



Article citation info: Nwaogbe, O. R. - Pius, A. - Dashe, F. N., Assessing the inter-city road transport quality of service from the travellers' viewpoint: A case study of Kaduna Metropolis. *Transport & Logistics: the International Journal*, 2017; Volume 17, Issue 43, September 2017, ISSN 2406-1069

## **ASSESSING THE INTER-CITY ROAD TRANSPORT QUALITY OF SERVICE FROM THE TRAVELERS' VIEWPOINT: A CASE STUDY OF KADUNA METROPOLIS**

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### ***Abstract:***

*The study assesses inter-city road transport performance and quality of service offered by the Kaduna State Transport Authority (KSTA) from the commuter viewpoint. A combination of secondary and primary data was sourced from the KSTA office, including a self-administered questionnaire through random and cluster sampling methods used across the terminals. A total of fifty-seven (57) commuters were sampled at bus terminals in the city, over two weeks period. For data analysis, Statistical Package for Social Science (SPSS), Time- Series Analysis, Spearman and Partial Correlation based on the 2-tailed were used in testing specified hypothesis and measuring commuter perception. The result shows that there is a significance relationship between the quality of services rendered and commuters' satisfaction at ( $p = 0.729 **$ ), with the passenger satisfaction level at (72.9%). Hence, a uniform ticketing and booking system for fares should be introduced, preferably ticketing machines across major and sub terminals, for standardisation and fair pricing policy. The introduction of e-commerce across the network, will reduce the possibility of passenger exploitation by the unscrupulous employees. Therefore, using Artificial Intelligence System (AIS) such as the E-fleet management system for effective monitoring and tracking of staffs' activities will improve on board and terminal quality of service, for a better user experience, which guarantee repeat patronage and loyalty.*

### ***Keywords:***

*Mass transit, Performance, Quality of service and Commuter perception.*

## **INTRODUCTION**

Urban mass-transit system is one of the most efficient mediums of transporting people from point A to B, especially in the highly populated urban centres, and it is cost effective and accessible. Urban road network plays a vital role in the productivity capacity of cities and nations' socio-economic development [7]. It is regarded in many quarters as the life wire and arteries that drive nation's economic growth and urban development, in terms of job creation and poverty alleviation within and around the city. Many authors [1, 2, 3] argues that mass transit is the cornerstone of commercial activities and human capital development of a nation. Therefore, an efficient urban transport network is indispensable element in a dynamic society. Without one, many towns and cities would be severely limited in physical and economic advancement, needed for the resident well-being [12]. Urban transportation development and the land use are inter-reliant, consequently, it is imperative that these constants are considered carefully for long-term purposes and the benefits that normally associated with the development of critical national asset, especially in the emergent nations where these infrastructures are limited. Previous studies [5, 3, 1] confirm that there is a relationship between these constants. They argued that transportation route is part of distinct development pattern or road network and mostly described by regular street patterns as an indispensable factor of human existence, development, and civilization [13]. As noted by [10,11] it is the duty of service provider in the sector to plan and design profitable road networks and support with robust strategy for effective service delivery that meet service user need and expectation, to encourage repeat patronages and a better service user experience. [8] argues that the practice of service of providers in Nigeria neglecting or not recognising punctuality, customer service and road congestion as major challenges, the bad road's network hindered the effective delivery of urban transport services and operations [15].

This paper assesses operational performance of KSTA. In a view to suggest possible areas of improvement. While, the study objective evaluates the quality of service and customer satisfaction. Thus, the sector has not received adequate attention from the transport management scholars, most especially in the developing countries, where service providers are focusing inward (organisation), instead of outward (passenger oriented) to meet their needs and expectations. Incidentally, previous studies have focused on the established mass transportation networks, as a result limited attention is given to the quality of service and performance at the Kaduna State Transport Authority (K.S.T.A), where this research focuses. Kaduna municipal transport network, was chosen based on the city immense commercial contributions to the nation's transport network and the concentration of mass transit companies in the state.

## **1 URBAN TRANSPORT MODEL REVIEW**

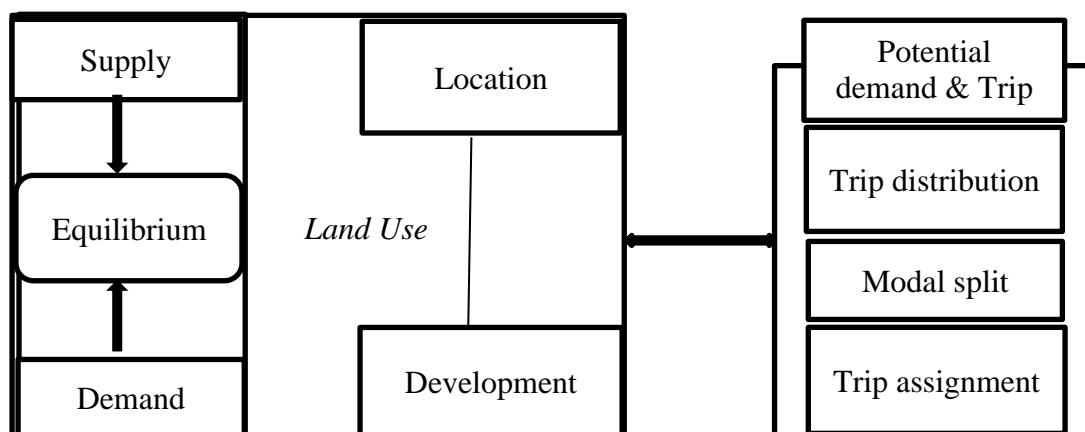
Urban transport network is the spine of economic, cultural, social, and industrial development of any country, besides, the two-dimensional roles of creating jobs and space utilities [3,]. [8] argues that transport is the life wire of modern urbanization. It is one of the several factors, which determines and contributes to the socio-economic development of as a city [13]. The mobility and accessibility provided by the public transport system are key drivers of nations' gross domestic product (GDP). The urban transport system is under mounting pressure from the ever-growing passenger's demands, with weak infrastructure and limited road network capacity[13]. The increase in city dweller's population and urbanization has contributed immensely to the road congestion and dependence on the road transport [4]. [8] studied the operational performance of urban mass transport in Nigeria focusing on the Abuja network. The research uses efficiency indicators to evaluate the overall capability of the public transport network. It is observed that the current efficiency of the organized bus transit operators

in the Abuja was below standard. There are service deficiencies in the areas of passengers' volume, vehicle kilometres and revenue generation, thus the system is overstretched and underfunded, and has impacted on the service quality negatively. [9] assessed the quality of service in Abuja urban mass transit system, focusing upon the problem of equitable bus service distribution across Abuja metropolis. The study finding confirm that there is a significant relationship between the quality of service such as reliability, comfortability, and affordability of service. Theoretical Framework

### 1.1 Theoretical Framework

The paper adopts Trip Generation (TG) as the framework for this analysis: the TG is the first step in the conventional four-step transportation forecasting process widely used for forecasting travel demands followed by (destination choice, mode choice, and route choice). It predicts the number of trips originated from or destined to, for a specific traffic analysis zone, as every trip has two ends (origin zone and destines zone). As noted by [1, 6] land use is divided into two broad categories – the residential and non-residential land uses. For residential land use, trip generation is a function of social and economic attributes of the households, which are often measured as shelter variables. The households produce trips, even when they are returning homes; that is, when the household is in destination [4]. The trip generation models and trip production models estimate the number of home-based trips to and from zones where trip makers reside; while trip attraction models estimate the number of home-based trips to, and from each zone at the non-home end to the trip [4]. The Trip Distribution (TM): Known as destination choice or zonal interchange analysis, before mode choice and route assignment, in the traditional four-step transportation forecasting model. The trip distribution stage takes actual trips from the trip generation model and matches them with trips attracted to the destination zones [4].

In this case, the TM motivates the distribution of predicted trips for origin zones to destinations. Often the distribution mechanism employed is the gravity model. Here, the number of trips made between an origin and destination is governed to be proportional to some measure of the destination zones 'mass' (e.g. the volume of activity opportunities there) and inversely proportional to some measure of travel impedance. The Modal Split(MS): It is concerned with estimating what proportions of trips are made by each defined mode of travel from an origin to a destination zone. In statistical terms, it is expressed as a multinomial logit model. It represents mode choice as a function of the disutility or cost of using one mode of travel (i.e. private automobile) over another mean of transport, for instance, public transit [4]. The illustration below is the (Plate II): The general structure of a land-use–transportation model:



**Fig. 1 Transport model.**

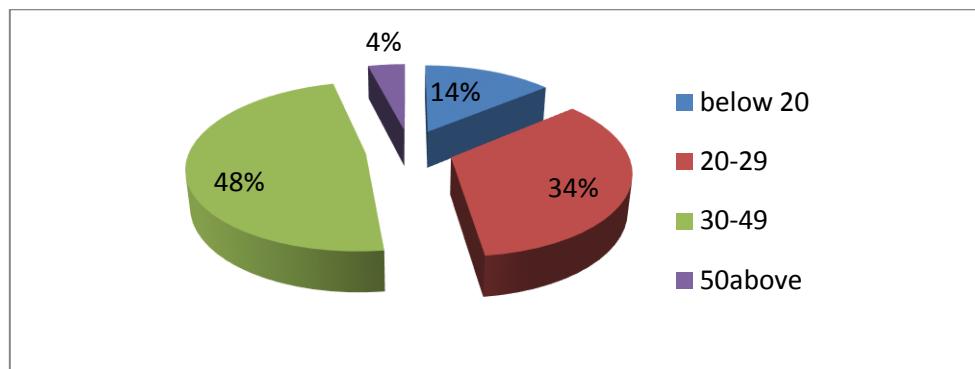
Sources: [4].

## 2 DATA ANALYSIS AND PRESENTATION

Data analysis was carried out using Statistical Package for Social Science (SPSS), including Time- Series Analysis and Spearman Correlation. These were used to describe the demographic section and the commuter's perception on the operational performance of K.S.T.A. The variables listed on the questionnaire were: Capacity- maximum number of passengers. Comfortability - the level of passenger comfort. Fare structure - the rate charged for a trip. Reliability - the extent to which passengers can trust the service provider. Safety/security - view on incidents and/or accident's rates. Speed-fastness of the system. Travel time - time spent in traveling. Waiting time-time spent by passengers on the terminals. The questionnaire was self-administered to the passengers at the terminals, data gathered was analysed and presented as follows.

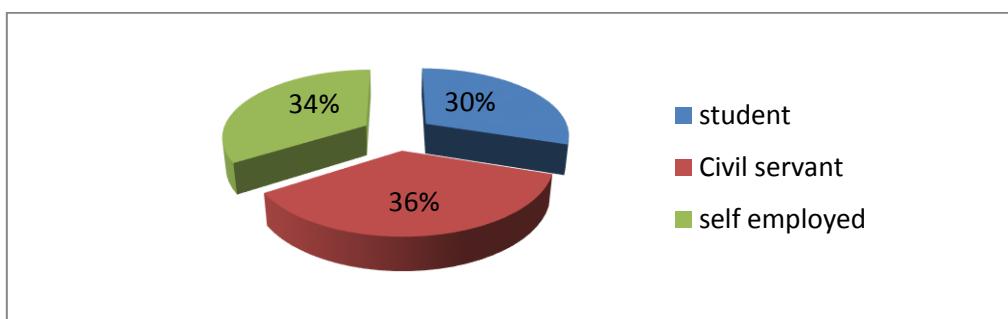
### 2.1 Socio-Economic Characteristics of Respondents

The age distribution of bus passengers determines the level of patronage of bus services within the metropolis. The ages of the respondents sampled were between below 20 and 50 years above.



**Fig. 2 Age distribution of respondent**  
Source:Authors

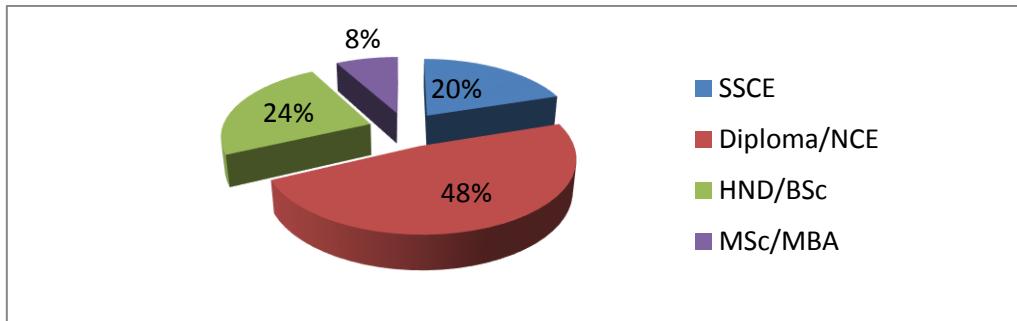
The above figure shows that the largest percent of the respondents falls between the age distribution of 30 – 49 years, with 48% and 4% of the respondents were within the age of 50 years and above. Clearly, K.S.T.A service is not suitable for the disable people, since there are no provisions for them. The figure below presents respondents' breakdown of professions.



**Fig.3 Respondent's occupations.**  
Source:Authors

Employed, business and student passengers need to get to their schools and places of work on the daily basis, as some have no alternative to the public mass transit. The above 'fig'

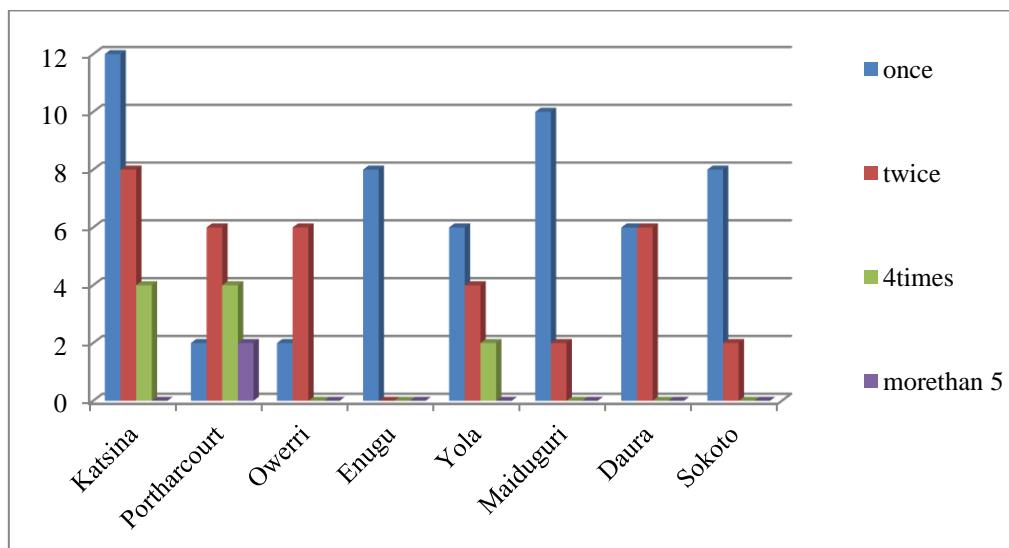
shows that 36% of the respondents were civil servants, which constitute the largest portion, 34% are self-employed, while, 30% of the respondents were students. Based on the information gathered civil servants and self-employed are the two major groups. The next figure presents respondents' qualifications breakdown.



**Fig.4** Respondent educational qualification.

Source:Authors

The above figure shows that those with Diploma/NCE was 48%, while those HND/BSc was 24%; respondent with MSc/MBA was 8% and SSCE was 20% the lowest. The largest group of respondents was those with Diploma/NCE. The table below presents cross tabulation of destination and number of travel.



**Fig.5** Cross tabulation of destination and number of travel.

Source:Authors

The above figure shows the current route network deficiencies of K.S.T.A are Enugu, Owerri, Maiduguri, Daura and Sokoto which have the lowest frequency on the number of times traveled by the customers, as a result of insecurity and bad roads on that axis. The chart shows the trend of K.S.T.A bus dispatches and passenger volume.

## 2.2 Performance and Quality of Service Assessment

The use of public transport is measured by comparing the annual number of passengers carried, with the number of service kilometres. Service kilometres are kilometres operated on scheduled passenger services and exclude "non-productive running" i.e. traveling to or from

the terminal to commence a service trip or re-positioning to commence another service trip. The next table presents Ten Years KSTA Trips Generated (TG) and Service Kilometre(KM).

**Tab.1** Ten years KSTA trips generated (TG) and service kilometre(KM).

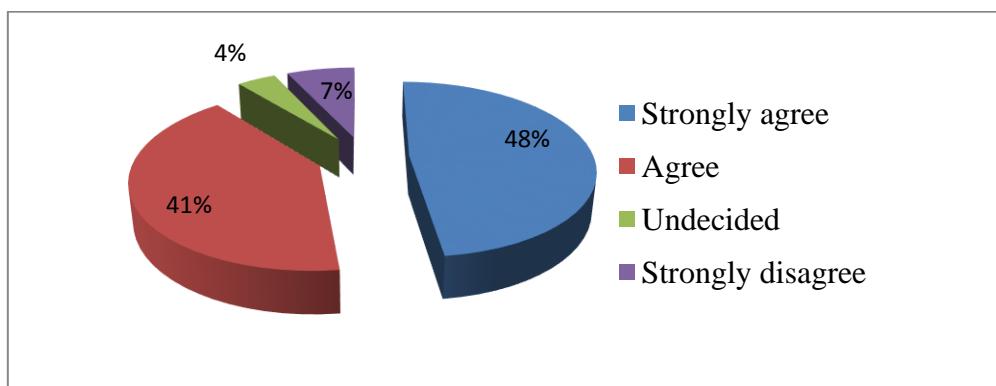
Years	Trips Generated (TG)	kilometer (KM)
2005	6,040	1,513,020
2006	6700	1,678,350
2007	7300	1,828,650
2008	7390	1,851,195
2009	8064	2,020,032
2010	8700	2,179,350
2011	8739	2,189,120
2012	7392	1,851,696
2013	7090	1,776,045
2014	7300	1,828,650
2015	7600	1,903,800

Source: [14]

The numbers above indicate the extent to which services provided, as represented by the number of kilometres operated, are being utilized. An increasing trend in the indicator will generally signify that patronage is growing at a rate greater than the rate of the rise in service kilometres operated and represents an improvement in effectiveness as well as an increase in the use of public transport.

### 2.3 Travel Efficiency

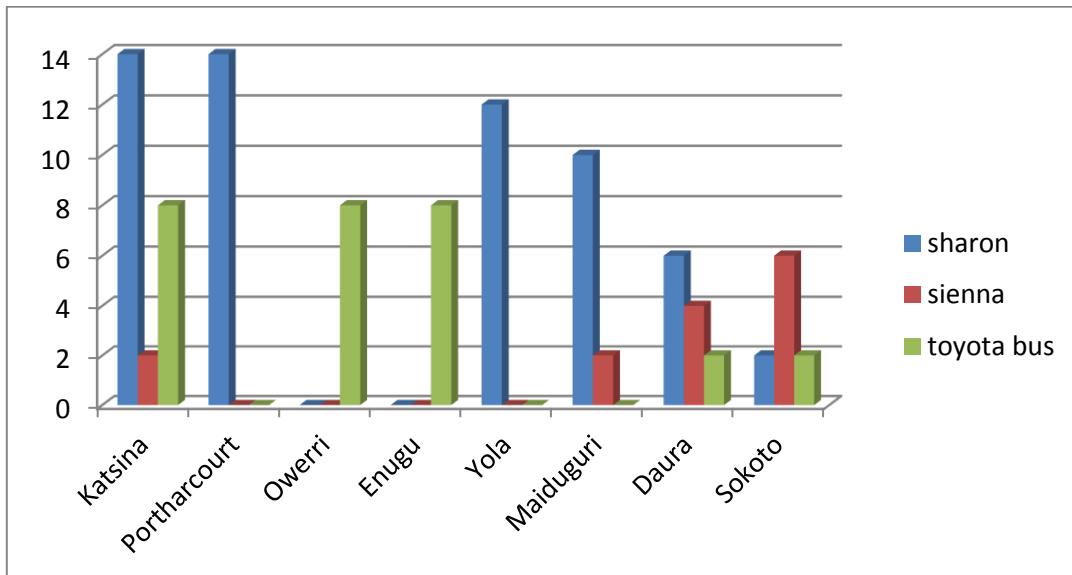
There are more than one reason why people use public transport, it is a combination of factors. For instance, affordability and accessibility often mentioned as the reasons why people use public transport. Three main factors govern travel efficiency, includes reliability, effectiveness of operation and service coverage. Service reliability is regarded as one of the most significant characteristics of service quality. Service reliability is essentially a combination of two main factors, punctuality, and consistency. Services are punctual if they arrive within a defined period stated. This was measured on a 5-point likert scale ranging from strongly agree - strongly disagree on customers' perspective on the services rendered by the K.S.T.A.



**Fig.6** Service rendered by K.S.T.A.

Source:Authors

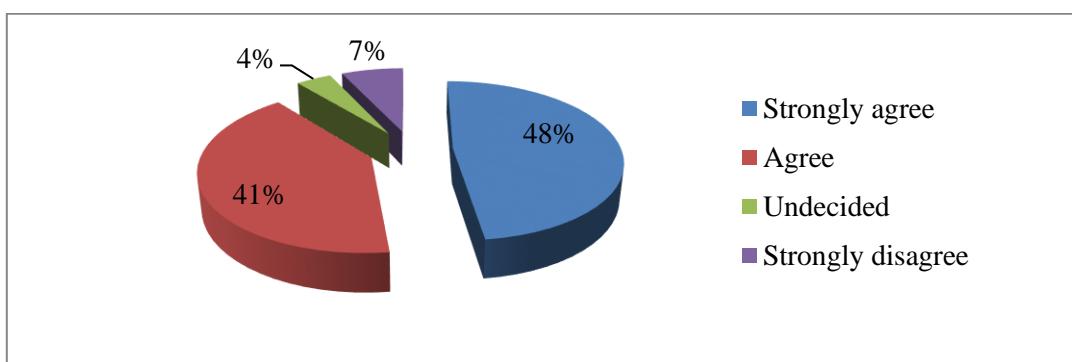
The above figure represents about 89% of the respondent agrees that the services rendered by K.S.T.A public bus services were reliable and comfortable. The proportion of respondents who expressed overall satisfaction for the services received was high, this reflects and measures public perception of KSTA performance, while providing quality and attractive services. This graph below considers the efficiency of energy use for the overall transport system.



**Fig.7** Cross tabulation of destination and vehicle type.

Source:Authors

The above figure shows the type of vehicle most preferred by the customers to make their journeys with, in all the available destinations, Sharon's buses are rated high, because of convenience, comfortability, and punctuality. By understanding the overall energy use for the traveling public, one can get an understanding of not only the energy use per trips made, but also an indication of the CO<sub>2</sub> emission. Estimation models gave reasonable indication of CO<sub>2</sub> emission level based on fuel consumption level.



**Fig.8** Affordability of service.

Source:Authors

The above figure shows the larger proportion of patrons expressed their satisfactions on fares paid and how affordable it is. Hence, it is observed that KSTA offers an affordable price charge to their patrons. Affordability is one of the primary drivers of public transport patronage.

### 3 FINDINGS DISCUSSION

Correlations estimate the strength of the linear relationship between two (and only two) variables. Correlation coefficient ranges from -1.0 (a perfect negative correlation) to 1.0 (a perfect positive correlation). The closer correlation coefficients get to -1.0 or 1.0, the stronger the correlation. The closer a correlation coefficient gets to zero, the weaker the correlation is between the two variables. A correlation coefficient of 0 indicates that no relationship between the variables. However, correlations are limited to linear relationship between variables. Even if the correlation coefficient is zero a non-linear relationship might exist.

$H_0$  There is no statistical relationship between the quality of service of KSTA and the level of customer satisfaction. A correlation matrix is given below. The variables are: "The services rendered by KSTA to customers." All measures were recorded on five-point Likert scales anchored by strongly disagree = 1, while strongly agree = 5.

**Tab.2 Spearman Correlation Analysis**

		The service rendered by KSTA
		Correlation Coefficient
The service rendered by KSTA		Sig. (2-tailed)
Spearman's rho	N	57
	Customer Perception	0.729**
	N	.000

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

Source:Authors

The study analysed the question whether the quality of service of K.S.T.A, and the level of service rendered to the customers are somewhat linked or interdependent. From table, 4.4.1 Spearman's correlation coefficient indicates an association between these two variables as ( $p=0.729$  \*\*. Correlation is significant at the 0.01, level 2-tailed). This shows that the services rendered by KSTA in relation to customer satisfaction have about 72.9% relationship. There is a partial strong relationship between the services rendered and customer satisfaction. The test of significance indicates that with  $p < 0.001$ , we can reject the null hypothesis that both variables are not independent in the general population. A confidence of more than 95%, observed positive correlation between the quality of service of K.S.T.A, and the level of customers' satisfaction is not caused by random effects, and both variables are interdependent [9].

**Tab. 3 Partial Correlation Analysis**

Control variables base on customer perception	The service rendered by KSTA
Vehicles are overloaded, vehicles are poorly maintained and overstretched, long waiting time for boarding. Vehicles numbers are insufficient.	1
Fare/booking system are tedious and unreliable.	Significance (2tailed)
	Df
	Correlation
	Significance (2tailed)
	Df
	56

Source:Authors

The table shows the partial correlation coefficient between the quality of service of K.S.T.A and customer satisfaction when controlled by service delivery variables. The partial coefficient is now 0.614, about 61.4% correlation significance or interdependency in relationship between the quality of service of KSTA and customer satisfaction.

### 3.1 Decision rule

There is a positive correlation and both p values were less than 0.05 ( $p<0.05$ ), with 95% confidence level, the result allow the null hypothesis to be rejected.  $H_0$  There is no statistical relationship between the quality of service at the KSTA and the level of customer satisfaction. The result shows that the quality of service of KSTA is interdependent with the level of customer satisfaction. Although, it shows a positive relationship, which implies that as the quality of service improves, so the level of customer satisfaction.

## 4 CONCLUSION AND RECOMMENDATIONS

A quantitative analysis was used in measuring the operational performance and passenger perception of urban mass transit (KSTA). In the empirical study, partial correlation analyses reveal that vehicles are overloaded, long waiting time, limited number of vehicles, poorly maintained, overstretched, the ticket booking system is tedious and unreliable. While, the Spearman's correlation coefficient indicates that there is a link between these two variables as ( $p= 0.729 **$ ). This shows that the services rendered by KSTA in relation to customer satisfaction have about (72.9%) relationship. There is a partial strong relationship between the services rendered and customer perception. Thus, confidence of more than (95%) observed positive correlation between the quality of service of K.S.T.A, and the level of customers' satisfaction is not caused by random effects, and the variables are interdependent. Therefore, it is recommended that reliable vehicles such as Sharon's model most passengers preferred this brand. It is faster, comfortable, convenient, and reliable. Artificial Intelligence System (AIS) such as the E-fleet management system should be introduced and used effectively in monitoring and tracking staffs' activities on board. A uniform ticketing system for transport fare should be introduced, preferably ticketing machines across KSTA major and sub terminals. Electronic

platform (e-commerce), will reduce the possibilities of passengers' exploitation by the unscrupulous staffs.

### Acknowledgement

We would like to use this opportunity to express our profound gratitude to these two individuals Prof. Innocent C. Ogwude, Chairman Governing Council, Institute of Transport Administration (Nigeria) and Dr Emmanuel Cleeve, Reader in Economics, MMU Business School UK. We appreciate everyone who contributed positively in making this study a success, especially KSTA employees. In case, any error is found in this work, it should not smear the reputation of these revered persons mentioned.

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