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DETERMINANTS OF TRAVEL BEHAVIOR IN TAXI TRANSPORT SYSTEM IN THE LAGOS METROPOLIS OF NIGERIA

Determinanty zachowań komunikacyjnych pasażerów na rynku korporacji taksówkowych w aglomeracji Lagos w Nigerii

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Abstract: Literatures have stressed the importance of mode choice preference in accurately predicting the future travel demand. Despite having diverse travel needs and challenges coupled with the proliferation of informal operation of car hire services in Lagos over the years, there is still a lack of knowledge and understanding of the intra-mode use behaviour of Lagos metropolitan residents of taxi services. This is necessary to address the numerous challenges posed by inadequate transport supply within the Lagos metropolis. Using the availability of the traditional taxi (Lagos yellow cabs), Uber, Bolt, this study examines the factors that drive a sustainable intra-modal competition through the mode choice behaviour of a diverse Lagos population with residents sampled from selected areas where all the three modes operate within the Lagos metropolis. A structured questionnaire form was administered randomly to 174 commuters to find out the reasons behind their preference and their perception of the service delivery of ride service hailing operators in comparison to the traditional taxi (Lagos yellow cabs). The study revealed that Uber had the highest preference (41.3%) followed by Bolt (36.8%) with yellow cabs recording only 6.9%. Service charge (cost) for taxi service was responsible for 74.1% of intra-modal preferences. The stepwise multiple regression results further revealed that easy access to Uber and Bolt (through the use of ride-sharing apps) and service charge had significant influence on passengers' intra-mode preference. The study suggests that government should step up action at reviving the 'yellow cabs' to boost access to taxi services within Lagos metropolis.

Keywords: intra-mode, preference, Yellow Cab, intra-city travel, Uber, Bolt

1. Background

The continuous sustainability of cities has largely depended on the transportation sector. Public transport improvements may increase economic productivity if they enable the growth and densification of cities, downtowns, or industrial clusters and thereby increase external agglomeration economies (Chatman, Noland, 2010). It has been argued that the potential agglomeration benefits are large; if so, understanding them better would be useful in making funding decisions about public transport improvements (Aiyegbajeje, Ajayi 2018; Chatman, Noland, 2010) opined that the movement of people from one point to the other within the Lagos metropolis has always been a major challenge. This is largely due to many reasons. Some of the reasons are: the incessant problems of inadequate cars and buses for transport purposes, heavy traffic congestions resulting in the loss of between ₦8 billion and ₦10 billion per day on Lagos roads and poor condition of available transport service facilities leading to gross inefficiency of this sector (Oyesiku, 2013; Filani, 2003). Also, economic, psychological and social factors affect customers' preferences in almost every decision about the consumption of goods and services. The travel market is a part of the service industry in which many factors are considered before decisions are made by customers (Erdoğan, Açikalin, 2015).

It was the objective of this study to explore why commuters that prefer to commute by taxi within Lagos often prefer to use Uber or Bolt for commuting. Specifically, the study aims to find out reasons why commuters prefer one mode over the other within a particular mode (taxi services – Uber, Bolt and the traditional/conventional Yellow cabs) among frequent and occasional users. Furthermore, the study hypothesized that taxi service charge, service quality, safety, comfort, availability, and vehicle condition influences the modal choice of taxi in Lagos. Finally, the findings of this research adds to the understanding of the intra-mode competition among taxi service providers within Lagos metropolis in view of improving the quality of taxi services for effective service provision to commuters.

Studies on mode choice as an application of consumer choice theory suggest that people choose among alternatives to maximize personal utility or net benefit to them. In road transport and other modes, there exist different sub-modes within each of the transport mode. Choices within any particular mode are based on several factors ranging from cost, convenience, safety, and speed, among others (Erdoğan, Açikalin, 2015). As argued by (Pan et al., 2017), passenger volume is positively associated with employment density and residents' commuting distance around station. Other variables identified by them are commercial activity centers and metro network accessibility. In Lagos, the vast majority of taxi transport services were provided by the informal sector, which includes 'yellow cabs', later joined by 'red cabs' and the newly emerging type: Uber. These privately-operated taxi transport services provided about 24% of the bulk of urban bus passenger transport in Lagos compared to 45% commercial buses, 29% Bus Rapid Transit (BRT) buses and 2% for others (Afolabi et al., 2017). The traditional Lagos 'yellow cabs' has been carrying on the business of taxi transportation in Lagos in all its aspects and other businesses incidental to it, including provision of contract cab services (Atoyebi et al., 2015). During its reign, the 'yellow cabs' monopolized the taxi service provision to travellers in Lagos metropolis until recently when Red-cab, Bolt and Uber broke into the business. This has changed the template because the monopoly enjoyed by the 'yellow cabs' is being threatened by the introduction of Uber and Bolt. They are ride-sharing apps for fast, reliable rides in minutes during the day or night (Silverstein, 2014; Wallsten, 2015). There is no need to park or wait for a taxi or bus. With Uber and Bolt, you simply tap the app to request a ride, and it is easy to pay with credit or cash in select cities. Whether you are going to the airport or across town, there is an Uber or Bolt for every occasion.

The metropolitan Lagos provided the basis for this study because of the large population size and being the most populous city in Nigeria (National Population Commission, 2006; National Bureau of Statistics, 2016). Also, because of the fact that Lagos has the highest number of taxi service operators in Nigeria couple with the availability of online car hiring services – Uber and Bolt (formerly Taxify). Other reasons include the diverse economic activities, availability of good road network and being one of the few cities in Nigeria providing taxi services through ride-sharing app. In addition, Lagos possesses the highest number of intra-city commuters in Nigeria, which is put at about six million passengers moving within the metropolis [particularly the Mainland areas and Lagos Island areas (Fig. 1) on a daily basis in about 75,000 unregulated mini-buses and taxis (Olokesusi et al., 2017)].

Several studies such as (Rayle et al., 2016; Cramer, Krueger, 2016; Russell et al., 2017; Venkatesh, 2017) have emphasized the great improvements that ride-sharing app have brought to urban transit system. Therefore, with the introduction of Uber and Bolt into the intra-city taxi services within the Lagos metropolis, there is a need to ascertain the determinants of intra-modal preference or choice within taxi ser-

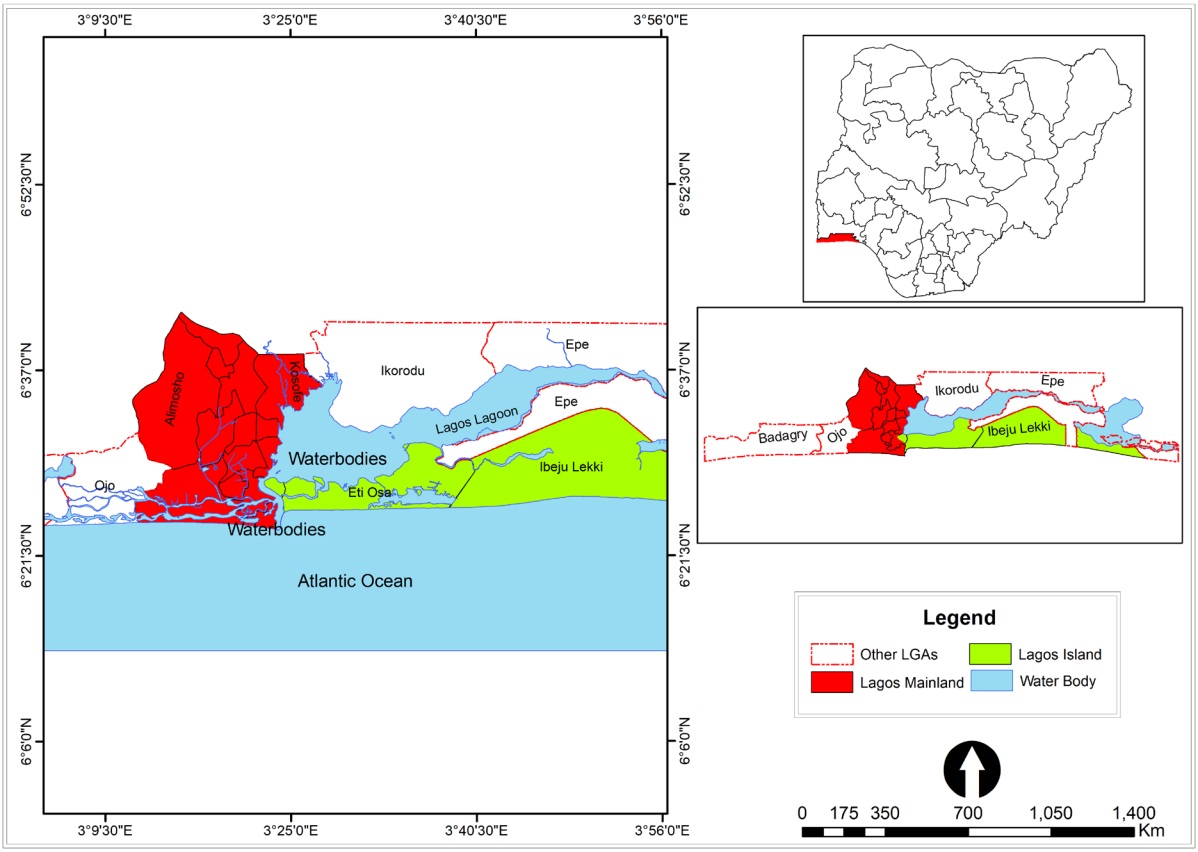

Fig. 1: Lagos, Nigeria.

Source: own elaboration.

vice providers in Lagos metropolis. However, this has remained a puzzle as there is a paucity of data on intra-modal preference of taxis in Lagos metropolis, especially with the newly introduced operators (Uber and Bolt). Also, the need to address the numerous challenges posed by inadequate transport supply within Lagos metropolis is compelling.

2. Related Literature

Taxis accounted for a smaller share of urban transit and are not extensively studied like other transport modes. As argued by G. Venkatesh (2017), taxis serve several markets, older residents, higher-income groups, and lower-income households without a car. But despite their smaller share of passenger movement within urban areas, they still fill a critical gap by complementing and substituting for public transit (Austin, Zegras, 2012; King et al., 2012). According to (Wohl, 1975; Cervero, 1997; Enoch et al., 2004; Santi et al., 2014), shared taxis can potentially bring benefits, including increased efficiency, lower costs for passengers, and reduced congestion and overall vehicle travel.

In a working paper by (Cramer, Krueger, 2016), they argued that Uber utilizes a more efficient driver-passenger matching technology based on mobile internet technology and smart phones than do taxis, thereby achieve a significantly higher capacity utilization rates than taxi drivers. The use of on-demand transport mode (ride-sharing) has been able to resolve many problems for both commuters and operators. These problems relate to operators looking for where to park, and or scouting for passengers. Other problems may include passengers and operators arguing endlessly on service charges and or passengers finding it difficult to locate taxi parks. The main reason for these problems is because Taxi service in Lagos metropolis is not fully regulated (Gilbert, Samuels, 1982; Dempsey, 1996). As submitted by C. Winston (2013) that a significant portion of traffic in some cities, such as San Francisco and Los Angeles, is attributable to drivers of ride-sharing taxis searching for parking and this corroborates what is obtainable in Lagos metropolis at the moment. C. Winston, (2013) concluded that people who use ride-sharing instead of driving no longer need to search for these spaces, which could reduce congestion. He further stated that there may be a reduction in congestion costs associated with taxis finding customers (to the extent that ride-sharing substitutes for traditional taxi services).

Another interesting aspect of ride-sharing operators as noted by D. White (2016) is surge pricing. This pricing is used to balance supply and demand during peak periods or periods in which the supply of drivers is too low. In Lagos metropolis, surge pricing exists even among the traditional taxis as is the case with ride-sharing operators. Surge pricing among the ride-sharing operators is well regulated compared to the traditional taxis, where it is unregulated. For instance, in Lagos metropolis and most other cities in Nigeria, taxi operators charge exorbitantly during heavy traffic congestion, heavy rain and or during odd hours of the day. According to (Hall et al., 2015), they suggested in their study that surge pricing is helpful in keeping expected passenger's waiting-time to within five minutes and may also provide significant economic benefits for drivers. In addition, the recent rise of ride-sharing as an alternative intra-city transportation mode has cast the regulation in taxicab markets back into question (Çetin, Deakin, 2019). As further argued, in over 60 countries, services such as Uber and Lyft have begun operations offering mobile apps which allow members with smartphones to submit a trip request, which is routed to member-drivers, who then provide rides using their own cars.

Since 2010, ride sharing has expanded and gained significant market share throughout the world (Çetin, 2015). As of September 2015, Uber performs in 60 countries and 300 cities (Çetin, 2015). Today, Uber is in use in 507 cities throughout the world (Rogers, 2015). It has an estimated market value of over $68 billion (Rayle et al., 2016). In the case of many cities, ride sharing started to be substitute for the traditional taxicab services in the intra-city public transportation. One recent report found that ride sharing met an average 46% of all total paid car rides through Uber in the major US cities in the first quarter of 2015 (Çetin, Oğuz, 2010) because ride sharing is cheaper than a cab trip (Çetin, Deakin, 2019).

3. Research methods and materials

This study measured level of service based on variables which include reliability, frequency, accessibility and travelling time. Others include ease of transfer, price, vehicle condition, safety, comfort and aesthetics. These 10 variables were broken down to cover a total of 18 indicators on which taxis level of service was measured. On a Likert scale of excellent to poor, commuters assessed the different types of taxi services (Yellow cabs, Uber, and Bolt) based on how they perceived them. This assessment was done by two categories of commuters: frequent-users and occasional-users. The Lagos yellow cabs have an unrecorded number of parks with at least 5 in each local government area (LGA) within the metropolis of 16 LGAs where some of the journeys start. A few yellow cabs move around the metropolis though to seek prospective riders rather than wait for riders at these designated parks. But the online car hire service providers (Uber, Bolt) use mobile apps to initiate their journey requests. Data was collected at some selected LGAs of the metropolis which have been revealed to control passenger traffic based on their population size and availability of different human activities. The study targeted commuters aged 18 to 65 who are within the working age of the population. Commuters at the selected LGAs were randomly approached and asked a screening question: "How often do you use taxis?" The respondents were structured into two: users of the ride-sharing apps (Uber and Bolt) and non-users of the apps. The frequency of its usage led to a further categorization – frequent-users and occasional-users. The frequencies of the usage are defined based on the number of days in a week that the app was used. For example, respondents who used the app for 1 to 6 days a week are frequent users while those that used the app once or twice within a month or as and when the occasion arose are classified as occasional-users. Non-users, on the other hand, are considered as categories of commuters who have never used the ride-sharing apps (Uber and Bolt). The self-administered methods were used in collecting the data. A total of 200 respondents were interviewed, resulting in 174 completed questionnaires and a response rate of 87%. The yellow cab operators, officials from the National Union of Road Transport Workers (NURTW), cab operators from Uber, Bolt and Red cab with in-depth knowledge on their respective operations and service delivery were purposively sampled to acquire detailed information on the service delivery of their operations.

A structured questionnaire was used to collect revealed primary data from commuters and taxi operators. The structured questionnaire was pretested to avoid ambiguity and to ensure that the content was understood by respondents before the actual survey was conducted. Concepts used in this study are based on reviewed literature from academic articles, journals, and books. Academic articles and reports are referenced in the data analysis in order to validate the results and findings from field studies.

Simple statistical frequency analysis was used in this study to evaluate service levels/quality. This is because of the main aim of the study, which is to explore the reasons behind the preferences of commuters within the available car hire services for intra-city travel in Lagos metropolis. Data was edited, coded and captured using Statistical Package for Social Sciences (SPSS) version 20. It was then interpreted using fre-

quency tables, custom tables and cross tabulations, where appropriate. Charts and graphs were also generated using excel spread sheets. This method gives an overview of the situation as perceived by participants. With the help of SPSS, open-ended responses of respondents were collated and interpreted.

4. Results

Information on gender, age, educational and employment status, monthly incomes and purpose of travel were obtained from all respondents (Tab. 1). In all, 174 commuters were sampled for interview. These comprised of 114 occasional- and 34 frequent-users and 26 non-users. As shown in table 1, there is a sharp contrast between males and females each constituting 47.1% and 52.9% of the samples. The same scenario played out at the sub-group level. Respondents between the ages of 18 and 51 years were interviewed. The minimum and maximum ages for non-users are 18 and 48 years. Occasional users range from 20 to 51 years. The minimum age among frequent users is 25 while the maximum age is 50. The table further shows that 100% of the respondents are literate. A total of 70 out of 114 (61.4%) of occasional users are graduates while 22 out of the 34 (65%) frequent-user respondents have tertiary degrees. Analyses of the employment status of respondents showed that respondents are categorized as students, employed (self-employed, private and public workers) and unemployed. Among these categories, 19.5% are frequent users and 65.5% are occasional-users. This suggests that people of diverse background patronize the taxi services (Uber, Bolt and yellow taxi). Those in the income bracket of ₦100,000 ($278.5) and ₦200,000 ($557.1) comprise of 50 (43.9%) occasional-

Tab. 1. Socio-demographic profile of respondents.

GENDER	Non-users	Occasional-users	Frequent-users	Total
Male	14 (53.8%)	56 (49.1%)	12 (35.3%)	**82 (47.1%)**
Female	12 (46.2%)	58 (50.9%)	22 (64.7%)	**92 (52.9%)**
Total	**26 (14.9%)**	**114 (65.5%)**	**34 (19.5%)**	**174 (100%)**
AGE of RESPONDENTS				
18-27	10 (38.5%)	37 (32.5%)	20 (58.8%)	67
28-37	6 (23.1%)	61 (53.5%)	8 (23.5%)	75
38-47	6 (23.1%)	14 (12.3%)	4 (11.8%)	24
48-57	4 (15.3%)	2 (1.7%)	2 (5.9%)	8
Total	**26 (14.9%)**	**114 (65.5%)**	**34 (19.5%)**	**174 (100%)**
EDUCATIONAL STATUS				
Undergraduate	4 (15.4%)	44 (38.6%)	12 (35.5%)	**60 (34.5%)**
Bachelor's degree holders	14 (53.8%)	40 (35.1%)	12 (35.5%)	**66 (37.9%)**
Master's degree holders	6 (23.1%)	26 (22.8%)	10 (29.4%)	**42 (24.1%)**
PhD holders	2 (7.7%)	4 (3.5%)	0 (0%)	**6 (3.4%)**
Total	**26 (14.9%)**	**114 (65.5%)**	**34 (19.5%)**	**174 (100%)**
EMPLOYMENT STATUS				
Employed	22 (84.6%)	78 (68.4%)	20 (58.8%)	120 (68.9%)
Unemployed	2 (7.7%)	12 (10.5%)	8 (23.5%)	22 (12.6%)
Student	2 (7.7%)	24 (21.1%)	6 (17.7%)	32 (18.4%)
Total	**26 (14.9%)**	**114 (65.5%)**	**34 (19.5%)**	**174 (100%)**
INCOME STATUS				
₦10,000 - ₦99,000	10 (34.5%)	24 (20.1%)	12 (35.3%)	46
₦100,000 - ₦199,000	16 (47.1%)	50 (43.9%)	10 (29.4%)	76
₦200,000 - ₦299,000	0 (0%)	2 (1.8%)	12 (35.3%)	14
₦300,000 - ₦399,000	0 (0%)	14 (12.2%)	0 (0%)	14
₦400,000 - ₦499,000	0 (0%)	15 (13.2%)	0 (0%)	15
₦500,000 - ₦599,000	0 (0%)	4 (3.5%)	0 (0%)	4
Above ₦600,000	0 (0%)	5 (4.3)	0 (0%)	5
Total	**26 (14.9%)**	**114 (65.5%)**	**34 (19.5%)**	**174 (100%)**
Note: '₦' refers to Naira (the currency of Nigeria)				

Source: own elaboration.

Tab. 2. Mode Preferences of respondents.

Mode Type	Frequency	Percentage
Uber	72	41.3
Bolt	64	36.8
Lagos yellow cab	38	21.8
Total	174	100

Source: own elaboration.

users and 10 (29.4%) frequent-users and they represent 43.7% of the total respondents. Few of those in the higher income category of above ₦300,000 ($835.6) are occasional users. The Naira sign (₦) refers to the Nigeria's currency. In table 2, it was revealed that a total of 72 (41.3%) of the commuters prefer the services of Uber. This is closely followed by Bolt with 64 (36.8%). A total of 38 (21.8%) commuters indicate their preference for the traditional Lagos yellow taxi services.

The relative importance of quality attributes in affecting public transport demand is to a large extent dependent on user demographics, personal situations and previous experiences with public transport services (Redman et al., 2013). As shown earlier in table 2, Uber and Bolt were the most preferred mode of taxi service. This observation was based on some reasons that were revealed in this section. Respondents were questioned as to their preferences for taxi usage. The main responses acquired from users centered on service charge (cost), convenience, easy access to Uber and Bolt, safety, travelling-time (speed), reliability, distance, and aesthetics. Among other reasons are physical appearance of the car, comfort, noise level, mechanical condition, safety, cleanliness and driver handling (Tab. 3).

5. Findings

The test results from a step-wise multiple regression (Tab. 4), indicated that service charge (cost), safety, easy access to Uber and Bolt through the use of ride-sharing applications (apps), service quality, and car condition (physical appearance and mechanical condition) influence the intra-modal preference for taxi in Lagos. The results revealed that easy access to

Tab. 3. Basis for the preference for Uber/Bolt over Yellow Cabs.

Variables	Percent
Reliability	49.4
Accessibility	83.9
Service charge (cost)	96.6
Travelling time	26.4
Distance	43.1
Easy access to Uber and Bolt (through the use of apps)	86.2
Car Condition (physical appearance and mechanical condition)	83.9
Comfort	78.2
Noise level	69.5
Mechanical condition	68.9
Safety	85.1
Aesthetic	85.1
Cleanliness	73.6
Driver handling	81.6

Source: own elaboration.

Tab. 4. Stepwise multiple regression results of the intra-modal preference.

Predictor variables	b coef.	Std. Error of b	Multiple R	Level of explanation	Increase in level of explanation	t-value for variables
Easy access to Uber and Bolt (through the use of apps)	0.989	0.015	0.861	86.1	86.1	46.847*
Service charge (cost)	0.098	0.023	0.128	1.6	72.5	3.434*
Intercept: 0.022; F = 29789.616*						

Source: own elaboration.

Uber and Bolt was identified as the principal predictor variable that best explained the passenger's mode preference as indicated in table 4. This is corroborated by the argument of (Cramer, Krueger, 2016). Thus, service charge (cost) was responsible for 86.1% of intra-modal preference. The result further revealed that service charge and easy access to Uber and Bolt (through the use of apps) have significant influence on passengers' intra-modal preference for Uber and Bolt ($F = 29789.616$, $p<0.05$). The signs of the regression coefficients indicated that service charge and easy access to Uber and Bolt (through the use of ride-sharing apps) were positively related to intra-mode preference for taxi service. There was however no significant difference among respondents on how safety, service quality and car condition (physical appearance and mechanical condition) predicts intra-modal preference for taxi service. In other words, they all contributed equally to respondents' intra-modal preference.

However, considering the standardized regression coefficients of the predictors, service charge received the strongest weight in the model followed by easy access to Uber and Bolt (through the use of ride-sharing apps). The t-value results indicated that among the seven set of predictor variables, service charge exerted significant effect on intra-modal preference. From the analysis, it could be adjudged that service charge is the foremost factor that prescribes the use of ride-sharing app among taxi users. This is apparent as this factor has strong weights in the model because service charge is very important to most commuters. This corroborates the findings of a study by (Silverstein, 2014) that ride-sharing is cheaper than the conventional taxi in the 21 largest cities in the US. This is because commuters who patronize Uber or Bolt enjoy transparent fare services that are very affordable unlike the exorbitant charges by the yellow cab operators. Also, Uber and Bolt services are easily accessed through the use of ride-sharing applications (apps). Uber and Bolt enjoy much acceptability because commuters get their charges even before approving the ride. This makes it more comfortable and convenient as it gives no room for cheating. The equation for estimating intra-modal preference for taxi is of the form:

$$Y = 0.022 + 0.989EAA + 0.098SC$$

where: Y – is the predicted use of ride-sharing APP among taxi users, EAA – Easy Access to ride-sharing App, SC – Service Charge

6. Recommendations and conclusion

Results of the study revealed that Uber had the highest preference (41.3%) followed by Bolt (36.8%), with yellow taxis recording only 6.9%. Service charge (cost), easy access to Uber and Bolt (through the use of apps), safety, service quality and car condition (physical appearance and mechanical condition) accounted for the major reasons for intra-modal preference. These findings fall in line with (Çetin, Deakin, 2019) that reliability is a key quality attribute in addition to attributes such as frequency, fare prices, and speed of public transport service, which can attract car users. In addition, as revealed in this study that price may not be the primary reason consumers use the service, the study of (Salnikov et al., 2015) also found that consumers also value other aspects of the service, such as frictionless payments or nicer cars in New York City. Furthermore, (Beirão, Cabral, 2007) also confirmed that with unreliability of a mode of transport, low frequency or lack of comfort, people are likely to shift to other mode.

Since the advent of Uber/Bolt, the patronage enjoyed by yellow taxis (yellow cabs) has greatly declined. It is therefore necessary now more than ever for the 'yellow taxi' operator to improve on its services, particularly in the area of its service charge regimes, easy access, safety, service quality, car condition (physical appearance and mechanical condition) and most importantly attitude towards passengers. Subsequently, quality of service should be improved to make the yellow cabs more attractive to commuters. Furthermore, since commuters prefer unhindered and immediate access to taxi services, yellow

cab operators must find a way to increase access to their services. Lastly, yellow taxi operators should improve on the operating standard of their vehicles so as to attract increased number of commuters. All these can be achieved if the yellow cab operators stop unrealistic service charges because pricing is fundamental to the operation of public transport. It will increase the level of accessibility and livability of the Lagos metropolis and in no little way improves the economic condition of the residents. The study suggests that government should step up action at reviving the 'yellow cabs' to boost access to taxi services within Lagos metropolis, thereby enhancing government's effort at improving transport supply within the Lagos metropolis.

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