Bus Rapid Transit and Socioeconomic Condition of Bus Commuters in Lagos State

Kuye, Owolabi L.[1], Sulaimon, Abdul-Hameed A.[2], Azeez, Oladele O.[3]

Abstract: Road transport is one of the most common means of transportation across the world. Bus transportation in Nigeria had witnessed many problems for the past decades considering the growing population with the attendant loss of lives and properties in most cities like Lagos in Nigeria. This paper focuses on the adequacy of services provided by Bus Rapid Transit (BRT) in Lagos State with respect to the extent to which it influences the socioeconomic conditions of bus commuters. It examines the effect of services rendered by BRT on cost reduction potential, income and safety. Multistage sampling technique was used to select 20 samples each from all respondents in all local government area in Lagos State to reach a total of three hundred and thirty (330) samples. The data collection instrument was the questionnaire which was validated. Data collected were analysed with the use of descriptive statistics such as means, percentages and standard deviation and inferential statistics such as regression and analysis of variance techniques. Findings showed that BRT services has reduced the cost of bus commuters and also increased safety and security thereby increasing the socioeconomic condition of Lagosians. The study recommends improvements in BRT services through the deployment of technology as it had been used in developed countries.

Keywords: Bus-Rapid Transit (BRT); Socio-economic; Mobility; Congestion; Safety and Security; Service Quality

JEL Classification: F00

1. Introduction

Mobility is crucial to functionality of cities as it affects their socio-economic activities (Aworemi, Abdul-Azeez, Oyedokun & Adewoye, 2009; Raji & Waziri 2008). It is also a fact that the economic development of a nation is closely linked

[1] Department of Business Administration, University of Lagos, Lagos State, Nigeria, Address: University Road, Akoka 101017, Yaba, Lagos State, Nigeria, Tel.: +234 1 280 2439, Corresponding author: okuye@unilag.edu.ng.
[2] Department of Business Administration, University of Lagos, Lagos State, Nigeria, Address: University Road, Akoka 101017, Yaba, Lagos State, Nigeria, Tel.: +234 1 280 2439, E-mail: asulaimoni@unilag.edu.ng.
[3] Department of Business Administration, University of Lagos, Lagos State, Nigeria, Address: University Road, Akoka 101017, Yaba, Lagos State, Nigeria, Tel.: +234 1 280 2439, E-mail: oazeez@unilag.edu.ng.

to its transport system. One of the hindrances to effective mobility is road traffic congestion, which according to Sanders (2015) has cost associated with 87606 crashes in work zones, 1200 deaths, 37476 injuries, 482 million hours lost in driver delays and 6.5 billion dollars lost time (Olagunju, 2015). In Lagos State mobility issues associated with congestion has been estimated to have drained 40% of the income of bus commuters (Mobereola, 2012). Traffic cost consumed 37 billion shillings annually in Nairobi city and about 570000 dollars daily (This is Africa, 2014; McGregor & Malingha, 2014). More so, congestion has cost Cairo, Egypt up to 8 billion dollars (World Bank, 2010; Olagunju, 2015).

Increasing urbanization, human activities and the resultant heavy dependence on road transportation warrants increase in the number of vehicles, of different categories, on the road, hence congestion. (Aworemi et al., 2009; Raji & Waziri 2008). More so, other factors that constituted to the difficulty of movements on major roads has been attributed to obstructions such as traffic crashes, broken down vehicles or certain land use activities located along these corridors, or sheer traffic volume exceeding the road network capacity during festive seasons and some other major activities (Raji & Waziri, 2008).

Over the years, Lagos has witnessed rising transport demand and road traffic which have led to increased congestion and delays (go-slow) occasioned by greater access to cars (as purchasing power of the middle-income classes has risen), access to credit, population growth and large supply of used cars; as well as poor quality of driving especially by those who drive commercial vehicles or transit vehicles. Traffic congestion in Lagos State affects both private car owners and public transport users and produces losses in terms of economic efficiency and other negative social effects like road accidents (Aworemi et al., 2009; Raji & Waziri 2008; Economic Intelligence Unit Ministry of Economic Planning and Budget, 2013).

A state agency responsible for traffic matters, traffic lights at certain junctions, road expansion, and alternative route creation are parts of government efforts to mitigate the effects of traffic congestion within all routes in the state. Other measures by the Lagos state government include the Bus Rapid Transit (BRT) initiative, the rail lines project and the introduction of a traffic radio to alert Lagosians on traffic issues (Aworemi et al, 2009; 2013).

The study focused on the Bus Rapid Transit (BRT) initiative, amongst efforts taken by the government of Lagos state. This is because road transport is the most common mode of transportation used by Lagosians on one hand; it is also the government's objective to solve the problems associated with immobility through the initiative on the other hand. Thus, according to Mobereola (2009) is possible to provide efficient service at low cost, high frequency, high speed, high occupation, high safety, and low emissions; provide adequate institutional and regulatory

framework; ensure significant socioeconomic benefits most especially for the low-income population; ensure maximum private expenditures and liability; enable minimum public expenditures and liability, and also ensure adequate mitigation of environmental and social impacts through the BRT system.

Adebambo & Adebayo (2009) state that a significant advantage of BRT over regular bus service is that BRT vehicles can carry more passengers than an ordinary bus and the marketing campaign for BRT has helped it to detach itself from the common stigmatism of old buses, and is beginning to pay-off with increases in ridership in Lagos Metropolis. However, the extent to which this has affected the socio-economic condition of Lagosians is still questionable because research has shown that issues of traffic congestion and inappropriate transportation management had socio-economic costs in Lagos (Economic Intelligence Unit Ministry of Economic Planning and Budget, 2013). Some of the socio-economic costs according to the study were: excess time delay to automobile users, excess time delay transit to public and private users, increased vehicle operating costs, excess accident externality costs, and excess vehicle emissions externality costs.

According to Adebiyi (2011), traffic congestion in Lagos is caused partly by road users as they are known to be very impatient and lawless at obeying traffic rules. Very often huge traffic jams develop simply because a driver refuses to give way to another motorist. Additionally, most drivers do not acknowledge road signs because many do not know the meaning of different road signs like "U-Turn", "One Way", "Zebra Crossing" and so on (Economic Intelligence Unit Ministry of Economic Planning and Budget, 2013).

Road traffic congestion remains a global phenomenon that bedevils the cities of the world especially developing countries such as Lagos state, resulting in massive delay, unpredicted travel times, increased fuel consumption, man-hour and monetary loss (Olagunju, 2015; Ukpata & Etika, 2012). Moreover, record has shown that the government has made attempt in the past to approach this problem. Amongst these was the introduction of a Bus Rapid Transit (BRT) system (Olagunju, 2015).

The objective of the schemes is to relieve congestion, enhance mobility, and improve the environment especially with regard to air pollution in the Lagos metropolis (Kolawole, 2010). Other goal of Lagos state BRT tend towards developing a BRT system with the following characteristics: efficient service at low cost, high frequency, high speed, high occupation, high safety, and low emissions. Others are to provide; adequate institutional and regulatory framework, that has significant socioeconomic benefits especially for the low-income population (Mobereola, 2009).

However, the extent to which this initiative has affected the socioeconomic wellbeing of Lagosians such as safety, security, people mobility, income, wealth, cost reduction and business activities as a whole is questionable in such a time the cost of living is high in Lagos and in Nigeria as a whole owing to inflation and other macro-economic problems. Thus, this study examines the extent to which the BRT scheme has been able to impact on the socio-economic conditions of commuters of BRT in Lagos. It is expected that there should be a long lasting solution to traffic situation in Lagos and it should be under control especially because of its status as an evolving mega city. Ascertaining the efficacy of the existing BRT service is necessary and has strategic impacts on the citizens. Doing this in this study would provide more insights on critical areas of the services that need improvements, and aspects that should be abolished. This has strategic importance such as aligning the nature of the services with current population and projected rise on one hand, and looking into possible socioeconomic problems that might hold down opportunities for the state.

This study is important as it provides information that has positive socioeconomic implications in Lagos state. It is an attempt taken to examine how veritable services rendered by BRT have positively influence Lagosians. It reveals the extent to which BRT scheme introduced by the government on November 2007, through the Bola Ahmed Tinubu administration (Ehidiamen, 2015); has achieved its socioeconomic objectives in terms of cost reduction, income enhancement, security and safety, reduced congestion and facilitated mobility in Lagos.

Research Hypotheses

The following are the null research hypotheses raised for the study:

Ho_1: Safety and Security of Bus Commuters in Lagos is not significantly cushioned by the BRT Services in Lagos State;

Ho_2: Mobility of Bus Commuters in Lagos is not significantly enhanced by the BRT Services in Lagos State;

Ho_3: Perception of BRT Service Quality does differ significantly among income levels of Bus Commuters in Lagos State.

2. Literature Review

This section describes the BRT scheme in terms of the requirements that makes up an appropriate and a more standardized BRT. Attempt was also made in this section to review various empirical perspectives as regards the socio-economic impacts of BRT. Theoretical justification of the BRT socioeconomic impacts was also explained.

Bus Rapid Transit

Bus Rapid Transit system is a mode of public transit in Lagos State in which its emergence or aim is to provides a unique opportunity to a changed negative perceptions regarding the traditional public transit in Lagos state (Adebambo & Adebayo, 2009). According to Mobereola (2009) the idea of BRT system was the subject of an open discussion with the BRT Steering Committee, chaired by the Commissioner for Transport, Mr. Muiz Banire, and composed of key stakeholders. The BRT initiative was established after feasibility study undertaken by the Integrated Transport Planning Limited (Mobereola, 2009). The study, which encompassed infrastructure, operations, and regulatory and institutional reform, was launched with the goal of developing a BRT system with the following characteristics such as efficient service (low cost, high frequency, high speed, high occupation, high safety, and low emissions), adequate institutional and regulatory framework and significant socioeconomic benefits. The BRT idea was assumed to be a flexible one, implying a systems-based approach to public transport, but defined by local user needs, context, and deliverability (Mobereola, 2009).

BRT combines the flexibility and low cost of bus service with the comfort, efficiency, cost-effectiveness and versatility of rail transportation system. The flexibility derives from the fact that BRT vehicles (e.g., buses, specialized BRT vehicles) can travel anywhere, where there is pavement and the fact that BRT basic service unit, a single vehicle, is relatively small compared to rail based rapid transit modes. BRT can operate with exclusive rights of way, quieter and cleaner vehicles, and rapid off-board fare collection, correct and attractive infrastructure and short dwell times. It is a hybrid transit service falling between traditional rail and bus modes. Any BRT have the following characteristics such as exclusive right of way, rapid boarding and alighting, clean, secure, and comfortable stations and terminals, fast and efficient fare collection, collection at stations or on board vehicles, effective regulations for bus operators, use of Intelligent Transportation Systems (ITS) transit priority at signalized intersections, integration with other modes of transportation and good customer service (Kolluru & Jain, 2015).

BRT provides higher quality services than traditional urban bus operations because of reduced travel and waiting times, increased service reliability, improved user experience as well as its contribution to an urban transport transformation. A good BRT system works well when it is integrated with other transport systems and an efficient "Park and Ride" facility which can compensate the feeder service, enabling people to use their private vehicles till the corridor (Kolluru & Jain, 2015). Lack of adequate junction capacity creates a bottleneck and a successful system requires some special measures like restricting certain movements of traffic at junctions, development of an intelligent signalling system to provide priority to buses. In addition, absence of adequate pedestrian crossing facilities fails to meet the safety of pedestrian (Kolluru & Jain, 2015).

BRT and Socio-Economic Condition of Bus Commuters

Socio-economic condition can be described as the state or nature citizens of livelihood of a particular state. It is a measure of changes in social and economic conditions in a given society. Various policies made by the government of a nation are directed at improving socio-economic conditions of citizens. That is why the effectiveness of these policies is measured by changes in socio-economic conditions that occur with its implementation.

Adebiyi (2011) identified the major factor that has socio-economic effect on bus commuters in Lagos as congestion. The effects of congestion are in many fold; some directly affect the drivers' sense of wellbeing, be it times wasted sitting in a traffic queue and the changes in the behaviour of drivers. Such behaviour might include rude gestures, verbal insults, deliberately driving in an unsafe or threatening manner, or making threats. This can further lead to altercations, assaults, and collisions which result in injuries and even deaths (Adebiyi, 2011).

Greater Toronto Transport Authority (2008) categorised the costs of traffic congestion into five major clusters as excess time delay to automobile users, excess time delay transit to public and private users, increased vehicle operating costs, excess accident externality costs and excess vehicle externality cost. Costs of congestion result in a higher cost of business activity due to the direct increase in transportation costs; the adverse impact on the labour market, as higher commuting costs are manifested in higher wages and decreased demand for labour, which leads to a suboptimal allocation of labour resources. The end result is that overall economic output (measured by GDP) will be below the level that exists in the absence of congestion (Greater Toronto Transport Authority, 2008). Other effects include missed appointments, higher fuel bill**,** decreased productivity, and high degree of stress and so on (Economic Intelligence Unit Ministry of Economic Planning and Budget, 2013).

Asia LED Partnership Workshop (2014) in their reports states that socio-economic impact of BRT system by improving quality of life and the environment at the same time. Passenger travel times are reduced by moving BRT buses out of mixed traffic and into exclusive, segregated lanes. Effective traffic signal management and high-frequency bus service can help to minimize passenger waiting and transit times. BRT systems reduce Greenhouse Gas (GHG) emissions by reducing vehicle-kilometres travelled and replacing older technology and smaller vehicles with newer, cleaner, high-capacity BRT buses. More so, through higher quality of management, BRT systems take road safety issues into account such as providing pedestrian crossing, which help reduce the reduce the rate of road fatalities.

Thus, this study is justified by socio-economic theory which emphasizes how economic activity is affected and is shaped by social processes. In general, it analysed how societies progress, stagnate, or regress because of their local or

regional economy, or the global economy. It is concerned about the interaction of social and economic factors. The underpinning of the theory is on socio-economic development through improvement in socio-economic variables like social status, income, standard of living amongst others. Thus, the establishment of BRT was an attempt by Lagos state government to improve the socio-economic condition of Lagosians.

Factors Affecting Bus Rapid Transit

Adebambo & Adebayo (2009) examine the impact of Bus Rapid Transit System on passengers' satisfaction in Lagos metropolis. Data was collected through the use of questionnaire which was administered using simple random sampling technique. Findings revealed that less than average of the passengers were satisfied with the BRT system while some were fully dissatisfied. The paper concluded that BRT can be a practical and technical alternative to highway reconstruction.

Similarly, Kolawole (2010) evaluates the impact of BRT in urban intra-city passenger movement in Lagos state. The study examines urban transportation situation in Nigeria with reference to Lagos state BRT within the two years of intensive operation along designated traffic corridors. It also examined the overall contribution of the Bus Rapid Transit in providing a lasting solution to problems of urban passenger operation in Lagos state coupled with an evaluation of its social and economic impact. The research was able to establish the rate of accident among the BRT buses to be infinitesimally low while the rate of susceptibility of BRT passengers to road traffic accident was equally low. Both were 0.000008 and 0.000006 respectively. The study further revealed that an annual average of 0.6 km mileage per passenger based on the level of BRT bus operation along the exiting traffic corridors.

Okuagbe, Adamu, Iyase & Owokolo (2015) examine the challenges faced by commuters using Bus Rapid Transit in Lagos. According to the observation from the survey, there are no much sex differences in the distribution of challenges faced by commuters using BRT. Result from the survey showed that the commuters' satisfaction in patronizing the BRT are mostly affected by security of the buses, reduced commuting time, attitude of the staff, the attitude as seen in the behaviour of the drivers, the prices charged as it affect the income of the commuters, and the present available routes. More so, adequate security at the buses and bus stops, availability of more buses, downward review of the prices charged and increase in the available routes are some recommendations that can help to address the challenges faced by commuters using BRT especially as means of conveying them to their workplaces (Okuagbe et al., 2015).

3. Research Methodology

The study adopts cross-sectional research design using quantitative research approach. Thus the population of study consist of commuters who boards BRT in Lagos state. The population of Lagos state is over nine million residents scattered in 20 Local Government Areas (LGAs). With the use of multistage sampling techniques a total of three hundred 330 bus commutes were selected from the population. The choice of 330 respondents for this study enabled the researcher to reach various local government areas, although not all levels, for the study as equal number of respondents were examined across all the various LGAs selected at random in order to ensure representativeness. About 10 LGAs were selected out of the 20 LGAs in Lagos state. More so, from the 10 LGAs at least 5 in different areas BRT bus-stops were considered for the survey. Simple random method was used in making selections from the various stages of the multi-stage sampling process. This method was used to pick the LGAs under the state level, the levels under the selected LGAs, and the respondents within the levels.

Table 1. Multistage Sampling of Local Government Areas in Lagos State

Selected LGAs in Lagos State	Area Selection In LGAs	Selected Location					
Mushin		A	B	C	D	E	Total
Oshod-IIsolo	Oshod-iIsolo	6	9	5	9	4	33
Ojo							
Ikorodu	Ikorodu	7	4	5	11	6	33
Surulere							
Agege	Agege	13	5	5	7	3	33
Ifako-Ijaiye							
Shomolu	Shomolu	10	8	5	4	6	33
Ikeja							
Apapa	Apapa	11	7	4	5	6	33
Lagos Island							
Kosofe	Kosofe	8	5	5	3	11	33
Epe							
Ajeromi-Ifelodun	Ajeromi-Ifelodun	7	11	6	5	4	33
Eti-Osa							
Ibeju-Lekki	Lekki	12	5	2	8	7	33
Lagos Mainland							
Amuwo-Odofin	Amuwo-Odofin	4	10	5	7	7	33
Alimosho							
Badagry	Badagry	9	5	8	7	4	33
TOTAL		87	69	50	66	58	330

Source: Field Survey, 2017

From Table 3.1. above, the multi stage sampling techniques was used to randomly select equal respondents who were bus commuters from the (15) local government to reach selected samples of three hundred and thirty (330) bus commuters in the state.

A closed ended questionnaire was designed and measured on a five point Likert's Scale. Another psychometric tests carried out was the reliability. The result from the pilot test conducted showed a reliability result of 0.711 for the overall construct which implies high internal consistency, using Cronbach alpha. Descriptive statistics such as percentage tables were used to present the data, while inferential method such as Regression and Correlation test were used to test the hypotheses.

4. Presentation and Analysis of Data

This section is the presentation and analysis of data collected during the study. In the analyses, variables described were BRT services adequacy and this was measured with proxies such as service quality, system performance and the deployment of technology. Also, the socio-economic impacts of BRT were assessed through its enhancement of mobility; cost reduction, safety/security. Furthermore, inferences were made through the assessment of the amount of relationships between BRT services and socio economic condition according to the study objectives. These are shown below.

Description of BRT Service Adequacy

Table 2. Commuters Perception of Adequacy of BRT Services

	N	Sum	Percentage (%)	Rank	Mean	Std. Deviation
BRT Service Quality	330	1203	52.4	1ST	3.65	.807
BRT System Performance	330	1305	35.1	2nd	3.96	.720
Deployment of Technology in BRT	330	1205	12.5	3rd	3.65	.897
Valid N (listwise) Total	330	3710	100			

Source: Field Survey, 2017

Table 4.1. shows that commuters' perception of adequacy of BRT services with respect to services quality, system performance and the deployment of technology. From the table, BRT system performance was rated second highest among all other quality of adequate BRT services constituting 35.1% of the total response. This shows that BRT has provided adequate system performance to bus commuters. This can however be measured in terms of fast travel times, less time spent waiting on the queue, uninterrupted services and appropriate scheduling

system. The Table 4.1 also shows that BRT service quality scored the highest point at 52.44%. This has to do with the provision of prompt services, appearance of BRT personnel, and politeness of its employees, accurate and dependable services. Deployment of technology was rated lowest side with 12.5% showing that the state government need to work more on the deployment of technology in BRT. Thus result shows deficiency in the deployment of technology such as the use of smart cards, the use of traffic detectors, lack of in-built tracking systems, lack of surveillance cameras and lack of information signs at each bus-stop.

Table 3. Commuters Perception of BRT Service Quality

		BRT Service Quality
N	Valid	330
	Missing	34
Mean		3.65
Std. Deviation		.807

Source, Field Survey, 2017

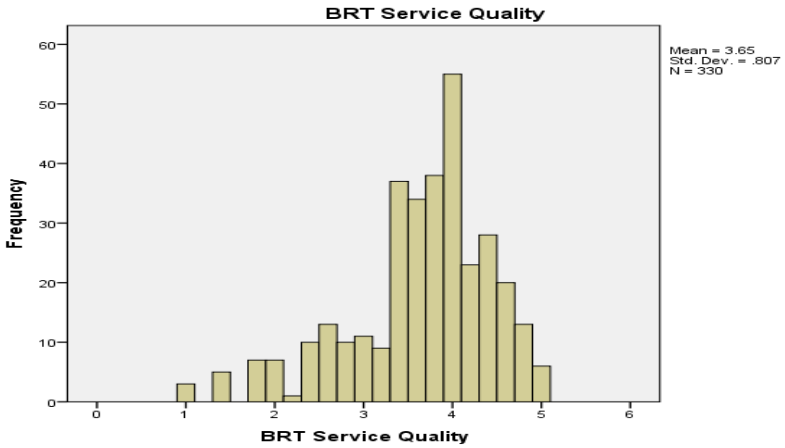

Figure 1. BRT Service Quality

The Table 4.2. and figure 4.1. show the bus commuters' perception of BRT service quality in Lagos State Thus, with an average score on BRT service quality of 3.65 which has 44.5% rating, it shows that there are elements of quality services provided by BRT. The standard deviation was also found to be 0.807 which shows that respondents 'views are quite related and that variance is not much.

Table 4. Commuters Perception of BRT System Performance

		BRT System Performance
N	Valid	330
	Missing	34
Mean		3.96
Std. Deviation		.720

Source: Field Survey, 2017

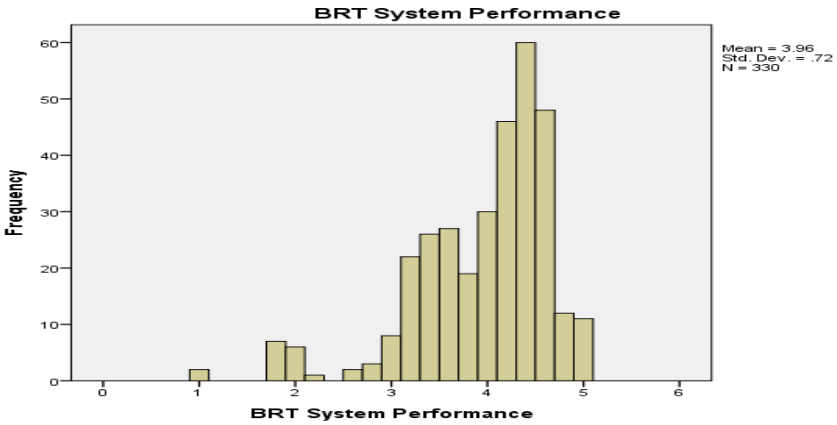

Figure 2. BRT System Performance

Table 4.3. and figure 4.2. show the bus commuters' perception of BRT system performance in Lagos metropolis with an average score on BRT system performance of 3.96 which has 31.5% rating; it shows that there are elements of BRT system performance. The standard deviation was also found to be 0.720 which shows that respondent's views are quite related and that variance is not much.

Table 5. Commuters Perception of Deployment of Technology in BRT

		Deployment of Technology in BRT
N	Valid	330
	Missing	34
Mean		3.65
Std. Deviation		.897

Source: Field Survey, 2017

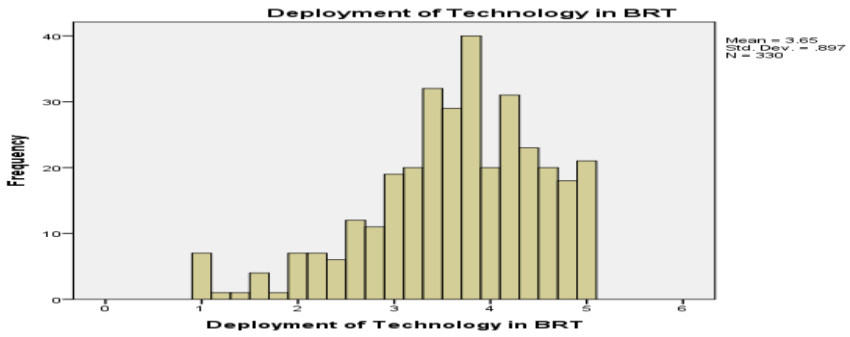

Figure 3. Deployment of Technology in BRT

The Table 4.4. and figure 4.3. depict the deployment of Technology in BRT. Thus, with an average score on 3.65 which has 47.6% rating, it shows that there are elements of deployment of Technology in BRT. The standard deviation was also found to be 0.897 which shows that respondents' views are quite related and that variance is not much.

Description of Socio-Economic Impacts of BRT Scheme

Table 6. Descriptive Statistics on Socio-Economic Impacts of BRT on Bus Commuters

	N	Sum	Percentage (%)	Rank	Mean	Std. Deviation
Mobility of Bus Commuters	330	1181	34.4	1st	3.58	.790
Safety/Security of Bus Commuters	330	1148	33.4	2nd	3.48	.814
Cost Reduction to Bus Commuters	330	1102	32.2	3rd	3.34	.830
Valid N (listwise) Total	330	3431	100			

Source: Field Survey, 2017

Table 4.5. shows commuters' perception of socio-economic impacts of BRT scheme in terms of mobility, safety/security and cost reduction. From the table, mobility of bus commuters was rated highest among all others in terms of its timeliness, it easy routes and quick access to location and its reduction of travel distance constituting 34.4% of the total response. This shows that BRT has impacted mobility of bus commuters. The table also showed that safety/security of bus commuters scored the second highest point at 33.4%. This has to do with the commuters feeling of security, lack of car accident, easy travel, guaranteed safety and improved health. More so, cost reduction to bus commuters was rated lowest side with 32.2% showing that the impact of BRT on commuters cost reduction. Thus result shows that BRT low impact on cost reduction of bus

commuters as they incur less cost of transportation, medical costs, and other associated cost.

Table 7. BRT impact on Mobility of Bus Commuters

		Mobility of Bus Commuters
N	Valid	330
	Missing	34
Mean		3.58
Std. Deviation		.790

Source: Field Survey, 2017

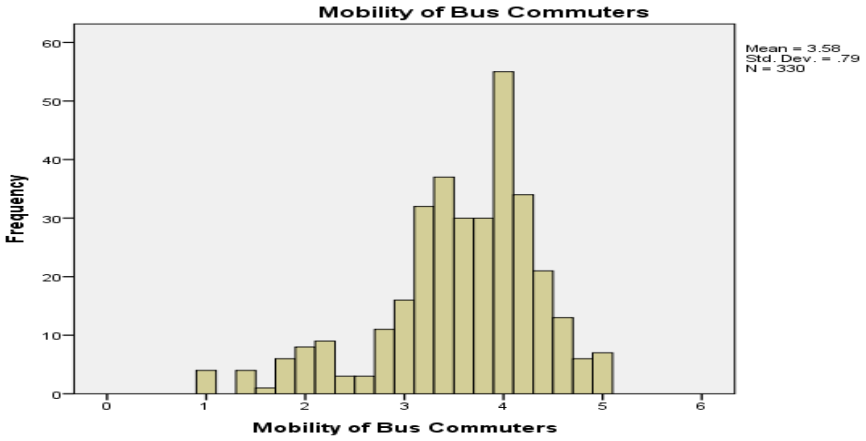

Figure 4. Mobility of Bus Commuters

The Table 4.6. and figure 4.4. show the mobility of bus commuters with respect to BRT services. Thus, with an average score on mobility of bus commuters of 3.58 which has 40.6% rating and it shows that mobility of bus commuters has been enhanced through BRT services, however, below average. The standard deviation was also found to be 0.790 which shows that respondents' views are quite related and that variance is not much.

Table 8. BRT Impact on Safety/Security of Bus Commuters

		Safety/Security of Bus Commuters
N	Valid	330
	Missing	34
Mean		3.48
Std. Deviation		.814

Source: Field Survey, 2017

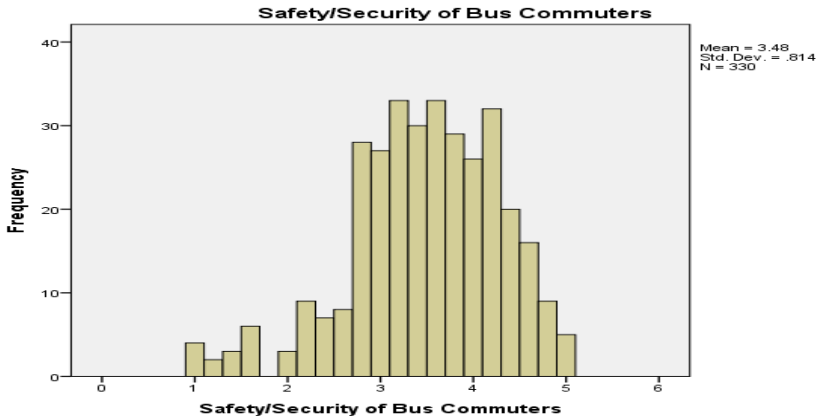

Figure 5. Safety/Security of Bus Commuters

The Table 4.7 and figure 4.5 depict the safety/security of bus commuters with respect to BRT services. Thus, with an average score on mobility of bus commuters of 3.48 which has 48.6% rating and it shows that safety/security of bus commuters was enhanced through BRT services, however, below average. The standard deviation was also found to be 0.814 which shows that respondents view are quite related and that variance is not much.

Table 9. BRT impact on Cost Reduction of Bus Commuters

		Cost Reduction to Bus Commuters
N	Valid	330
	Missing	34
Mean		3.34
Std. Deviation		.830

Source: Field Survey, 2017

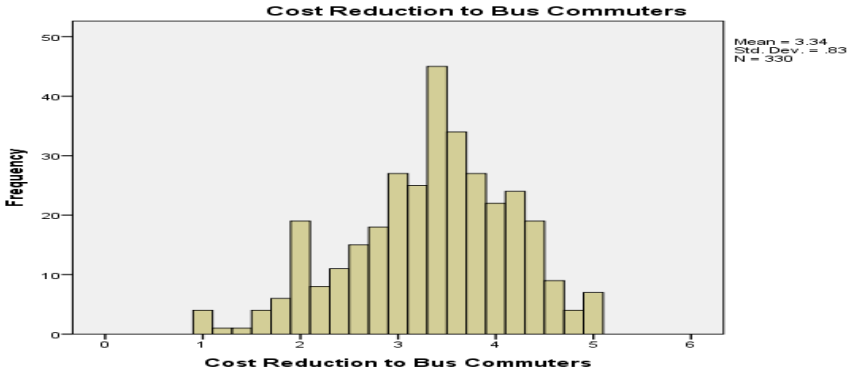

Figure 6. Cost Reduction of Bus Commuters

Test of Hypotheses

Table 10. Model Summary of Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.176[a]	.031	.022	.805

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6.785	3	2.262	3.489	.016[b]
	Residual	211.318	326	.648		
	Total	218.103	329			

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.821	.260		14.715	.000
	BRT Service Quality	-.064	.067	-.064	-.960	.338
	BRT System Performance	-.207	.093	-.183	-2.233	.026
	Deployment of Technology in BRT	.195	.068	.215	2.854	.005

a. Dependent Variable: Safety/Security of Bus Commuters
b. Predictors: (Constant), Deployment of Technology in BRT, BRT Service Quality, BRT System Performance

Table 4.9. shows that the R square value is 0.031 at a standard error of estimate of 0.805. The R square implies that the variables that were used to describe BRT service adequacy predicts safety/security of bus commuters by 3.1 %. They also shows that the sig. value = 0.016< 0.05 which implies differences in prediction of safety/security of bus commuters by the variables of BRT service adequacy. The table further showed that 0.00 < 0.05 which also implies that there is a significant difference in safety/security of bus commuters by the variables that determines BRT service adequacy. Furthermore, the table showed that BRT service quality have negative prediction of safety/security of bus commuters in Lagos (t = -0.960; β = -0.064, sig = 0.338 > 0.05). More so, BRT system performance also appear to be a negative predictor of safety/security of bus commuters (t = -2.233; β = -2.07, sig = 0.026< 0.05). However, deployment of technology in BRT appears to have positive prediction of safety/security of bus commuters (t = 2.854; β = 0.195, sig = 0.005 < 0.05). Based on the following result, it is therefore stated that safety and security of bus commuters is explained by BRT service adequacy. However, both BRT service quality and BRT system performance has negative prediction of safety and security of bus commuters, deployment of technology has positively explain safety and security of bus commuters in Lagos.

Table 11. Model Summary of Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.141[a]	.020	.011	.826

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.516	3	1.505	2.207	.087[b]
	Residual	222.336	326	.682		
	Total	226.852	329			

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.097	.266		11.624	.000
	BRT Service Quality	-.033	.068	-.032	-.476	.634
	BRT System Performance	-.062	.095	-.053	-.648	.518
	Deployment of Technology in BRT	.166	.070	.179	2.374	.018

a. Dependent Variable: Cost Reduction to Bus Commuters
b. Predictors: (Constant), Deployment of Technology in BRT, BRT Service Quality, BRT System Performance

Table 4.10 shows that the R square value is 0.020 at a standard error of estimate of 0.826. The R square implies that the variables that were used to describe BRT service adequacy predicts cost reduction of bus commuters by 2.0 %. The table also shows that the sig. value = 0.087 >0.05 which implies differences in prediction of cost reduction of bus commuters by the variables of BRT service adequacy. The table further showed that 0.00 < 0.05 which also implies that there is a significant difference in prediction of cost reduction of bus commuters by the variables that determines BRT service adequacy. More so, the variables showed that BRT service quality appears to have negative prediction of cost reduction of bus commuters in Lagos ($t = -0.476$; $\beta = -0.033$, sig = 0.634> 0.05). Furthermore, BRT system performance also appear to be a negative predictor of cost reduction of bus commuters ($t = -0.648$; $\beta = -0.062$, sig = 0.518 > 0.05). However, deployment of technology in BRT appears to have positive prediction of cost reduction of bus commuters ($t = 2.374$; $\beta = 0.166$, sig = 0.018< 0.05).

Based on the results it is therefore stated that cost reduction of bus commuters is explained by BRT service adequacy. However, both BRT service quality and BRT system performance had negative prediction of cost reduction of bus commuters, deployment of technology has positively explain cost reduction of bus commuters in Lagos.

Table 12. Model Summary of Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.093[a]	.009	.000	.791

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.777	3	.592	.948	.418[b]
	Residual	203.777	326	.625		
	Total	205.554	329			

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.676	.255		14.415	.000
	BRT Service Quality	-.087	.066	-.089	-1.327	.185
	BRT System Performance	-.015	.091	-.013	-.160	.873
	Deployment of Technology in BRT	.076	.067	.086	1.129	.260

a. Dependent Variable: Mobility of Bus Commuters
b. Predictors: (Constant), Deployment of Technology in BRT, BRT Service Quality, BRT System Performance

Table 4.11 shows that the R square value is 0.009 at a standard error of estimate of 0.791. The R square implies that the variables that were used to describe BRT service adequacy predicts mobility of bus commuters by 0.9 %. The table also shows that the sig. value = 0.418> α = 0.05 which implies differences in prediction of mobility of bus commuters by the variables of BRT service adequacy. The table further showed that 0.00 < 0.05 which also implies that there is a significant difference in prediction of mobility of bus commuters by the variables that determines BRT service adequacy. Furthermore the table showed that BRT service quality appears to have negative prediction of mobility of bus commuters in Lagos (t = -1.327; β = -0.087, sig = 0.185 < 0.05). More so, BRT system performance also appear to be a negative predictor of mobility of bus commuters (t = -0.160; β = -0.015, sig = 0.873> 0.05). However, deployment of technology in BRT appears to have positive prediction of mobility of bus commuters (t = 1.129; β = 0.076, sig = 0.260<0.05).

Based on the result, it is therefore stated that mobility of bus commuters is explained by BRT service adequacy. However, both BRT service quality and BRT system performance had negative prediction of mobility of bus commuters, deployment of technology has positively explain mobility of bus commuters in Lagos.

Table 12. ANOVA of Perception of BRT Service Quality between Income Earners

BRT Service Quality					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.623	3	.208	.317	.813
Within Groups	213.396	326	.655		
Total	214.020	329			

The ANOVA table 4.12 measures the differences in perception of service quality between commuters that earn various income levels. The table shows that (F =0.317, and p value = 0.813 >0.05). This implies that no significant differences in perception of service quality between commuters that earn various income levels.

Table 13. ANOVA of Perception of Cost Reduction of Bus Commuters between Income Earners

Cost Reduction to Bus Commuters					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	4.133	3	1.378	2.016	.111
Within Groups	222.719	326	.683		
Total	226.852	329			

The ANOVA table 4.13. measures the differences in perception of cost reduction between commuters that earn various income levels. The table shows that (F =2.016, and p value = 0.111>0.05). This implies that no significant differences in perception of cost reduction between commuters that earn various income levels.

Discussion of Findings

Major findings showed that safety and security of bus commuters is explained by BRT service adequacy. However, both BRT service quality and BRT system performance has negative prediction of safety and security of bus commuters. BRT service quality is measured by the extent to which an appropriate BRT system possesses such elements as commuters' perceived reliability, responsiveness, empathy, assurance and tangibility. Prediction shows a negative prediction of safety and security to bus commuters by service quality which calls for improvement in the quality of services provided by the bus transit administration. This is importance because findings imply that consumer perceived service quality is not effective enough to assure maximum safety and security.

Result shows that the deployment of technology has positively explained safety and security of bus commuters in Lagos state. The use of technology in BRT systems equally implies the adoption or introduction of intelligent transportation system to the services. Commuters' responses shows that their safety and security is highly predetermined by the use of intelligent transit or transport systems in BRTs. Intelligent transport system is characterized by the use of public transport

operations centre, passenger information sign, the building of a communication backbone, electronic payment system, traffic detector, surveillance cameras amongst others.

Also, BRT service quality and BRT system performance had negative prediction of cost reduction of bus commuters, deployment of BRT service has positively explain cost reduction of bus commuters in Lagos. Service quality of BRT has been explain above, however, BRT system performance deals with the travel time, its reliability, extent of service adherence, lack of service interruption, perceived image and identity and even perceived safety and security.

No significant differences in perception of service quality between commuters that earn various income levels. The implication of this is that various income earners who are bus commuters to the BRT scheme had similar evaluation of the nature of BRT service. The BRT service quality has on the other hand, been adjudged by bus commuters as not up to standard. Therefore, commuters who even earn a very high income might not be willing to pay more due to the perceived poor service quality, not to talk of the willingness to pay, by low income earners.

5. Conclusion and Recommendations

The study has shown that a BRT service has socio-economic implication to bus commuters. Implications deduced from these findings were that bus commuters' assessment of BRT service quality and overall system performance has not largely impacted their socio-economic condition. Even, the absence of intelligent transportation system poses more risks to the security and safety of bus commuters in BRT. The, lack of BRT service adherence has been perceived equally amongst bus commuters with diverse income and consumption levels. Lack of quality services affects consumers' willingness to sacrifice or pay for certain services.

Contrary to the above, and in the assessment of the socio-economic impacts of BRT in intra-city passenger movement in Lagos state, Kolawole (2010) submitted positive socio-economic impacts in terms of low accident. However, this study extends by stating more risk to safety and security due to poor services and even lack of the implementation of intelligent transport system in the BRT services. Another conclusion is that low system performance affects the satisfaction of commuters in BRT and this result is similar to Okuagbe *et al.,* (2015) who showed that commuters' satisfaction in patronizing the BRT are mostly affected by security of the buses, reduced commuting time, attitude of the staff (the attitude as seen in the behaviour of the drivers), the prices charged as it affect the income of the commuters and the present available routes.

On the basis of the findings of this study, the followings recommendations were offered.

i. For BRT to have positive socioeconomic impacts to bus commuters in terms of their safety and security, the administrators should improve on the use of technology. Bus commuters should be allowed to make payments through the use of smart phone. The use of surveillance cameras should be encouraged and in built vehicle tracking system;

ii. The government should continue to subsidize the cost of boarding BRT in order to reduce spending by bus commuters. Efforts should be made to improve on maintenance of BRT vehicles to avoid or reduce the risk of accidents and improve commuters' mobility;

iii. Efforts should be made to improve on BRT system performance in terms of ensuring fast travel times, the introduction of appropriate scheduling times and wider coverage.

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