An Appraisal of Intercity Commuting Pattern Using Railway Services in South-Western Nigeria

Bashiru Adisa Raji[1], Adeolu Dina[1], Muse Olayiwola Solanke[1], Taiwo Kareem Alli[1]

[1]Department of Transport Management, Olabisi Onabanjo University, Ago-Iwoye, 120107, Nigeria

Abstract Tracking the influence of service improvements on passengers particularly is an important component of transport management. This study examined the characteristics of intercity travellers in the Economy Class Units (ECU) and recently introduced Diesel Multiple Unit (DMU) service within the Lagos District Nigeria Railway Corporation in south-western Nigeria. A structured questionnaire was randomly administered to 1206 passengers traveling on these trains over two months with analysis in-volving the use of the regression model. The findings of the study indicate the socio-economic characteristics of passengers accounted for about 90.3% and 88.2% of the variation in volume trips made by passengers using DMU and ECU service respectively. Significant socio-economic predictors of trip volume on DMU train are Occupation (0.137), Vehicle Ownership (0.218), and Type of vehicle (0.218). On the other hand, significant socio-economic attributes of ECU passengers that affect trip volume are Age (0.274), Education (0.970), Occupation (-0.918), Income (0.435), Vehicle Ownership (0.249), and type of Vehicle (-0.165). The result further indicates Trip Purpose explained 83.5% and 86.7% of the variation in the trip volume of both services. The trip purpose that significantly influences the volume of trips on the ECU trains are Business (0.210), Shopping (0.447) Leisure (-0.463), and other trip purposes (0.775). For the DMU train, only Other-trip forms of purpose (0.753) is significant in explaining the volume of passengers using that service. The study shows similarities in the use of the two services while several useful recommendations on ways to improve both services of the corporation were proffered.

Keywords Intercity, Railway, passengers, Commuting, South-West, Nigeria

JEL R4, R41

1. Introduction

In most African countries including Nigeria, railway transportation is not growing rapidly as they have not been encouraged or allowed to respond to changes in the economies they serve [22]; [17]. Nigeria railway transport development in similitude has for long been heavily criticized in the studies of [10]; [7]; [5]; [21]; [21]; [27]; [2]; [26]; [4]; [9]; [3] and many others for a good reason. Despite the long history of rail travel in the country that spans about 123 years, the existing track network and rolling stock is largely a relic inherited from its colonial administrators in 1960. Failure to invest in the sector for several decades led to a moribund operation. The railways also lost most of its traffic to its road mode competition with skeletal operations in most regions of the country except South-Western Nigeria.

The operation of the corporation within the Southwest region of Nigeria for several decades remains the busiest among the geo-political zones of the country. There are 16 daily mass transit train trips operated between the Lagos megacity and several sub-urban settlements within the region. Estimated daily passenger traffic of 18,000 passengers are moved on the mass transit service of the corporation on Economic Class Units (ECU) trains that target low-income earners.

The operation of the refurbished fleet of ECU Trains has however been much criticized for lacking the requisite service quality to make train travel an attractive alternate mode of travel within the region. “[9]” noted the need to adapt Nige-ria’s colonial railway to modernism which must involve the provision of rail infrastructure and services to a wider public spectrum of users across socio-economic groups. The outlook of overcrowded trains, rooftop riding has for long reinforced a popular saying that train travel in the country is for the poor. “[28]” report estimated two-way road passenger traffic crossing of the three main bridges between mainland and Lagos Island in Lagos state per day to be around 1.59 million lending credence that the train service is grossly underutilized and unattractive to the public. Comparatively [16] noted that within its first seven years of operation, ECU operation, an average of 810,622 passengers is moved yearly by the service within the region.

[20]” further noted that the NRC Management is mandated to operate in a manner that will ensure continuous growth by marketing an efficient technically competent transportation service in pursuit of the country's socio-economic development. As part of wider reforms being implemented to revive

DOI: 10.26552/tac.C.2021.1.2

and modernize train service in the country, the management of the corporation in 2014 introduced the service of 2 units of Diesel Multiple Unit (DMU) to its operations in the Lagos District in Southwest Nigeria. Each unit of DMU with a 540 passenger is intended to improve inter-urban service quality and make train passenger travel more attractive to higher economic class commuters within the region. The operation of the DMU service comes with minimal stops at selected stations and a fare regime three times higher than that of the ECU service.

Six years into its introduction of the service, it is unclear how far the DMU operation has impacted commuter movement in the region. It is unclear how the different socio-economic groups make use of both services. This becomes more important following the recent completion of the standard gauge mainline and test run of operations between Lagos and Ibadan in Southwest Nigeria in the year 2020. It is necessary to understand and track how improving services reflects on socio-economic groups in the country.

This study has the following objectives:

1. To understand the effect of passenger socio-economic on the use of commuter service of NRC in the Southwest Region of Nigeria.

2. Compare the influence of trip purpose on the use of trains among DMU and ECU passengers.

3. Compare the influence of socio-economic characteristics among DMU and ECU passengers.

2. Literature

Several authors have outlined factors of transport patronage among passengers generally. “Reference [11]” observed that socio-economic characteristics of trip makers remain crucial to trip frequency, cost, length of trip, and their modal choice of trips. “[12]” also observed that urban trips are often affected by variables such as higher occupational status, household size, income, and level of education. Since the quality and types of coaches in use for passenger traffic by NRC now vary, there may also be an implication for the pattern of patronage of the rail services by commuters. “[13]” noted that the relationship between transport fares of public transport and their patronage tend to be inverse. Such inverse relationship according to [14] is not similar in all public transport modes as changes in fares alone did not explain changes in demand for public transport in Mexico City. The study showed more significant improvements in service qualities on patronage than changes in fares.

Studies such as [10]; [7]; [5]; [21]; [21]; [27]; [2]; [26]; [4]; [9]; [3] have made heavy criticism to railway development in Nigeria noting problems such as inadequacies of policy, rolling stock, lack of maintenance, staff depletion, vertical integrated management and failure to deregulate the sector among others as reasons for the failure of the sector of transportation in Nigeria. The neglect of the railway system by successive post-independence governments further culminated in a precipitous decline in railway patronage both in passengers and freight traffics. A survey by the Nigerian Statistical Association (NSA, 2000) showed that the railway began to lose its once pre-eminent position in the mid-1970s. By the end of the 1990s, the study noted the use of rail transport in Nigeria had fallen insignificantly [18].

“References [25], [23], [29],[16] and [1];” observed that rail transport provides the most cost-effective, affordable, energy-saving, and environmentally friendly form of travel available to man especially in areas where traffic densities are known to be high. “[6]” further observed that when railway systems are properly integrated with other modes of transportation, economic levels of traffic can be consolidated to enable the railway to provide efficient services for high-density flows of homogenous traffic to be carried over relatively long distances. Access to rail transport is regarded as one of the main strategies for coping with some of the critical effects of urbanization at the town, city within the regional level.

Among the studies so far reviewed, only reference [8] had investigated the socio-economic influence on the patronage of train service in the region in 2011. The time lag of study [8] coupled with the introduction of DMU trains service altered of service offered in the region. The dynamics and changes remain a research gap and the focus this study intends to fill is to understand how commuters have responded to the service options available to them.

3. Methodology

The study area is the Lagos District of the NRC. The administrative district of the corporation is the smallest and the busiest of the 7districts of the corporation in the country. The district has a total mainline track length of about 41km with about 16 stations from Iddo terminus to Ifo Junction in Ogun state (figure 3.1). The active line in the district is barely 1.1% of the 3505km of single-track network of narrow-gauge line in the country.

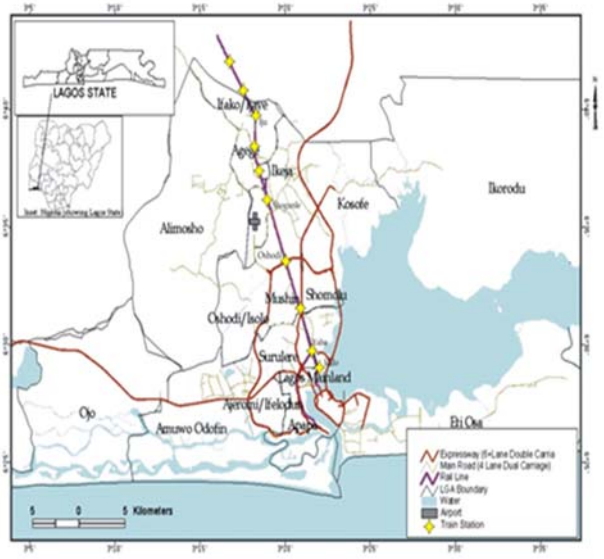

Figure 3.1: Rail Track and Stations within Lagos District

Source: [30]

The district runs two types of train service; the economic class trains are made up of salvaged coaches that previously formed part of the rotted rolling stock of the corporation. These run a total of 16 daily train trips in the district moving an average of 1000 passengers per trip. The district also operates 2 new Diesel Multiple Units (DMU) a service that targets middle-income commuters within the district.

The DMU trains run 6 daily trips between Apapa in mainland Lagos and Ijoko a suburb township in neighbouring Ogun State. The district operates mixed traffic of freight and passenger within and outside the state to other regions of the country. The service run by the corporation is the only train service available within the megacity of Lagos, the most densely populated area of Nigeria which is home to an estimated 18 million inhabitants. There is about 95% reliance on the road network for daily commuting, there is a consistent drive to expand and improve access to rail travel at the state and federal level of government.

The study employed a descriptive research survey through the use of a structured questionnaire. Variables used are premised on the objectives of the study which include socio-economic characteristics, types of trip generated, and problems encountered by passengers using the DMU and ECU class of NRC service. An interview guide elicits in-formation on the challenges facing the management of railway transport as well as the possible ways of improving the railway transport system that was sent to the top officials of NRC. The questionnaires were randomly administered to 1206 passengers on board between the origin and destination of train trips covering Ijoko – Itoki – Alagomeji and Iddo. The sample frame emanated from seat numbering on board the DMU and ECU train services operated by NRC. The DMU has three coaches with each coach capacity of 72 passengers while ECU ten coaches with a capacity of 99 passengers.

Therefore, the sample size for the study is 1206. This implies that a copy of 1206 questionnaires was distributed at train stations from Ijoko, Itoki, Alagomeji, and Iddo. Data collected were analysed using both descriptive and inferential statistical methods. Descriptive statistics include the use of frequency, percentage, and pictures and was used to explain the socio-economic characteristics of the DMU and ECU passengers. Multiple regression analysis was used to (i) estimate the influence of socio-economic characteristics on the volume of trips generated by the passengers at the aggregate level. (ii) estimate the four purposes on the volume of trips generated by DMU and ECU passengers. (iii) examine the influence of socio-economic characteristics on the volume of trips generated by DMU and ECU on a disaggregated level.

The regression equation usually used for the analysis is:

$Y = a + b_1X_1 + b_2X_2 + b_3X3 + b_nX_n + c$ .....*(eq 1)*

Where:

Y=dependent variable (Volume of trips generated.)

a = constant

$X_1 \rightarrow Xn$=independent variables (gender, age, marital status, education, employment, and income)

$b_1 b_n$=coefficients of independent variables

c=random error term measuring the deviation of the observed trips *(Y)*

Where:

Y=dependent variable (Number of trips generated) (1 – 3 times, 3 – 5 times, and above 5 times).

$X_1 \rightarrow X_n$=independent variables (gender, age, marital status, education, employment, and monthly income).

4. Results and Discussion

A. Socio-Economic Characteristics of Passengers

The result of the passenger survey as indicated in the table 4.1showed that 817 respondents out of 1206 sampled are male while the remaining 389 were female representing 67.7% and 32.3% of the total response respectively. Furthermore, 33 out of 1206 (2.7%) were under the age of 18 years, 252 (20.9%) are between the ages of 18 and 25 years, while 789 (65.5%) are between the ages of 26 and 50 years. There are 132 (10.9%) respondents above 50 years of age, this revealed that the majority (65.5%) of the respondents are between the ages of 26 and 50 years.

The educational pedigree of respondents indicates that 60 out of 1206 representing 5 % of the total population had no formal education. There are 88 (7.2%) of the respondents with primary education, while 488 (40.5%) had secondary education, 570 (47.3%) had post-secondary education. The majority of the respondent had post-secondary education with a percentage of 47.3%. The occupational status of respondents also showed that 143 respondents making up 11.8% are employees. 367 (30.5%) are civil servants, 22 (1.8%) indicated teaching as their occupation, 197 (16.4%) are students, 428 (35.5%) are self-employed and 49 (4.1%) are unemployed. Most of the respondents are self-employed with a percentage of 35.5%.

The income stream of respondents showed that 203 of the 1206 respondents representing 16.8% earned a monthly income below 18,000. Another 554 (45.9%) earned a monthly income of between 18,000 and 50,000 Naira while 148 (12.3%) earned a monthly income between 51,000 and 83,000 Naira. 175 (14.5%) of the respondents earned a monthly income between 83,000 and 115,000 naira, 126 (10.5%) earned a monthly income above 115,000 naira. The study revealed that most of the respondents earned a monthly income between 18,000 and 50,000 Naira with a cumulative percentage of 45.9%. Response on vehicle ownership indicates 691 out of the 1206 respondents representing 57.3% of total responses indicated ownership of vehicles. Another 515 (42.7%) indicated non-ownership of vehicles. The study thus revealed that most of the respondents owned one form of vehicle or the other with a percentage of 57.3%. On the types of vehicles owned by the respondents, 647 representing 53.6% indicated car ownership as their type of vehicle. An-other 203 (16.8%) indicated buses as their type of vehicle, 88 of the respondents (7.3%) indicated truck ownership as their type of vehicle, 203 (16.8%) indicated motorcycle as their type of vehicle owned and 66 (5.5%) indicated that they owned other types of vehicles. The study revealed that most

DOI: 10.26552/tac.C.2021.1.2

respondents indicated car as their type of vehicle owned with a percentage of 53.6%.

Table 4.1. Socio-Economic Characteristics of Passengers

N/S		Freq	%
	Sex		
1	Male	817	67.7
	Female	389	32.3
	Total	**1206**	**100**
2	**Age Group**		
	Below 18 years	33	2.7
	18 - 25 years	252	20.9
	26 - 50 years	789	65.6
	50 years and above	132	10.9
	Total	**1206**	**100**
3	**Educational Level**		
	No Formal education	60	5
	Primary education	88	7.2
	Secondary education	488	40.5
	Post-secondary education	570	47.3
	Total	**1206**	**100**
4	**Occupation**		
	Employee	143	11.8
	Civil servant	367	30.5
	Teaching	22	1.8
	Student	197	16.4
	Self-employed	428	35.5
	Unemployed	49	4.1
	Total	**1206**	**100**
5	**Income Level**		
	Below 18,000	203	16.8
	18000 – 50,000	554	45.9
	51,000 – 83,000	148	12.3
	83,000 – 115,000	175	14.5
	Above 115,000	126	10.5
	Total	**1206**	**100**
6	**Ownership of Vehicle**		
	Yes	691	57.3
	No	515	42.7
	Total	**1206**	**100**
7	**Type of Vehicle Owned**		
	Car	647	53.6
	Buses	203	16.8
	Truck	88	7.3
	Motorcycle	203	16.8
	Others	66	5.5
	Total	**1206**	**100**

Source: Authors' Field Survey

B. Socio-economic Characteristic of Train Passengers and Travel

The study first sought to understand the overall effect of passenger socio-economic variables on the combined response from both the DMU and ECU passengers. The variables considered in the regression model include Gender, Age, Education, Occupation, and income of passengers. The hypothesis postulated below was tested to establish if one or more of these variables can explain the choice of usage of trains along the route.

From the result, the coefficient of determination R^2 indicates that the model can only account for 2.8% of the variation in the volume of the trip by train passengers as indicated in table 4.2. The model is unable to account for the remaining 97.2% variation in the volume of trips generated, a residual associated with variables not imputed into the model. Furthermore, variables considered such as Gender, Age, Education, Income with exception of Occupation have negative coefficients. However, the age of the train travellers appears to be the most important in determining the choice of travel among the socio-economic variable considered in the model. The regression result of the study's model suggests that the socio-economic characteristics of train passengers in the study area do not have any impact on the volume of trips generated. Hence, the postulation that there is no significant relationship between the socio-economic characteristics of passengers and the volume of trips generated is valid at a 5% level of significance.

Table 4.2. Volume of trips generated and socio-economic characteristic

Dependent variable: Volume of Trips					
Variable	**Coef.**	**F-Stat**	**Sig.**	**T-Stat**	**R^2**
Constant	2.408	1.227	0.000	5.435	0.028
Gender	-0.161		0.372	-0.895	
Age	-0.208		0.140	-1.482	
Edu. level	-0.088		0.446	-0.731	
Occupation	0.077		0.908	-0.116	
Income level	-0.066		0.421	-0.806	

Source: Authors' Field Survey

The study further revealed the fitness of the study model in terms of the trip purpose of both DMU and ECU train passengers. The coefficient of determinations R^2 indicates that the volume of trips generated by DMU passengers in terms of fitness of the study model is 83.5 % of the variations in trip purpose can be explained by the combined influence of trip purpose characteristics in the regression model as shown in tables 4.3a.

Table 4.3a. Volume of Trip generated and Trip purpose of DMU

Dependent variable: Volume of Trips					
Variable	**Coef.**	**F-Stat**	**Sig.**	**T-Stat**	**R^2**
Constant	0.027	64.826	0.917	0.104	0.835
Visitation	-0.066		0.656	-0.447	
Business	0.311		0.071	1.835	
Shopping	0.107		0.304	1.035	
Leisure	-0.126		0.593	-.537	
Others	0.753*		0.000	9.176	

*significant at 5% Source: Authors' Field Survey

The remaining 16.5% are variables not factored into the model. Details of the result showed that variables considered such as visitation and leisure trips have a negative relationship with the dependent variable; only "Others" had a

significant relationship among the five variables considered. The ECU passengers on the other hand equally exhibited the same effect as "visitation" and "leisure" trips of DMU passengers as they both had a negative relationship with the volume of trips. However, trip purpose such as business trips, shopping, leisure trip, and others all had a significant relationship with trips volume among ECU passengers, only trips made for visitation was insignificant. Meanwhile, overall, 86.7% of the variation in trip purpose can be accounted for by the model while the remaining 13.3% are associated with variables not imputed into the model as indicated in the table 4.3b. In all, "other trip" purpose is the most important variable effect on the trip of passengers using the two classes of service.

The individual DMU and ECU passenger characteristics were also examined in terms of trip volume generated. Variables at this stage include Gender, Education, Income, Age, Occupation, Ownership of Vehicle, and type of Vehicle Owned.

Table 4.3b. Volume of Trip generated and Trip purpose of ECU

Dependent variable: Volume of Trips					
Variable	**Coef.**	**F-Stat**	**Sig.**	**T-Stat**	**R^2**
Constant	0.006	187.864	0.975	0.031	0.867
Visitation	-0.057		0.424	-0.802	
Business	0.210*		0.000	4.055	
Shopping	0.447*		0.000	4.821	
Leisure	-0.463*		0.000	-4.467	
Others	0.775*		0.000	11.268	

*significant at 5% Source: Authors' Field Survey

The model result showed that the coefficient determination R^2 for DMU is 90.3% which implied that the variations in the volume of trips generated are explained by the combined influence of socio-economic characteristics in the study model. The remaining 9.7% may be attributed to other variables not accounted for in the model. All coefficients of the independent variables are positive except Age and Income while Occupation and Vehicle Ownership were the only significant contributors to the model at a 5% level of significance as shown in table 4.4a. The ECU service also showed that the combined influence of the independent variables considered to be 88.2% implying the outstanding 11.8% unaccounted for by the model may be due to variables not imputed. The coefficients of independent variables such as Gender, Occupation, and Vehicle Ownership have negative while the remaining are positive as shown in table 4.4b. Age, Education, Occupation, Income, and Ownership of vehicle are significant contributors to the model at 5%. Vehicle Ownership is the most important contributor to the variation in passenger trip frequency on DMU services while the occupation of respondents is most important for ECU services.

Table4.4a. Volume of Trip Generated and Socio-economic Characteristics of DMU

Dependent variable: Volume of Trips					
Variable	**Coef**	**F-Stat**	**Sig.**	**T-Stat**	**R^2**
Constant	0.378	82.163	0.403	0.839	0.903
Gender	0.060		0.372	0.894	
Age	-0.055		0.446	-0.763	
Educ.	0.018		0.809	0.242	
Occup.	0.137*		0.055	1.926	
Income level	-0.007		0.927	-0.091	
Ownership of Vehicle	0.218*		0.002	3.113	
Veh. Ownership Type	0.103		0.135	1.501	

Source: Authors' Field Survey

Table4.4b. Volume of Trip Generated and Socio-economic Characteristics

Dependent variable: Volume of Trips					
Variable	**Coef**	**F-Stat**	**Sig.**	**T-Stat**	**R^2**
Constant	-0.69	51.996	0.644	-0.463	0.882
Gender	-0.018		0.854	-0.185	
Age	0.274*		0.000	4.997	
Educ.	0.970*		0.000	8.363	
Occup.	-0.918*		0.000	-9.191	
Income level	0.435*		0.000	4.754	
Ownership of Vehicle	-0.165*		0.042	-2.052	
Veh. Ownership Type	0.249		0.084	1.741	

Source: Authors' Field Survey

DMU: TRIP FRQ = 0.37 + (0.060)Gender – (0.055)Age + (0.18)Education + (0.137)Occup – (0.007)Income + (0.218)Vehicle Ownership + (0.103)Veh. Ownership Type

ECU: TRIP FRQ = - 0.69 – (0.18)Gender + (0.274)Age + (0.970) Education – (0.918)Occup + (0.435)Income - (0.165)Vehicle Ownership + (0.249) Veh. Ownership Type

Train travel appears to be dominated by male passengers as there was twice as much male commuting by trains than females. Train use is also dominated by the most active working age group between 25-50 years. It is not immediately clear why more males use this medium however the dominant age groups are those in the economic class or working-age group (see figures 4.1 and 4.2 for ECU and DMU Trains).

The introduction of the DMU service is targeted at middle-income commuters along the route under study. A Reconnaissance Survey report in 2011 suggests these classes of Nigerian citizens earn an average monthly income in the range of N75,000-100,000 ($480- 645). Although the report suggests the middle class makes up about 23% of the Nigerian

DOI: 10.26552/tac.C.2021.1.2

population only about 25% of commuters surveyed in this research fall within this income category.

Figure 4.1. ECU Trains used in the Study Area

Figure 4.2a. DMU Trains used in the Study Are

Figure 4.2b. DMU Trains used in the Study Area

This suggests train travel particularly by the DMU service is yet to adequately capture its target audience along the route. The negative coefficient of income as shown in table 4 above further suggest that the more or less passenger earn the more it affects their choice of travel in both services, however, the negative coefficient of age may also be suggestive that younger travellers are more attracted to the service than older travellers. It also not clear if this is related to the near absence of platforms at most train stations which can make embarking/disembarking difficult for the elderly.

The significant relationship between socio-economic characteristics of passenger and trip purpose such as business shopping leisure and other trip purpose suggest the varying reason for the use of the ECU trains in particular. Business and related activity are the main generators of train travel in both cases for DMU and ECU service the relationship between these trip purposes and the socio-economic attributes of train commuters are positive. In other words, the more business and shopping trips the more likelihood of generating a train trip. However, leisure trips are seemingly un-attractive to train travel, it is not clear if this can be associated with the comfort and convenience of NRC services or other service quality attributes of their operations. It is however noteworthy that while no significant pattern of use is established for the DMU service, ECU trains must accommodate accompanying loads of business travellers on such trips and ensure minimal in-convenience to other travellers.

In terms of the effect of passenger socio-economic characteristics on the frequency of train trips, the positive coefficients of regression from the survey on DMU passengers and key socio-economic variables are worthy of note. For example, the significant relationship between ridership, occupation, and vehicle ownership suggests the service may be attracting its target audience. Occupation and vehicle ownership are associated with higher economic earners who remain the main targets for modal shift to the railway from road travel by NRC authorities. It is expected more of this category of commuters will utilize the park and ride facilities in some strategic stations. The regression result from the ECU service suggests Age, Education, Occupation, income, vehicle ownership, are significant socioeconomic variables associated with trip frequency of passengers. The result on another hand suggests the frequency of patronage of ECU service increases with Age, Education, and Income while the type of occupation and vehicle ownership may also explain the frequency of passenger ridership on the ECU trains. The result particularly that of ECU confirms the position of [11] who had opined that socio-economic characteristic of trip makers remain crucial to their trip frequency, length of trips, and their modal choice of trips. “[12]” had also observed that urban trips are often affected by variables such as higher occupational status, household size, income, and level of education. In other words, the ECU trains may be attractive to multiple age and income groups in the study area.

5. Summary and Conclusion

This study aims to compare the socio-economic attributes of intercity train travellers using the NRC DMU and ECU service in South-Western Nigeria. The study established a comparative difference in passenger's socio-economic characteristics and their patronage of the ECU and DMU service of NRC in the study area. The study established that the socio-economic attributes of ECU train users significantly

influenced passenger trip purpose and the frequency of such than that of the DMU service where occupation type plays the only key role in a train trip. In conclusion, although socio-economic characteristics play a crucial role in transport patronage globally, the role played by the variable particularly for DMU service in South-Western Nigeria is limited which is attributable to the high cost of the service and limited coverage of tracks within the region along the route.

The first recommendation emanating from this study follows that of [8] who had suggested trip cost be subsidized or reduced to increase the trip frequency of passengers which will allow for more defined use of the DMU service in the sub-region. Another recommendation is that the management of NRC must ensure station infrastructure such as platform area is constructed at each of its stations to ensure no age group is marginalized from its service. The present difficulty of climbing vertical staircases into ECU will not encourage the fiscally challenged persons to use the mode. Such a gesture will make train travel more attractive to the aged and physically challenged persons. There must be a concerted effort to ensure the extension of rail tracks into other catchment areas within the South-West Region particularly in Lagos as a measure to boost passenger traffic and relevance of train travel. Furthermore, the single-track network operation is currently a major challenge to efficient operation; mainline tracks should be expanded to double track to improve travel time, service quality, and attractiveness of train travel. Finally, the management of NRC must target and understand the passenger user mix of its service to optimize the satisfaction of all users. The significance of business travel and office travel suggests passengers have varying needs of convenience and possibly load onboard trains. Managing the mix will maximize convenience for these classes of travellers who may have varying needs.

REFERENCES

[1] Abioye, O. Shubber, K. and Koenigsberger, J. (2016). Evaluating the role and impact of railway transport in the Nigerian economy, options and choices: case of Nigerian Railway Corporation. Journal of Economics. 2(4) 103-113.

[2] Abubakar, A.A. (2006). Nigerian railways: Past, present and future perspectives. Rail News. 4 (6): 4

[3] Ademiluyi, I. A. and Dina, O. A. (2011). The millennium development goals and the Sustainable future for Nigeria's urban environment: A railway strategy. Journal of Human Ecology, vol. 33 (3): 203-209

[4] Ademiluyi, I.A., (2006). Rail transport system in Nigeria: it contributions, constraints and the way forward. Knowledge Review. 12 (4): 1-8.

[5] Adepoju, I. B. (2019). Efficiency of railway transport as a sustainable mode of transport in Nigeria: A Study of Rail Mass Transit in Lagos and its Environs. Electronic Research Journal of Social Sciences and Humanities. 1(1). DOI: 10.2139/ssrn.3576072

[6] Adesanya, A. (2010). Bringing the Nigerian railways back on track: challenges and options. A paper presented at monthly NISER Seminar Series, Held at the NISER Ibadan.

[7] Agbaeze, E. K. and Onwuka, I. O. (2014). Boosting Railway System Infrastructure in Nigeria: The Public-Private Partnership Option. Journal of Business Administration and Management Sciences Research Vol. 3(3), 39-48.

[8] Agunloye, O.O. and Ilechukwu,U.U. (2011) Travels pattern and socio-economic characteristics of rail transport passengers in Lagos Metropolis, Nigeria. International Journal of Economic Development Research and Investment. 2 (1):115 -126.

[9] Akwara, A. F., Udaw, J. E., Ezirim G. E. (2014). Adapting colonial legacy to modernism: A focus on rail transport development in Nigeria. Mediterranean Journal of Social Sciences. l 5 (6).

[10] Badejo, B. A. (2014). Transporting the future today: Portrait of Nigeria. 65th Inaugural Lecture, Olabisi Onabanjo University, Ago-Iwoye, Nigeria.

[11] Basorun, J. O. and Rotowa, O.O., (2012). Regional assessment of public transport operations in Nigerian cities: The Case of Lagos Island. International Journal of Developing Societies. 1(2).

[12] Bresson, G., Dargay, J., Madre, J.L. and Pirotte, A. (2004). Economic and structural determinants of the demand for public transport: An analysis on a panel of French urban areas using shrinkage estimators. Transportation Research Part A, (38), 269-285.

[13] Crotte, A. (2008), Estimation of transport related de-mand elasticities in Mexico city: An application to road user charging. MSc Thesis submitted to Centre for Transport Studies, Department of Civil and Environmental Engineering, Imperial College, United Kingdom.

[14] Fadare, S. O. and Omole, T., (1991). Socio-economic and travel characteristics of rail passengers: A case study of Western Division of the Nigerian Railway Corporation routes. Ilorin Journal of Business and Social Science. (43) 56.

[15] Farrell, K. (2018). An Inquiry into the Nature and Causes of Nigeria's Rapid Urban Transition. Urban Forum. (29), 277–298. https://doi.org/10.1007/s12132-018-9335-6

[16] Filani M.O (2011). Transport and national development: issues, challenges and the way foward. Commemoration lecture delivered at the 70th birthday in honour of Engr. (Dr) Tajudeen O. Bawa-allah. African Research Institute for Transport and Communication Development (ARITCD), Lagos 2011.

[17] Huff, L.W. and Thompson L.S., (1989). Techniques for railway restructuring. (Railway Management Component, Phase II), Paper prepared for the Union of African Railways (UAR), Washington, D.C.: World Bank.

[18] Nigeria Statistical Association report (2000).

[19] NRC, (2015a). A welcome address to post-graduate students of Masters in Transport of the Department Geog-raphy, Olabisi Onabanjo University, Ago-Iwoye during the 2015 Field trip exercise to NRC.

[20] NRC, (2015b) Welcome address by the Managing Di-rector NRC on the occasion of the familiarization tour of railway facilities at Ebute-Metta, Lagos by the Hon Minister of Transport on Monday 14th December 2015.

DOI: 10.26552/tac.C.2021.1.2

[21] Odeleye, J. A., (2000). Reviving the Nigeria Railway – options and challenges. Japan Railway and Transport Review. 21(8): 12-18.

[22] Odeleye, J.A., (2015). The challenges to competitive rail transport system in Nigeria. A paper delivered at National Railway Conference, Sheraton Hotel and Towers Abuja on10/31/2015.

[23] Olanrewaju, S. A. (eds) (1986). Transport Systems in Nigeria, 31-50.

[24] Ojekunle, K., (2012). Urban rail transport in Lagos, Nigeria. Encyclopedia of Earth.

[25] Onakomaiya, S. O. (1978). Overland Transport. In Geography of Nigerian Development Oguntoyinbo, J. S. (ed). Heinemann Educational Books, Ibadan, 319-337.

[26] Oni, S. (2000). Encouraging a multimodal transport system in Nigeria. Presented at a seminar titled Towards a Competitive and Sustainable shipper-friendly shipping En-vironment.

[27] Solarin, A.M. (2000). An appraisal of rail transport and its effect on freight mass transit in Nigeria. M.Sc. Thesis, Unpublished Ago-Iwoye, Centre for Transport studies Ogun-State University, Nigeria.

[28] Word Bank, (2002). Sustainable transport: priorities for policy reform. World Bank, Washington, D.C.

[29] Word Bank, (2010). Sustainable transport: priorities for policy reform. World Bank, Washington, D.C.

[30] LAMATA, (2016): Lagos State Metropolitan Area Transport Authority (2016)..