



Research Article

Assesment of the Growth in Transport Infrastructure in Relation to National Development

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Abstract

Transport is one of the major infrastructural facilities that is basically fixed as part of the transportation structure. Development of transport infrastructure remains one of the basic and vital techniques for achieving the much needed growth in Nigeria. Hence, the study is critically focused at determining the effect of financing transport infrastructure development and the implication of this to the Nigeria economy. The area of coverage of the study was confined within the time frame of 2011-2024. The research utilized GDP, Budgetary Allocation to Transport and the contributions of Transport Modes to the GDP for the computation and analysis of estimated values. Pearson Correlation Coefficient (r), was applied in testing Hypothesis 1. The result showed a positive r value of 0.63 which was statistically significance, hence, H_a was accepted to conclude that the quote of the transport sector of the economy increase as investment in infrastructure increases. Hypothesis was tested with analysis of variances. As a result of the test, H_a was accepted to conclude that there was a clear distinction among the contributions of modes to the economy over a period of time. In the case of hypothesis III, analysis of variance was used with multiple regression for testing. The outpu showed a significant R value of 0.98 and R of 0.97. Therefore H_A , was accepted to conclude that there was a significant contribution to the GDP by the transport sector. The researcher identified insufficient funding as the bane of growth of the sector. The study finally recommends that policy makers should ensure adequate and proper investment on transport infrastructure for enhancement of a reliable and improved economy.

Keywords: Transport, infrastructural facilities, economy, utilized GDP, Budgetary Allocation

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Introduction

Background of the Study

The term infrastructure collectively covers many areas that can be broken down into: (i) capital (building) facilities, housing, factories, and other structures which provide shelter, (ii) transportation of people, goods, and information; (iii) public services and utilities, power plants, water resources, waste removal, minimization and control; and (iv) environmental restoration (Vandu-Chikolo, 2004). In other words, transport infrastructure is the fixed part of transport such as the road and rail, its environs, plus signs and signaling. It also includes transport terminals, depots and interchange, airports, seaports and canals (David, 2001).

Transportation is the cornerstone of civilization. As the society and economic organizations become complex, the relevance of transport grows. Also, the demand for transport is a derived one, because it depends on the demand for the commodities carried or the benefit of personal travel and each travel is unique in time and space. Hence, the demand for transport services increases with the extension of the input-output relationships of an economy (Oni, 2004).

The elasticity of demand for transport depends on the elasticity of demand for the commodity being transported as well as on the proportion of transport costs in the value of the delivered product. Also, studies in Nigeria's economy suggest that transportation costs have a significant proportion of the final price of most goods—agricultural, manufactured and mining products. On the average, transport accounts for more than 30% of the value of the delivered product. The high cost is due to the inadequacy and inefficiency in Nigeria's transport infrastructure. Transport costs on the feeder roads to the trunk road or the railway to the port often cost as much as between 55 and 60 percent of the receipts from commodities (Olanrewaju and Falola, 1986). Also, price elasticity of demand for transport is very high in Nigeria's transport system. The more efficient the transportation network is, the lower the transport costs but presently, large production of the economically important movements are bulky, low value agricultural and mineral products (Olanrewaju and Falola, 1986).

In a modern economy, the role of transport is very strategic for it facilitates trade, enhances and improves the movement of goods, people, ideas, technology and services and furthermore, it permits the knitting of friendship and fraternal relations among people. In other words, transportation as a system of linkages brings about spatial interaction not only between people but also between geographical locations and sectors (Williams, 1992). It does not only influence our personal mobility and the

prices that we pay for goods and services but it is also a determinant of where we choose to live and work (Owen, 1968).

Transportation could also be defined as that aspect of general business that deals with the movement of passengers and goods from point of origin to point of destination (Huber et al., 2015). It moves idle resources from point of low value to point of higher value and demand. Transportation therefore governs world trade, commerce and industry. It controls production or manufacturing. It is the pivot of any economy. It is the hub upon which the wheel of the economy revolves. In fact, the role of transport to development of any society cannot be over-emphasized. Therefore, let me assert that whenever the transport sector of an economy sneezes, other sectors catch cold. Of course, if there is no movement for any single day, everything will be at a standstill.

The development of the mechanism of transportation has exerted a far reaching impact within the human environment and its implications are so wide that it cuts across virtually every facet of human endeavour (Kaiser & Barstow, 2022). For example, its impact extends beyond offering expanded employment opportunities to altering individual's life style and aspiration. It raises the level of production and income as well as shaping the internal comparative advantage which in turn exerts significant influence on the structure of the global economy. Advancement in the mechanism of moving people and the delivery of information is now generally acclaimed as the bedrock of economic and social progress. The impact of the technology of the information super highway attests to this assertion. The modern transport systems are easier, cheaper, safer and more reliable but we are yet to attain to this height in Nigeria.

Thus, we can state without reservation that the very unique nature of transport, its potential to minimize the problem of social friction caused by physical distance, its role in the national defence, unity, economic, social and political integration makes a very strong case for the transport sector to be designated as a strategic sector.

Statement of the Problem

Let me also assert that any nation that is immobile will remain undeveloped. Hence, efficient transport facilities act as catalyst for development. There is therefore, cause for concern while considering the infrastructural base in Nigeria today, which is incomparable with those of many African nations, both in terms of quality and service coverage. In particular, the rural areas where the bulk of our populations reside are largely deprived of the basic transport infrastructure.

In Nigeria today, a considerable number of the populace live away from an all-weather road. Neglect of road maintenance multiplies the cost of repair after every rainy season and increases cost to vehicle owners and shippers. The implication of this to manufacturers and producers is grievous to say the least. It increases cost of production making goods and products made in Nigeria less competitive in both domestic and international markets (Oni, 2004).

The effects of the inadequate maintenance and renewal of equipment and facilities are visible in all sub-sectors: inadequate condition of the roads and the need for their subsequent reconstruction; inadequate replacement and maintenance of vehicles, contributing to high social cost of atmospheric pollution, resulting in high operating costs. In turn, such excessive operating cost, by decreasing net operating revenues make timely replacement of vehicles difficult. In the case of railways, lack of necessary resources to keep track, rolling stock and maintenance facility in reasonable conditions produce a very serious deterioration of the railway system. Similar problems affect inland water ways, affecting their ability to perform useful functions (Oni, 2004).

According to Olomola (2003), inadequate provision of transport infrastructure and services provide basis for explaining the incidence of poverty across various Nigerian communities in both urban and rural areas. The categories of transport problems that can be identified are: bad roads, fuel problem (high fuel price, fuel shortage, supply and high transport cost), traffic congestion (long waiting time, bad driving habits), inadequate high passenger capacity/mass transit vehicles and overloading, high cost and shortage of spare parts, poor vehicle maintenance and old vehicles. More so, port congestion and decaying facilities pose a serious threat to the growth of the economy. It is clearly established that inadequate transport facilities and services as well as the constraint imposed on the mobility and accessibility of people to facilities such as markets, hospitals and water resources have grave implications on deepening poverty levels. Thus, there is need for urgent policy measures to address the prevailing travel and transport problems.

Research Questions

1. Does the quality transport infrastructure has any good and positive effect on economy?
2. How does the trend of performance of transport industry with reference to the budgetary allocation made to it over time?
3. Is there any constraint affecting the development of Nigeria's transport industry?

Objectives of the Study

Motivated by the strategic importance of mobility to the economy, this study is intended to achieve the following objectives:

1. Investigate the effect of the quality of transport infrastructure on economy.
2. Examine the trend of performance of transport industry with reference to the budgetary allocation made to it over time.
3. Identify the constraints affecting the development of Nigeria's transport industry.
4. Recommend solutions to the constraints.

Statement of Research Hypotheses

- H₀₁: The contribution of the transport sector to the economy does not increase as investment in infrastructure increases.
- H_{A1}: The contribution of the transport sector to the economy increase as investment in infrastructure increases.
- H₀₂: There is no significant difference between the contributions of the transport modes to the GDP over time.
- H_{A2}: There is a significant difference between the contributions of the transport modes to the GDP over time.
- H₀₃: The contribution of the transport sector to the GDP is not significant.
- H_{A3}: The contribution of the transport sector to the GDP is significant

Significance of the Study

The study will serve as a tool for policy makers to evolve suitable policies that will check the menace of immobility and hence lubricate the engine of growth of the economy. It will also serve as a basis for further research work especially for the transport industry and generally for other sectors of the economy where their impact could be felt. Though, several researchers have carried out one or two studies about or related to this topic, yet there are a lot of vacuums as far as transportation infrastructural development is concerned in Nigeria, African countries and globally to be filled up.

The Scope and Limitation of the Study

Given the pervasive nature of transport, this work could not cover all the aspects of transport. It only focused on the maritime transport mode, rail mode, aviation mode and road mode of transport. Furthermore, in the course of this study, the researcher was constrained with time factor, given a lot of issues competing for time. A research of this nature ought to have received more time than was allocated to it. This in a way affected the quality of the work.

Distance was another constraint as the researcher had to travel to Lagos where the Headquarters of most of the organizations concerned are situated (eg. NSC, NPA, NIMASA, NRC, etc). Finally, money was needed to make the trips and purchase books or photocopy the required materials. Despite these constraints, the objectives of the study were to a large extent achieved.

Research Methodology

Research Design

This is the framework used as guide in collecting and analyzing data. It could be seen as the tripod on which the study is balanced, since it provides the framework. According to Abdallah et al. (2017), research design deals with "how the study subjects will be brought into the scope of the required data". Frankfort-Nachimas and Nachmias (1982) posited that a research design is a framework or plan that is used as a guide in collecting and analyzing data for study.

Sources of Data

Only secondary data were used in the course of this research work. They were sourced from the internet, journals, textbooks, dissertations, magazines and periodicals.

Methods of Data Analysis

For hypothesis I, the tool used in the analysis of the research data is Pearson Product Moment Correlation Coefficient.

It is designated as

$$r = \frac{n \sum xy - (\sum x)(\sum y)}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

Where n= number of pair sample x, y But (-1 r)

Decision Rule

Accept H_0 if $t_{cal} < t_{0.05} (n-2)$

otherwise accept H_A

In testing hypothesis II, data collected were analyzed using Analysis of Variance. This is a technique of partitioning the total variation of our data into useful component which provides means of measuring different sources of variation. In

order to use the analysis of variance for our test, we shall make the following assumptions:

- i. The modal contributions of the transport sector are normally distributed.
- ii. The standard deviation (6) of all the distribution of the modal contribution are equal, i.e σ_1

$$= \sigma_2 = \sigma_3 = \sigma_4$$

With these assumptions, we may regard the four modes of transport of four different populations with identical standard deviation.

Consequently, if the Hopps is true, we can regard random among X_1 , X_2 , X_3 and X_4 and the variation within the four samples as having occurred by chance. The following calculations were carried out:

- SST = Sum of Squares of Total
- SSB = Sum of Squares between modes
- SSE = Sum of Squares of Error.

Decision Rule:

Reject H_0 if the F-ratio computed is greater than the table value ie, $F_{cal} > F_{\alpha}(1-k, N-k)$
Accept H_0 if the F-ratio computed is less than the table value.

In the test of Hypothesis III, **Multiple Regression Statistic** was used in analyzing the data. The equation of the model is expressed

Decision Rule:

Reject H_0 if F-ratio computed is greater than the table value i.e.. $F_{cal} > F_{1-\alpha}(k, n-k-1)$

In furtherance of our investigation, the **Trend Analysis** was used in explaining hypothesis III. The trend of a time series is the smooth upward or downward movement of a time series over a long period. The trend gives a picture of the general tendency in the development of a process.

Fitting the Trend Line: The task of estimating the trend of a time series starts with plotting the time series data on a graph. The resulting scatter diagram suggests the appropriate trend line to fit the data. If the points follow closely a straight line, a straight-line trend has to be fitted to the data. The following are the methods of finding the straight-line trend:

1. The freehand method
- ii. The method of least squares
- iii. The method of moving averages.

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But, for the purpose of this work, only the method of least squares was used. The method is similarly applied in fitting a trend line to a time series. The equation of the trend line is defined as:

$$y_t = a + bt \quad (3.3)$$

Where

y_t = the estimated trend value for a given time period

a = the trend line value when $t=0$

b = the slope of the trend line, i.e., the change in y , per unit time or $\frac{\Delta y_t}{\Delta t}$

t = the time unit (where $x = t$)

But

$$b = \frac{\sum y_t(\Delta t) - (\sum y_t)(\sum \Delta t)}{\sum \Delta t^2 - (\sum \Delta t)^2} \quad (3.4)$$

$$a = \frac{\sum y_t - b \sum \Delta t}{n}$$

$$a = \frac{\sum y_t}{n} - b \frac{\sum \Delta t}{n} \quad (3.5)$$

Once this is accomplished and the line $ya + bt$ is obtained, we may substitute values of t into Equation (3.3).

Results and Discussions

Table 1 : Data for Test of Hypothesis I

Year	Allocation to Transport Sector (N'000)	Transport Sector's Contribution to GDP (N'000)
1990	1,105,000	8,573.91
1991	1,105,000	9,405.09
1992	4,273,031	16,947.24
1993	4,273,031	22,089.19
1994	4,273,031	28,928.15
1995	4,273,031	61,527.63
1996	14,245,710	97,066.74
1997	14,245,710	112,359.10
1998	26,155,080	101,227.84
1999	26,155,080	111,335.72
2000	9,604,800	185,318.89
2001	53,176,100	165,529.51
2002	53,176,100	206,287.26
2003	29,309,400	195,792.91
2004	15,046,000	279,506.29

Summary Output
Correlation Coefficient

$r = 0.6297$

$t = 2.915$

The summary output of the correlation coefficient shows that r has a positive value of 0.63 and the test of its significance t is 2.92

Since $t_c = 2.92 - t_{0.975} (13)$ we reject and accept to conclude at 2.16

$H_{01} \quad H_{A1}$

that the sector's contribution to the economy increases as investments in infrastructure increases.

Table 2: Set of data used in testing this particular hypothesis

YEAR	ROAD	RAIL	OCEAN	AIR
1981	5.17	0.15	0.46	0.20
1982	5.93	0.17	0.38	0.23
1983	3.26	0.16	0.61	0.26
1984	3.31	0.11	0.43	0.27
1985	3.38	0.12	0.34	0.25
1986	3.34	0.11	0.26	0.21
1987	3.39	0.08	0.23	0.21
1988	3.12	0.06	0.23	0.18
1989	2.97	0.04	0.18	0.16
1990	2.80	0.02	0.17	0.15
1991	2.97	0.03	0.17	0.14
1992	2.80	0.02	0.16	0.14
1993	2.93	0.02	0.15	0.11
1994	3.94	0.02	0.14	0.10
1995	2.91	0.03	0.14	0.10
1996	2.99	0.04	0.35	0.21
1997	3.30	0.12	0.236	0.23
1998	3.30	0.07	0.28	0.27
1999	2.92	0.05	0.22	0.17
2000	2.15	0.13	0.38	0.26
2001	2.77	0.001	0.19	0.04
2002	2.97	0.001	0.21	0.05
2003	2.96	0.001	0.24	0.04
2004	4.08	0.001	0.26	0.04
2005	5.29	0.001	0.20	0.05

Test of Hypothesis II

H₀₂: There is no significant difference between the contributions of the transport modes to the GDP over time.

H_{A2}: There is a significant difference between the contributions of the transport modes to the GDP over time.

The following set of data (Table 2) was used in testing this particular hypothesis

Reliability Analysis-Scale (Alpha)

Table 3: Correlation Matrix

	Road	Rail	Ocean	Air
Road	1.0000			
Rail	.3019	1.0000		
Ocean	.2582	.7737	1.0000	
Air	-.0132	.8448	.6272	1.0000
No of cases =	25.0			

Table 4: Analysis of Variance

Source of Variation	Sum of Sq.	DF	Mean Square	F	Prob.
Between Modes	5.3588	24	.2233		
Within Modes	210.2038	75	2.8027		
Between Measures	196.7377	3	65.5792	350.6355	.0000
Residual	13.4661	72	.1870		
Total	215.5626	99	2.1774		
Grand Mean	.9717				

Reliability Coefficients: 4 items

Alpha = .1624

Standardized item alpha = .7769.

In Table 4, since $F_{cal} = 350.63$, $F_{0.05}(3.96) = 2.76$ we therefore reject H_{02} and accept H_{A2} to conclude that there is significant difference between the contributions of the transport modes to the GDP over time.

Test of Hypothesis III

H_{03} = The contribution of the gtransport sector to the GDP is not significant.

H_{A2} = The contribution of the transport sector to the GDP is significant.

Table 5: Data for Test of Hypothesis III

	Modal Contribution to the GDP (N000)				GDP @2003 current factor cost = Y(N000)
	ROAD = X 1	RAIL = X2	OCEAN = X3	AIR = X4	
1981	2608.58	75.68	232.09	100.91	50456.1
1982	3063.05	87.81	196.28	118.80	51653.4
1983	1835.80	90.10	343.51	146.41	56312.9
1984	2067.90	68.72	268.64	168.68	62474.2
1985	2387.40	94.76	240.15	176.58	70633.2
1986	2400.09	79.05	172.46	150.90	71859.0
1987	3667.40	86.55	248.62	227.18	108183.0
1988	13883.01	85.57	328.02	256.71	142618.0
1989	6593.94	88.08	396.36	352.32	220200.0
1990	7613.42	54.38	462.24	407.86	271908.0
1991	9405.09	95.00	538.34	443.34	316670.0
1992	15016.54	107.26	858.09	750.83	536305.1
1993	20162.40	137.63	1032.21	756.95	688136.6
1994	35617.79	180.80	1265.61	904.01	904004.7
1995	56303.52	580.45	2708.76	1934.83	1934831.0
1996	80843.89	1081.52	9463.33	5677.99	27038090
1997	92465.10	3362.36	6612.66	6444.54	2801972.6
1998	89798.89	1904.83	7619.30	7347.18	2721178.4
1999	96756.04	1656.78	7289.84	5633.06	3313563.1
2000	101641.74	6145.78	17964.59	12291.56	4727522.6
2001	148869.07	53.74	10211.24	2149.73	5374334.8
2002	185097.63	62.32	13087.71	3116.12	6232243.6
2003	179426.32	60.61	14548.08	2424.68	6061700.0
2004	263368.49	64.55	16783.29	2582.04	6455110.0

Source: Federal Office of Statistics (2004)

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Fitting a Trend Line to The Least Square Method

For this type of time series data observed over an even number of hyears, we choose the first year in our series as the origin and assign that year a clode ($t=0$). All successive years are then assigned consecutively increasing integer codes 1,2,3.....n, so that the year in the series, the n^{th} year, has the code $n-1$ (Table 6).

Table 6: Least Square Analysis Method

t	Y	Ty	t ²
0	5.98	0	0
1	6.71	6.71	1
2	4.29	8.58	4
3	4.12	12.36	9
4	4.09	16.36	16
5	3.90	19.50	25
6	3.91	23.46	36
7	3.59	25.13	49
8	3.35	26.80	64
9	3.14	28.26	81
10	3.12	31.20	100
11	3.16	34.76	121
12	3.21	38.52	144
13	3.20	41.60	169
14	3.18	44.52	196
15	3.59	53.85	225
16	4.01	64.16	256
17	3.72	63.24	289
18	3.36	60.48	324
19	3.92	74.48	361
20	3.08	61.60	400
21	3.31	69.51	441
22	3.23	71.06	484
23	4.33	99.59	529
24	5.54	132.96	576
300	97.04	1108.69	4900

Further Analysis of Transport Infrastructural Development and its Effect on National Economy

Between 1990 and 1992, a sum of 2, 210,000 was budgeted for the transport sector and the contribution of the sector to the GDP for the three years were 3,14%, 3.31%

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and 3.12% respectively. In the 1991-1993 Rolling Plan, the sum of 42, 695,428 was spent on the sector. It contributed only 3.21% to the GDP in 1993, Between 1993 and 1995; N8, 379,446 was earmarked for the sector and it contributed 4.2% of the GDP in 1994. Of course, the GDP of the sector appreciated, probably because of the slight increase in budgetary allocation. Significantly, the allocation increased to 28, 491,420 in the 1996-1998 Rolling Plan. The contribution of the sector to the GDP appreciated 3.59%, 4.01% and 3.92% in 1996, 1997 and 1998, respectively (Tables 3 and 4). This is an indication that appropriate and adequate funding of the sector will enhance its contribution to the economy.

However, this does not mean that there have been adequate investments to the industry. If you compare what a country like Canada invests into transport, then, you will know that ours is relatively low (Zhang and Cheng, 2023). This also reflects in the sector's contribution to the GDP. For most advanced economies, it contributes between 11% and 16% while for emerging economies like ours it is between 3 and 6% (Table 3). The investment into the sector has been consistently inadequate. In the year 2000, 49, 604,800 of the budget was allocated to transport. But in the years 2001, 2002, 2003, 2004 and 2005; only 5.01%, 4.49%, 2.39%, 1.23% and 1.52% of the respective budgets was earmarked to the sector (Table 7).

Table 7: Budgetary Allocation to the Transport Sector (2000)

Year	2000	2001	2002	2003	2004
Amount	9,604,800	53,176,100	53,662,600	29,309,400	15,046,000

Source: Federal Bureau of Statistics (2004)

Discussion of Findings

- i. The result of Hypothesis I showed that the increased investment in the transport sector impact positively on the returns it made to the economy. This means that returns has a direct relationship with investment.
- ii. The contributions of the various modes transport to the GDP varied over time according to the attention given to them
- iii. Hypothesis III indicates that the transport sector has contributed significantly to the GDP.

Conclusion

Based on the findings of this study, we conclude that appropriate and adequate investment in transport infrastructure is a catalyst to the economic growth of Nigeria.

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This goes a long way to show that if substantial amount of money is invested in transport infrastructure, the sector will contribute much to the economic growth of the nation.

As a matter of fact, the pace of transport infrastructural development in Nigeria is low. Really, the bureaucracy of the state and its attendant short-comings coupled with the socio-economic realities have raised questions on what exactly should be the role of the state in transport infrastructure provision and maintenance. A key factor that makes private participation in transport infrastructure provision essential is the continuous assured managerial autonomy.

Recommendations

In view of the foregoing observations, the following recommendations were made:

- i. Public ownership and private sector operations of the transport infrastructure should be encouraged.
- ii. Private sector should henceforth be involved in the transport infrastructure planning and development as a part of the present administration.
- iii. Government should see to it that the port tariffs are further reduced to make out ports competitive.
- iv. Government should take legislative, policy and fund intervention measures to develop our transport infrastructure,
- iv. Government should set up Transport Regulatory Commission which will provide regulatory roles while the private sector provides the operational requirement.
- vi. A holistic strategy involving the overall improvement of all the modes is required. Consequently, a Master/Blue Print should be evolved instead of uncoordinated approach for all the modes.

Contribution to Knowledge

This study will be of great relevance and useful for students in Engineering discipline of any tertiary institution for learning or further research investigation and it will also be of a great benefit for the professional engineers who need some meaningful information to carry out a research findings, meanwhile policy makers would also have some information and data to tap that will enhance the good and best decision making.

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