



ANALYSIS OF INTRACITY PASSENGER TRANSPORT OPERATIONAL CHARACTERISTICS IN IBADAN METROPOLIS

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Abstract

Passenger mobility is very crucial for achieving daily activities in any mega city or metropolitan state. The motivation behind this study emanated from the emergence of operational characteristics of passenger transport over the years in Ibadan metropolis with the use of Hiace buses to Micra taxi and recently the use of taxify for passenger mobility in the state. Therefore, this study has been set out to investigate the operational characteristic along the changes involved in mobility of passengers in Ibadan metropolis. The objectives of this study are to assess the socio-economic characteristics of road transport passengers in Ibadan metropolis and examine the factors influencing intra-city passenger transport service delivery in Ibadan. Females account for 37.4% while male gender is 63% and this gender disparity could potentially signify distinct travel patterns, preferences, or occupational influences that contribute to the observed imbalance in the utilization of intra-city passenger transport services. Notably among the factors influencing service delivery based on Principal Component Analysis are fuel price, road condition, demand features by passengers, distance respectively. This investigation has emphasized the complicated interaction of these parameters, stressing their vital significance in guaranteeing service quality and efficiency. As such, planners must analyze the subtle interactions between these drivers in creating effective measures to increase the performance of intracity passenger transport services in the city.

Keywords: Metropolis, Passenger, Transport, Characteristics, Intracity

Introduction

Passenger mobility is very crucial for achieving daily activities in any mega city or metropolitan state. The characteristics of passenger transport envision the cost, the infrastructure and modal choice (Dolya, 2017). The motivation behind this study emanated from the emergence of

operational characteristics of passenger transport over the years in Ibadan metropolis with the use of Hiace buses to Micra taxi and recently the use of taxify for passenger mobility in the state. The use of public transport is considered to be one of the cheapest means of mobility in the city as it offers economy of scale over transport operating costs. Changes in the trend of transport system definitely have concomitant effects on mobility and socio-economic characteristics of commuters. While changes in transport system attempt to modify existing practice in transport operations; the existing problems of congestion, environmental challenges and bad roads persist (Michaela, et al, 2017).

Transport acts as a catalyst, driving both economic growth and decline, particularly in areas where economic resources, conditions, and human effort are lacking. (Atoyebi *et al.*, 2015). Transportation is crucial for the existence and survival of any urban community, as it underpins interactions related to work, leisure, and residential activities. (Olorunfemi *et al.*, 2014) According to Adeniran & Olorunfemi (2019), transportation is concerned with mobility. Mobility is attributed with the flow of people, delivery of goods and services without which production (finished products that get to the final consumers) cannot be achieved. The growing urban population and city expansion in Nigeria lead to a heightened demand for transportation services. Despite efforts, the demand for adequate transport infrastructure has not always been met, resulting in ad hoc, uncoordinated, and substandard facilities (Adeniran & Olorunfemi 2019). Urban centres used to have influx of people from all works of life as a result of amenities, businesses and government establishments in the metropolis. In the daily commuting activities, transportation is at the centre. Sun et al (2020) expressed that, commuting is usually necessitated by the distance from work place to residents. Revolution and dynamics of passenger transport operations have shown that there is increasing demand for passenger transport in the cities. Conversely, the ownership of individual automobiles is also on the rise. (Mrníková, 2017). According to Schafer and Victor (1999) and USDOT (1997) who noted that passenger transport service will increase from 26 trillion passengers per kilometer to 103 trillion by the year 2050. Ibadan is a city with a rich history located in southwestern Nigeria. Over the past five decades, it has undergone several political status changes: initially serving as a regional capital and now functioning as a state capital. As a result, it has drawn people from nearby towns and villages to engage in various economic activities for their livelihood. Arising from this intra-city logistics, there is consequence in form of congestion around the city. Atoyebi *et al.*, (2015) observed that, passengers in most cities are exploited by the unionism of the operators without any form regulation to control them. Owoeye *et al* (2022) noted that, most transport infrastructure in urban centers are the cause of congestion and increased waiting time in the streets. Some of the public transport operations in Nigeria were characterized by the utilization of pre-owned vehicles, poorly maintained vehicles, and a culture of minimal maintenance. The resultant effects in the use of old vehicles for passenger transport operations can be witnessed

with smoky, noisy and unsatisfied service Yatskiv *et al*, 2017). Ipingbemi (2010) observed the level of indiscriminate parking and how vehicles are parked indiscriminately resulting to congestion in Ibadan metropolis. He also emphasized the pattern of building along Beere, Oje, Ogunpa and some other areas in Ibadan. The drainage system is not available in most places and space of road too narrow for two vehicles at a time in transit. Inadequacy of transport road signs, coverts and pedestrian infrastructures put passengers at risks.

Literature Review

Understanding Affordability, Accessibility, and Availability

This study is centered around the principles of availability, accessibility, and affordability. Agu & Nwakonobi (2013) employed this concept to assess the quality of public transportation services within four universities in South-Eastern Nigeria. The notion of affordability elucidates the degree to which the financial considerations of a journey determine one's willingness to make sacrifices to travel, or conversely, the extent to which a traveler can afford to journey at their preferred time. Affordability refers to the capacity of public transport users to undertake necessary trips to school, the market, and workplaces without sacrificing other vital activities, as this may compel restrictions on movement.

Availability in public transport pertains to timing, route options, frequency, and suitable modes of travel aligned with an individual's journey purpose, potentially influenced or restricted by the route and travel duration (Agu & Nwakonobi, 2013).

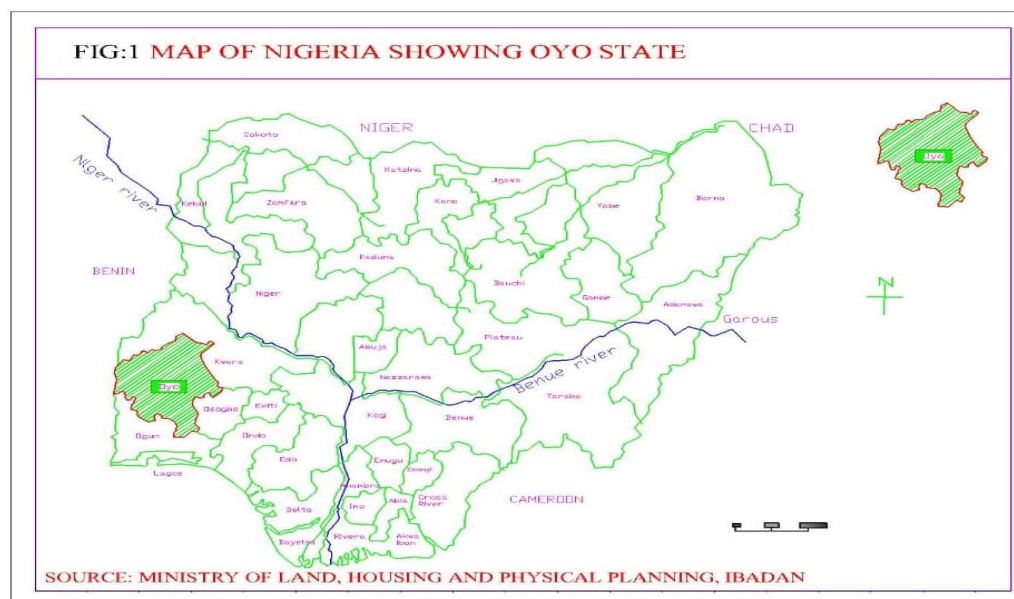
Similarly, accessibility denotes the degree of ease with which diverse passenger groups can utilize public transportation. For example, boarding buses with low steps is more convenient compared to those with high steps, as individuals such as the elderly, infants/children, the physically challenged, and passengers with bulky luggage may face difficulty accessing public transportation otherwise. As such, accessibility encompasses both the convenience of reaching bus stops, obtaining travel information, and experiencing public transportation to the fullest (Akanmu *et al.*, 2020). The system's success hinges on the crucial balance of the 3As—affordability, availability, and accessibility—while also addressing challenges such as revenue, transportation fares, operational costs, deficiencies, and system mismanagement, among other factors. Given that urban transport infrastructure and its operation are funded solely by user fares, whereas other forms receive government subsidies, it's crucial to incorporate availability, affordability, and accessibility into the urban transport framework. Akanmu *et al.* (2020) proposed that urban mobility encompasses more than simply the quantity of trips taken within a set timeframe; it also encompasses the ability to fulfill essential citizen rights through necessary travel and consideration of the resulting environmental impacts. Hence, the key factors determining the anticipated effectiveness of urban transportation include availability, accessibility, and affordability. Therefore, quality stands as a crucial competitive factor and a

fundamental requirement for thriving in the market. It encompasses the holistic evaluation of the service provided relative to a specific standard, gauged by its ability to meet or surpass both internal and external specifications pertinent to the unit, as perceived by transportation users. Service quality, thus, stands as a paramount determinant in shaping the demand for a service or product, encompassing urban transport (Ogunsesan, 2015). The concept of service quality revolves around comparing customers' expectations with the actual services provided, and the degree to which they align or diverge directly impacts customer satisfaction or dissatisfaction. Trip makers are more familiar with the urban transport service and the quality of service offered by operators.

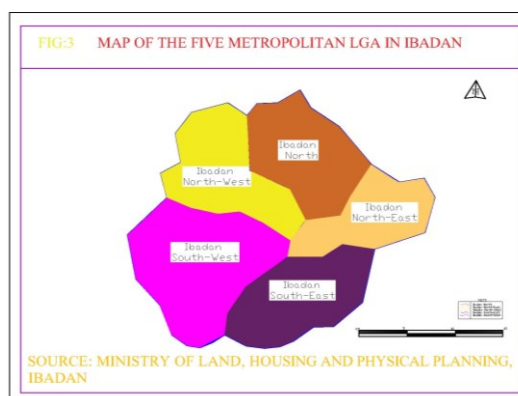
Methodology

The study's research design employs a descriptive and exploratory approach to examine the socio-economic characteristics and factors affecting intra-city passenger transport service delivery in Ibadan metropolis. Using a cross-sectional design, data was gathered at a single point in time to provide a snapshot of the current situation. Quantitative methods were utilized to obtain detailed insights into the research questions and objectives.

The study focuses on Ibadan metropolis, which is the capital city of Oyo State and encompasses 11 out of the state's 33 local governments. Figures 1-4 presented the Map of Oyo State with different local government in the State. Due to the fact that, Ibadan is the focus of this study, the following Local governments are within the metropolis: Ibadan North, Ibadan South West, Ibadan North East, Ibadan South East, and Ibadan North West.



Extraction of Oyo State Map from Nigerian Map



Forty (40) cordons were set up across the five Metropolitan Local Government areas in Ibadan. Each selected terminal within these local governments has a minimum of 30 operators, chosen based on the traffic volume of the routes. The projected population of the area for this study is One million, Nine hundred and Nineteen Thousand Six Hundred (1,919,600) (National Population Commission NPC & National Bureau of Statistics NBS 2022). The sample size for this study was determined using the Taro Yamane formula.

$$n = \frac{N}{1+N(e)^2}$$

Where, n = Sample size;

N = Population size;

and e = Level of Significance (at 5%).

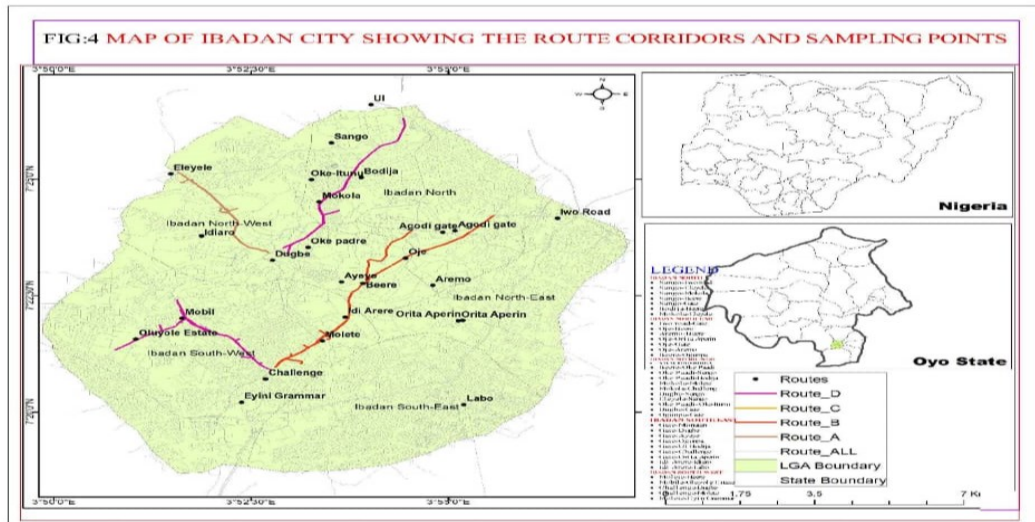
$$\begin{aligned} n &= \frac{1919600}{1+1919600(0.05)^2} \\ &= 399.91 \\ &= 400 \end{aligned}$$

Table 1: LOCAL GOVERNMENT AREA ANALYSIS

Population of the 5 Metropolitan Local Government and Sample size.

S/N	LOCAL GOVERNMENT	POPULATION	POPULATION SAMPLE
1	Ibadan North	440,400	92
2	Ibadan North East	473,700	99
3	Ibadan North West	220,100	46
4	Ibadan South East	380,800	79
5	Ibadan South West	404,600	84
	Total	1,919,600	400

That is,
$$\frac{\text{Local Government Population}}{\text{Total Population}} \times 400$$



Source: Field Survey 2024

Table 2: The road networks spanning the five metropolitan local governments in Ibadan.

S/N	IBADAN NORTH	IBADAN NORTH EAST	IBADAN NORTH WEST	IBADAN SOUTH EAST	IBADAN SOUTH WEST
1.	Sango – Iwo road	Iwo road - Gate	Beere – Ogunpa	Gate – Monatan	Molete – Beere
2.	Sango Eleyele	- Oje - Beere	Beere – Oke- Padre	Gate – Dugbe	Mobil – Oluyole Estate
3.	Sango Mokola	- Aremo – Beere	Oke-Padre – Sango	Gate - Ayeye	Challenge – Dugbe
4.	Sango Beere	- Oje – Aperin	Ok-Padre – Bodija	Gate – Ogunpa	Challenge – Molete
5.	Sango – Gate	Iwo road - Challenge	Ayeye – Molete	Gate – UI/Bodija	Molete – Eyin Grammar
6.	Bodija Beere	- Oje – Aremo	Dugbe – Challenge	Gate – Challenge	-
7.	Mokola Eleyele	- Oje - Gate	Dugbe – Sango	Gate – Orita Aperin	-
8.			Eleyele – Sango	Idi Arere – Idi Aro	-
9.			Oke-Padre – OkeItunu	Idi Arere – Labo	-
10.			Dugbe – Gate		-
11.			Ogunpa – Gate		-
12.			Ayeye - Sango		-

Source: Author’s compilation (2024)

The adopted sampling techniques were both random sampling technique and stratified sampling techniques as suitable for some of the objectives. The cordon were shared based on strata and route selection criteria set for capturing commuters and various types of commercial passenger transport operators.

Result and Discussion

Socio-Economic Characteristics of Road Transport Passengers in Ibadan Metropolis

Table 3: Distribution of Respondents according Socio-Economic Characteristics

Variables	Frequency	Percentage
Gender		
Male	223	62.6
Female	133	37.4
Age		
20-30 years	203	57
31-40 years	80	22.5
41-50 years	53	14.9
51years and above	20	5.6
Marital status		
Single	178	50
Married	144	40.4
Divorce	34	9.6
Educational Qualification		
SSCE	43	12.1
NCE	44	12.4
OND	127	35.7
HND	80	22.5
B.SC	45	12.6
Above B.Sc.	17	4.8
Occupational Background		
Civil Service	46	12.9
Trading	108	30.3
Driving and Other related Service	131	36.8
Students	62	17.4
Unemployed	9	2.5
Income level		

less than N30,000	189	53.1
above N30,000 less than N50,000	78	21.9
Above N50,000 less than N70,000	26	7.3
Above N70,000	63	17.7
Religion		
Christianity	191	53.7
Islam	149	41.9
Traditional	16	4.5
Ethnicity		
Yoruba	270	75.8
Igbo	45	12.6
Hausa	41	11.5

Table 3 shows descriptive analysis of the gender distribution among road transport passengers in Ibadan metropolis reveals a predominant presence of males, constituting 62.6% of the surveyed population. In contrast, females account for 37.4%. This gender disparity could potentially signify distinct travel patterns, preferences, or occupational influences that contribute to the observed imbalance in the utilization of intra-city passenger transport services. Previous studies, such as Guihaire and Hao's global review on transit network design (Guihaire & Hao, 2008), emphasize the importance of considering gender-related factors in urban transportation.

The age distribution among passengers offers perspective on the demographics. The majority, constituting 57%, fall within the 20-30 years age range, indicating a substantial reliance on intra-city transport services by young adults. The second-largest group comprises individuals aged 31-40 years, representing 22.5%, suggesting a broad representation of passengers in their thirties. Additionally, passengers aged 41-50 years and 51 years and above constitute 14.9% and 5.6%, respectively. McSharry and Paul's study on public transportation demand in Lagos (McSharry & Paul, 2021) and Enimola et al.'s analysis of public transport service quality in Kogi State (Enimola et al., 2022) provide additional context on age-related factors in urban transportation.

Examining the marital status of road transport passengers further enriches our understanding of the demographic landscape. The data indicates that unmarried individuals constitute the largest group at 50%, followed by married individuals at 40.4%. The smallest group is composed of divorced individuals, representing 9.6% of passengers. This information sheds light on the diversity of passengers in terms of marital status and can guide efforts to customize services to accommodate various family structures and life stages. The marital status variable, including single, married, and divorced individuals, sheds light on the potential influence of family

structures on commuting behaviors. Understanding the transport needs of different marital statuses is pivotal for planning family-friendly transport services that cater to diverse household compositions. Adeniran's study on the impact of fuel subsidy on transportation expenses in Nigeria (Adeniran, 2018) could provide valuable insights into factors related to marital status.

Factors Influencing Intracity Passenger Transport Service Delivery in Ibadan

Table 4: Factors influencing intracity passenger transport service delivery in Ibadan

Variables	Component
Fuel Price	0.973
Road Condition	0.481
Passenger Demand	0.986
Distance	0.502
Competition	0.989
Vehicle Condition	0.982
Traffic Condition	0.978
Road Network and Infrastructure	0.984
safety and Security	0.984

The Component Matrix, obtained through Principal Component Analysis (PCA), serves to elucidate the relationships between the original variables and the principal components extracted, specifically in the context of factors affecting intracity passenger transport service delivery in Ibadan.

From table 4, fuel price displays a notably high positive loading of 0.973, indicating its strong link to this component. In the aspect of intracity passenger transport, this suggests a close relationship with fuel pricing, signifying its crucial influence on the operational costs and pricing strategies of transport service providers. Road Condition possesses a moderate positive loading of 0.481, implying its association with the quality of road infrastructure in Ibadan. It is evident that this component pertains to the state of roadways and their potential impact on passenger transport service delivery. The variable Passenger Demand features a strikingly high positive loading of 0.986, highlighting its significance within this component. It is inherently connected to aspects such as peak travel times and the popularity of specific routes, underscoring the vital role of passenger demand in the service delivery dynamics. Distance maintains a moderate positive loading of 0.502, suggesting its relationship with geographical factors, particularly the length and extent of transportation routes. The geographical scope of routes emerges as a critical determinant in the context of transport service delivery. Competition is intrinsically linked to this component with a high positive loading of 0.989. This component is closely intertwined

with competitive dynamics affecting intracity passenger transport. Notably, it signifies factors such as the number of service providers and market competition as crucial contributors.

Vehicle Condition features a very high positive loading of 0.982, underlining its strong association with this component. The state of vehicles used in intracity transport is a salient factor, with potential implications for service quality and overall service delivery. Traffic Condition emerges with a high positive loading of 0.978, indicating its likely connection to the state of traffic within Ibadan. The presence of traffic dynamics significantly influences passenger transport service delivery. The variable Road Network and Infrastructure maintains a strong association with a positive loading of 0.984, underlining its role in the quality and extent of the city's road networks and infrastructure. Safety and Security also demonstrates a high positive loading of 0.984, emphasizing its relationship with factors concerning the safety and security of passengers. This encompasses concerns related to personal safety and its broader influence on the passenger experience.

In Ibadan, as in many urban centers across Nigeria, intracity passenger transport service delivery is shaped by a confluence of factors that significantly impact the performance and accessibility of transportation options. A study conducted in Nigeria underscores the relevance of these factors and their implications for service delivery (Ojo et al., 2019). Among the key determinants, fuel prices emerge as a critical factor, impacting the operational costs of transport providers (Adeyemi & Adewale, 2018). Elevated fuel prices can strain the financial sustainability of transport services, which subsequently affects service delivery.

Furthermore, the condition of vehicles used for intracity passenger transport is a paramount consideration. Well-maintained vehicles are associated with enhanced service quality, ensuring a comfortable and reliable travel experience for passengers. The condition of vehicles is a central aspect of service delivery that influences the overall quality of transportation services in the city (Idowu et al., 2020). Passenger demand and traffic conditions are also central to the efficient delivery of intracity transportation services. Studies have shown that understanding peak travel times, route popularity, and congestion dynamics is critical for optimizing service delivery (Umar et al., 2017). The ability to respond to passenger demand and navigate traffic challenges efficiently is instrumental in providing reliable and accessible transportation options to the city's residents. Infrastructure and safety further play a pivotal role in service delivery. Well-maintained road networks and easily accessible bus stops are crucial for ensuring transportation services operate smoothly. According to Okonkwo et al. (2019), the condition of road infrastructure plays a vital role in determining how efficiently and conveniently transport services can be accessed and utilized. Safety measures, both for passengers and vehicles are central to ensuring the well-being of passengers during their journeys. Competition and market dynamics in the transportation sector are also notable determinants of service delivery. The number of service providers, pricing strategies, and market competition can drive service

improvement and innovation, ultimately benefiting passengers (Ibe et al., 2021). Healthy competition motivates transport providers to improve service quality, a crucial element in ensuring effective intracity transportation services.

Conclusion and Recommendations

The Principal Component Analysis (PCA) has successfully disentangled the main factors of intracity passenger transport service delivery. Factors such as passenger demand, competition, safety and security, together with road network and infrastructure, fuel price, and vehicle condition have emerged as major contributors to the operational features of passenger transport services. This investigation has underlined the multi-dimensionality of elements impacting transport operations and their relevance in catering to the varied and dynamic urban populous. Simultaneously, the PCA has provided light on the essential elements determining the choice of intracity passenger transit. Components like as price, the cleanliness of cars, and comfortability have appeared as significant drivers affecting the preferences of commuters. These results suggest the relevance of service quality and price in influencing the choices of citizens in Ibadan. The multiple characteristics that regulate intracity passenger transport services in Ibadan and drivers, include passenger demand, competitiveness, safety, infrastructure, vehicle condition, and fuel price, all define the operational dynamics of this industry. This investigation has emphasized the complicated interaction of these parameters, stressing their vital significance in guaranteeing service quality and efficiency. As such, planners must analyze the subtle interactions between these drivers in creating effective measures to increase the performance of intracity passenger transport services in the city.

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