

Evaluation of Nigeria's Transport System for Higher Productivity

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Abstract – The paper evaluated the performances of the transportation systems in Nigeria, with a view to addressing some key issues for productivity improvement. The road transport, rail and air were major areas considered, due to the higher responses received during data gathering. Results showed that poor maintenance culture is still a major challenge to productivity improvement in this sub-sector.

Keywords – Transportation, System Evaluation, Productivity, Evaluation.

I. INTRODUCTION

Decaying infrastructure is one of the deficiencies that Nigeria's National Economic Empowerment Development Strategy (NEEDS) seeks to address. The government has begun to repair the country's poorly maintained road network. Because Nigeria's railways are in a parlous condition, the government is trying to rectify the situation by privatizing the Nigerian Railway Corporation. Similarly, the government is pursuing a strategy of partial port privatization by granting concessions to private port operators so that they can improve the quality of port facilities and operations. As of 2003, Nigeria's rail system had 3,557 kilometers of track, 19 kilometers of which were dual gauge and the remainder, standard gauge. The country has two major rail lines: one connects Lagos on the Bight of Benin and Nguru in the northern state of Yobe; the other connects Port Harcourt in the Niger Delta and Maiduguri in the northeastern state of Borno. As of March 2006, Nigeria and Niger expected to move forward with plans to establish a rail link between the two countries. Nigeria is also seeking a rail link with Cameroon, but discussions are more contentious in the aftermath of the International Court of Justice's October 2002 verdict in favor of Cameroon on the issue of control of the Bakasi Peninsula. In order to remedy the poor condition, efficiency, and profitability of the nation's railways, the government is seeking to privatize the Nigerian Railway Corporation. Under the privatization plan, three separate concessions of 25–30 years would be granted to private-sector companies to run train services in the western, central, and eastern regions.^[1]

Years of neglect of both the rolling stock and the right-of-way have seriously reduced the capacity and utility of the system. A project to restore Nigeria's railways is now underway. A project to convert the gauge of the system to 1435 mm has also somewhat stalled. Couplings of the chopper kind, vacuum brakes and non-roller bearing plain axles are also obsolete.



Fig.1. Map of Nigeria showing neighboring Countries.

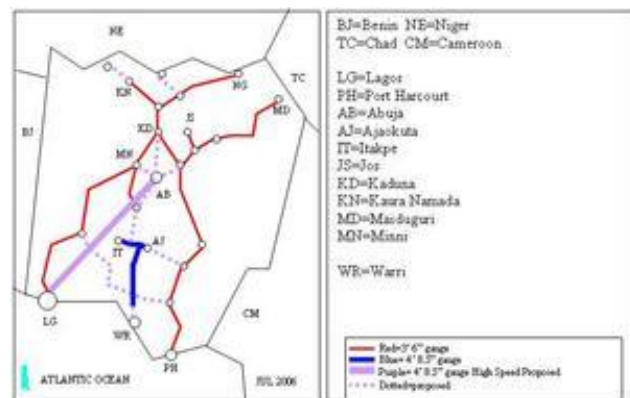


Fig.2. Map of Nigeria showing the Railway system.

1.1 Contract to rebuild Lagos to Kano Railway line

In October 2006, President Olusegun Obasanjo signed a contract with China Civil Engineering Construction Corporation^[4] to modernise the Lagos to Kano railway line. This is the first phase of the proposed 3 phase line upgrade. The project has been split up into 5 sections namely Lagos-Ibadan (181 km), Ibadan-Ilorin (200 km), Ilorin-Minna (270 km), Minna-Abuja-Kaduna (360 km), and Kaduna-Kano (305 km).

In terms of a Memorandum of Understanding signed by Nigeria's federal Government on 16 March, the Guangdong Xinguang International Group is to construct a revolutionary "fast" rail (RFR) system from Lagos to the capital Abuja (where there is no existing railway) as well as light rail lines to the Murtala Mohammed International Airport from Lagos city and to Nnamdi Azikiwe

International Airport from the Abuja city centre. According to the minister of commerce, \$US2billion has been made available to start the projects, and the Chinese company will also invest in the three planned stages of the projected Abuja light rail system.^[6]

1.2 Highways

Nigeria has the largest road network in West Africa and the second largest south of the Sahara, with roughly 108,000 km of surfaced roads in 1990. However they are poorly maintained and are often cited as a cause for the country's high rate of traffic fatalities. In 2004 Nigeria's Federal Roads Maintenance Agency (FERMA) began to patch the 32,000-kilometre federal roads network, and in 2005 FERMA initiated a more substantial rehabilitation. The rainy season and poor equipment pose challenges to road maintenance.^[11]

According to National Productivity Centre's report on maintenance practices (2010), "Maintenance affects all aspects of business effectiveness, risk, safety, environmental integrity energy efficiency, product quality, users satisfaction and the end consumer's services; but not excluding total costs and availability of such infrastructures for use as at and when needed". However, the increasing growth of mechanization and automation in recent times have brought to limelight the concepts of reliability, maintainability, and Availability of infrastructures as key issues in Road maintenance practices.

1.3 International highways

Nigeria's strategic location and size results in four routes of the Trans-African Highway network using its national road system:

- The Trans-Sahara Highway to Algeria is almost complete but border security issues may hamper its use in the short term.
- The Trans-Sahelian Highway to Dakar is substantially complete.
- The Trans-West African Coastal Highway starts in Nigeria, connecting it westwards to Benin, Togo, Ghana and Côte d'Ivoire with feeder highways to landlocked Burkina Faso and Mali. When construction in Liberia and Sierra Leone is finished, the highway will continue 7 other ECOWAS nations further west.
- The Lagos-Mombasa Highway has been awaited for many decades to kick-start trade across the continent. It does provide improved highway links to neighbouring Cameroon but its continuation across DR Congo to East Africa is lacking, as are highways from Cameroon to Central Africa and Southern Africa which could boost trade within the continent.

1.4 Waterways

Nigeria has 8,600 km of inland waterways. The longest are the Niger River and its tributary, the Benue River^[1] but the most used, especially by larger powered boats and for commerce, are in the Niger Delta and all along the coast from Lagos Lagoon to Cross River.

1.5 Pipelines

In 2004 Nigeria had 105 kilometers of pipelines for condensates, 1,896 kilometers for natural gas, 3,638

kilometers for oil, and 3,626 kilometers for refined products. Various pipeline projects are planned to expand the domestic distribution of natural gas and to export natural gas to Benin, Ghana, Togo through the West African Gas Pipeline, and, potentially, even to Algeria (where Mediterranean export terminals are located) by proposed Trans-Saharan gas pipeline. Energy pipelines are subject to sabotage by militant groups or siphoning by thieves.^[1] crude oil 2,042 km; petroleum products 3,000 km; natural gas 500 km

1.6 Ports and harbors

The Nigerian Ports Authority (NPA) is responsible for managing Nigeria's ports, some of which have fallen behind international standards in terms of the quality of facilities and operational efficiency. Recognizing that the government lacks the funding and expertise to modernize facilities and run the ports efficiently, the NPA is pursuing partial port privatization by means of granting concessions to private port operators. Under the terms of concession agreements, the government would transfer operating rights to private companies for a finite number of years without forgoing ownership of the port land. Nigeria's principal container port is the port of Lagos, which handles about 5.75 million tons of cargo each year. The port, which consists of separate facilities at Apapa and Tin Can Island, has a rail connection to points inland. Port Harcourt, a transshipment port located 66 kilometers from the Gulf of Guinea along the Bonny River in the Niger Delta, handles about 815,000 tons of cargo each year and also has a railway connection. Both ports are not only responsible for Nigeria's seaborne trade but also serve inland countries such as Niger and Chad. A new port is under construction at Onne about 25 kilometers south of Port Harcourt. Relatively modern and efficient terminals managed by multinational oil companies handle most oil and gas exports.^[1]

1.7 Merchant marine

The Nigerian Merchant Navy is not a legally recognized body, but the senior officers are represented by the Merchant Navy Officers' and Water Transport Senior Staff Association.^{[7][8]} The maritime industry is regulated by the Nigerian Maritime Administration and Safety Agency (NIMASA), which is responsible for regulations related to Nigerian shipping, maritime labor and coastal waters. The agency also undertakes inspections and provides search and rescue services.^[9]

Total: 40 ships (1,000 gross register tons (GRT) or over) totaling 360,505 GRT/644,471 metric tons deadweight (DWT)

Ships by type: bulk carrier 1, cargo ship 12, chemical tanker 4, petroleum tanker 22, specialized tanker 1 (1999 est.)

1.8 Airport & Airlines

Nigeria's principal airports are Murtala Muhammad Airport in Lagos and Mallam Aminu International in the northern state of Kano. Three other international airports are located in Abuja, Kaduna, and Port Harcourt. Overall, Nigeria's airports, whether international or regional, suffer from a poor reputation for operational efficiency and

safety. Private domestic air carriers began to win business at the expense of Nigeria Airways, the former government-owned national airline which was declared bankrupt in 2004. The national flag carrier of Nigeria is now Air Nigeria, in which Virgin Atlantic owns 49% and the remaining 51% by Nigerian investors

II. CHALLENGES

Motorized travel in Nigeria can be a challenge. It is limited by several factors. Lack of resources make improvement and repair of roads, boat docks, airports and railways difficult. Topography is another restrictive factor. The arid areas to the north are much different from the tropical rain forest in the south and delta area with each area having unique problems. Being the furthest from oil supply, the north often suffers from lack of fuel. Lack of funding to bridge many of the small rivers limits travel in the Delta region to boats. Nigeria's climate is also a factor. Many roads have little or no effective drainage; very few have culverts or side ditches. With frequent heavy downpours during the rainy season (April to October) many roads become impassable, as the water has no place to go. This causes flooding that erodes the roadways. Without funds to maintain roads, many are in a constant state of disrepair.

Adding to the weather and terrain, roads typically have few or no speed limit signs or warning signs to alert the motorist of curves, hills, intersections or problems with the road itself such as large potholes or eroded road beds.. Law enforcement is minimal except for sporadic roadblocks of armed policemen who check for registrations and other "irregularities".

2.1 Car Ownership

About 70% Nigerians own private cars, yet, the cost of maintenance is prohibitive to most Nigerians. If long distance transportation is needed, most will likely hire a car and driver for the day or for an out-of-town trip. The car usually belongs to the driver or to a business. The drivers are skilled but rarely licensed. Another way to travel is to stand by the side of the road until someone in a car or truck stops. Early in the morning and late in the afternoon, at points of intersections of main roads, there can be a long line of people standing at strategic spots, usually a wide spot in the road. These are commuters who are waiting for rides. Private cars will stop and a price will be negotiated for the ride. This informal system of carpooling has two benefits. The rider gets to his/her destination and the driver receives some money for his (rarely her) trouble in making transportation costs less. Traveling for recreational purposes is limited to those in the highest wage brackets.

2.2 Interstate Travel

What are called "interstate" highways in the U. S., are called carriageways in Nigeria. There are not many miles of divided highways in Nigeria. The primary routes go from Lagos to Ibadan, Ibadan to Benin City, and Port Harcourt to Enugu. There is no speed limit on them and very few access ramps. It is common to see cars and vans

driving through the median to cross into oncoming traffic in order to make a left turn. It is also common for many breakdowns. Drivers uproot small clumps of vegetation from the ditches and place them on the roadway in order to warn traffic to merge around the stalled vehicle much like triangular warning signs used by truck drivers in the U.S. Drivers passing the stalled vehicle often create a slowdown. Other drivers avoid this slowdown by driving through the median, often a small ditch 2- or 3-feet deep, and proceeding along the left shoulder of oncoming traffic. If oncoming traffic is thin, the drivers often drive in the inside lane. Those oncoming vehicles must then merge into the right lane and/or the outside shoulder. Once past the obstruction the cars are driven back through the median to the correct side of the road.



Fig.3. Dangers of poor road maintenance.

Source: Field survey on Road Network Condition, Management and Service Delivery (Oduwale, 2011)

As with city traffic, the horn is the most used tool on the car. One honk lets the car ahead of you know you want to pass, another honk is given after passing to let them know you appreciated their attention while you were passing. Horns are also honked to show irritation and to warn other drivers and/or pedestrians that may be in a direct line of contact. Driving without honking the horn is considered discourteous and dangerous.

2.3 Traveling at Night

Driving at night is only for the brave - or foolhardy - for two reasons. First, it is not considered manly (very few women drive in Nigeria or, if they do, they don't drive very long distances) to drive with one's lights on lest they put stress on the battery or show that one's eyesight is not good. Second, armed bandits are frequently on the carriageways and on other main roads at night. With very few overhead lights, the lack of headlights and the potential for armed robbery makes night driving very stressful as well as imprudent.

2.4 Mass Transportation

Buses run between most major cities. Formal and informal bus depots located at the edge of the city closest to the city of destination. Passengers congregate at the location during the morning and negotiate a price. Once a

bus has enough passengers going to a certain destination, the bus will leave. If there is not enough daylight left to travel safely, some buses will delay departure until the next day or travel only part of the distance before stopping for the evening. Passengers must provide their own food and sleeping arrangements. Often the buses are filled beyond recommended capacity. Buses are owned privately or by companies who run them primarily for their employees.

Another inter-city mode of transportation is a small truck commonly called a "mammy wagon." These are used to carry goods from city to city, but they often fill up any extra space with passengers. These trucks are colorfully decorated with sayings painted on the sides such as "Jesus saves. Slow down, save lives." All prices are negotiable. Riding on a mammy wagon is cheaper than a bus but is not as comfortable. (Comfort in either mode of transportation is relative!)

2.5 City Transportation

In-town transportation comes in a variety of forms. Modes of transportation include, taxis, taxi-vans commonly called "danfos," private cars that are hired out by the day with a driver, personal family cars, scooters, and by foot. All fares are negotiable depending upon the number in the party and the distance to be traveled. Fares are also dependent on whether the passengers are Nigerian or foreigners. The average taxi is a small car, which seats four people and the driver. A danfo is a van which seats seven people and the driver. This does not mean that more people will not be accommodated; often both taxis and danfos carry as many passengers as can squeeze into the vehicle. Danfos have an additional staff member. He is the "conductor" who arranges fare agreements and keeps track of delivery points. He is often to be seen holding onto the frame of the van while hanging out the door in order to locate potential fares. Taxis and danfos charge an average of 50-100 Naira per rider. Scooters operate in the evening in certain locations. They often do not use their headlights, but due to limited traffic they are able to navigate relatively safely. They are used for short distances, and charge 50 Naira per rider, and they can hold up to two passengers in addition to the driver.

2.6 Air Travel

Nine airlines have regularly scheduled flights between Lagos, Kano, Abuja, Enugu, Jos, Kaduna, Maiduguri, Yola, Calabar, and Port Harcourt. Airfares vary from ₦22,500.00 to ₦35,000.00 but since the average household income is low, very few Nigerians can afford to fly. Travel to Europe is even more cost prohibitive at \$1000-\$1500, a full three to five years income! There are few international airports, Lagos, Kano, Port Harcourt and Abuja, some of which had been sanctioned for travel by the U.S. government due to lack of security as well as lack of maintenance. Recent events have indicated the Lagos airport (Murtala Mohammed International) is being reconsidered for the reopening of service by U.S. air carriers.

2.7 Rail Travel

Rail travel is erratic and often undependable. There are 3500 kilometers (2187.5 miles) of rail lines with the main routes from Lagos to Kano, Port Harcourt to Kaduna with a spur to Maiduguri, Zaria to Kaura Namoda, and Kano to Nguru. The average price per trip is ₦250 to ₦500. Spare parts are difficult to find, so when lines, engines or cars are in need of repair the rails may be shut down for several months.

III. TRAFFIC OPTIMIZATION MADE AFFORDABLE

You've heard about adaptive traffic controls, macro-modeling, and hi-tech sensors. They're expensive, right? The good news is, you need none of these things.

Adaptive traffic control systems claim 20% improvement at most. They really deliver 5-7%. Despite their mammoth costs, the results they deliver are hardly noticeable to drivers.

No computer model delivers anything like real-world results. Too many factors affect traffic flow, and the task of predicting them is far beyond the intelligence of any computer.

Sensors can't hurt, but why would you need them? All you really care about is whether the queue increases or decreases. And queue length is easily monitored with a \$150 camera, or even by human observers.

Face it: traffic optimization is an art, not a science. Why, then, do so many people try to do it with electronic gadgets? Simply speaking, they do it to make money, but also because top-level traffic professionals are few and expensive to hire.

Here is the solution: highly skilled traffic-optimization engineers from Ukraine. For decades, these engineers honed their skills working in the mission-impossible conditions of Eastern Europe: bad roads, a near-total lack of highways, and no funding for any improvements, from multilevel junctions down to simple shoulders.

You can hire us to redesign your entire city's traffic plan, to fix a stand-alone choke point, or even to outsource the mundane job of splitting pedestrian phases and calculating short night-time phases. All for a fraction of what it would cost in the West.

3.1 Intelligent Transportation Systems (ITS)

Nigeria will face tremendous economic growth in coming years. With over 150 million populations and urbanizing at one of the fastest rates resulting from the oil production in the country requires immediate attention in infrastructure and traffic management areas.

Traffic congestion is increasingly becoming a severe problem with several other transportation related problems such as increasing emissions of pollutants and depleting infrastructure that adversely impact the overall well being of Nigeria.

3.2 Proposed Methodology for ITS Applications in Nigeria

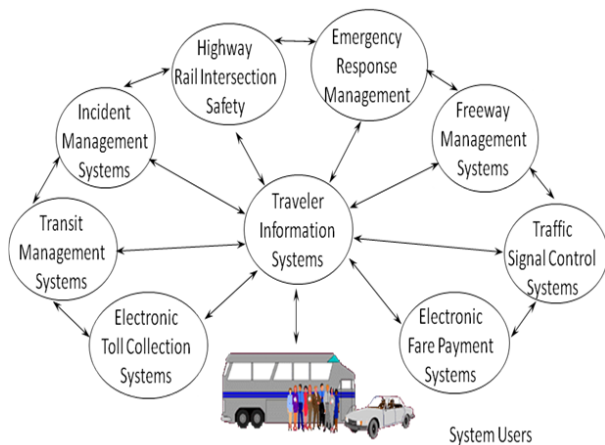


Fig.4. Typical Schematic Travel Information Systems

IV. CONCLUSION

Nigeria is still among the fast developing nations. The transportation industry is also fast growing. If not for the global economic recession, the transportation sub-sector would have rapidly improved in the overall productivity.

Road construction contractors, consultants and agencies charged with responsibility for maintaining these roads should put into consideration the uniqueness of the areas and the volume of traffic that uses these road at any point in time. The metro is an efficient but very expensive urban mass-transit system (demanding large initial investment); it is only suitable for very large cities, where the daily turnouts on urban transportation are high enough to support the very high initial investments. Even in large cities, the use of metro should be combined with efficient light-rail mass-transit systems, in order to optimize the cost and also enhance the efficiency and flexibility of the overall urban transportation system.

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AUTHOR'S PROFILE



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Engr Dr. Godson Ogbuikwe Osueke hails from Ndinuhu Abueke in Ihitte/Uboma local Government Area of Imo state. He attended St. Patrick school, Abueke where he Obtained the first school living certificate with distinction in 1964 and his West African School certificate from Ibeku High school, Umuahia in 1974. He then went to Government college Afikpo for his advanced level in Sciences and also served as college captain for IBIAM House. He went on to be one of the pioneer students at Petroleum Training Institute (PTI) permanent site, Efurum, warri where he bagged PTI Diploma in Petrochemicals (1977- 79). His outstanding performance earned him automatic employment with NNPC in 1980 and was one of the pioneer indigenous Technologist at the Kaduna Refinery/PPL. He continued his education two years later at Texas Southern University in Houston, USA and Texas A&M University, Prairie view where he bagged B.S (Cum Laude) in Industrial Engineering and M.S Industrial Engineering respectively. While in USA, Engineer Osueke was the founding member of the famous "Nigerian Foundation" which they registered in Houston, Texas in 1982. He won the prestigious National Dean's list honor in USA in 1982.

His engineering practice took him to National Productivity Centre as a Productivity Research Officer. He was one of the pioneer staff of Benin zonal office in charge of research operations within Edo, Delta, Ondo and Ekiti States. He rose to Ag. Director of Technological Services at the Abuja Corporate headquarters from where he transferred his services to Federal University of Technology, Owerri (FUTO) as a lecturer in Mechanical Engineering. He is a Senior Lecturer and has over 49 Technical publications (Local and International). He holds his Ph. D. in Industrial Engineering from Federal University of Technology, Owerri, Nigeria. He is married with four children.