400	3	7.5	-	-	-	-
	₦401-₦500	-	-	-	-	16	40.0
	Above ₦500	-	-	-	-	24	60.0
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**
Average travel time to destination	1-30 min	1	2.5	8	18.3	11	27.5
	31 min - 1 hour	21	52.5	32	72.7	29	72.5
	1 hour - 1 hour 30 min	14	35.0	2	4.5	-	-
	1 hour 30 min – 2 hours	4	10.0	2	4.5	-	-
	Total	**40**	**100.0**	**44**	**100.0**	**40**	**100.0**

The cost of travel to destination varied across the identified modes of transport with that of the BRT buses being the

cheapest and the ferry being the most expensive. The analysis presents that more than 90% of the yellow buses travelers spend ₦300 and below while about 7.5% spent more than ₦300 but not exceeding ₦400. The cost of travel to various destination using the BRT was observed not to exceed ₦300 irrespective of the travelers' destinations. However, for the ferry users, the least cost of travel to the destination was observed to be higher than ₦400 within the study area as more than half of the respondents spend more than ₦500 as the travel cost. To this end, it was noticed that public transport on road were more used and far cheaper than public transport on water.

The average time taken was also observed to have varied among the road and water means of public transport in the study area as the ferry was noticed to have the least travel time while the yellow buses had the longest/highest time of travel. The analysis of the average travel time indicated that almost half of the respondents using the yellow buses spend between 1 hour and 2 hours on their travel while the higher proportion of respondents (about 58%) had destination travel time of 1 hour and below. For the BRT buses, about 91% of the respondents estimated an average travel time of 1 hour and below while the remaining 9% traveled to their destination within the time frame of 1 to 2 hours. However, for the public travelers by ferry, all the respondents (100%) had a maximum travel time of 1 hour to their destinations within the study area. In terms of delay at the terminals and travel time the ferry was observed to have offered the best travel experiences to public travelers while with reference to cost, the BRT was noticed as the best option to the travelers.

Table 4: Model summary of the linear regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.552(a)	.304	.292	.589	
2	.725(b)	.526	.509	.490	
3	.747(c)	.558	.534	.478	1.044

a Predictors: (Constant), Average Travel Time To Destination
b Predictors: (Constant), Average Travel Time To Destination, Cost Of Travel To Destination
c Predictors: (Constant), Average Travel Time To Destination, Cost Of Travel To Destination, Delay Time At The Terminal
d Dependent Variable: Preferred Travel Mode

A linear regression analysis was conducted to predict the effect of the experiences of public travelers on their preferred mode of public transport. The analysis examined their experiences from the terminals of boarding to the point of destination considering the travel time, travel cost, delay time and boarding delay at the terminals. The test was conducted using the stepwise method of linear regression, which made the analysis of be broken down as each predictor is examined with an eventual combination of all predictors. It was observed that the R^2 value on the analysis of the combined predictor is 0.558 with an adjusted R^2 value of 0.534. This means that the results obtained from the linear regression analysis explain about 55.8% of the total variance within the dataset.

Since the regression analysis was carried out in a stepwise manner, the information presented in the third row of the table of coefficients was examined as it combined the predictors of travelers' preferred mode. However, the boarding delay at the terminal was excluded from the stepwise linear regression analysis as it had a p-value that is greater than 0.1. The table of coefficients was used to compared the effects of the predictors on the travelers' choice of public transport. It was noticed the cost of travel to destination was the most effective factor influencing the choice of public travelers with a standardized beta coefficient of 0.547 and a level of significance that is less than 0.001. The average travel time to destination was the next effective experience of the travelers that influenced their preference with standardized beta coefficient of -0.460 ($p<0.001$) and the delay time at the terminal was another significant factor but the least among this three with a standardized beta coefficient of 0.195 ($p<0.05$).

Table 5: Linear regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	3.040	.236		12.859	.000
	Average Travel Time to Destination	-.526	.104	-.552	-5.079	.000
2	(Constant)	2.183	.257		8.509	.000
	Average Travel Time to Destination	-.475	.087	-.498	-5.473	.000
	Cost of Travel to Destination	.242	.047	.474	5.204	.000
3	(Constant)	1.745	.330		5.287	.000
	Average Travel Time to Destination	-.438	.086	-.460	-5.070	.000
	Cost of Travel to Destination	.279	.049	.547	5.713	.000
	Delay Time at the Terminal	.094	.046	.195	2.029	.047

a Dependent Variable: Preferred Travel Mode

It could be inferred that the experiences of public travelers from the terminals to their various destinations were the key factors that influence their choices of public transport in the area. This is because other factors of access to terminals had lesser levels of significance compared to the users' experiences when analyzed against their modal choices. These factors determine the utility derived by the passengers on their public travel.

4.4 Commuters' Evaluation of Public Transport

Table 6: Relative performance analysis of the selected modes of public transport

ASSESSED VARIABLES		**5**	**4**	**3**	**2**	**1**	**PWV**	**N**	**RPI**	**MPI**	**MPD**
Yellow bus	Travel fare	5	20	78	16	-	119	40	**2.98**	2.62	0.36
	Waiting time	-	24	72	12	4	112	40	**2.80**		0.18
	Travel time	5	16	75	14	3	113	40	**2.83**		0.21
	Travel safety	-	4	54	40	1	99	40	2.48		-0.14
	Travel convenience	-	8	45	40	3	96	40	2.40		-0.22
	Travel efficiency	-	8	72	24	2	106	40	**2.65**		0.03
	User friendliness	-	8	33	40	7	88	40	2.20		-0.42
	Total								**18.34**		
BRT	Travel fare	55	80	33	4	-	172	44	**3.91**	3.72	0.19
	Waiting time	5	24	27	22	17	95	44	2.16		-1.56
	Travel time	50	92	27	4	-	173	44	**3.93**		0.22
	Travel safety	45	96	30	2	-	169	44	**3.84**		0.12
	Travel convenience	95	64	24	2	-	185	44	**4.20**		0.48
	Travel efficiency	85	64	24	6	-	179	44	**4.07**		0.35
	User friendliness	45	92	33	2	-	172	44	**3.91**		0.19
	Total								**26.02**		

Ferry	Travel fare	20	4	48	24	7	103	40	2.58		**-0.43**
	Waiting time	65	40	36	10	-	151	40	**3.78**		0.77
	Travel time	60	64	27	6	-	157	40	**3.93**		0.92
	Travel safety	-	4	27	38	11	80	40	2.00	**3.01**	-1.01
	Travel convenience	10	8	30	24	14	86	40	2.15		-0.86
	Travel efficiency	15	56	57	8	-	136	40	**3.40**		0.39
	User friendliness	5	64	42	16	1	128	40	**3.20**		0.19
	Total								**21.04**		

Performance Weight Value (PWV) = $1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5$

$$PWV = \sum_{i=1}^{5} XiYi$$

Relative Performance Index (RPI) = $\frac{\text{Performance Weight Value (PWV)}}{\text{Total number of responses (N)}}$

Mean Performance Index $(MPI) = \frac{\sum RPI}{Nv}$

Mean Performance Deviation (MPD) = MPI – RPI

Where N = Total number of responses
n = Ratings of respondents
Nv = Count of identified assessed variables

Ratings of the impact of the public transport system on sustainable livelihood indicators
1 = Poor, 2 = Fair, 3 = Good, 4 = Very good, 5 = Excellent

The Relative Performance Analysis (RPA) conducted above was carried out to identify the the assessed variables of public transport that had significantly performed across the three selected modes, based on the users' ratings. The analysis made use of the Mean Performance Index (MPI) as the threshold when compared with the Relative Performance Index (RPI) of each assessed variable. The assessed variables in the analysis were travel fare, time, safety, convenience, travel efficiency, waiting time and user friendliness. These variables were assessed and compared by the three identified public transport modes.

The evaluation of the performance ratings of the public travelers by the yellow buses indicated a mean performance index of 2.62, which was compared with the various indices of the variables. It was noted that of these variables, there were significant performance ratings on the waiting time, the fare, time and efficiency of this travel mode. It was also observed that the relative performance indexes of the variables clustered around the mean performance index with mean deviations ranging from -0.42 to +0.36. This means that there were no wide variations between the performance rating of the respondents using the yellow buses. The performance of the BRT mode of public transport as rated by the respondents was observing to be better than that of the yellow buses. From the performance analysis, the mean performance index was 3.72 and when this was compared to the relative performance indexes, all the assessed variables had significant performance ratings except for the waiting time at the terminals. A wide variation was noticed between the mean performance index and the performance index of the waiting time with a mean performance deviation of -1.56. However, the respondents' performance ratings on all the other variables were not having wide variations.

The assessed variables under the ferry mode of public transport with significant performance rating include the waiting time, travel time, travel efficiency and user friendliness. Considering the mean performance index of the ferry mode of transport, it was observed that this mode received more performance ratings than the yellow buses but not up to the ratings of the BRT. This means that based on the users' ratings, the BRT had the best performance considering the user friendliness, waiting time, the travel fare, time, safety, convenience and efficiency with a mean performance index of 3.72. This was followed ferry mode of public transport with mean performance index of 3.01 and the yellow

buses were least rated in performance with an index of 2.62.

Table 7: Pearson Correlations analysis of accessibility, demographic attributes, travel experiences and the performance of public transport in the study area.

	Level of accessibility	**Travel experience**	**Average Monthly Income**	**Education Qualification**	**Age**	**Employment Status**
Travel Fare	.032	.160	-.298(**)	-.023	-.174	.009
Waiting Time at Terminal	-.279(**)	-.059	.230(*)	-.027	.143	-.046
Travel Time	-.202	.254(*)	.232(*)	.112	.031	-.061
Travel Safety	-.010	.229(*)	-.359(**)	-.017	-.136	.118
Travel Convenience	-.002	.218	-.194	.026	-.190(*)	.014
Travel Efficiency	-.064	.216	-.071	.074	-.110	-.075
User Friendliness	-.047	.160	-.120	.072	-.019	-.109

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

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

The Pearson correlations analysis was used to determine the relationships between socio-economic characteristics, travelers' experiences, accessibility to public transport and the respondents' perception of the performance of the selected public transport modes. Performance was examined using the variable of travel fare, users' friendliness, travel convenience, waiting time, travel safety, efficiency and travel time. The coefficients of the Pearson correlations revealed that accessibility levels, travel experience, average monthly income and age had significant relationships with some of the performance variables. The level of accessibility had a significant negative relationship with performance ratings of waiting time at the terminal ($p<0.01$). This means that the higher the level of access to terminals of public transport, the lesser the concern of public travelers with the waiting time at the terminals. Also, the experience of public travelers from the terminals to their various destinations had significant positive correlations with the travel time and safety ($p<0.05$), implying that the better the experience of the travelers, the more satisfied they are with the travel time and travel safety of public travelers.

The age of public travelers was observed to had negative correlations with their perception of the performance of public transport modes in providing travel convenience. With a significance level that is less than 0.05, this means that the older the public traveler the lesser their performance ratings of public transport in providing the convenience value on the travel. In addition, the average monthly income of the respondents had significant negative correlations ($p<0.01$) with the travel fare and travel safety variable of public transport systems. The implication of this is that the higher the monthly earnings of the respondents, the lower their ratings on travel safety and travel fare. This could be possibly linked with the need of respondents of higher earnings desiring more safer mode of public transport irrespective of the amount attached to the safety derivable. Finally, average monthly income also had significant positive correlations ($p<0.05$) with their ratings on waiting time at terminals and the travel time to their various destinations. Possibly, public travelers of higher earnings in the study area tend to choose modes of public transport that safes them the time of waiting long at pick-and-drop points and also takes them to their destinations faster without delay on their ways. These people could be making use of chattered taxis or organized mode of public transport such as Uber, Taxify etc.

Conclusion

This study has compared the choices and behaviors of commuters/travelers using three selected modes of public transport on the Ikorodu-Lagos Island axis of Lagos state. Having examined the access to, travel experiences with, and performance of the yellow buses, BRT and ferry modes of public transport in the study area, the study discovered there are significant variances in the issues influencing choices and behaviors of public travelers. While the yellow buses were the most accessible mode of public transport within the study area followed by the BRT and ferry in sequence of accessibility, the ferry offered the best travel experiences in reference to delay at the terminals and travel time to various destinations with the BRT and yellow buses following in ranks. However, with reference to travel cost, and performance of public transport using the identified utility functions/variables of assessment, the BRT had the highest performance rating on these variables and offered the best option in terms of travel cost. The ferry and the yellow buses followed in sequence of performance ratings behind the BRT.

Since each of these modes of public transport has its strengths and weaknesses, there is the need to improve of service delivery and quality of travel experiences by each of these selected modes of public travel in the study area. These improvements will help to increase patronage by residents, enhance standard of living of the people and developed the public transport systems within the study area. This study therefore recommends that the BRT should try to improve their service delivery by providing more buses to mitigate boarding delay and reduce the delay times at the terminals. This will help to ensure that public travelers have confidence and trust in the services of the BRT thereby promising bus reliability to the users. Similarly, this study recommends the provision of more safety measures (in terms of policy and equipment) in the services of the ferry such that travelers will have better travel experience of safety, comfort and convenience on the ferries. Also, more jetty points could be provided at Ikorodu and Lagos Island to increase accessibility to water transport by ferry, such that the time and cost of travel to jetty points and ferry terminals would be reduced. The residents and the general public can also be sensitized on the safety, importance and need to embrace water transportation in the study area so as to relieve the pressure on road infrastructure.
Finally, the improvement of the BRT and ferry services is paramount at this point in time considering the population growth in Lagos state, particularly within the study area. This will help to increase travelers' preference on these modes of public transport that will support the existing traditionally yellow buses and also keep the forces of demand and supply of public transport balanced and effective. This is expected to bring about a sustainable and efficient public transport system within the study area in the long term.

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