

Development of Rail Traffic Management Systems for Supporting Competition on the Nigerian Rail Network

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Abstract:

Transportation is a necessity for all nations, regardless of their industrial capacity, population size, or level of technological development. Nigeria's transportation systems were designed poorly from the start and are incapable of scaling up to meet increased demand, a flaw that results in traffic congestion on roads, overstressed railways, faltering airfields, and mass-transport blind spots. The railway reform in Nigeria, which is based on a separation of network and operating functions, is inextricably linked to the improvement of the railway network's service quality. Rail traffic management system development is bringing significant benefits to the railway sector, boosting freight and passenger transportation. Indeed, it is self-evident that network competition will only work if network activities are reliable, fair, and reasonably priced. At this point, rail operations in Nigeria continue to be connected via a fragmented network, making it difficult for locomotives to cross national borders. Interoperability needs to be enhanced. Interoperability is the right concept for thinking about open and competitive transportation systems. This research is geared towards designing a system for the Nigerian Railway Corporation (NRC) to be determined that a single standard for a signalling system, the Nigerian Rail Traffic Management System, should be established directly.

Keywords: Traffic Management System; Reform; Railway Network; Transportation

1. Introduction

Recent government investment and intervention in the railway sector through legislation have demonstrated how critical the sector is to the Nigerian economy. The railway industry creates jobs, stimulates economic growth, facilitates trade, and achieves economies of scale. It increases Nigeria's competitiveness by strengthening local, regional, and national connections. Numerous pieces of legislation, regulations, and projects aimed at rehabilitating the rail transportation industry have been adopted in Nigeria over the last two decades, contributing to global perceptions of the country's rail transportation system. The Nigerian Railway Corporation Act CAP N129, LFN 2004, 2015 (SB. 001) was repealed and re-enacted in order to revitalize and improve the operating framework, as well as to remove impediments to global best practices in the rail transportation industry. This research examines the current state of rail transportation regulations in Nigeria, as well as the sector's safety. Its purpose is to assess Nigeria's rail transportation legislation and policy efforts in order to determine how well they address the country's mobility, transportation, and safety needs.

Nigerian railway reform, which is based on a separation of network and operating functions, is inextricably linked to the enhancement of the railway network's service quality. Indeed, it is self-

evident that network competition will succeed only if network activities remain reliable and are priced fairly (Nash, 2005). On this point, additional work is required, both in Nigeria and among the Neighbouring Countries. Railway reform has resulted in numerous innovations, both institutionally (by separating network from transport activities, for example) and operationally (by separating transport from network activities). Railway changes and innovations are fuelled by technology, for example, in the network.

Along with its relative safety, reliability, lower user costs, and unique ability to reshape the national economy through mass movement of people, goods, and services, rail transportation holds a great deal of promise (Sietchiping et al., 2012). The need for a functional railway system, as well as the enormous potential for lucrative rail infrastructure investment in Nigeria, are unavoidable in this environment. Nigeria began developing its railway system in 1896, making it one of the world's earliest railway systems. (2012) (Odeleye) According to Kakumoto, the first train in London ran in 1863, while the first train in Japan ran in 1872. (Joshua A. O., 2012; Kakumoto, 1997). The British government began building railways in Nigeria in March 1896, connecting Lagos Colony and Ibadan. The Lagos Government Railway began operations in March 1901 and was extended to Minna, Niger State, in 1911, where it connected with the Northern Nigerian government's Baro-Kano Railway Station, built between 1907 and 1911. In 1912, the Government Department of Railways (GDR), the forerunner of the Nigerian Railway Corporation, merged the two lines, thereby establishing the Nigerian Railway Corporation (NRC) (Y. Manji, 2020; A.F. Sumaila, 2013)

Our objective, is not to study the technical characteristics of the Nigeria Railway Transport Management System (NRTMS) but rather to study the Nigeria Transport Policy in innovation and Intelligent Transportation System (ITS) through the NRTMS innovation process case linked with competition of the railroad network. We will, in the first part, focus on the Nigerian Transport Policy and the role played by the Government. In the second part, we will analyse the NRTMS innovation process according to the available data and methodology. Lastly, we will analyse the difficulties for the implementation of an ITS innovation, the necessity to have a good innovation management and the possible impact on competition.

2. Nigerian Transport Policy: Towards Network Interoperability

Under the 1995 Act (CSJ, 2016), the Nigerian Railway Corporation (NRC) was responsible for the country's rail system, which included 3,505 kilometers of 3 ft 6 in (1,067 mm) Cape gauge lines and 507 kilometers of standard gauge lines. The majority of British territories in Africa use the same gauge of track as Nigeria's railways (see Figures 1 and 2). The Western Line, one of two major Cape-gauge rail lines, runs 1,126 kilometers between Lagos on the Bight of Benin and Nguru in the north-eastern state of Yobe (700 mi). (2012; Manji Y., 2020) (Joshua A. O., 2012; Manji Y., 2020) The Eastern Line connects Port Harcourt in the Niger Delta to Maiduguri in Borno's north-eastern state of Borno, near the Chadian border (Manji Y., 2020). According to the Infrastructure Concession Regulatory Commission (ICRC) and as documented by Manji Y., 2020, there are also several branch lines:

- a. The Linking Line connects Kaduna on the Western Line to Kafanchan on the Eastern Line.
- b. Ifa-Ilaro (Western Line), 20 kilometres (12 mi)(Miller, 1966)
- c. Minna-Baro (Western Line), 150 kilometres (93 mi)(Miller, 1966)
- d. Zaria-Kaura Namoda (Western Line), 245 kilometres (152 mi).
- e. Kuru-Jos (Eastern Line), 55 kilometres (34 mi)(Miller, 1966)
- f. Baro-Kano Railway Station (Northern Line), 200 kilometres (120 mi). (Miller, 1966)

The Bauchi Light Railway, with a gauge of 2 ft 6 in (762 mm), ran 143 miles between Zaria and Bukuru and was constructed in phases between 1912 and 1914. (Manji Y., 2020; Miller, 1966).

Between Jos and Bukuru, a ten-mile stretch was converted to 3 ft 6 in (1,067 mm) gauge in 1927 and became part of the Kafanchan to Jos branch line (Manji Y., 2020). The 2ft 6 was operational in the Zaria-Jos section until 1957, when it was decommissioned (Manji Y., 2020). Additionally, there was a brief existence of the 2ft 6in gauge Wushishi Tramway, which opened in 1901 and connected Wushishi to Zungeru (12 miles) before being expanded to Bari-Juko in 1902. (10 kilometers). (Y. Manji, 2020) After the Hunslet-built 0-6-2T locomotives were retired in 1911, they were transferred to the Bauchi Light Railway (Manji Y., 2020). It is also necessary to mention the Lagos Steam Tramway (1902) and the Lagos Sanitary Tramway (1906), both of which are 2ft 6in gauge (Manji Y., 2020). Nigeria does not use the same track gauge as its neighbors, whose metre gauge railway networks were built by French and German colonial powers. As a result, there are currently no railway connections with them (Manji Y., 2020). Rail connections to Niger were planned via Illela in Sokoto state and Cameroon, but have not yet been built (Manji Y., 2020).

The Nigerian Railway Corporation (NRC) experienced a precipitous decline as a result of inadequate enforcement, implementation, and monitoring, as well as a lack of review of the 1995 Act. This decline was evident over decades in terms of insufficient passenger and freight traffic. Rail lines' capacity and utility have been eroded as a result of obsolete locomotives and rolling stock. The data in Table 1.1 cover the years 1964 to 2003 and include passenger and freight traffic (Manji Y., 2020). By early 2013, Nigeria's rail network had only one operational segment between Lagos and Kano (Manji Y., 2020) Trains carrying passengers completed the route in 31 hours at an average speed of 45 kilometers per hour (BBC, 2013). Together with the requirement to assess the Nigerian Railway Corporation (NRC) Act in its entirety, this trend necessitated the enactment of additional legislation.

As shown in Table 1, the primary reason for completing railway lines was to facilitate the export of agricultural products. Only the segments Zaria-Jos-Bukuru and Kaduna-Kafanchan were not built for agricultural purposes, as stated in Table 1. (Cash crops for export). (2020, Onokala& Olajide) Nigerians have recently argued for a return to railway usage, arguing that the nation was once propelled forward by pre-railway levels of economic development, the presence of major roadways, missionary activity, railway construction timing, differential spillovers, or crude oil output (Okoye et al., 2019a). The Bauchi Light Railway, with a gauge of 2 ft 6 in (762 mm), ran 143 miles between Zaria and Bukuru and was constructed in phases between 1912 and 1914. (Manji Y., 2020; Miller, 1966). Between Jos and Bukuru, a ten-mile stretch was converted to 3 ft 6 in (1,067 mm) gauge in 1927 and became part of the Kafanchan to Jos branch line (Manji Y., 2020). The 2ft 6 was operational in the Zaria-Jos section until 1957, when it was decommissioned (Manji Y., 2020). Additionally, there was a brief existence of the 2ft 6in gauge Wushishi Tramway, which opened in 1901 and connected Wushishi to Zungeru (12 miles) before being expanded to Bari-Juko in 1902. (10 kilometers). (Y. Manji, 2020) After the Hunslet-built 0-6-2T locomotives were retired in 1911, they were transferred to the Bauchi Light Railway (Manji Y., 2020).

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Figure 1: Rail Line, Straight Lines Between Nodes, and Nodes(Okoye et al., 2019b)

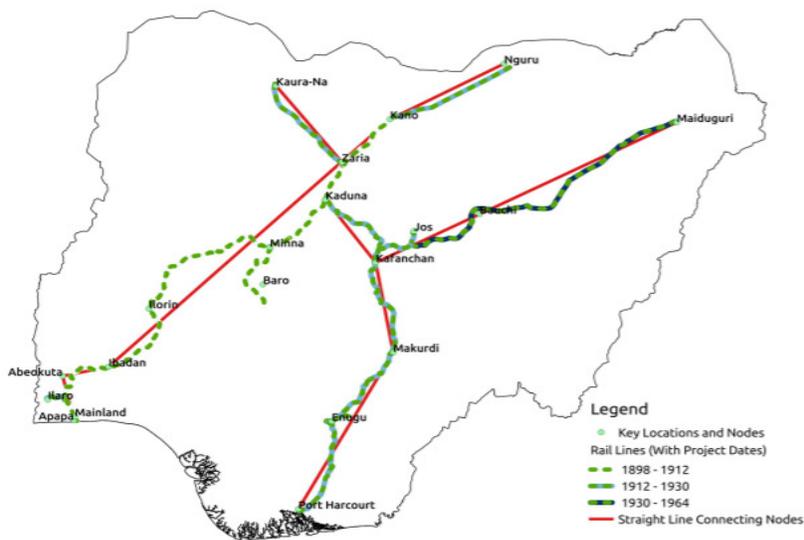


Figure 2: Rail Lines, Roads and Placebo Lines(Okoye et al., 2019b)

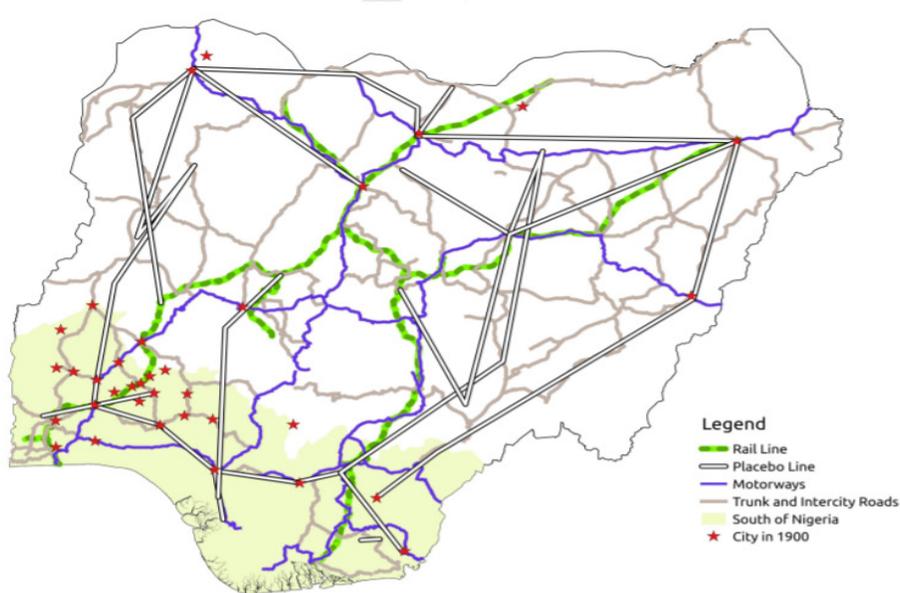


Table 1: History of Railway Construction in Nigeria(Okoye et al., 2016, 2019a)

Link	Date	Length (Km)	Motivation
Lagos - Otta	1898	32	Administrative & Agricultural
Otta - Abeokuta – Ibadan	1901	165	Administrative & Agricultural
Ibadan - Ilorin	1908	201	Administrative & Agricultural
Ilorin - Jebba	1909	96	Administrative & Agricultural
Zaria - Jos - Bukuru	1911	227	Mineral

Jebba - Zungeru - Minna	1912	233	Administrative & Agricultural
Baro – Kano	1912	573	Administrative & Agricultural
Port Harcourt - Enugu	1916	243	Agricultural & Mineral
Enugu - Makurdi – Jos	1927	596	Agricultural & Mineral
Kaduna - Kafanchan	1927	201	Agricultural & Mineral
Zaria - Gusau - Kaura Namoda	1929	232	Agricultural
Kano - Nguru	1930	229	Agricultural
Ifo - Ilaro - Idogo	1930	39	Agricultural
Jos - Maiduguri	1964	645	Agricultural

Note: The motivations for railway construction are classified into three categories: administrative (political or military), agricultural, and mineral.(Okoye et al., 2016, 2019a)

The NRTMS must be viewed in the context of two primary objectives: interoperability and competitiveness in the interior great railway market. Intramodality and mode complementarity are critical components of transport policy with the goal of reviving the appeal of railway transport through reduced environmental impact. Fair pricing is also a tool for improving the efficiency of Nigeria's transportation activities. Later, as the strategy evolves toward neighbouring countries, further integration becomes a priority, particularly in rail transport (NRTMS), which must contend with the opportunism and dynamism of international road freight transport.

2.1 Railway transport and NRTMS: Supporting the Recovery of Rail Transport

The Nigerian Railway Corporation Act CAP N129, LFN 2004, 2015 (SB. 001) was repealed and re-enacted with the goal of reviving and improving the operational framework, as well as removing constraints that had previously inhibited international best practices in the rail transport sector(Omishore, 2016). Between the mid-1950s and the 1970s, Nigeria had a great rail transportation system that not only served as a safer, cheaper, and more efficient means of transporting passengers, goods, and services across the country, but also as a major source of employment(Omishore, 2016). From the mid-1980s, when the Nigerian Railway Corporation was declared bankrupt, until very recently when it was resuscitated, little or no investments were made in the Nigerian rail sector until the inception of civilian administrations in 1999 when the rail sector received some serious attention(Omishore, 2016). In both developed and developing countries, rail transportation has a strong foundation for social and industrial operations. However, it looks that Nigeria and Nigerians are unable to realize their ideal of having efficient rail transportation infrastructure(Omishore, 2016). The problems hindering the effective development of the Nigerian Railway system are a multitude, but the most important ones as adduced by Sumaila A.F., (2013) are listed below:

- Technical problems such as tight curves, steep gradient, rail buckling with
- associated track/speed limits
- Poor communications
- Falling rolling stock level
- Interference by the government in the managerial structure
- Lack of freedom to set tariffs
- Underfunding

- Plummeting traffic levels (freight and passenger)
- Inflexible bureaucracy
- Volatile staff training

Despite recent efforts at repealing and re-enactment of the Nigerian Railway Corporation Act, some of the highlighted problems persist to date(Omishore, 2016). However, a closer review of how the railway system was rejuvenated through legislation is pivotal in encapsulating the efforts made so far by the government(Sumaila, 2013). The nature, magnitude, and dimensions of these challenges, as well as potential remedies, are not only prominently featured in official and academic publications on Nigeria, but are also at the forefront of major conversation on the country(Sumaila, 2013). What has remained troubling is the various solutions' inability to make meaningful improvements in the transportation sector. Rather the situation appears to be getting worse (Sumaila, 2008; Sumaila, 2013).

According to reports, Nigeria's railway crisis has been exacerbated by a lack of a well determined development agenda (Levinus, 2020). This stance is based on widespread agreement that the rail transportation system is unbalanced in terms of resource allocations to various modes, the inadequacy of existing infrastructure, and a misalignment between the goals of transport parastatals and operators and the material and organizational resources available to them (Levinus, 2020). These are undeniably important challenges that a national policy should seek to confront and fix. As a result, it may be inferred that the Nigerian railway transportation system's chronic inefficiencies are owing to, or attributable to, policy inconsistencies, faults, and deficiencies, which have resulted in piecemeal and uncoordinated rail transportation program planning and implementation(Sumaila A.F., 2013).

3. Initiation Period: Towards A Nigerian Signalling System

The Federal Government of Nigeria's renewed efforts to revitalize the railway system through legislation began in 2006 with the implementation of the 25-year rail vision plan, which began with the award of the first phase of standard gauge rail spanning 1,315 kilometres from Lagos to Kano, and was awarded to Messrs CCECC at \$8.3 billion, and the planned second phase extending from Port Harcourt to Maiduguri at a cost of more than \$9 billion(Manji Y., 2020). Unfortunately, as admirable and desirable as the planned modernization initiative is, the current administration is having difficulty funding it for three reasons:

First, the expected source of money is an excess crude oil account, which is subject to constitutional constraints and hence deemed unacceptable(Manji Y., 2020) but there is a reprieve for the sector as the House of Representatives has passed a bill seeking to remove railway from the exclusive legislative list and include it in the concurrent list. (Levinus, 2020). Second, for several reasons, the project's intended 1.28 billion US dollar concessionary financing from China has yet to be implemented. Third, the 25-year plan's rehabilitation phase was excluded, which would have allowed for a smooth transition from the old to the new lines(Manji Y., 2020).

Given it all, Nigeria requires good rail transportation legislation and network to carry a large portion of its expected 50-60 million tons of freight each year, particularly before the new lines are completed(Manji Y., 2020). If this is not done, we will continue to have excessive road use and the severe repercussions that come with it, which include quick deterioration of our roads, catastrophic accidents and high accident rates, inefficient intermodal freight split, and other inefficiencies.

This development period shows the complexity of network innovation at a Nigerian level and the need for political support, especially if competition is a driving motor in the field of transport operations because of its cost-killing function (Pellegrin, 2008). While the system is already proposed in different product ranges (range ATLAS by Alstom), the 'change requests' required by the users must be taken into account. It requires that the system remains open to adaptation. Therefore, this innovation presents important risks for the investor: the reason may be its poor reception by the Nigerian networks.

3.1. Developments and Trends in Rail Transport Management System in Nigeria

The railway's most major advantage is its efficiency in moving huge numbers of people and goods across long distances by land. Rail travel is low-cost, low-energy, and low-impact on the environment (Marson et al., 2021a). When connected to other modes of transportation, the railway may be a potent stimulus for socio-economic growth and development in Nigeria and beyond. For these reasons, railways are advised for countries like Nigeria that have a high cost of land, people, and resources (Onokala & Olajide, 2020). As a result, it's not unexpected that Nigerians' reliance on rivers and creeks as primary modes of transportation changed to railways as soon as rail travel became available (Okoye et al., 2019b; Onokala & Olajide, 2020). Despite these tremendous advantages, rail transport in most developing countries is usually the least developed mode. For instance, in Nigeria, the vibrant fortune of rail transport operations and development has been on the decline since the mid-1970s (Onokala & Olajide, 2020).

The developmental gap in rail transport in Nigeria is responsible for a significant level of access denial to a safer, affordable and environmentally-friendly mode of transport, to the younger generation of Nigerians (Adepoju, 2019). The inefficient rail network reflects political institutions' lack of commitment, money, and expertise; numerous agencies are involved in building railroads, but few in maintaining them; legal obligations are unclear, and core competence professionals in railway transportation are in low supply (Adepoju, 2019).

While this gap persists in some of the railway stations across Nigeria, another major problem is employees (individuals) with poor experience which form an integral factor in the development of the railway sector.

To revive the rail transportation system, the government established some policy trusts aimed at identifying alternative funding sources for road construction and maintenance, particularly in light of dwindling government funds due to increased competition and resource demands from other sectors of the economy. As a result, private sector involvement in rail transportation, and indeed all types of transportation, was seen as a viable government strategy (Sumaila A.F., 2013). According to Sumaila A.F., (2013), the government in 2003 through its policy, identified areas of private sector involvement. In 2008, the transportation policy was further reviewed to carry out rehabilitation and modernization of rail lines to serve as attractive means of high-speed passenger movement (Sumaila A.F., 2013). No doubt there was a measure of progress as can be seen in Table 2; 2016-2017, Passenger data for 11 functional passenger trains in Nigeria showed an impact of these policies in passenger patronage.

Functional railway in Nigeria between 2016-2017:(Adepoju, 2019)

Table 2: 2016-2017 Passenger data for 11 functional passenger trains in Nigeria

Rail	2016 Q1	2016 Q2	2016 Q3	2016 Q4	2017 Q1	2017 Q2
LAGOS MTT	532,474	565,642	531,898	655,724	530,993	427,760
KDJ-ABV-EXP	-	-	53,874	89,263	86,966	76,820
DD-IA-DD	6,109	7,535	8,585	7,012	3,620	2,663
DD-KC-DD	24,100	21,529	31,088	26,951	22,898	18,512
OA-KC-OA	17,810	16,732	14,269	22,693	14,612	6,709
KC-NRU-KC	6,262	7,941	3,288	894	4,264	2,783
MX-KDJ-MX	36,308	26,573	11,753	17,948	13,761	573
PH-KC-PH	6,122	9,508	21,804	15,829	8,359	2,870
ABA-PH-ABA	21,557	73,768	102,248	111,617	64,924	42,547
RX-KRN-ZRX	3,997	7,118	4,574	6,240	5,116	3,189
OSSG/EXCURION	3,997	7,118	4,574	6,240	5,116	3,189

Data Sources: National Bureau of Statistics report November 2017(NBS, 2017)

Despite these commendable policies, the country's major challenge in developing rail transportation is putting policy recommendations into reality. This could be attributed in part to the policy-making process. The 1965 policy statement, like previous ones, was essentially a synopsis of a study report. The policy guidelines were not properly followed, and the government's different techniques and instruments developed and deployed worsened the transportation system(Sumaila A.F., 2013).In a similar context, the 2003 and 2008 policy initiatives, while well-intentioned, did not progress past the draft stage, meaning that government execution of their proposals was completely voluntary(Sumaila A.F., 2013).

Today, the government is taking a comprehensive approach to rebuilding the nation's transportation infrastructure and increasing service delivery capacity through a reform process aimed at introducing a market economy to attract private sector investment and initiative in a true Public-Private-Partnership (PPP) arrangement(Sumaila A.F., 2013).This places a share of the responsibility for investing in, owning, and managing various aspects of the rail transportation system on the shoulders of the private sector, but in collaboration with the government, which will create an overall enabling environment(Sumaila A.F., 2013). The proposed synergy as reviewed by(Sumaila A.F., 2013) takes into account the following investment choices:

- a. Outright Privatization
- b. Equality Participation
- c. Concession in the forms of
 - i. Build, Operate and Transfer (BOT)
 - ii. Build, Operate and Own (BOO)
 - iii. Build, Transfer and Operate (BTO)
 - iv. Build, Own, Operate and Transfer (BOOT)
 - v. Design, Build, Finance and Operate (DBFO)

vi. Design, Construct, Maintain and Finance (DCMF)

The Medium-Term Rail Transportation Development Strategy focuses on the rehabilitation of rail infrastructure and rolling stock, as well as the building of new Standard Gauge lines(Sumaila, 2013).

4. NRC Management

The development of an ITS project at a Nigerian rail network scale not only results from a strong policy in the long-term perspective but also needs an undertaking from the economic actors to invest in the new project. The status of each policy initiative, the somewhat cumbersome institutional mechanism for dealing with rail transportation issues, the constitutional responsibilities assigned to the three tiers of government and the resulting confusion, and the series of action plans initiated at various modal levels have all been identified as factors affecting the implementation of National transport policy on the railway (Odeleye, 2012; Ogunsanya, 2006; Sumaila, 2013).

There are identified gaps that have been and will continue to be responsible for the government's failure to revitalize Nigeria's rail transport industry. The 1955 Act of Parliament, which added railways to the Federal government's exclusive list, is a good example. This act must be repealed in its entirety if the Nigerian railway is to see significant changes and improvements in infrastructure, train speed, and operations(Odeleye, 2000; Ogunsanya, 2006). The industrialised countries have religiously utilised and accepted dynamic transport policy alternatives, which is accountable for the dynamism of their transportation sectors, particularly railways, today(Odeleye, 2000; Ogunsanya, 2006).

While most rich economies' railway monopolies have been dissolved through policy reforms such as railway market deregulation, most developing economies' railways are still owned, operated, managed, funded, and controlled by the government(Marson et al., 2021b; OECD, 2013; Ogunsanya, 2006). This is the major problem in the Nigerian rail sector in the last 35 years. This is seen as an anomaly because it does not promote efficiency or productivity. As a result, the existing railway's monopolistic structure is to blame for a succession of political interferences in railway funding, investment, and reforms by successive Nigerian administrations. Table 3 depicts the various government involvement in Nigeria's railway development.

Table 3 Government railways reforms in Nigeria(Odeleye, 2000, 2012).

Year	Project types
1979	The bilateral technical management agreement with the RITES (Rail India Technical and Economic Services)
1986	Nigerian/Romanian government counter trade agreement
1995	The bilateral pact signed with the Chinese government through CCECC (China civil engineering construction corporation)
2001	The Federal Government commissioned an international consortium through BPE (Bureau of Public Enterprises)
2001	Federal Government initiated a 25-year development plan for railways
2006	Partnership with the government of China through CCECC to modernize the railway, through a concessionary loan of 2.5 billion from the Chinese government.

However, as beneficial as these government efforts are, they have not been able to alleviate Nigeria's problems of railway infrastructure degradation and mismanagement. The failure of most of these interventions can be traced back to Hensher and Walters II's(Hensher, 1999; Odeleye, 2000; Ogunsanya, 2006) statement that railways tend to become a weapon for all kinds of political

intervention, from favouring certain groups or commodities to being used as anti-inflationary measures (Hensher, 1999; Ogunsanya, 2006). Some of these policies were doubtful in their effectiveness, but politicians use whatever weapons they had.

The NRC's (Nigerian Railway Corporation) profile has consistently revolved around negative attributes such as obsolescent technology, snail-like train speeds, derailment, maladministration, corruption, workers unrest, abandoned projects, financial constraints, low staff morale, and staff downsizing and/or rightsizing, to name a few (Ogunsanya, 2006). Due to these issues, the company provides inconsistent services that seldom match the satisfaction and needs of clients over time and space. As a result, prospective clients' patronage of the railway swings steadily (Ogunsanya, 2006).

The main barrier for the NRC has been in the management of the migration of the Nigerian networks towards the new system (Brühwiler, 2002; Cordner, 2004, Laperrouza & Finger, 2009; Vinois, 2004). The challenge is important because the NRTMS needs, to be a success, a minimal number of line kilometres equipped to form a true network. As long as this critical point (or 'critical mass') will not be reached, the NRTMS project may be not interoperable and may be a net extra cost for the operators and network managers. This cost problem is strengthened by the legal impossibility of the EC to subsidise the rail operators for their migration (competition rule); then it seems essential to assure a quick implementation of NRTMS, that the rail operators make a significant investment in the system to engage a virtuous circle (Vinck, 2005).

5. Findings and Discussion: Towards A Proactive Management By NRC

NRTMS is a sophisticated innovation that has the potential to significantly impact competition. Its complexity is a result of Nigeria's size and nature. As a network innovation, its success is contingent on one condition associated with the theory of network externalities (Curien, 2005): that all Nigerian networks adopt the system as quickly as possible and in a truly cooperative manner. Thus, NRTMS is interested in establishing a network and continuity concept that will bolster competition. Refusal to migrate by an actor will result in a network discontinuity. The NRC's challenge for the innovation's success is thus to facilitate the transition from the existing national networks to the new system. Railway reform has continued in Nigeria since 2004, when the National Assembly repealed the rail industry's NRC Act. Recent developments and legislation have aimed to liberalize Nigeria's rail services by granting open access to monopoly infrastructures, particularly in Europe. Between the mid-1950s and the 1970s, Nigeria had an efficient rail transportation system that served as a safer, more cost-effective, and more efficient means of transporting passengers, goods, and services throughout the country, as well as a significant source of employment (Omishore, 2016). The rail system's safety has provided new perspectives on Nigeria's future (Vanguard, 2020). While the safety of the rail system and its passengers has always been guaranteed, recent rail transportation incidents have cast doubt on everyone (Omishore, 2016).

6. Conclusion

Nigeria's railway development and traffic Management System are still in the early stages. One of the key goals of these changes has been to open up the rail sector to Public-Private-Partnership (PPP), which will result in a large amount of direct foreign investment in Nigeria. Effective and efficient transportation generates economic benefits that have a multiplier impact, such as increased market accessibility, employment, and investment. As a result, persons who lack transportation infrastructure miss out on a variety of economic prospects. With these developments and legislation, comes the issue of safety. For railways in Nigeria to develop significantly there is a need to put in place machinery that is capable of breaking the corrupt link between business and politics.

In Japan, the link was broken through a review of railway law, which consequently allowed for the privatization of Japanese National Rails (JNR). The Ninth Senate of the Federal Republic of Nigeria is working to abolish the 1955 Act of Parliament that included railways to the Federal government's exclusive list of functions. This legislation is essential if Nigerian railway infrastructure, train speed, and operations are to improve dramatically. The tremendous technological development in railway infrastructure that developed countries are witnessing today is the result of a realization that railway reforms will only produce the expected positive results if reforms are accompanied by the necessary legal framework that allows for private fund injection. This approach will allow for the independence and autonomy of the railway institution in Nigeria.

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