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## AN ANALYSIS OF LAGOS STATE BUSS RAPID TRANSIT OPERATION AND QUALITY OF SERVICE

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### Abstract

This study assess Lagos Bus Rapid Mass Transit (BRT) operational quality of service a passengers' perspective. The aim of the study is to examine Lagos BRT systems in Lagos and its performance in terms of quality of service and users' satisfaction. Structured questionnaires were used as sources of data to analyse the overall quality of service at the terminals and bus stops. The primary data included passengers' responses on the quality of service (reliability, safety, affordability, comfortability and waiting), road networks, and number of trips per day by operators, operating speed, vehicle speed, and waiting time. The total number of completed questionnaires for the survey was 200 for users. The sampling technique used was random sampling from several bus stops in the study area. Data were analysed using the appraisal standards for public mass transit systems and the IPA quadrant analysis. The study shows that the system over load their vehicles (142.9%) at peak periods, while at off peaks they load as low as 42.9% of their bus capacity. The BRT vehicles travels at an average speed of 53.57km/hr which is rated as a good speed for a public transport service. These can be attributed to the fact that the BRT system has a separate route of operation. The bus service has a headway of about 15mins, and it operates 24hrs a day. The result from the IPA quadrant shows that passengers wait so long at the bus stops, as regards comfortability in the quadrant C, shows that passengers are not fully satisfied, they need improvement. While in terms of safety, affordability and reliability are the tangible ones in the quadrant B, meaning that the users are satisfied with this variables as a good category and needs to be maintained. The study recommends that the overall quality of service needs improvement.

**Key words:** Bus Rapid Transit, Transportation, and Overall Quality of service

## **INTRODUCTION**

Transport is significant in order to sustain livelihood in contemporary societies and in the absence of it there would be no life in the city [1]. Transport exhibited critical behavior in its relationship to other public systems at many different scales which includes social and political activities, among levels of economic development. Transportation serves as the foundation for the development of any nation. Levels of economic development is defined largely by a country's transport system conditions. Transport improves trade and production, and the exchange of ideas in the economic setting. A country without transport facilities is less advantageous in the global economics [2].

There is need for wide varieties of public transport modes in modern cities especially cities of developing nations. Buses are predominantly the choices of a majority of communities in the developing countries of the World. The option of any or combination of public mass transportation systems can be influenced by the size or area of the city and its population, their mobility demand and characteristics and the land use pattern of the city couple with the intensity of capital for such projects [3].

Bus systems are transport systems characterized by a wide range of passenger capacities and performance, they serve fixed routes with fixed schedules, or with flexible routes. With efficient Bus transit systems larger number of urban residents can be reached particularly those without private means of transportation or those who cannot regularly afford taxi services, this also extend to those who possess private means of transportation but choose to utilize the services of the public transport system. Bus transit systems have the potential of being used as policy tools to decrease the number of cars on urban roads and thus reduce traffic congestions in cities [4].

Currently, the number of residents in Nigeria, especially the city of Lagos, continues to increase in line with the increase in the economy activities. This causes the need for transportation to continually increase, especially land transportation. Therefore, movement of vehicular traffic increased rapidly, resulting in various problems of land transportation such as traffic congestion. Significant rise in the use of private vehicles has poses the greatest challenge for public transport in Nigeria. This is because people prefer to use private vehicles as a mode of transportation due to aspects of time schedule, comfort and security. However, possible solutions or perhaps the best solution to overcome this problem is for the Government together with Private Parties should continue to seek ways to improve the quantity and quality of public mass transportation in Nigerian cities [5].

It is against this background that this research attempts to critically analyse the performance of urban mass transit as it affects urban life in Nigeria. Therefore, the study uses the Lagos BRT system as a case study. The available mass transit needs reliable and efficient methods for identifying the determinants of service quality and performance to accomplish these ends. Thus, the focus of this study is to investigate the service quality attributes that influence passenger satisfaction with the Lagos BRT system.

### **Study Area**

Lagos State has a bus rapid transit (BRT) system; It operates along routes using specially designated bus rapid transit lanes running through the city, with the aim of expanding to other routes in the future. PRIMERO Transport Services Limited is the BRT system operating in the city. It was launched on the 12th of November, 2015 by His Excellency Mr. Akinwumi

‘Dapo Ambode, the former executive Governor of Lagos State at Majidun depot. It’s full operation commenced on 13th November, 2015. Operation commenced on approved routes with 434 Youtong high capacity buses.

Major terminals are located at Ikorodu, Agric and Mile12, BRT lane extension from Ikorodu to Mile12. Progressively, from the time of commencement of operation, the number of bus roll out has been on the increase and based on customers’ demand. The main depot is at Majidun boasts a state of the art and ultra-modern equipment for the maintenance workshop; automated washing machine for bus wash; Fuel storage facility; Administrative offices and a mini depot at the Mile-12 terminal. The BRT services run all day, 7 days a week.



**Fig. 1** Lagos BRT Route Network

## **1. LITERATURE REVIEW**

Over the years, the development of public transportation has been necessary because of the population increase and expansion of urban centres. Improvement in public transport leads to modifications and changes in areas of high human population density such as economic agglomeration, enhance access to employment, infrastructural and regional development. The absence of adequate public transportation limits economic and social performance. These has been the focus of several studies in public transportation. Empirical findings have showed using several performance evaluation instruments to measure the state and condition of public transportation systems around the world. These have many practical applications including trend analysis, comparison, target settings, system improvement and incentives for managers and employees. Determining performance level of public transport systems particularly urban mass transport which is the focus of this study help identify potential problems and how to optimally solve them. A number of studies and projects have been performed in the past that assess transportation using performance evaluation for appropriate use and implementation.

According to [6], Land transportation needs are increasing. One of the problems is the uncontrolled number of private vehicles. Buses as public transportation become the right choice to overcome the problem. The research purpose is to know the performance of and to analyse the service quality factors of Trans Bandung Raya Bus (TBRB). Findings show that the value of service quality is lesser than the expected value which implies that the bus system needs continuous improvement.

Furthermore, [7] in his research Diagnosing Transportation: Developing Key Performance Indicators to Assess Urban Transportation Systems observed that rapid urbanization is putting pressure on transportation agencies to respond to increasing demand for greater access to services. In response, policy makers, faced with limited budgets and time constraints, are looking for instruments and measures to identify primacy problems in a timely and cost effective manner. According to Yousaf urban transport assessments can be performed using a diagnostic study that can identify cities' individual problems within the global context. In other to achieve such objective performance evaluation seems to be a better option. In his research he uses a series of performance indicators to assess different cities' mass transportation systems. The performance indicators rank cities according to an overall score as well as different categories of transportation performance. Such an approach allows planners to identify priority problems in the transportation network and design targeted solutions. The final results benchmark the performance of transportation systems according to peer cities with relatively similar sizes.

On top of traditional performance indicators that focus on demographics, mobility, costs, and benefits, new approaches to transportation performance indicators also measure accessibility, safety, and environmental performance [8]. Accessibility is measured by a series of indicators from basic data such as average speed and travel time to spatial and utilitarian investment decisions based on individual perspectives of travel. While traffic fatalities can be used to measured safety levels [8]. Moreso, [9] reviewed a number of transportation plans and policies performances in North America for environmental and sustainability indicators. Gudmundsson made two classifications; quality of life and environment, and resource conservation. Instances include indicators for land use, air quality, noise, fuel use, recycling, and customer satisfaction with environmental decision making. However, while many agencies used the same few environmental measures, there is still high emphasis on air pollution.

Furthermore, [10] describes the role that performance measurement can play in public transportation planning and management, the need for developing cities to start adopting performance evaluation and the steps for initiating this. Chhavi uses examples of successful public transport performance evaluation systems from across the globe, including developing cities that are beginning to explore these systems, and identifies key factors necessary for creating successful evaluation systems. This information will be useful to policy-makers, analysts, and practitioners involved in urban transport planning and particularly public transport planning and provision in cities, in both developed and developing countries.

Moreso, [11] in their study examines urban mass transit service efficiency, passengers' perspectives and bus route deficiencies. The aim of the study is to evaluate urban mass transit systems in Nigeria and its transport problems of equitable bus service distribution to the masses in Nigeria. The research uses performance indicators to evaluate the overall efficiency of the transport system quality. Their study revealed that the current efficiency and performance of the organized bus transit operators in is poor. There are service deficiencies in the areas of passengers' volume, vehicle kilometres and revenue generation. Form the study they observed that the operators of urban mass transit in the study area were operating at average of 6 trips per day. 43.49% of the respondents responded that they wait more than 15 minutes at the bus stops. The hypothesis test was used to study people's feelings about the attributes of the service provided for urban mass transit users, such as affordability, regularity, maintenance of arrival and departure time, comfort and safety. It was found that there are significant differences at the 5% level between the various categories of these respondents.

Moreover, [5] evaluates the performance of urban mass transit using passenger satisfaction with the service quality attributes in Abuja, Nigeria. To achieve this, 300 public bus transport users were randomly selected to elicit their overall satisfaction and factors that influenced their satisfaction in the use of public bus transport services in Abuja using a self-rated questionnaire. Nwachukwu found out that passengers were not satisfied with the public bus transport services in Abuja. Using Principal Component Analysis (PCA), four underlying factors were extracted that influenced passenger satisfaction with public bus transport services in the city. The four components together explained 83.87% of the cumulative variance of PCA, leaving 16.32% of the total variance unexplained. The standardized regression coefficients further showed that comfort has the greatest impact on overall satisfaction, followed by accessibility. Adequacy and bus stop facilities were the third and fourth factors in the order of relative importance in influencing passenger satisfaction of public bus transport services in the city. Similar results was found in [4]. On the basis of the findings, recommendations were made to improve public bus transport services in the city of Abuja which is an important reason of carrying out transport performance evaluation.

## **2. METHODOLOGY**

### **2.1. Sampling and Data Collection**

This study was focused on the evaluation of the performance of urban mass transit systems in Nigeria. The starting point of the work is that the perspective of the decision maker might not accord with that of the actors of the system (public transport operators and customers). The study is of the opinion that, performance evaluations should be referred to the users' point of view, since they are the target for providing the service.

The statistical data in which the researcher used in this study were those gotten from the primary and secondary sources. Primary data include passengers' responses on the quality of

service (reliability, safety, affordability, comfortability and waiting) of Lagos BRT service. While secondary data were operational records of the companies from 2012 – 2018. The target population in the study include the passengers of the BRT system in the study area, At least 200 respondents are sampled within operating terminals for the purpose of questioning and interview. Multistage sampling technique is adopted for this study. Terminals are randomly selected within the study area. And in each terminal, passengers are randomly selected for questionnaire administration and interviewing.

## 2.2. Method of Data Analysis

Importance-Performance Analysis (IPA) model and Key Performance Indicators (KPI) will be used in this study to determine specific performance level (operational performance and quality of service) of the two transportation systems.

## 2.3. Key Performance Indicators (KPI)

The study uses set of performance indicators based on the appraisal standards of the Department of Land Transportation, World Bank, to evaluate the performance and service quality of Trans Bandung Raya Bus service as adopted in [6]. The performance indicators are as follows:

**Tab. 1** Performance Indications

	Performance indicator	Formula
1.	Load factor (peak/off-peak): These is the ratio of the number of passengers carried with the actual carrying capacity of the vehicle used at a particular time.	$Lf = \frac{P}{C} \times 100\%$ Where, Lf = load factor (%); P = number of passengers carried; C = carrying capacity.
2.	Traveling speed: The travel speed of the transport system is the ratio of the operating distance to the travel time required.	$V = 60 \times \frac{L}{t}$ Where; V = travel speed (km/hr), L = distance travelled, t = time of travel
3.	Travel time: Time to travel a kilometre along a route in unit minute/kilometre.	$T = \frac{t}{L}$ Where; T = travel time (min/km), L = distance travelled, t = travel time
4.	Headway (time between): Headway is the time interval between two vehicles moving in succession along the same route at a certain point	$H = \frac{60}{F}$ Where; H = Headway (min), F = Frequency
5.	Frequency: Frequency is the number of vehicles that operate within one hour	$F = \frac{N}{60}$ Where; F = Frequency (veh/hr), N = number of vehicles in operation
6.	Number of vehicle in operation (%): This is the Percentage of the number of operating vehicles with a total number of vehicle	$Vo = \frac{N}{TnV} \times 100\%$ Where; Vo = Vehicle in operation (%), N = number

		of vehicles in operation, TnV = total number of vehicles
7.	Hours of operation (service time): This is total operating hours in a day. Service time is very influential in determining the number of trips in one day, the operational cost, income and services of the transport system provides to the community	
8.	Passenger waiting time (min): This is the time a passenger spent at the terminal before transit. It is solely based on the time between bus departures (headway).	$Wt = \frac{1}{2}H$ Where; Wt = waiting time (min), H = Headway

Source: Damayanto et al, (2018)

## 2.4. Standard appraisal of public transport performance

The performance appraisal of public transport uses the indicators and standard of value published by the Department of Land Transportation, World Bank.

**Tab. 2** Performance indicators of public transport

s/n	Indicators	Unit	Assessment standard		
			Not good (1)	Moderate (2)	Good (3)
1.	Load factor <i>Peak</i>	%	> 100	80 – 100	< 80
2.	Load factor <i>Off-peak</i>	%	> 100	70 – 100	< 70
3.	Travel speed	Km/hour	< 5	5 – 10	> 10
4.	Headway	Minutes	> 15	10 – 15	< 10
5.	Time travel	Minutes/km	> 12	6 – 12	< 6
6.	Service time	Hour	< 13	13 – 15	> 15
7.	Frequency	Vehicle/hour	< 4	4 – 6	> 6
8.	Number of vehicles operating	%	< 82	82 – 100	100
9.	Waiting time	Minutes	> 30	20 – 30	< 20
10.	Start and end time of trip	Time	05.00 18.00	- 05.00- 20.00	05.00 >20.00

Source: Damayanto et al, (2018)

Table 2 shows that the Total performance value of public transport is categorized according to the standard. It shows all the parameters that are used in measuring public transport performance as regards to quality of service according to Damayanto. Furthermore, table 3 shows the standard appraisal of the performance and the categories.

**Tab. 3** Standard appraisal of public transport performance

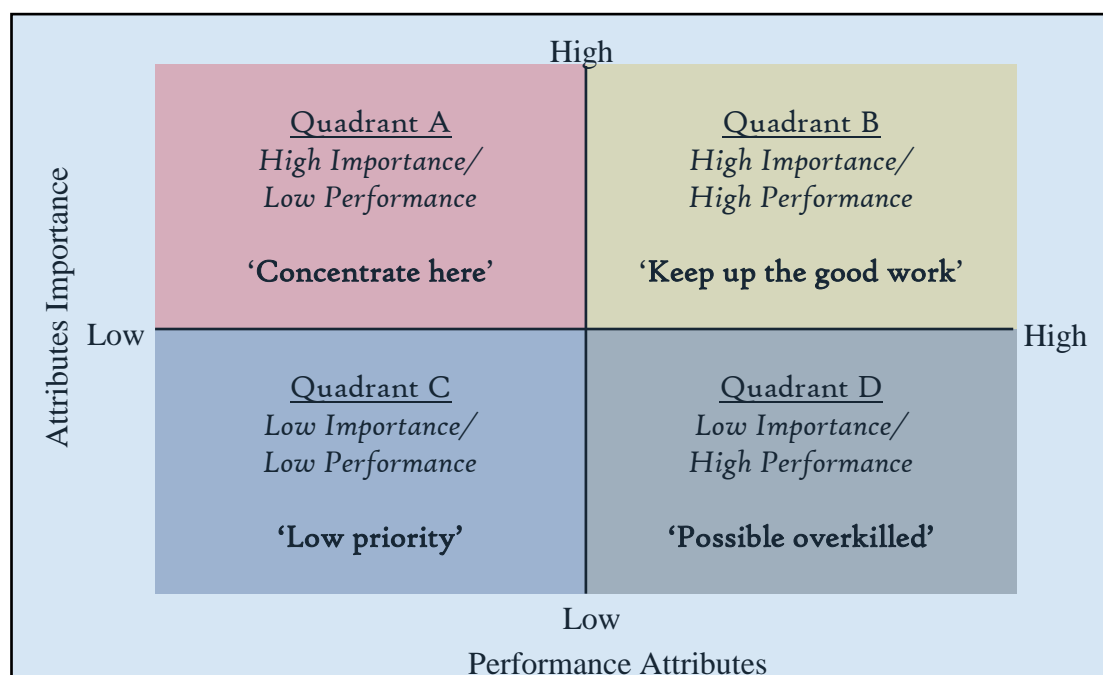
CATEGORY	TOTAL VALUE
Good	18,00 - 24,00
Moderate	12,00 - 17,99
Not good	< 12

Source: Damayanto et al, (2018)



## 2.5. Importance-Performance Analysis (IPA)

In this research, the Importance-Performance Analysis (IPA) grid was used to measure the urban mass transit users' expectation from the users' perspective. A list of performance indicators was identified from the literature reviews and was rated using a five point Likert scale. This enables the users to rate the relative importance and the actual performance rating. The purpose of the survey is not only to measure the actual satisfaction level, but also to highlight important areas for improvements. The IPA, a two-dimensional grid, is broken into four categories: (A) Concentrate Here; (B) Keep up the good work; (C) Low Priority; and (D) Possible Overkill, to enable each of the indicators to be plotted into the grid.



**Fig. 2** Four quadrants of importance-performance analysis (IPA) developed by Martilla and James (Martilla and James, 1977).

ServQual method is used to divide the service quality into five dimensions in this study (main variable): Affordability, Reliability, Safety, Comfortability, and Waiting time.

The main variables of service quality are described in several sub variables, as follows: Both low and middle income class Passengers are able to pay for the bus service without much stress. Bus services are frequent, The number of buses of the company are sufficient, Operators have provided necessary facilities at bus stops, Bus stop facilities are in good working condition, There are sufficient shelters and seats for passengers at the bus stops, There is a working time schedule, The time schedules are adhered to by the operators, Regular information on time schedule is provided, The bus service system is safe for passengers, Accidents are always prevented at all cost, There are safety measures in place to avoid violence/theft, There is enough seating/standing space in the buses, The buses are always clean and tidy, Operation hours are convenient for users, Passenger loading and off-loading is fast thereby reducing waiting time, Passengers are given adequate attention through the course of transaction and carriage.



### 3. DATA ANALYSIS

#### 3.1. Performance analysis for the Lagos BRT System

Based on the survey and analysis, the performance of the Lagos BRT system can be seen in table 4 below.

**Tab. 4** Performance Analysis of the Lagos BRT System

s/n	Indicators	Unit	Assessment standard			Result	Value of performance
			Not good (1)	Moderate (2)	Good (3)		
11.	Load factor, busy hour	%	> 100	80 – 100	< 80	142.9	1
12.	Load factor, no busy hour	%	> 100	70 – 100	< 70	42.9	3
13.	Travel speed	Km/hour	< 5	5 – 10	> 10	53.57	3
14.	Headway	Minutes	> 15	10 – 15	< 10	15	2
15.	Time travel	Minutes/km	> 12	6 – 12	< 6	1.12	3
16.	Service time	Hour	< 13	13 – 15	> 15	24	3
17.	Frequency	Vehicle/hour	< 4	4 – 6	> 6	4	2
18.	Number of vehicles operating	%	< 82	82 – 100	100	47.93	1
19.	Waiting time	Minutes	> 30	20 – 30	< 20	15	3
<b>Total value of performance</b>							<b>21</b>

Source: Author's Calculation, 2019

Moreso, table 4 shows the result from the analysis of the parameters and the level of their performance as regards to quality of service of the Lagos Bus rapid Transit in Nigeria. The performance result of the parameter result shows the performance values of the load factor, travel speed, headway, travel time service time, frequency, number of vehicles operating in the corridors, and waiting time of the passengers at the bus stops with performance values of 1, 2, and 3.

**Tab. 5** Result of Performance Analysis of the Lagos BRT System

<b>CATEGORY</b>	<b>TOTAL VALUE</b>	<b>SCORE</b>
Good	18,00 - 24,00	<b>21</b>
Moderate	12,00 - 17,99	
Not good	< 12	

Based on the performance assessment in the above table 5, it can be said that based on the standards of the Department of Land Transportation of World Bank the *Performance of the Lagos BRT System* is included in the "Good" category. Therefore the public transport system can be considered to be in Good performance.

From the results in table 4, the system over load their vehicles (142.9%) at peak periods, while at off peaks they load as low as 42.9% of their bus capacity. The BRT vehicles travels at an average speed of 53.57km/hr which is rated as a good speed for a public transport service. These can be attributed to the fact that the BRT system has a separated route of operation. The bus service has a headway of about 15mins, and it operates 24hrs a day, these can be seen due to the nature and characteristics of Lagos [6 & 12]. However, the system have

a low percentage of operating vehicles with 47.93% of total available vehicles, which is considered “Not Good”.

### **Service quality Analysis**

The IPA (Importance-Performance Analysis) quadrant was used to analyse the service quality of the Lagos BRT system. The service quality is measured based on the users’ response to the SERQUAL Indicators used. Table 6 shows the number of variables used.

**Tab. 6** *Public Bus Service Quality Attributes Measures*

<b>Variable code</b>	<b>Variable Description</b>
OS	Overall Satisfaction with public transit service
<b>X1</b>	<b>Affordability</b>
X2	All Income levels can afford the service
X3	Frequency
X4	Number of bus
X5	Terminal facilities
X6	Working conditions of facilities
X7	Seats at shelters
<b>X8</b>	<b>Reliability</b>
X9	Time schedule
x10	Adherence to time schedule
x11	Information on time schedules
<b>x12</b>	<b>Safety</b>
x13	Accident control
x14	Violence and theft control
<b>x15</b>	<b>Comfortability</b>
x16	Enough seating/standing space in buses
x17	bus cleanliness
x18	Convenient operating hours
<b>X19</b>	<b>Waiting time</b>
x20	Fast (off)loading
x21	Customer care

The service quality attributes used are divided into 5 main variables and 17 sub variables.

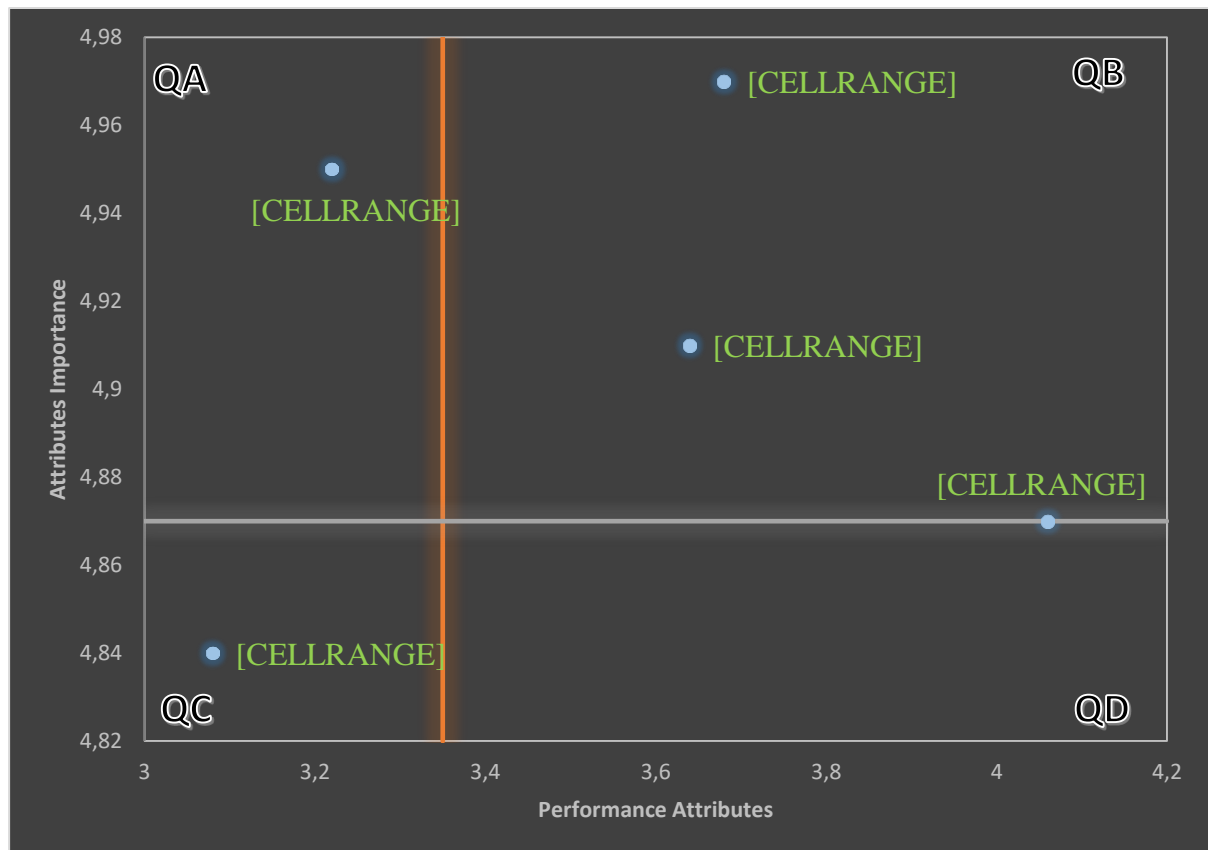
The statistical (mean and standard deviation) distribution of respondents’ expectation (importance) and perception (performance) of the overall satisfaction and specific service quality attributes (as shown in table 6) that affect their satisfaction of public bus transport services in the city of Lagos is shown in Table 7.

**Tab. 7** Statistical Distribution of Quality of Service Attributes Responses of L-BRT (N=100)

	N	Importance		Performance	
		Mean	Std. Deviation	Mean	Std. Deviation
OS	100	4.96	.197	2.94	.908
x1	100	4.87	.418	4.06	.952
x2	100	4.87	.367	4.00	.943
x3	100	4.61	.601	3.50	1.087
x4	100	4.85	.359	3.22	1.097
x5	100	4.73	.617	2.79	1.047
x6	100	4.96	.243	2.80	1.172
x7	100	4.91	.288	2.23	1.053
x8	100	4.97	.171	3.68	.931
x9	100	4.88	.383	4.49	.718
x10	100	4.88	.409	2.85	1.123
x11	100	4.80	.492	2.61	1.004
x12	100	4.91	.321	3.64	1.078
x13	100	4.93	.293	4.36	.835
x14	100	4.87	.418	3.18	1.149
x15	100	4.84	.487	3.08	1.061
x16	100	4.76	.553	3.17	1.064
x17	100	4.92	.307	3.35	.978
x18	100	4.91	.288	3.98	.864
x19	100	4.95	.261	3.22	1.069
x20	100	4.92	.339	3.06	1.090
x21	100	4.87	.418	3.41	.975
<b>Valid N (listwise)</b>	<b>100</b>	<b>Ave. mean</b>	<b>4.87</b>	<b>Ave. mean</b>	<b>3.35</b>

Source: Author's Calculation 2019

Based on the analysis of variables in table 7, the average value of service perception (Performance) is 3.35 and the average value of service expectation (Importance) is 4.87. The analysis of the results are described in the IPA quadrant, as shown in figure. 3.



**Fig. 3** IPA analysis of main variables of L-BRT quality of service

Based on figure 3, it can be explained that: In the Cartesians diagram, there is one main variables in quadrant A, which is Waiting time. This means that passengers wait so long at their bus stops, thus, waiting time of L-BRT needs to be improved / upgraded by the management of L-BRT. The implementation of L-BRT service related to waiting time still can't fulfil the expectation from L-BRT users. The variables in B quadrant (safety, affordability and reliability) are the tangible ones, meaning the users are satisfied with these variables as a good category and needs to be maintained. The responsive variable is the variable in quadrant C (comfortability), which means that this variable needs to be improved, even though it is not a priority variable. Quadrant D is empty meaning there is no main variable which is good, but felt more than is needed [13].

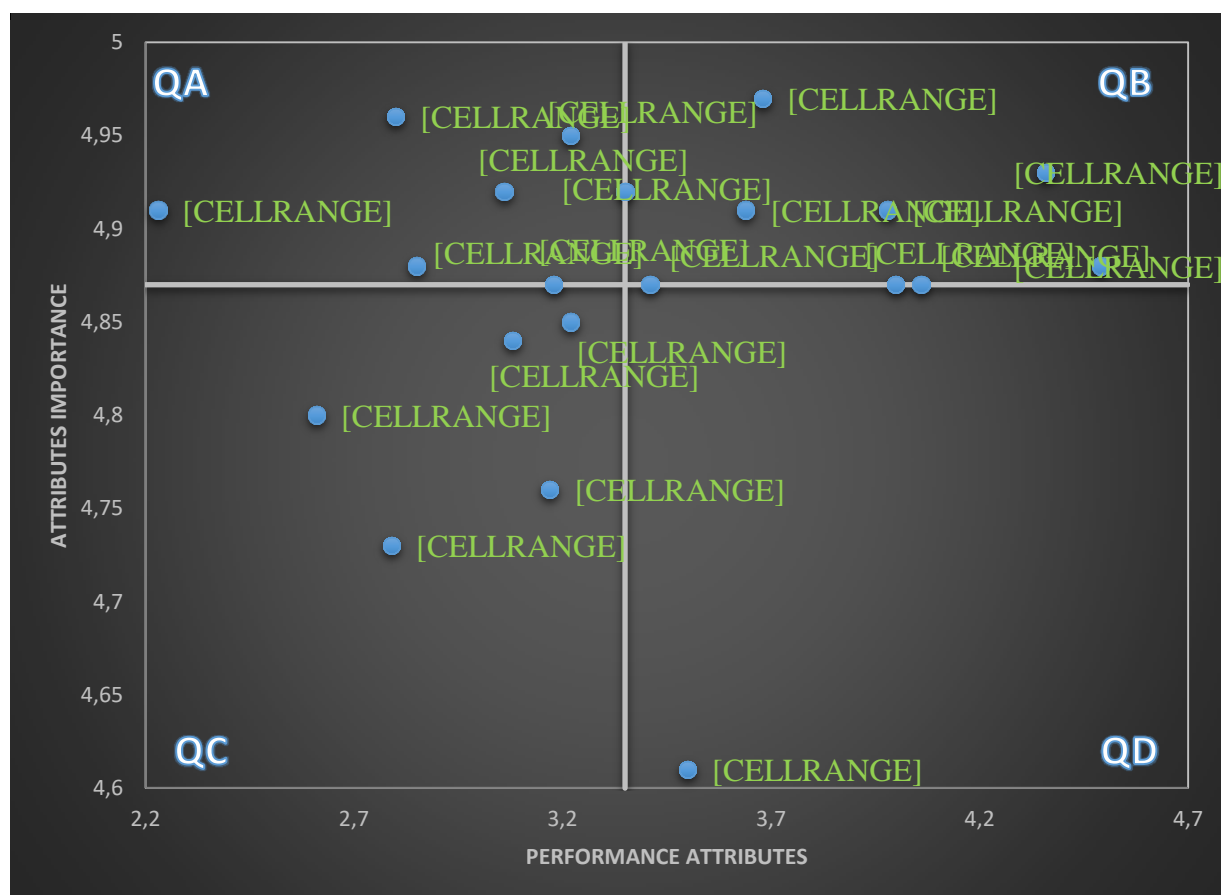


Fig. 4 IPA analysis of service quality sub variable of L-BRT

Figure 4 presents the Cartesian graph showing users perception against their expectation of the L-BRT public transport service. For the results the following can be deduced:

- Quadrant A (Concentrate here / Main Priority):** In this quadrant, the users perception to the service quality of L-BRT is lower than the user's expectation, or it can be said that the service level of some aspects in quadrant A is still disappointing/unsatisfactory, so the management of L-BRT should pay attention, and improve some aspects of it. Some aspects that need to be improved in quality are: Working conditions of facilities, sufficient seats at shelters, Waiting time, fast loading and unloading, Adherence to time schedule, Violence and theft control, bus cleanliness.
- Quadrant B (Keep Up good Work):** This quadrant shows some aspects that have been good or are levelled between the performance and expectations of the users, therefore the quality factors in the quadrant needs to be maintained and improved the more. These aspects of L-BRT service are: Affordability of the service, ability for all income levels to pay for the Service with ease, customer care service, reliability, and convenient operating hours for users, safety, and accident control and time schedule.
- Quadrant C (Low Priority):** Indicates the level of satisfaction as lower than the user's desire to the service, so it is said to be less satisfactory so it needs to be improved, but that aspect includes low priority scale as the user's desires to the factors in this quadrants are not high. Figure 4.1 reveals Frequency of the service, violence and theft control, comfortability, number of buses available, and information on time schedule as factors in this quadrant.

- *Quadrant D (Possible Overkill)*: Factors in quadrant D are considered satisfactory and redundant in their implementation, although the user considers these factors less important. From figure 4 only one variable is seen in this quadrant, which is all income levels are able to pay for the services of the public transport.

**Tab. 8** Summary of IPA Outcome for users' satisfaction on the quality of service provided by Lagos BRT

Quadrant A	Quadrant B	Quadrant C	Quadrant D
<ul style="list-style-type: none"> <li>▪ Working conditions of facilities</li> <li>▪ Sufficient seats at shelters</li> <li>▪ Waiting time</li> <li>▪ Fast loading and unloading</li> <li>▪ Adherence to time schedule</li> <li>▪ Violence and theft control, and</li> <li>▪ Bus cleanliness.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Affordability of the service</li> <li>▪ Ability for all income levels to pay for the Service with ease</li> <li>▪ Customer care service</li> <li>▪ Reliability</li> <li>▪ Convenient operating hours for users</li> <li>▪ Safety</li> <li>▪ Accident control, and</li> <li>▪ Time schedule</li> </ul>	<ul style="list-style-type: none"> <li>▪ Frequency of the service</li> <li>▪ Violence and theft control</li> <li>▪ Comfortability</li> <li>▪ Number of buses available, and</li> <li>▪ Information on time schedule</li> </ul>	<ul style="list-style-type: none"> <li>▪ all income levels are able to pay for the services of the public transport</li> </ul>

Source: Author's 2019

## 4. DISCUSSION

### 4.1. IPA Analysis of Lagos BRT

From the result of the IPA analysis shown in figure 4 reveals that passengers of Lagos BRT complain of waiting long at the terminal before boarding, therefore, the company needs to improve their bus ratio (i.e. the ratio of operating vehicles to total number of vehicles) in order to achieve greater frequency of service in order to reduce passenger waiting time. Meanwhile the passengers report that they are satisfied with the service in terms of reliability, safety, and affordability of the service, therefore, the company should maintain their quality in those areas, or if possible further improve them as passengers' shown high importance for those qualities. And finally, comfortability shows a balance condition as well.

## 5. CONCLUSION

This study has identified major findings which is the expectation and the perception level of users towards the services of the Lagos BRT service. It was identified that the service are poor because most of the commuters said that the comfortability, reliability, efficiency are not up to standard, and that these components is very important in the success of transportation operations, thus, the commuters prefer that the operations of the BRT be improved. It is also identified that the Bus rapid transit (BRT) system is a better option for public mass transit. BRT is a bus management system with characters: fast, convenient and secure, and timely in terms of schedule. Bus rapid transit (BRT) is used as an alternative of transportation because it has better service quality than other conventional public systems. In the BRT system,

passengers up and down are done faster at the bus stop, thus saving travel time, which ultimately improves the quality of bus services. Currently, Lagos is the only city in Nigeria that have Bus Rapid Transit (BRT), However it is seen in this study that the BRT system is a better option hence the need for adoption in other cities in Nigeria. Finally, Bus operation needs to be improved steadily, because it is not functioning optimally yet.

### **Recommendation**

Based on the findings of this study the following recommendation is made.

1. The working conditions of facilities, Waiting time, Fast loading and unloading, Adherence to time schedule, Violence and theft control, bus cleanliness are huge passenger priority and, as a result, basic standards for bus passenger in these regards must be established and monitored by operators.
2. Operators should work towards achieving greater percentage (if possible 100%) of bus ratio i.e. operational vehicles to total number of vehicles for transport services so as to increase bus service frequency and reduce passenger waiting time and walking distance in the area, especially at the peripheries of the city.
3. The government should construct more city link roads, especially in the peripheries of the cities, and should maintain the existing ones to increase accessibility to encourage bus operators to provide more services to more areas in the city.
4. Government should enhance the public-private partnership policies in order to provide better public bus transport services in the areas to enhance private operator operation and serviceability standards required of them to increase passenger satisfaction.



### References

- [1] Onokala, P. C. (2001). Urbanization and Urban Transportation Problems in Nigeria, in E. O. Ezeani and N. N. Elekwa (eds) *Issues in Urbanization and Urban Administration in Nigeria* Jamoe Enterprises (Nigeria) Publishers Enugu.
- [2] Nwankwo C. O., Fawohunre F. A. and Obasanjo O. T. (2016). Abuja Urban Mass Transit Company Operations Impact on Passengers' Movement within Abuja Metropolis. *European Journal of Research in Social Sciences*, 4(6), 23 – 33.
- [3] Florida Department of Transportation: Best Practices in Evaluating Transit Performance. Final Report, Freight Logistics and Passenger Operations, Transit Office, July 2014.
- [4] Oluwaseyi, O. S., & Olaniyi, A. A. (2018). Assessment of Passengers' Satisfaction of Public Transport System in Akure-Owo Axis, Nigeria. *American International Journal of Multidisciplinary Scientific Research*, 4(1), 1-16. doi:10.54655/aijmsr.v4n1p1
- [5] Nwachukwu A, N. (2014). Assessment of Passenger Satisfaction with Intra-City Public Bus Transport Services in Abuja, Nigeria. *Journal of Public Transportation*. DOI: 10.5038/2375-0901.17.1.5
- [6] Damayanto A., F. Kenedi, and B. R. Yogatama, (2018). Evaluation of performance and service quality of Trans Bandung Raya Bus (case study: route of Elang Terminal – Jatinangor Terminal). *MATEC Web of Conferences* 181, 06005 (2018) <https://doi.org/10.1051/mateconf/201818106005>
- [7] Yousaf M. Shah (2012). Diagnosing Transportation: Developing Key Performance Indicators to Assess Urban Transportation Systems. Supervised Research Project Report
- [8] Tiwari, G. and D. Jain, (2012) Accessibility and Safety Indicators for all Road Users: Case Study of Delhi BRT. *Journal of Transport Geography*, 22(0), 87-95
- [9] Gudmundsson, H. (2001). Indicators and performance measures for Transportation, Environment and Sustainability in North America: Report from a German Marshall Fund Fellowship 2000 (D.o.P. Analysis, Trans.) Research Notes from NERI No. 148: National Environmental Research Institute, Denmark.
- [10] Chhavi Dhingra, (2011). Measuring public transport performance. A lesson for developing cities. Sustainable Urban Transportation Technical Document (SUTTD) # 9.
- [11] Nwaogbe, O. R., Ukaegbu, S.I, Ibe Calistus, C. (2013). The Quality of Mass Transit Service in Abuja, Nigeria: An Analysis of Customers Opinions. *International Journal of Scientific & Technology Research*, 2(12),
- [12] Ukpata, J.O. and Etika, A.A. (2012) Traffic Congestion in Major Cities of Nigeria. *International Journal of Engineering and technology*, 2(0), 1433-1438.
- [13] Martilla, J. A., & James, J. C. (1977). Importance-performance analysis. *The journal of marketing*, 77-79.