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An Examination of the Factors Influencing the Choice of Route Selection by Intercity Bus Operators in Lagos, Nigeria

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Abstract

The most preferred and highly patronized form of public transportation for regional trips in Nigeria is the intercity bus service. The Origin-Destination (O-D) market operators can serve numerous markets, just as many operators are in the segment. Many O-Ds are served more than others. This study examined the significant factors influencing choice-making by carriers in the selection of O-D markets to serve the movement of passengers away from Lagos to cities in other regions. The study selected five major carriers (operators) based on traffic volume and outputs. They are ABC, GIGM, Chisco, PMT, and YSG Transport, with a total of fifty-five terminals across Lagos State. The terminal operators have the permission of their respective firms to determine which O-Ds to serve. For data gathering, 55 questionnaires were administered to each terminal to solicit answers to questions that would reveal the significant factors in route selection. The factors are demand, fare along routes, political and ethnic affiliation, distance between origin and destination, accruable revenue, monopolistic power, average fuel consumed along routes, labor size required per route, assurance of return passengers or traffic, level of security along the route O-Ds, cost of offering the service, and fuel supply situations for the O-Ds, which serve as the independent variables while the selected routes for the dispatched buses are the dependent variables. Multiple regression analysis was adopted for the study. The outcome of the analysis revealed that choice of route selection by intercity bus operators was influenced by passenger trip demand with a p-value of 0.002182; fare charged (p-value of 0.009264); and political and ethnic affiliation (p-value of 0.027598) in order of significance.

Keywords: Public transport, Route selection, Choice factors, Bus operators, Intercity.

1 | Introduction

Public transport is a system of buses, trains, etc., running on fixed routes for the public to travel. According to Aderamo [1], public transport systems provide the most efficient means of moving large numbers of people, especially in densely populated urban centers, which is crucial for the productivity of cities with a

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direct impact on the country's economy, in addition to the welfare of its users [2]. In developed countries like the United Kingdom, Brazil, Canada, and other developed nations, the sector plays a very important role in both the developed and developing nations; it also serves as a means of reducing reliance on private cars and private operators by providing very large bus capacities for public users.

However, in Nigeria, the reverse is the case; private operators dominate the transport routes, be it road, air, or waterway transport. In transportation planning and forecasting, route selection plays a prominent and strategic role, especially in the business-oriented industry [3]. In Nigeria, there are a wide variety of urban mass transit options, with many of these services operating on various routes based on the means of transportation available to them. Many options in large cities include regular taxis, ride-sharing services, motorcycle cabs, rickshaws, and minibus services. However, when it comes to public transport, the choices and routes are more limited, and this is also based on the strength of the operators.

Al-Sahili and Sadeq [4] observed that public transport is of two types based on service: intercity and intracity public transport. Intercity buses are buses that travel between cities, while intracity buses travel within a city. In this study, attention will be focused on the intercity transport service provider. Therefore, this study examines the factors influencing the route selection by intercity bus operators in Lagos, Nigeria. The most popular and widely used mode of public transportation in Nigeria appears to be bus services [5]. This is despite their operational and managerial plans' shortcomings and deficiencies. Public transportation choice factors are stated to be numerous and vary from location to location, individual to person, and culture to culture. This suggests the possibility that the intercity bus service's decision determinants in Nigeria may differ from those in other parts of the world.

In Nigeria, there is a problem of traffic demand on some intercity routes, while there is availability of buses on some intercity routes where passengers need to wait hours before loading is completed. Likewise, there is a situation on some intercity routes in Nigeria with a large number of public transport providers on a particular route, while some routes register only a limited number of operators. Many public transport services, both cooperative organizations and individual bodies, like to register as intercity transport operators even when the buses available to them are insufficient and not in good condition to operate for long distances. Therefore, the question left unanswered is: what factors influence the route selection by public bus operators in Nigeria? The reasons for this act in Nigeria are yet unknown.

2|Literature Review

Past research has considered many factors behind inter-city bus routing and scheduling in some parts of developed countries but seems limited in the Nigerian context. There has been comparatively extensive research on urban bus routing/scheduling, categorized as bus routing, scheduling, or a combination of routing and scheduling problems. For example, different studies such as [6], [7] have been carried out on bus operators' route choice selection, and the studies posit that factors such as fare, journey time, fleet size, labor cost among other factors were significant at influencing the choice of bus operators route selection. Fare, otherwise known as the fare charge, is the amount the passenger will have to pay for the service offered by the bus company. The fare charged by the bus company influences the route selection to a great extent, attested to by Ali et al. [8]; findings suggested that the operators' route selection is optimized within a certain range of fares.

Bale et al. [9] studied route optimization techniques and focussed on the various routing problems in road transportation systems, route optimization, and its techniques. However, this study intends to consider route selection decision-making regarding route choice by intercity bus operators. Yan and Tang [10] developed an integrated framework to help intercity bus carriers plan bus routes and schedules during stochastic bus travel times. The integrated framework embedded in an iterative solution process combines these two stages by repeatedly solving a series of planned bus scheduling and real-time schedule adjustment problems to find suitable bus routes and schedules. The test results, related to a major Taiwan intercity bus operation, show the proposed framework performs well.

Al-Sahili and Sadeq [4] conducted a study on the demand for intercity bus ridership, assessed existing services, and formed a basis to predict future ridership in the Palestinian territories. The relationship between public transportation demand and operating and socioeconomic variables influencing demand was established. For example, Wu et al. [11] observed that insufficient taxis and private hire services are the factors most influencing the choice of route by most private operators in developed countries. Kolawole et al. [12] conducted a study on the factors influencing modal choice on the Accra-Takoradi route and failed to look into the factors influencing the choice of route by the operator.

The fleet size of an intercity transport company is the number of buses in operation and scheduled across the terminals operated by the bus company. The important underlying issues are cost and arrival time at the destination. The usual phenomenon is to travel between two points using the shortest path known within a specific time and cost. Route selection in intercity bus service can be regarded as the decision reached by a bus service provider to select the routes to schedule their buses, having prior knowledge of traffic situation and considering other factors.

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Based on the empirical literature review, one can conclude that no thorough investigation has been made in Nigeria on the factors influencing intercity bus operators' route selection. More so, considering that bus services appear to be the most popular and often used, despite the subpar operational management practices that defined them in Nigeria. Therefore, this study became necessary to assess the factors influencing the route selection by intercity bus operators in Nigeria.

2.1 | Brief History of Bus Transit Services in Nigeria

Us transit history in Nigeria is replete with a catalog of temporary successes and failures of attempts at providing both intra-city and inter-city bus transit facilities; although the causes of the failures of these facility provision efforts are very similar, it will be pertinent to discuss the two facility types separately.

2.2 | Intra-Urban Bus Transit Services

Intra-urban bus transit services have been featured intermittently in each major Nigerian urban center during the last four decades. These can be categorized into publicly owned and operated services and privately owned and operated enterprises. Notable among the former group were the former Lagos Municipal Transport Service (LMTS), which existed as far back as the 1950s, and the Lagos City Transport Service (LCTS). Among these categories was the Ibadan City Council Bus Service, established in 1957, and the later bus service provided by the Ibadan City Council Joint Transport Board (ICCJTB) in 1967 [13]. Pioneer's efforts in providing intra-urban public municipal bus facilities in the country's eastern states included the oriental bus lines and later the coal city bus service, which was introduced in the 1970s. In the northern states, pioneer attempts included the Jos city bus service, established in the early 19701s, the Kaduna city bus transport service, and the Kano bus service, also established in the 1970s.

2.3 | Inter-Urban Bus Transit Services

Like the intra-urban bus transit facilities, the inter-urban bus transit operations could be categorized into public-sector services and private-sector transit enterprises. However, public-sector inter-urban transit services had been virtually non-existent except for one or two that could easily be remembered. One of these

was the mid-west lines plowing the Lagos-Asaba road and several other major roads in the early 1970s. Another inter-urban public transit service was the Benue Plateau Bus Service, which plied the northern and some north-south highways, notably Jos-Enugu, after the Nigerian civil war in 1970.

3 | Methodology

The study is a quantitative research. This is so because the data are quantifiable [14]. The research design adopted is primarily descriptive in nature and has a blend of survey design. The intercity bus service providers were sampled to ascertain their operational characteristics and the most significant factors influencing the route selection choice. The research population for the study is bus operators. These include all registered intercity bus operators in Lagos State that operate from the state to other parts of Nigeria. The Lagos Metropolitan Area Transport Authority (LAMATA) register showed that 109 registered intercity passenger carriers in Lagos operate in other parts of Nigeria.

Also, the National Union of Road Transport Workers Union (NURTW) Lagos State branch showed 250 registered outfits/operators in the State. The register of LAMATA was used as it offers more credibility than that of NURTW since it is the legislated authority for transportation in the Lagos Metropolitan area (Lagos State). Therefore, the population for this study is the 109 operators found in the LAMATA's register. The study, however, sampled five private operators. The five were selected by ranking all the 109 operators using their respective annual traffic (passenger). *Table 1* shows the intercity passengers of the five bus companies selected for the study.

Table 1. Intercity passengers carried in and out of lagos.

Operator	Average				Percentage Passenger Traffi
	Daily	Weekly	Monthly	Annual	c
God is Good Motors (GIGM.com)	2449	17140	40000	822720	32
Peace Mass Transit (PMT)	1717	12020	56320	576960	22
Young Shall Grow Transport (YSGT)	1537	10760	44800	516480	20
CHISCO Transport Nigeria (CTN)	1060	7420	43200	356160	14
ABC Transport PLC (ABC)	900	6300	30240	302400	12
Total	7663	53640	214560	2574720	100

Source: field work (2023)

We have daily, weekly, monthly, and annual passengers who are carried in both inward and outward movements. These first five had 15.73 % of the total market share (16,368,214 passengers) as of 2019. However, the belief information about the company is presented in *Table 2*.

Since it has been identified that the selected five operators have two hundred and five-eight (258) terminals in different locations across the state, the study focuses only on fifty-five terminals in Lagos state since Lagos state serves as a hub for most of the selected companies. The sampling technique adopted was purposive sampling, as the questionnaire was administered on the number of terminals operated by each of these five bus companies. The study used the primary data collection. The data was collected over five weeks, devoting a week per operator. Multiple regression was adopted as the analytical tool to determine the most significant factors.

Table 2. Belief information about the five selected companies.

Company Names	Year of Establishment	Number of Fleets	Total Number of Terminals (Nigeria)	Number of States Available	Number of Interstate Routes	Capacity
ABC Transport Plc	February 13, 1993	500+	25	20+	74	14 to 52 Pax
Chisco Transport	1981	500+	27	8	58+	49 – 63 Pax
God Is Good Motors (GIGM)	1998	500+	15	10	29	14 Pax, 50 and above Pax
Young Shall Grow Transport (YSGM)	1972	1500+	91	31	100+	14 Pax
Peace Mass Transit (PMT)		3000+	100+	19	100+	14 Pax

Source: author's computation (2023)

The operators were selected based on the levels of traffic handled and output attained over the years. The routes considered were Origin-Destination (O-D markets) served by these operators. The operators combined had fifty-five terminals within the Lagos metropolis, where buses depart to other cities.

The factors that are significant in route choice by operators are demand, fare along routes, political and ethnicity affiliation, distance between origin and destination, accruable revenue, monopolistic power, average fuel consumed along route, labor size required per route; assurance of return passenger or traffic; level of security along the route O-Ds; cost of offering the service; fuel supply situations. These are the factors that operators consider for route selection, so they form the independent variables that determine the O-D to be served. This O-D is the dependent variable. Multiple regression analysis was adopted to understand the relationship between these dependent and independent variables.

Data for this analysis was obtained using a questionnaire administered to operators via their terminal operators, who eventually chose O-D markets based on the most significant factors. Fifty-five terminals are being operated by the major operators of intercity passenger bus services from Lagos to other regions. To this end, fifty-five questionnaires were prepared for each terminal operator, and they were allowed to reflect on the factors most significant in their choice of routes for the O-D markets served during the period of this study. A five-point likert scale was given to rank the significant factors in route selection.

$$i_1 = B_0 + B_1x_1 + B_2x_2 + B_3x_3 + B_4x_4 + B_5x_5 + B_6x_6 - B_7x_7 + B_8x_8 + B_9x_9 + B_{10}x_{10} + B_{11}x_{11} + B_{12}x_{12} + e_i \quad (1)$$

where i_1= operator's route choice; B_0= intercept; b_0, b_i,….,b_k are the coefficients of the independent variables, x_1 = passenger trip demand, x_2 = fare per route, x_3 = political and ethnic affiliation, x_4 =Distance between origin and distance, x_5= accruable revenue, x_6 = monopolistic power, x_7 = average fuel consumption, x_8= labor size, x_9= assurance of return passenger or traffic, x_{10}= level of security along the O-D market, x_{11} = cost of offering the service, x_{12}= fuel supply and e_i= error term.

4 | Result and Discussion

There are so many routes that can be served across Nigeria from Lagos. The size of the country and the volume of domestic trade and other forms of interaction will generate large passenger traffic dispersed across the thirty-six states of the federation. This gives ample opportunities for intercity bus operators to have a few O-D markets they can choose to serve. Some will, however, strive to serve as many as possible depending on several factors. In fact, operators will make a market choice based on certain factors, some of which existing literature (and used for this study) include the level of demand, political and ethnic affiliation, distance between origin and distance for the O-D markets, accruable revenue; possibilities of monopolistic power and tendencies; average fuel consumption; labor size requirement; assurance of return passenger of traffic; level of security along the O-D market; cost of offering the service; fuel supply.

To this end, *Table 3* shows the significant factors that influenced the choice of routes by the operators of intercity bus services away from Lagos to other cities and towns in Nigeria, where it was observed that the multiple regression value was 0.996. This implies that the independent variables explained 99.6% of the dependent variable. With an R^2 value of 0.966, this shows that a strong relationship exists between the dependent variable and the independent variables.

The outcome of the analysis revealed that choice of route selection by intercity bus operators was influenced by Demand (β=0.045, $p \leq 0.05$), the fare charged (β= 3.98E-05, $p \leq 0.05$), political and ethnic affiliation (β=0.027, $p \leq 0.05$), as well as the distance between origin and destination (β=0.024, $p \leq 0.05$), respectively. They are all significant at 0.05 level of significant. This simply means passenger demand, the fare charged, politics and ethnicity, and distance between origin and destination all contribute positively to the route selection by intercity bus operators serving O-Ds away from Lagos.

This corroborates the findings of Tirachini [6], and Saradini et al. [7], who found similar factors as fare and distance between origin and destination significant in influencing bus operation choice of route. Intercity bus operators tend to schedule buses to a route with a higher passenger demand than the route with less passenger demand. However, this varies from one route to the other. The fare charged by bus operators is directly proportional to the revenue of the intercity bus operators; it will also influence, to a large extent, the route choice. Political and ethnicity have a great influence on the route choice of bus operators. It was observed that all the bus operators selected for the study ply more of the eastern route from which their base originated.

5 | Conclusion

The importance of intercity transport operations to the socioeconomic growth of any economy cannot be underestimated, as they also impact social well-being, provide options for travelers, and promote the use of public transport. The study focused on factors that influence the choice of route. The objectives stated for the study were achieved with a well-designed methodology that was adopted. The study established that the choice of route selection by intercity bus operators was influenced by passenger trip demand with a p-value of 0.002182, the fare charged (p-value of 0.009264), and political and ethnicity affiliation (p-value of 0.027598) in order of significance. The study recommends that intercity bus operators' revenue per passenger kilometer can be improved through a network of different routes. Hence, intercity bus operators must look inward to extend their geographical spread.

Table 3. Regression statistics for choice of route by all operators of inter-city bus passenger service.

Multiple R	0.995814							
R Square	0.991646							
Adjusted R Square	0.966253							
Standard Error	0.103372							
Observations	55							
ANOVA								
	Df	**SS**	**MS**	**F**	**Significance F**			
Regression	12	54.54051	4.545043	425.3352	8.88E-40			
Residual	43	0.459489	0.010686					
Total	55	55						
	Coefficients	**Standard Error**	**t Stat**	**P-value**	**Lower 95%**	**Upper 95%**	**Lower 95.0%**	**Upper 95.0%**
Intercept	12.07671	5.132599	2.352943	0.023904	1.686312	22.46712	1.686312	22.46712
Passenger trip demand	0.045358	0.013914	3.259999	0.002182	0.017299	0.073418	0.017299	0.073418
Fare per route	3.98E-05	1.46E-05	2.72488	0.009264	1.04E-05	6.93E-05	1.04E-05	6.93E-05
Political and ethnic affiliation	0.026889	0.011791	2.280439	0.027598	0.00311	0.050669	0.00311	0.050669
Distance between origin and distance	0.024302	0.012194	1.992967	0.052636	-0.00029	0.048894	-0.00029	0.048894
Accruable revenue	0.030429	0.015954	1.907294	0.063177	-0.00175	0.062604	-0.00175	0.062604
Monopolistic power	0.029104	0.016939	1.718165	0.09296	-0.00506	0.063265	-0.00506	0.063265
Average fuel consumed	-0.00121	0.000737	-1.64356	0.10756	-0.0027	0.000275	-0.0027	0.000275
Labour size	0.060815	0.050016	1.215928	0.230646	-0.04005	0.161681	-0.04005	0.161681
Assurance of return passenger or traffic	0.01277	0.013661	0.93473	0.355147	-0.01478	0.040321	-0.01478	0.040321
Level of security along the O-D market	0.008056	0.013932	0.578263	0.566103	-0.02004	0.036152	-0.02004	0.036152
Cost of offering the service	0.002103	0.013255	0.158675	0.874668	-0.02463	0.028834	-0.02463	0.028834
Fuel supply	0.000473	0.020097	0.023525	0.98134	-0.04006	0.041003	-0.04006	0.041003

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