International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Evaluation of Nigerian Railway Transportation System

[1]Muhammad Sani Aliyu, [2]Abdulkadir Sabo Osu, [3]Hamza Hamza Musa, [4]Ighodaro Onaiwu, [5] Olabode Amos Abayomi

[1,2,3,4,]*Department of Civil Engineering Technology, The Federal Polytechnic Nasarawa, Nigeria*
[5]*B.Eng. Student, Department of Civil Engineering, Bayero University, Kano, Nigeria*
Corresponding Author:Muhammad Sani Aliyu,

Submitted: 05-01-2022 Revised: 15-01-2022 Accepted: 18-01-2022

ABSTRACT
This research aims at evaluating the modernization in the Nigerian railway sector and to make recommendation based on the challenges observed facing the sector. The research offers an analytical evaluation of the railway sector, using both primary and secondary data. To do this, survey research questionnaires were used as data collection instrument. Two train terminus were selected for the study out of several terminus in Nigeria., A sample of 126 respondents from Gude and 201 respondents from Lagos were included in the study. Therefore a total of 327 questionnaires were administered to respondents, out of which 318 questionnaires were completed given a response rate of 97.25%. The data analysis revealed that for all the research hypotheses, the null hypothesis should be rejected at 5% level of significance, because the values of chisquare (X^2) are all greater than the critical value. Therefore it was concluded that, the Nigerian railway sector has witnessed modernization, though not significantly, in terms of improving the national economy, as well as transportation safety and comfort.
Keywords: Nigeria, Railway, Evaluation, Modernization

I. INTRODUCTION

The main objective of railway construction in Nigeria between 1898 and 1927 was partly to maintain links between the central seat of colonial government and other parts of the country. The first train ran in London in 1863, while the first in Japan, according to kakumoto, ran in 1872 .The centenary historical background of the railway in Nigeria notwithstanding, the spate of its development and growth is conspicuously slow, while its colleagues have advanced technologically and operationally such that an average speed of their train is put to 150km/hr., while that of Nigeria currently ranges between 30-40km/hr. In other words have in their stock titling train, satellite control information systems, but the Nigerian railway is still largely being manually operated using the key token instruments, semaphore network to mention but few.

However, in recent years Nigeria has witnessed some form of advancement and technological improvement of their facilities, example of such advancement are the light rail system, standardization of some of their gauges and few other things

Light rail transit is of various forms of electronically powered rail system.it ranges from low cost trains operating on streets ways with other road users to metro or heavy rail when demand arises

Passengers' carrying capacity ranges from 255-533 per coach. Light rail is distinguishable from heavy rail by its operation, shorter train units at moderate speed, shared track way etc.

Standardization of gauges was started in the Goodluck Ebele Jonathans regime in the year 2012, so as to upgrade the narrow gauge track to standard gauge track in specific locations where standard gauge track does not previously exist. A narrow gauge track can be identified by its width which ranges from 600mm to 1067mm (3ft 6in), while the standard gauge track have a width ranging from 1070mm to 1435mm (4ft 8.5in)

Finally, recently Nigeria has also witnessed the development of the rail networks, rehabilitation of stations. Rail networks were built to link more states of the federation as opposed to the earlier objective of the colonial administration. Before this time, there were some attempts to resuscitate the Nigerian railway system. The first of such efforts began with the engagement of the Rail

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

India Technical and Economic Services (RITES), by the government. RITES contract was for the period between 1978 and 1982. A second attempt, tagged 'Ogbemudia Revolution', was between 1989 and 1992. While the RITES project was to overhaul the rolling stock and manage the services of the NRC, the Ogbemudia Revolution brought a new dimension to local rail transport experience. However, the First National Rolling Plan (1990 - 1992) recognized that the benefits of RITES' efforts could not be sustained soon after they left. The most significant effort at revamping the Nigerian railway system is the engagement of a Chinese company China Civil Engineering and Construction Corporation (CCECC) in 1995 for thirty-six months. The contract, worth about US$528,697,000, required CCECC to fulfill the obligation of rail-track restoration which includes track surveys, track repair and realignment/reinforcement as well as reduction of sharp curves. Another major mandate in the contract was the provision of rolling stock. In this respect, CCECC supplied 50 locomotive, 150 coaches and 400 wagons. While Odeleye (2000) noted that the project ended with marginal improvement in the service of Nigeria Railway Corporation (NRC), Adesanya (2002) observed that, by 1998, not all aspects of the mandate were fulfilled.

1.2. **Statement of Hypothesis**

- Ho - The Nigerian railway sector has not witnessed any modernization/advancement since its inception
- Hi - The Nigerian railway sector has witnessed advancement/modernization since its inception

- Ho-railway has improved the Nigerian economy in recent years
- Hi-railway has not improved the Nigerian economy in recent years

- Ho-railway is not the safest/most comfortable means of transportation in Nigeria
- Hi-railway is the safest/most comfortable means of transportation in Nigeria

1.3.**Research Questions**

- Has the Nigerian railway sector witnessed any advancement or modernization in recent years?
- Has the Nigerian railway sector had any impact on the Nigerian Economy?
- The railway mode of transportation, is it the safest and most comfortable mode of transportation in Nigeria today?
- How has the railway transportation system affected communal lives?

II. RESEARCH METHODOLOGY

The study was carried out in selected train stations to evaluate the level of modernization in the Nigerian railway transport system. In this research study, the researcher made use of both primary and secondary data. The primary data were obtained through questionnaire administration, personal interviews, direct observation, photo shooting etc. Questionnaires were administered to the respondents directly and a follow up interview was also made to clarify and retrieve accurate information. Camera was also used to take picture of what was directly observed

On the other hand, secondary data was collected from the internet, research papers and periodicals, facts from seminar papers, government gazettes on Nigerian Railway
Corporation (NRC)

2.1 Location and Geology of the Study Area

The study was carried out at two different areas,

- The Lagos railway terminus at Iddo: the Lagos railway started under the management of the Nigerian railway corporation with its terminus at Iddo .The employees met at the different sections of the terminus were duly and properly considered for the research.

- The railway terminus at Gude settlement of Akwanga LGA, Nasarawa State: Gude is a nucleated settlement with an estimated population of about 3750 people. The study involves consulting the staffs at the terminus and the linear settlement around the railway station, hence a selected portion of the entire population of Gude and the staffs at the terminus were duly considered for the research.

2.2 Sample Size Determination

The estimated population of the nucleated settlement of Gude was found to be around 3750(Wikipedia), but the entire population was not considered for the study. The linear settlement near the train station was considered and the population of the people including the management staff of the train station was estimated to be around 405. And at the Lagos train station a total of 185 management staffs were counted. The Yaro Yamene statistical tool was used to determine the sample size Formula:

$$n = \frac{N}{1+N(e)^2}$$

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Where n= sample size N=population size e= margin of error (5%) 1=constant
Sample size for Gude
N= 405
e= $\frac{5}{100}=0.05$ n $=\frac{405}{1+405(0.05)^2}$
n=201
Sample size for Lagos
N = 185
e = 0.05
n= $\frac{185}{1+185(0.05)^2}$
n=126
On this note a total of 201 and 126 questionnaires were distributed to the respondents and 194 and 124 were filled and returned.

2.3 Method of Data Analysis

The analysis of data was organized along the following lines. The use of simple percentile table, the calculation and trend of response were equally drawn up on the table. To draw valid conclusion for the study, the hypothesis formulated were tested with the aid of chi-squared formula at 0.05 or 5% level of significance. Chi – square formula is stated as follows

$X^2 = \frac{\sum(O-E)^2}{E}$

Where
X^2 is chi-square
O is observed frequency in the corresponding category
E is the expected frequency in the corresponding category
$\sum$ Is sum of
Df is the degree of freedom
Ways of calculating chi square:
For a 2 by 2 contingency table

	NUMBER OF RESPONDENTS		PERCENTAGE (%) OF SAMPLES		TOTAL
	GUDE	LAGOS	GUDE	LAGOS	
OPTION A	a	b	_____	_____	a + b
OPTION B	c	d	_____	_____	c + d
TOTAL	a + c	b + d	_____	_____	N

$X^2 = \frac{N[(ad-bc)^2]}{(a+C)(b+d)(a+b)(c+d)}$

It can also be calculated as thus: for 2 by 3 contingency table

	NUMBER OF RESPONSES		PERCENTAGE (%) OF SAMPLES		TOTAL
	GUDE	LAGOS	GUDE	LAGOS	
OPTION A	a	b	_____	_____	a + b
OPTION B	C	d	_____	_____	c + d
OPTION C	e	f	_____	_____	e + f

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

TOTAL	a + c + e	b + d + f	_____	_____	a+b+c+d+e+f = N

Now, the expected values for each cell in the table will be calculated as thus: Example, for a cell, the expected value (E) will be

$$E = \frac{(a+b)(a+c+e)}{N}$$

Degree of freedom (df) = (c- 1) (r-1) Where c = Number of columns r = Number of rows

III. DATA PRESENTATION AND ANALYSIS OF RESULT4.1INTRODUCTION

The data generated for the study were presented and analyzed according to the research question and hypothesis that guided the study. For every research question, a combination of responses from both questionnaires administered at Gude and Lagos was considered.

The researcher had a total response rate of 97.25% for both location.

Table 4.1 Sample Size Distribution

Description Of Sample	Samples Size	Response Rate	Percentage Of Stratum Response
Gude	126	124	98.41%
Lagos	201	194	96.52%
Total	327	318	
Percentage Total	100%	97.25%	

Source: Research Questionnaires

3.2 Analysis of Research Questions

The research questions for this study are:

Research Question 1

Has the Nigerian railway sector witnessed any advancement or modernization in recent years?

Item 1:- How long has train terminus been in existence?

Table 4.2.1.0 shows number of years which the terminus has been in existence

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
100 years	10	5	5.15	4.03	15
Over 100 years	184	119	94.85	95.97	303
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

From table 4.2.1.0, it was shown that 184 respondents from Gude and 119 respondent from Lagos, representing 94.85% and 95.97% respectively said the Nigerian railway has been in existence for over 100years,whereas 10 respondents from Gude and 5 respondents from Lagos representing 5.15% and 4.03% said otherwise.

Item 2:- How often have the train and other facilities associated with it been rehabilitated?

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Table 4.2.1.1 shows how often the train and its facilities are rehabilitated

Town	Options		Year/Description
Gude	Latest Year/Description.	Rehabilitation Rehabilitation	2012, Standardization Of Guages At Major Train Station Like That Of Kafancan,With The Exception Of Stations In Rural Areas (Gude). They Are Still Yet To Witness Rehabilitation.
	Previous Year/Description.		_____
Lagos	Latest Year/Description.	Rehabilitation Year/	21st Dec, 2012, The Nigerian Government Inauguarated The Nigerians Railyway Corporation Passengers, Train Service And Haulage Of Petroleum Product.
	Previous Rehabilitation Description		2006, Contract To Rebuild Lagos To Kano Railway Line, 2007 (Febuaury 2007) Inland Container Deport Under Construction 2009, 25new C25 Emps Locomotives From General Electricals.

Source: Research Questionnaires (computed result)

From table 4.2.1.1, it is shown that the latest rehabilitation was in the year 2012, which was standardization of gauges at major train stations, with the exception of train stations in rural areas like Gude. And also in 2012, the Nigerian government inaugurated the Nigerian railway corporation in Lagos, while there was previous rehabilitations at Lagos train station at 2006, 2007 and 2009.

Item 11:- How will you rate the modernization of the railway sector as a whole?

Table 4.2.1.2 shows the ratings of the modernization in the railway sector

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
Significant	14	39	7.22	31.45	53
Insignificant	180	85	92.78	68.55	265
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

From table 4.2.1.2, it is shown that 14 respondents from Gude and 39 respondents from Lagos, representing 7.22% and 31.35% respectively said the modernization in the sector is significant, while 180 respondents from Gude and 85 respondents from Lagos representing 92.78% and 68.55% respectively said otherwise.

Research Question 2

Has the Nigerian railway sector had any impact on the Nigerian Economy?

Item 3:- What class of commodity are being transported?

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Table 4.2.1.3 shows the class of commodity transported

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
Commercial	10	40	5.00	32.26	94
Non-commercial	165	30	85.00	24.19	224
Passengers	19	54	10.00	43.55	318
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

From table 4.2.1.3, it is shown that 10 respondents from Gude and 40 respondents from Lagos representing 5% and 32.26% respectively said the class of commodity transported are commercial, 165 respondents from Gude and 30 respondent from Lagos, representing 85% and 24.19% respectively said the class of commodity transported are noncommercial while 19 respondents from Gude and 54 respondents from Lagos representing 10% and 43.55% respectively said the commodity transported are passengers.

Item 5:- What is the frequency of trip of passengers/goods per week?

Table 4.2.1.4 shows the frequency of trip of passengers/goods

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
1-2 times	194	-	100	0	194
3-4 times	-	11	0	8.87	11
Others	-	113	0	91.13	113
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

From table 4.2.1.4, it is shown that 194 respondents from Gude and non from Lagos, representing 100% and 0% respectively said the frequency of trip of passengers/goods per week is between 1-2 times, while non from Gude, 11 and 113 respondents from Lagos representing 0%, 8.87% and 91.13% said the frequency of trip of passengers/goods is between 3-4 times and others respectively per week.

Research Question 3

The railway mode of transportation, is the safest and most comfortable mode of transportation in Nigeria today?

Item 2:- How often have the train and other facilities associated with it been rehabilitated?

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Table 4.2.1.5 shows how often the train and its facilities are rehabilitated

Town	Options	Year/Description
Gude	Latest Rehabilitation Year/Description.	2012, Standardization Of Guages At Major Train Stations Like Kafancan,With The Exception Of Train Stations In Rural Areas (Gude). They Are Still Yet To Witness Rehabilitation.
	Previous Rehabilitation Year/Description.	_____
Lagos	Latest Rehabilitation Year/Description.	21st Dec, 2012, The Nigerian Government Inauguarated The Nigerians Railyway Corporation Passengers, Train Service And Haulage Of Petroleum Product.
	Previous Rehabilitation Year/ Description	2006, Contract To Rebuild Lagos To Kano Railway Line, 2007 (February 2007) Inland Container Deport Under Construction 2009, 25new C25 Emps Locomotives From General Electricals.

Source: Research Questionnaires (computed result)

From table 4.2.1.5, it is shown that the latest rehabilitation was in the year 2012, which was standardization of gauges at major stations in rural areas with the exception of train stations in rural areas like Gude. And also in 2012, the Nigerian government inaugurated the Nigerian railway corporation in Lagos, while there was previous rehabilitation at Lagos train station at 2006, 2007 and 2009.

Item 4:- Has the train witnessed any form of accident in recent years?

Table 4.2.1.6 shows the level of accident witnessed by the sector

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
Yes	-	94	0	76.81	94
No	194	30	100	24.19	224
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

From table 4.2.1.6, it is shown that no respondents from Gude and 94 respondents from Lagos, representing 0% and 75.81% respectively said they have not witnessed accident in recent years, while 194 respondents from Gude and 30 respondents from Lagos, respectively 100% and 24.19% respectively said otherwise.

Item 5:-What is the frequency of trip of the passengers/goods per week?

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Table 4.2.1.7 shows the frequency of trip of passengers/goods

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
1-2 Times	194	-	100	0	194
3-4 times	-	11	0	8.87	11
Others	-	113	0	91.13	113
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

From table 4.2.1.7, it is shown that 194 respondents from Gude and non from Lagos, representing 100% and 0% respectively said the frequency of trip of passengers/goods per week is between 1-2 times, while non from Gude, 11, and 113 respondents from Lagos representing 0%, 8.87% and 91.13% respectively said the frequency of passengers/goods is between 3-4 times and others respectively per week.

Item 6:-How will you rate the train arrival time, smoothness of ride and cleanliness of the train compared to other modes of transportation?

Table 4.2.1.8 shows the rating of the train arrival time, smoothness of ride and cleanliness of ride

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
V.Good	5	13	2.58	10.48	18
Good	180	58	92.78	46.77	238
Fair	9	53	4.64	42.74	62
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

From table 4.2.1.8, it is shown that 5 respondents from Gude and 13 respondents from Lagos, representing 2.58% and 10.48% respectively said the arrival time, smoothness of ride and cleanliness of the train is very good, while 180 and 58 respondent from Gude and Lagos respectively representing 92. 78% and 46.77% said the arrival time, smoothness of ride and cleanliness of the train is good and finally 9 and 53 respondents from Gude and Lagos respectively representing 4.64% and 42.74%, said the arrival time, smoothness of the ride and cleanliness of the train is fair.

Research Question 4

How has the railway transportation system affected communal life?

Item 7:- Have you witnessed any structural collapse of building due to vibration from the railway?

Table 4.2.1.9 shows how the railway system has affected communal life

	Number Of Respondents (Gude)	Percentage (% Of Sample)	Total
Yes	19	9.79	19
No	175	90.21	175
Total	194	100%	194

Source: Research Questionnaires (computed result)

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

From table 4.2.1.9 it is shown that 19 respondents representing 9.79% have witnessed structural collapse of building due to vibration from this railway while 175 respondents representing 90.21% said otherwise.

Item 8:- Have you witnessed any environmental pollution (air, noise, etc.) due to the railway in your locality?

Table 4.2.2.0 shows the level of pollution that the locality has been exposed to

	Number Of Respondents (Gude)	Percentage (% Of Sample)	Total
Yes	120	61.86	120
No	74	38.14	74
Total	194	100%	194

Source: Research Questionnaires (computed result)

From table 4.2.2.0, it is shown that 120 respondents representing 61.86% have witnessed environmental pollution due to railway in their locality, while 74 respondents representing 88.14% said otherwise.

Item 9:- How will you rate the impact of railway to the people of the community?

Table 4.2.2.1 shows the impact the railway on the people of the community

	Number Of Respondents (Gude)	Percentage (% Of Sample)	Total
Very Good	49	25.26	49
Good	126	64.95	126
Fair	19	9.79	19
Total	194	100%	194

Source: Research Questionnaires (computed result)

From table4.2.2.1 it is shown that 49 respondents representing 25.26%, rate the impact of railway to their community to be very good, 126 respondents representing 64.95% rate the impact of railway to their community to be good, 19 respondents respectively 9.79 rate the impact of railway to be fair.

Item 10:- Has any of the indigene of the community been employed either temporarily or as a permanent staff under the terminus of Gude?

Table 4.2.2.2 shows the number of indigenes of the communities employed

	Number Of Respondents (Gude)	Percentage (% Of Sample)	Total
Yes	155	79.90	155
No	39	20.10	39
Total	194	100%	194

Source: Research Questionnaires (computed result)

From table 4.2.2.2, it is shown that 155 respondents representing79.90% said indigenes of this community are being employed by the NRC, while 39 respondents representing 20.1% said otherwise.

3.3 Test of Hypothesis

To draw a reliable conclusion from the above analysis on the various research questions, the stated hypotheses shown below were tested with the aid of chi-squared formula at 5% level of significance. The null and alternative hypotheses are as follows:

3.3.1 Hypothesis I:

H_O – The Nigerian railway sector has not witnessed any advancement/modernization since its inception.

H_I – the Nigerian railway sector has witnessed advancement/modernization since its inception.

Item 11:- How will you rate the modernization of the railway sector as a whole?

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Table 4.2.1.2.a shows the ratings of the modernization in the railway sector

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
Significant	14	39	7.22	31.45	53
Insignificant	180	85	92.78	68.55	265
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

$$X^2 = \frac{318[(14)(85)-(180)(39)]^2}{(194)(124)(53)(265)}$$

$$X^2 = \frac{318[1190-7020]^2}{337866520}$$

$$X^2 = \frac{318[33988900]}{337866520}$$

$$X^2 = \frac{1.08084702\times10^{10}}{337866520}$$

$X^2 = 31.99$ OR

1. $E = \frac{(14+39)(14+180)}{318} = \frac{53\times194}{318} = \frac{10282}{318} = 32.3333$
2. $E = \frac{(39+14)(39+85)}{318} = \frac{53\times124}{318} = \frac{6572}{318} = 20.6667$
3. $E = \frac{(180+85)(180+14)}{318} = \frac{265\times194}{318} = \frac{51410}{318} = 161.6667$ 4.
4. $E = \frac{(85+180)(85+35)}{318} = \frac{265\times124}{318} = \frac{32860}{318} = 103.3333$

Table 4.2.1.2.b application of chi squared equation

	Observed (O)	Expected (E)	$(O-E)^2$	$\frac{(O-E)^2}{E}$
1	14	32.3333	336.1099	10.3952
2	39	20.6667	336.1099	16.2634
3	180	161.6667	336.1099	2.0790
4	85	103.3333	336.1099	3.2527

Source: computed results

$X^2 = 10.3952 + 16.2634 + 2.0790 + 3.2527$
$X^2 = 31.99$
Degree of Freedom $= (c-1)(r-1)$
$=(2-1)(2-1)$
$=(1)(1)$
$= 1$

At 5% level of significance, and degree of freedom of 1, the X^2 table value is 3.841, which is less than 31.99.

Decision

Reject null hypothesis (Ho) and accept alternative hypothesis (H_i) which says that, the Nigerian railway sector has witnessed advancement/modernization since its inception.

3.3.2 Hypothesis ii

H_O- railway has improved the Nigerian economy in recent years.

H_i – railway has not improved the Nigerian economy in recent years.

Item 3:- What class of commodity are been transported?

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Table 4.2.1.3 shows the class of commodity transported

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
Commercial	10	40	5.00	32.26	94
Non-commercial	165	30	85.00	24.19	224
Passengers	19	54	10.00	43.55	318
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

1. $E = \frac{(10+40)(10+165+19)}{318} = \frac{50\times194}{318} = \frac{9700}{318} = 30.5031$
2. $E = \frac{(40+10)(40+30+54)}{318} = \frac{50\times124}{318} = \frac{6200}{318} = 19.4969$
3. $E = \frac{(165+30)(165+10+19)}{318} = \frac{195\times194}{318} = \frac{37830}{318} = 118.9623$
4. $E = \frac{(30+165)(30+40+54)}{318} = \frac{195\times124}{318} = \frac{24180}{318} = 76.0377$
5. $E = \frac{(19+54)(19+165+10)}{318} = \frac{73\times194}{318} = \frac{14162}{318} = 44.5346$
6. $E = \frac{(54+19)(54+30+40)}{318} = \frac{73\times124}{318} = \frac{9052}{318} = 28.4654$

Table 4.2.1.3.b application of chi squared equation

	Observed (O)	Expected (E)	$(O-E)^2$	$\frac{(O-E)^2}{E}$
1	10	30.5031	420.3771	13.7815
2	40	19.4969	420.3771	21.5612
3	165	118.9623	2119.4698	17.8163
4	30	76.0377	2119.4698	27.8739
5	19	44.5346	652.0158	14.6407
6	54	28.4654	652.0158	22.9056

Source: computed results

$X^2 = 13.7815 + 21.5612 + 17.8163 + 27.8739 + 14.6407 + 22.9056$
$X^2 = 118.58$

Degree of Freedom $= (c-1)(r-1)$
$=(2-1)(3-1)$
$=(1)(2)$
$= 2$

At 5% level of significance, and degree of freedom of 2, the X^2 table value is 5.991, which is less than 118.58
Item 5:- What is the frequency of trip of passengers/goods for week?

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Table 4.2.1.4 shows the frequency of trip of passengers/goods

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
1-2 times	194	-	100	0	194
3-4 times	-	11	0	8.87	11
Others	-	113	0	91.13	113
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

1.
2.
3.
4.
5.
6.

$$E = \frac{(194+0)(194+0+0)}{318} = \frac{194\times194}{318} = \frac{37636}{318} = 118.3522$$

$$E = \frac{(0+194)(0+11+113)}{318} = \frac{194\times124}{318} = \frac{2356}{318} = 7.4088$$

$$E = \frac{(0+11)(0+194+0)}{318} = \frac{11\times194}{318} = \frac{2134}{318} = 6.7107$$

$$E = \frac{(11+0)(11+113+0)}{318} = \frac{11\times124}{318} = \frac{1364}{318} = 4.2893$$

$$E = \frac{(0+113)(0+0+194)}{318} = \frac{113\times194}{318} = \frac{21922}{318} = 68.9371$$

$$E = \frac{(113+0)(113+11+0)}{318} = \frac{113\times124}{318} = \frac{14012}{318} = 44.0629$$

Table 4.2.1.4.b application of chi squared equation

	Observed (O)	Expected (E)	$(O-E)^2$	$\frac{(O-E)^2}{E}$
1	194	118.3522	5722.5896	48.3522
2	0	7.4088	54.8903	7.4088
3	0	6.7107	45.0335	6.7107
4	0	4.2893	18.3981	4.2893
5	11	68.9371	3356.7076	48.6923
6	113	44.0629	4752.3238	107.8532

Source: computed results

X^2 = 48.3522 + 7.4088 + 6.7107 + 4.2893 + 48.6923 + 107.85

X^2 = 223.30

Degree of Freedom = $(c-1)(r-1)$

$=(2-1)(3-1)$

$=(1)(2)$

$= 2$

At 5% level of significance, and degree of freedom of 2, the X^2 table value is 5.991, which is less than 223.30

Decision

The tables 4.2.1.3.b and 4.2.1.4.b shows that the value of calculated X^2 are 118.58 and 223.30 respectively, which are both more than the expected value of 5.991 on the degree of 2 on a chi-squared distribution table, thus we reject the null hypothesis at 5% level of significance, since the calculated value is greater than the tabulated X^2.

3.3.3 Hypothesis III

H_O – railway is not the safest/most comfortable means of transportation in Nigeria.

Hi – railway is the safest/most comfortable means of transportation in Nigeria.

Item 4:- Has the train witnessed any form of accident in recent years?

Table 4.2.1.6 shows the level of accidents witnessed in the sector

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

	Number Of Respondents		Percentage (%) Of Samples		Total
	Gude	Lagos	Gude	Lagos	
Yes	-	94	0	76.81	94
No	194	30	100	24.19	224
Total	194	124	100%	100%	318

Source: Research Questionnaires (computed result)

$$X^2 = \frac{318[0 \times 30 - 194 \times 94]^2}{(194)(124)(94)(224)}$$

$$X^2 = \frac{318[0 - 18236]^2}{506523136}$$

$$X^2 = \frac{318[332551696]}{506523136}$$

$$X^2 = \frac{1.057514393 \times 10^{11}}{506523136}$$

$$X^2 = 208.78$$

OR

1. $E = \frac{(0+94)(0+194)}{318} = \frac{94 \times 194}{318} = \frac{18236}{318} = 57.3459$
2. $E = \frac{(94+0)(94+30)}{318} = \frac{94 \times 124}{318} = \frac{11656}{318} = 36.6541$
3. $E = \frac{(194+30)(194+0)}{318} = \frac{224 \times 194}{318} = \frac{43456}{318} = 136.6541$
4. $E = \frac{(30+194)(30+94)}{318} = \frac{224 \times 194}{318} = \frac{27776}{318} = 87.3459$

Table 4.2.1.6 .b application of chi squared equation

	OBSERVED (O)	EXPECTED (E)	$(O-E)^2$	$\frac{(O-E)^2}{E}$
1	0	57.3459	3288.5522	57.3459
2	94	36.6541	3288.5522	89.7185
3	194	136.6541	3288.5522	24.0648
4	30	87.3459	3288.5522	37.6498

Source: computed results

$X^2 = 57.3459 + 89.7185 + 24.0648 + 37.6498$
$X^2 = 208.78$
Degree of Freedom $= (c-1)(r-1)$
$=(2-1)(2-1)$
$=(1)(1)$
$= 1$

At 5% level of significance, and degree of freedom of 1, the X^2 table value is 3.841, which is less than 208.98

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Decision
Reject null hypothesis (H_o) and accept alternative hypothesis (H_i) which says railway is the safest/most comfortable means of transportation in Nigeria.

3.4 Discussion of the Findings and Implications

3.4.2 Discussion of Findings

Objective I: To ascertain the current state of the Nigerian railway sector

From research question 1,table 4.2.1.0,shows that 94.85% and 95.97% which represents the larger percentage of respondents from Gude and Lagos respectively, said that their various terminus has been in existence for over 100 years ,also table 4.2.1.1,shows how often the various railway terminus were been rehabilitated. Stating clearly their latest rehabilitation and previous rehabilitation and also with the years of rehabilitation repectively.it also shows that, there was no previous rehabilitation at Gude and the latest rehabilitation which was in 2012, did not extend to the Gude terminus but rather stopped at major stations and table 4.2.1.2 shows that 92.78% and 68.55% respondents which represent the larger percentage of respondents from Gude and Lagos said the rehabilitations were insignificant

Implications of the Findings

The findings based on the research questions gives an insight on the current state of the Nigerian railway sector, for instance, a railway terminus that has been in existence for over 100 years only got to be rehabilitated in the year 2012,which means for over a century, little or no attention was paid to the well-being of the terminus by various bodies responsible for such.it also gives an insight of what is happening in the rural(Gude) and urban (Lagos) areas,where rehabilitation was stated to be done in most train terminus but only the major terminus (Kafanchan) were rehabilitated ignoring the rural terminus, while railway terminus at urban areas such as Iddo terminus at Lagos got rehabilitated with several previous rehabilitations.

Objective II: To evaluate the challenges facing the Nigerian railway system of transportation

During the various visitation to the railway terminus, some of the challenges discovered to be facing the Nigerian railway system of transportation are as follows:

- **Inadequate Rehabilitation**: it will be observed from table4.2.1.1, that there were rehabilitations, but one, it does not cover the whole railway terminus and such rehabilitations can be termed grossly inadequate or negligible for a railway terminus that has been in existence for over 100 years
- **Government Paying Less Attention To The Activities Going On In The Sector**: One can conclude that the government pay less attention to the activities going in the sector, though rehabilitations were approved to be done, but lack of proper supervision by government or its agencies tend to limit such rehabilitations to specific locations
- **Inadequate Locomotives**: during the various visitation to Gude terminus, most of the locomotives were seen to be abandoned by the side of the rail tracks, which have automatically become habitat to wild animals and rodents over the years.
- **Lack of Public Awareness**: it was discovered that most of the public believed that the activities of the sector have gone into a coma.

Objective III: To compare the Nigerian system of railway with other nations system of railway transportation system

From research question 1, table 4.2.1.2 shows that 92.78% and 68.55% respondents which represents the larger percentage of the respondents from Gude and Lagos respectively said that the rehabilitations made in the various terminus were insignificant and also during the process of research it was discovered that at Gude, the key token and semaphore signaling system and method of communications were still in use.

Implication of the Findings

This shows that the level of development of the Nigerian railway system of transportation is way backward. The Nigerian railway can still fare a little bit better when compared to the railway of a developing country like South Africa, as they are also using the narrow gauges for their track system but most of the South African trains have been electrified(Wikipedia: the south African railways-history, scope and organization") and they tend to boost of the world most luxurious train in the form of the Blue train(''the blue train" www.bluetrain.co.za) .retrieved 2007-06-30) which Nigeria cannot boost of anything close to such. The Nigerian railway cannot be compared to the railways of developed country like Dubai, as the Dubai railways are fully automated, to permit automated operations, Thales rail signaling solutions supplied its SelTral IS communication-based train control and Net Track central control technology (Wikipedia: specifications: railway-technology.com).which is by far an upgrade to the Nigerian key token and semaphore method of communication and signaling system.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

Objective IV: To determine the economic benefits of railway to Nigeria

From research question 2,table 4.2.1.3 shows that 5% and 10% of the respondents from Gude said the commodities transported are commercial and passengers while 85% represents non-commercial commodities and 32.26% and 43.55% of the respondents from Lagos said that the commodities transported are commercial and passengers respectively while 24.19% represents non-commercial commodities. Also from table 4.2.1.4, shows that the frequency of trip of passengers in Gude between 1-2 times per week is 100% and 0% for other frequency of trips and the frequency of trips between 1-2 times per week is 0% in Lagos, 8.87% for 3-4 times and 91.13% for others.it can be seen that a conclusion cannot be arrived at, hence a hypothesis test was done to ascertain the authenticity of such findings and also to come to a conclusion. The hypothesis showed that on a 5% level of significance the null hypothesis which was 'the Nigerian railway has improved the Nigerian economy" and accept the alternative hypothesis because the X^2 value obtained is greater than the X^2 value on the critical table.

Implication of the Findings

The railway sector over the past 100 years has not improved the Nigerian economy

Objective V: to determine the effect of railway on communal life

From research question 4, table 4.2.1.9, 90.21% of the respondents said they have not witnessed any structural collapse due to vibrations from the railway, table 4.2.2.0,shows that 61.86% of the respondents said they have witnessed environmental pollution due to the railway in their locality, also from table 4.2.2.1,shows that 64.95% rated the impact of the railway on the community to be good and 25.26% rated it to be very good and finally table 4.2.2.2 shows that 79.90% of the respondents said that indigenes of the community are being employed. **Implication of the Findings**

The findings based on the research questions been asked ,the response have been positive even though, there was a response to a research question which tends to be negative, the overall effect can be summarized to be positive.

IV. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

In light of the analysis and the findings above, the following conclusions were deduced. The study showed the current state of the Nigerian railway sector, the level of modernization, its effect on the Nigerian economy, challenges faced by the sector and summarily that the much talked about renovation of the sector is below average.in view of this fact, I conclude that although the Nigerian railway sector foster appreciable developments in recent years, these developments can be negligible when compared to other modes of transportation in Nigeria and around the world.

4.2 Recommendation

In light of the findings and their consequent conclusion and implications, I make the following recommendations as a way towards realizing sustainable and modernized railway transport system in Nigeria. Although the railway system of transportation has not improved the Nigerian economy over the past 100 years, its potential of contributing to the economy of Nigeria, haulage of goods(heavy commodities),serves for inter-state transportation and reduce the stresses been induced by heavy trucks plying the Nigerian highways is very great .Hence, I advocate that the following should be done:

1. **Introduction of Public-Private Participation (PPP) Into the Nigerian Railway**: because railways are very capital incentive, the Nigerian government should encourage competition by allowing private sector participation in the ownership, funding and operations of the sector.
2. **Creation of Public Awareness**: there is need for the public to see the railway as the safest/most comfortable mode of transportation, as this can provide a turnaround in the fortune of the sector if there is an increase in patronage of the sector by passengers. During the research work it was discovered that most of the general public are ill informed about the activities of the sector, hence the government and its agencies should endeavor to provide adequate awareness.
3. Strict policies should be stated to cover certain class of commodities being transported, so as to ensure that such commodities are only transported by the rail mode of transportation. This also acts as a means of boosting the activities of the sector.
4. **Development of Good Maintenance Culture**: government should endeavor to develop or adopt the best maintenance method adequate to keep the rolling stocks in good working condition, thereby reducing the number of facilities being abandoned due to un-repairable damages.

5. **Preferential Allocation Of Funds To The Sector**: the allocations to the sector as part of the Nigerian system of transportation should be more compared to other modes of transportation for a foreseeable future pending the time the sector has averagely developed compared to other countries.

REFERENCES

[1]. Abduilsalami M.D, (2014); The Development Of The Railway System And Its Impact In Offa,Kwara State;1912-1955".
[2]. Ademiluyi I.A. (2006a). Rail Transport System in Nigeria: It Contributions, Constraints and the Way Forward. Knowledge Review, 12(4): 1-8.
[3]. Adesanya,A.(2002)."Reviving the Nigerian Railways" Text of a Lecture Delivered at the National Training Workshop on Transport Planning and Management in a Depressed Economy, Held at NISER, Ibadan.
[4]. Adesanya, A. (2002); Decling Fortunes of Rail Transport in Nigeria: Response and Direction of Policy" NISER Monograph Series.
[5]. Adesanya, A. (2010); Bringing The Nigerian Railway Back On Track: Challenges And Options"NISER Seminar Series,Lagos
[6]. Agbaeze,E.K Onwuka,I.O (2014); Boosting Railway System Infrastructure In Nigeria:The Public-Private Partnership Option".
[7]. Agunloye, O.O, Leke, O., (2010); Factors Influencing the Quality of Rail Transport Service in Metropolitan Lagos".
[8]. Akwara, A. F, Udaw, J. E, Ezirim, G.E. (2014); Adapting Colonial Legacy to Modernism: A Focus on Rail Transport Development in Nigeria".
[9]. Amba, Daniel, A., Danladi, Jonathan, D. (2013); an Appraisal of the Nigerian Transport Sector: Evidence from the Railway and Aviation Sub-Sectors".
[10]. Andrew, E.U, (2011); the Potential of Rail-Road Integration for Port-Hinterland Freight Transport in Nigeria"
[11]. Elechi S. I. O. (1998). Rail transport in Nigeria, problems and prospects. In: JOEniola
[12]. (Ed.): Transport, A Developmental Catalyst. Lagos: Trance Nigeria Ltd., pp. 241-255
[13]. Federal Ministry of Transport. (2011_2013) Mid Term Achievement of the Administration of President Goodluck Jonathan, GCFR in the Transport Sector".
[14]. Joshua, A .O (2000); Public-Private Participation to Rescue Railway Development in Nigeria".
[15]. Joshua, A .O, (2012); Politics of Rail Transport Development in Developing Countries: Case Of Nigeria".
[16]. Oyesiku , K., Onakoya, Adegbemi B., Folawewo A.,(2013); An Empirical Analysis Of Transport Infrastructure Investment And Economic Growth In Nigeria"
[17]. Paul, C.U (2013); A Sustainability Assessment of Nigerian Transport Policy". R. Kakumoto, Transportation investment and Japan's experience, JRTR (Japan
[18]. Railway and Transport Review) 11 (1997) 4–12
[19]. Yamene, T., (1964).Statistics: An Introductory Analysis.3rd Edn; New York: Harper and Row Publishers.

APPENDICES

Appendix I: Chi-Square Statistical Table Upper critical values of chi-square distribution with degrees of freedom

Probability of exceeding the critical value					
	0.10	0.05	0.025	0.01	0.001
1	2.706	3.841	5.024	6.635	10.828
2	4.605	5.991	7.378	9.210	13.816
3	6.251	7.815	9.348	11.345	16.266
4	7.779	9.488	11.143	13.277	18.467
5	9.236	11.070	12.833	15.086	20.515
6	10.645	12.592	14.449	16.812	22.458
7	12.017	14.067	16.013	18.475	24.322
8	13.362	15.507	17.535	20.090	26.125
9	14.684	16.919	19.023	21.666	27.877

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 1 Jan 2022, pp: 375-391 www.ijaem.net ISSN: 2395-5252

10	15.987	18.307	20.483	23.209	29.588

SOURCE: Dougherty C. 2001, 2002 (c.dougherty@lse.ac.uk), 'Statiscal table" **Appendix II: List of Plates**

PLATE A:

Picture of landline telephone used for communication

PLATE B: Picture of the key token

PLATE C: Picture of abandoned passengers train

PLATE D: Picture of rails drop by the train track intended for rehabilitation

PLATE E: Taking measurement at Gude train station

PLATE F: Accident encountered at Iddo rail track Lagos