

Focus on the Impact of Rail Transport Services on Economic Development in Lagos City, Nigeria

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Abstract: This research work centered on the effect impact of rail transport services on economic development in Lagos City, Nigeria. Rail transport services are the movement of people and commodities through the use of railways. Economic Development in other words programs, policies, or activities that seek to improve the economic well-being and quality of life for communities. The researcher focused more on specific objectives during its analysis including the effect of rail freight, excursion train, and rail services on market development, improved education, and job creation. This research study will be of significance to the government at all levels, the general public, and future academic researchers. In this research work, primary data were collected from 208 respondents, through the use of structured questionnaires and later adopted chi-square statistical techniques for hypotheses testing. However, findings revealed there is a strong significant positive effect between train freight, excursion train, rail services and market development, improved education, and job creation in Lagos state as the three null hypotheses were rejected. The researcher concludes that the expansion and improvement of the rail network creates more jobs by connecting laborers, businesses, and activity centers efficiently. This study recommends that the government should develop and prioritize the construction of rail infrastructures and train stations to create more jobs. Lastly, more excursion packages should be created to give proper enlightenment on the rail transportation system in Lagos State and Nigeria.

Keywords: Rail Transport; services; Economic Development; chi-square statistical techniques; Lagos city

Nomenclature

Abbreviation	Expansion
NRC	Nigerian Railway Corporation
CiTs	Cities in Transition
PSI	Passenger Satisfaction Index
OLS	Ordinary Least Squares
SWV	Sum of Weighted Value
POLS	Pooled Ordinary Least Squares
FE	Fixed Effect
RE	Random Effect
PMG	Pooled Mean Group

1. Introduction

A rail is a bar extending from one post or support to another and serves as a guard or barrier. Transport is the movement of persons or goods from one place to another using appropriate means of transport. Transport becomes very beneficial to an economy for many reasons, such as employment, and the movement of goods and people. Time is used to measure the beneficiary of the transport. There are different modes of transport [26] and one among them is rail transport. Rail transportation services (also known as train transport) is a means of transport that transfers passengers and goods on wheeled vehicles running on rails, which are located on tracks. In contrast to road transport, where the vehicles run on a prepared flat surface, rail vehicles (rolling stock) are directionally guided by the tracks on which they run. Tracks usually consist of steel rails, installed on sleepers (ties) set in ballast, on which the rolling stock, usually fitted with metal wheels, moves. Other variations are also possible, such as "slab track", in which the rails are fastened to a concrete foundation resting on a prepared subsurface [1].

Economic Development is a program, policy, or activity that seeks to improve the economic well-being and quality of life for a community. Each community has its opportunities, challenges, and priorities. According to [29], with growing populations, the major cities have to reinvent their urban transport systems looking towards mass transit and interlinked rail transportation to accommodate the current and future populations. [29] argues that rail transport can spur economic growth [25] by increasing income due to better access to work and amenities [10]. He suggests that rail transport can play a valuable role in shaping and increasing the economic activity of the location since it uses little land, which is important for long-term economic development [11].

This study therefore attempts to analyze the effect of rail transportation services on economic development in Lagos City. The researcher focused on two train stations namely, the Mobolaji Johnson station Located at No 8 Adisa estate, Yaba, Lagos State, and Babatunde Fashola station, Located at No 40 Olugbosho Street, Lagos. The unit scope covered staff, excursionists, tourists, and passengers who responded to the questionnaire. This research is based on the effect of train freight services on market development, the Effect of excursion train services on improved education, and the effect of rail services on job creation. The main objective of the study focused on the following.

1. Analyzed the effect of train freight services on market development.
2. Examined the effect of excursion train services on improved education.
3. Investigated the effect of rail transportation services on job creation.

This paper adopted chi-square statistical techniques for hypothesis testing for evaluating the responses of 206 respondents. The research helps to examine the effect of rail transport services on economic development in Lagos Mainland and Agege Local Government. It will directly benefit the Government at all levels in policy formulation for the ongoing railway rehabilitation program. This study also helps future academic researchers, tertiary institutions, and students to increase their knowledge and experience in Education research and teaching. Finally, The study will be significant to the general public as it will create more job employment for them since the state has been enumerated and identified it is hoped that the state government will undoubtedly tackle it and accelerate economic development in the state. The research hypotheses showed that there is no significant relationship between train freight services and market development, excursion train services and improved education, and rail service and job creation.

The following is an outline of this study's main findings: Section 2 covers a general study of Rail transport. Section 3 details the literature review, and Section 4 emphasizes the research methodology. The analysis and interpretation of results is explained in Section 5. The discussion of findings is explained in Section 6. Section 7 mentions the Advantages and Disadvantages of the proposed method and section 8 concludes the paper with recommendations.

2. General Study of Rail Transport

Transportation refers to the movement of products and people from one location to another. The ability and necessity to move vast quantities of commodities or large numbers of people across great distances at high speeds in comfort and safety has been an indicator of civilization and, in particular, technological advancement. The modes of transport [26] include roadways, railways, airways, waterways, pipelines, and cables. However, this research focuses on rail transportation and services. A rail is a steel bar extending horizontally between supports which is used as a track for railroads, cars, or other vehicles. It is preferred due to its high speed. train cars are directed by the train lines on which they travel. Rail transport aids in the provision of administrative services to the government. The railways serve as the primary mode of transportation for government employees and the military [27].

2.1 Advantages of Railways Transportation

Some of the common advantages of rail transport are

1. It is economical for long distances because it can easily cover all areas of states and cities.
2. This is much faster than roadways.
3. Most suitable for carrying a bulky amount of goods and products.
4. It provides proper protection from exposure to sun and dust pollution.
5. It is the most dependable and safe.
6. Rail transport helps to provide employment opportunities to both skilled and unskilled individuals.

2.2 Disadvantages of Railway Transportation

Some of the difficulties that are faced in rail transport are

1. Huge capital is required for construction and maintenance.
2. It is not suitable for hilly areas.
3. It is not flexible.
4. The cost and time of terminal operations are the major disadvantages of rail transport.
5. Monopoly in nature.
6. It takes much time to book goods and persons compared to road transport.

2.3 Nigeria Rail Transportation

The Nigerian railways were initially operated by the British colonial force. The railways were built up to 3 ft 6 in (1,067 mm) Cape gauge, a track size comparable to that used in most other British settlements in Africa. The country has two major Cape gauge rail lines: the Western line, which connects Lagos on the Bight of Benin to Nguru in the Northern Territory of Yobe over a distance of 1,126 kilometers (700 mi), and the Eastern line, which connects Port Harcourt in the Niger Delta to Maiduguri in the Northeastern Province of Borno, close to the Chadian border [2].

The Linking Line connects Kaduna on the Western Line to Kafanchan on the Eastern Line; Ifaw-Ilaro (Western Line), 20 kilometers (12 mi); Minna-Baro (Western Line), 155 kilometers (96 mi); Zaria-Kaura Namoda (Western Line), 245 kilometers (152 mi); and Kuru-Jos (Eastern Line), 55 kilometers (34 mi)[2].

2.4 Types of Rail Transportation in Nigeria

1. **Metro Rail:** This is a city's underground train system. It encompasses a smaller inner-urban area and extends outwards to between 12 and 20 km (8 to 14 miles). The tube is the common British term for London's underground railway system. Subway is the term used in the United States.
2. **Milk Run:** This is a train ride that stops and begins several times before arriving at the final destination.
3. **Mono Rail:** Trains move on a single metal track in this railway system.
4. **Overground Rail:** The train moves on the ground's surface rather than underneath in tunnels.
5. **Passenger Train:** This train exclusively transports passengers and not goods.
6. **Freight Train:** It is a train that only transports commodities.
7. **Light Railway:** It is a railway for miniature trains, mainly for recreational purposes.
8. **Eurostar:** It is a rapid train that passes through the Channel Tunnel between the United Kingdom, France, and Belgium.
9. **Cable Rail:** This railway is frequently connected to a cable that pulls it up in the mountain.
10. **Boat Train:** A train that transports people to a port where they can continue their journey by ship, as opposed to a train that transports passengers from a port to a town or city.
11. **People Mover:** It is a simple train system that is commonly seen in an airport or a theme park.
12. **Commuter Rail:** This is also known as suburban rail. It is a passenger rail transport service that primarily operates between a city center and the middle to outer suburbs beyond 15 kilometers (10 miles), as well as commuter towns or other regions that attract a high number of commuters who travel daily.
13. **Inter-City Rail:** This is a high-speed train line that connects big cities without stopping in little villages along the way.
14. **Funicular Rail:** This is a cable-powered railway that pulls carriages up a steep incline.
15. **High-Speed Rail:** This refers to passenger rail systems that operate at speeds of 200 to 300 km/h or more. It travels quicker than typical rail traffic because it employs an integrated system of specialized rolling stock and dedicated rails [18].
16. **Regional Rails:** It is a passenger rail service that runs between villages and cities, as opposed to inter-city rail, which only connects big population hubs. These trains make more stops over shorter distances than intercity rail, although they are faster [16].

2.5 Services

Services, as opposed to tangible things, are non-physical intangible components of our economy. Banking, education, medical care, and transportation comprise the majority of the economies of the developed world [6]. They also account for the majority of the emerging economies' GDP [28]. These are tasks

performed by other people, businesses, or government agencies on your behalf. The booking agent provides a service when you book a hotel room, airline, or holiday. You can't touch or handle that reservation; it's an intangible, abstract object. That booking cannot be stored or transferred. Every public service provided by the government is for the benefit of its residents. Examples include the police, armed forces, ambulances, and so on. [17]

2.6 Types of Rail Transportation Services

The NRC is one of the oldest institutions still in operation today, with over 100 years of continuous service to the country. However, aside from passenger services, which are the most common of NRC's services. Other services provided by the Corporation include freight and excursion/special train services. According to [15], the following are the types of rail transport services.

- **Freight Services:** NRC operates goods trains that run the length and width of Nigeria, stopping at 280 stations in 19 states. Cement, rice, salt, sugar, fertilizer, wheat, billet, vehicles, coil, petroleum products, and other ordinary goods can be transported. Other southbound traffic includes livestock, rams, grains, kaolin, and clinker. According to [15], the NRC operates two rail-served inland container dry ports in Kaduna and Kano. They also provide "block train" and "pick-up" services. The "Goods-In-Transit" insurance policy includes a value-added service.
- **Excursion and Special Train Services:** The NRC provides excursion services to schools, organizations, societies, and individuals looking to have a good time. These services are organized by the various District managers and can be provided to clients in any region of the country based on their needs.
- **Passenger Service:** Every Friday, NRC provides long-distance express passenger train services from Port Harcourt (Garden City) to Kano and Lagos to Kano. Express trains run from Lagos to Jos and Maiduguri, as well as from Port-Harcourt to Jos and Maiduguri. These services provide full air conditioning to first-class "seater" or "sleeper" luxury saloons, as well as restaurant cars outfitted with amenities. There are also standard-class carriages with ample headroom and luggage racks, as well as courier trucks. These trains go over the savannah into the interiors of Nigeria's vast green regions, revealing the country's stunning grandeur. Luxury coaches (mobile homes) with an open veranda for outdoor viewing, a parlor, a bedroom, a bathroom, a kitchen, storage, and a visitor's room.

2.7 Economic Development

Economic development is a series of targeted activities and programs designed to improve a community's economic well-being and quality of life by increasing local wealth, diversifying the economy, creating and maintaining jobs, and expanding the local tax base [9]. Communities must maintain their attractiveness as places that can create new economic prospects during all economic cycles. Communities that intentionally support their businesses get better economic and social outcomes than those that do not. Economic development programs are an excellent illustration of how elected authorities and communities can assist businesses [5].

2.8 Types of Economic Development

According to [14], the following are common types of economic development.

1. **Infrastructure:** Foundational services provide an efficient economy and act as an internet backbone.
2. **Education:** Institutions, processes, techniques, and facilities that facilitate knowledge and skill learning.
3. **Health & Wellness:** Hospitals and wellness programs such as after-school sports programs are examples of healthcare.
4. **Justice:** A legal system that is open and fair, with law enforcement, administrative authorities, courts, and additional systems such as a human rights tribunal. Fairness is essential; an unjust legal system can stifle economic development. After-school sports programs, for example, are popular among the Rams.
5. **Safety:** Crime prevention, disaster preparedness, and information security are examples of systems that give individuals the impression that they live in a safe and stable environment.
6. **Human Rights:** Human rights principles and frameworks that allow people to achieve happiness. A constitution upheld by all branches of government.
7. **Consumer Protection:** Regulation of product and service quality, commercial terms, and safety. For example, a system that ensures the safety and health of food goods.

8. **Fair Competition:** Bodies that safeguard free competition to prohibit anti-competitive practices that impede market efficiency.
9. **Markets:** Fair, efficient, and liquid markets for securities, assets, goods, and services.
10. **Finance:** Financial institutions and systems that are stable, respectable, and efficient. For example, a country where it is simple to obtain a loan if you are relatively likely to repay it.
11. **Political Stability:** A fair political system in which a people has faith in its leaders and administrators and believes that things are always getting better.
12. **Culture:** Architecture, art, performance art, literature, festivals, rituals, and pastimes are examples of things that people cherish. Encouragement of creative endeavors and cultural enterprises.
13. **Transportation:** A transit system that is both convenient and efficient in terms of time and money.
14. **Energy:** A system of energy production and delivery that offers adequate energy while minimizing environmental pollution.
15. **Water:** Infrastructure that ensures a region's water security, such as groundwater recharge infrastructure.
16. **Food:** Food security grows a large portion of its food, including a variety of crops.
17. **Information Technology:** Technology firms, IT infrastructure, and a large pool of technology-savvy individuals such as software developers and architects.
18. **Research:** Science facilities, universities, and a space program are examples of research and related activities.
19. **Industrial Base:** A sophisticated industrial sector capable of manufacturing a wide range of complex items.
20. **Service Economy:** Services are becoming an increasingly important component of economic activity in developed economies. As a result, the shift from an industrial to a service economy can be regarded as a modern form of economic development [28].
21. **Knowledge Economy:** A job shift that requires and produces significant knowledge such as medical research and software development [28].
22. **Experience Economy:** Video games and resort hotels are examples of products and services that compete on the level of customer experience [28].
23. **Public Space:** A metropolis packed with lovely blue and green landscapes is an example of public space.
24. **Community:** Elements of a country or place that foster a shared experience, allowing individuals to identify with one another and avoid isolation. For example, a popular local sports team that brings the community together.
25. **Sustainability and Resilience:** A country has structures and practices in place to withstand time and stress. For example, industries that do not generate hazardous waste or consume excessive amounts of resources [13].

2.9 Effects of Rail Transport Services on Economic Development

In terms of development, infrastructure, particularly transport infrastructure [8], is a critical aspect that allows a country to connect internally and externally for trade and interaction with the global economy. Rail modes are one of the most efficient ways of delivering huge quantities of commodities and manufactured goods, as well as providing economies of scale for passenger transit. According to [21], "Rail transportation can be either a catalyst for CiTs by attracting new businesses and facilitation for International service cities (competitive, attractive, and highly accessible cities) by accommodating future growth". Improved access and transport between a developed region and a less developed one allows firms in the latter to have better access to the inputs and markets of the former [21]. An efficient modern backbone rail network enhances International competitiveness and supports the regeneration and development of an economy. It also reduces pressure on land use, and pollution emissions as well as functioning as a major industrial sector on its own. Given the emerging importance of the Lagos state tourism industry, the rail network offers to be an essential component of the tourism industry.

3. Literature Review

In 2022, Aliyu, *et al.*, [31] have performed an analytical evaluation of both primary and secondary data. A survey was conducted in two train stations i.e., Gude and Lagos. A 327 questionnaires were prepared and 318 responses were collected from the passengers. Then the collected data was analyzed using chi-square tests to evaluate the research hypothesis. The result indicated that the Nigerian railway sector

had witnessed modernization, although not significantly, in terms of improving the national economy, transportation safety, and comfort.

In 2022, Nwosu, *et al.*, [32] have used a survey approach for collecting primary data from 124 and 276 respondents in Enugu and Port Harcourt clusters respectively. The research instrument underwent pre-test reliability testing. They used OLS statistical regression analysis to determine the significant effect of the present rail transportation operations on economic security in South East Nigeria. Data was obtained from both secondary and primary sources, including personal interviews. Descriptive statistics were used to analyze the variables in the study. The result found the negative effect of the economy leads to job loss, poor living conditions, and a decline in economic security.

In 2023, OLOJEDE, *et al.*, [33] have estimated passenger satisfaction using cross-tabulation, frequency distribution, percentages, and PSI. Initially, 246 passengers were sampled, and conducted a questionnaire. The respondents were collected based Likert-like psychometric scale. Then PSI and SWV were used to obtain the passenger's rated satisfaction with accessibility, coverage, fare, safety at the station and onboard, security at the station, and security of luggage. The result shows that the information provided to passengers was bad, schedules were not followed, and time delays.

In 2019, Mulenda, *et al.*, [34] have implemented a descriptive survey to investigate the transport and economic development in Tanzania. 106 respondents were collected based on closed-ended questionnaires from transport authorities and rail freight stakeholders. The quantitative method was used to determine the relationship between dependent and independent variables. The research found that rail transport can increase a country's economy, allow cost-effective transportation, reduce production costs, and increase the availability of products and services in the market.

In 2020, Wangai, *et al.*, [35] have executed a forecasting methodology and sensitive analysis to determine the future demand for rail travel in developing countries [12]. The various steps involved in the process are concept development, primary action, medium-term forecasting, and long-term forecasting. This method demonstrates the applicability of macro and micro levels, development of hipot devices, electro-magnetic compartments, etc., It also investigates the effects of load change and how the circuit responds to breakout. The dotmatrix helps to evaluate the results. The result evaluates the rail sustainability, emission reduction, timings, and adaption to the constrained electrical production of the country.

In 2020, Babatunde, A.I., [2] have evaluated rail transport using SPSS analysis and the Chi-square test. The data helps in the pre-colonial period in Nigeria's railway operations. Initially, primary and secondary data were collected and evaluated using a null hypothesis and obtained the difference between railway transport and operational efficiency in Lagos. The result shows that the logos will not progress based on the management weakness, nepotism, correction, etc., The research also suggested to transfer the operation and management of the rail transport through the private sector.

In 2020, Longe, *et al.*, [3] have investigated the impact of trade and transport through the POLS Method, the FE method, the RE method, and the PMG technique. The Hausman test was used to find the significant result. The result expressed that transport reduces the import and export of goods, energy consumption, and economic degradation was increased in Africa.

In 2023, Ubrurhe, [24] have conducted a structured/semi-structured questionnaire to 474 respondents in four railway stations. The perception survey was conducted to understand passenger satisfaction with ticket self-service, efficiency of ticketing staff, cleanliness and maintenance of stations/platforms, assistance/customer service in stations, toilet facilities in stations, refreshment facilities in stations, waiting rooms in stations, facilities for car parking in stations, responses to emergency, assistance and information for disabled/elderly people, punctuality of trains, temperature on-board, and security on-board. The result shows that the Nigerian railway system is poor and needs urgent improvement in infrastructure.

3.1 Review

Author	Methodology	Advantage	Disadvantage
Aliyu, <i>et al.</i> , [31]	Chi-square tests	<ul style="list-style-type: none"> This method provided insights for improvement. This study included both primary and secondary data for findings. So, it enhanced reliability. 	<ul style="list-style-type: none"> It is based on the self-reporting data, so, it may not provide a comprehensive understanding. Doesnot consider the Environmental impact or social equality.
Nwosu, <i>et al.</i> , [32]	OLS	<ul style="list-style-type: none"> This method provided detailed information on Economic security implications in rail transport. This method is reliable and increases the depth of richness in the analysis. 	<ul style="list-style-type: none"> It is connected with a small sample size that limits the generalization. The response may create bias and inaccuracies. Doesnot explain the social and environmental effects.
OLOJEDE, <i>et al.</i> , [33]	PSI	<ul style="list-style-type: none"> This method provided the empirical assessment of passenger satisfaction. The research included the operational environment and physical conditions of the train. 	<ul style="list-style-type: none"> Small sample size. It's difficult to assess the reliability and validity of the findings. Doesn't provide the reason for the satisfaction.
Mulenda, <i>et al.</i> , [34]	Descriptive survey	<ul style="list-style-type: none"> This method helped to understand the transportation and economic development of transport authorities and rail freight stakeholders. It's a cost-effective method. 	<ul style="list-style-type: none"> The use of close-ended questionnaires restricts respondents to predetermined responses, potentially limiting the depth and richness of the data collected
Wangai, <i>et al.</i> , [35]	Forecasting methodology and Indexed evaluation	<ul style="list-style-type: none"> Helps to develop long-term casting using the s-curve model. Provide information to information technology policy and decision-making. 	<ul style="list-style-type: none"> It contains limited samples.
Babatunde, A.I., [2]	Chi-square tests and SPSS analysis	<ul style="list-style-type: none"> Effective implementation of appropriate traffic management and control measures can help optimize the operations of railway services. 	<ul style="list-style-type: none"> Limitation in data accuracy and reliability. Doesnot provide a comprehensive analysis relevant to Nigeria's economy.
Longe, <i>et al.</i> , [3]	POLS, FE, RE method, and PMG technique	<ul style="list-style-type: none"> This method offers a balanced set of transport options to maximize development benefits and improve sustainable transportation in the long term. 	<ul style="list-style-type: none"> Contains a lot of challenges to implement this method.
Ubrurhe, [24]	Structured/Semi-structured questionnaire	<ul style="list-style-type: none"> The method includes the commissioning of old and unused railways, rehabilitation of existing rail lines, and the construction of new standard gauge lines and a light rail system. These developments will help increase the efficiency and capacity of the rail transport system, reducing the pressure on road transport and infrastructures 	<ul style="list-style-type: none"> The sample size of the study is relatively small. Not a reliable method.

3.2 Research Gap

Rail Transport is a key to a country's social and economic development [19]. The movement of Goods, passengers, and services from one destination to another develops the economy of the people and leads to the economy of the nation. As per the literature, books, and Internet articles it is very clear that Nigeria needs improvement in Rail transport. There is no systematic process to evaluate all the features. The survey [23] is a common method to obtain information from a group of people. However, the evaluation of the survey manually is a tedious and hectic process when the sample size is large. The open-ended questionnaire [31][32], Likert-like psychometric scale [33], and structured/semi-structured [23] are used

in the literature. Whereas open-ended questions create chaos and confusion, Likert-like psychometric scales and structured/semi-structured constrain the passenger's thoughts. The Ordinary Least Squares (OLS) [32], Fisher's exact test, t-test, and Chi-square test [31][36] are the common hypothesis tests used for the comparison of frequencies. However, the chi-squared test provides accurate results with the large sample size. The county's economic growth depends on three main factors [22] such as natural resources, capital formation, and market size but most of the literature hasn't covered all the factors. Different hypotheses are used in various papers. Yet, the research on a significant relationship between train freight services and market development, excursion train services and improved education, and rail service and job creation is very less.

4. Research Methodology

This study was carried out in Lagos State. Two Local government was selected which are Lagos Mainland and Agege local government of Lagos State because they function regularly and more passengers and staff can be found there.

The survey research method was adopted [4]. The questionnaires were prepared and collected information from the respondents. Survey research design was considered appropriate because the facts discovered and conditions that existed at a particular point in time were seen and commented upon.

A population is a group of individuals who have the same characteristics [7]. In this study, the target population was staff, tourists, and passengers at the Lagos Mainland and Agege local government of Lagos State train station. Thus, 208 questionnaires were distributed in both train stations together.

Sampling involves using a small number of items or parts of the population in an attempt to make conclusions about the whole population [30]. Thus, convenience sampling was adopted for the study. The convenience sampling technique [7] is a subgroup of the target population that the researcher plans to study for generalizing about the target population. The researcher used total sampling to collect the data sample. In this research, the sample was collected from staff, passengers, and tourists of the two local Governments with 208 respondents. There is no need to calculate the sample size because the number is small.

To realize the purpose of this study, descriptive statistics such as frequency, tables, and percentages were used to analyze the study objectives, and chi-square was used to test the hypotheses of the study. It is a statistical test to compare the observed result with the expected result. The validity of a research instrument is the degree to which the results are truthful [20]. The content validity of this research was achieved through careful examination by the supervisor and other professionals. When the frequency was not more than 20% the expected frequency was lower than 5 and all other individual expected frequencies were 1 or greater. There is also a rejection of the null hypothesis if the chi-square value is greater than the critical value.

The decision rule of the states that

If the chi-square value is less < than the tabulated value, Accept H₀ and Reject H₁.

If the chi-square value is greater > than the tabulated value, Accept H₁ and Reject H₀.

Where H₀ represents the null hypothesis and H₁ represents the Alternative hypothesis.

5. Analysis and Interpretation of Results

This study investigated the effect of rail transport services on economic development in Lagos City Nigeria. Table 1 describes the results analyzed during the research work.

Table 1: General observation on the distribution of the entire questionnaire

Name of the train station	Categories	Frequency	Percentage
Mobolaji Johnson Train Station	Staff	30	14.42%
	Passenger	50	24.03%
	Tourist	27	12.98%
	Excursionist	10	4.80%
Babatunde Fashola Train Station	Staff	27	12.98%
	Passenger	44	21.15%
	Tourist	15	7.21%
	Excursionist	5	2.40%
		208	100%

Source: Field Survey, 2023.

Table 1 shows that in Mobolaji Johnson Train Station, 30 staff respondents represent 14.42%, 50 passenger respondents represent 24.03%, 27 tourist respondents represent 12.98%, 10 excursionist respondents represent 4.80% and in Babatunde Fashola train station 27 staff respondents represent 12.98%, 44 passengers respondents which represent 21.15%, 15 tourist respondents represent 7.71% and 5 excursionist respondents represent 2.40%. This indicates that the majority of the respondents are passengers. The majority of the respondents are from Babatunde Fashola Train Station.

5.1 Hypothesis 1

The contingency table consists of a static count that is computed and then compared to look into an experiment to be repeated an infinite number of times until the result shows no effects. To prove the null hypothesis of no significant relationship between freight services and market production was explained in Table 2.

Table 2: Contingency table for hypothesis 1

RESPONSE					
QUESTION	SA	A	D	SD	TOTAL
1	114	75	10	9	208
2	100	89	10	9	208
3	130	65	8	5	208
4	100	50	28	30	208
5	128	67	8	5	208
TOTAL	238	214	226	360	

Where SA- Strongly Agree, A-Agree, D- Disagree, and SD- Strongly Disagree.

The Chi-square test of the relationship between freight services and market production is explained in Table 3. The chi-square is calculated in a formula

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

Where χ^2 represent the chi-squared, O represent the observed frequency, and E represent the expected frequency.

Table 3: Test of hypothesis 1

Cell	O	E	O - E	(O - E) ²	(O - E) ² /E
A	114	114.4	-0.4	0.16	0.001
B	75	69.2	5.8	33.64	0.486
C	10	12.8	-2.8	7.84	0.612
D	9	11.6	-2.6	6.76	0.582
E	100	114.4	-14.4	207.36	1.812
F	89	69.2	19.8	392.04	5.665
G	10	12.8	-2.8	7.84	0.612
H	9	11.6	-2.6	6.76	0.582
I	130	114.4	15.6	243.36	2.127
J	65	69.2	-4.2	17.64	0.254
K	8	12.8	-4.8	23.04	1.8
L	5	11.6	-6.6	43.56	3.755
M	100	114.4	-14.4	207.36	1.812
N	50	69.2	-19.2	368.64	5.327
O	28	12.8	15.2	231.04	18.05
P	30	11.6	18.4	338.56	29.186
Q	128	114.4	13.6	184.96	1.616
R	67	69.2	-2.2	4.84	0.069
S	8	12.8	-4.8	23.04	1.8
T	5	11.6	-6.6	43.56	3.755
TOTAL	1040	1040			79.903

From the above table 3, we can obtain the chi-squared (χ^2) is 79.903. The hypothesis was tested using chi-square analysis, comparing the calculated chi-square value to the critical value at a significance level (α) of 5% which is equal to 0.05. The Degree of freedom in a statistical test represents the number of values in a calculation that are free to vary. It is determined by the number of categories or groups being compared. The degrees of freedom in a chi-square test are typically calculated as (number of rows (r) - 1) multiplied by (number of columns (c) - 1).

$$Df = (r-1)(c-1)$$

Where $r=5$ and $c=4$, while calculating

$$Df = (5-1)(4-1)$$

$$Df = 4 \times 3 = 12$$

X^2 tab at 5% level of significance at 12 = 21.0261.

From the analysis above, X^2 the calculated value is 79.903 while X^2 the tabulated value is 21.0261. This shows that X^2 the calculated of 79.903 is greater than X^2 the tabulated of 21.0261.

i.e. $X^2 \text{ calculated (79.903)} > X^2 \text{ tabulated of 21.0261}$

Therefore, we reject H_0 which states that there is no significant relationship between train freight services and market development.

5.2 Hypothesis 2

To prove the null hypothesis of no significant relationship between excursion services and improved education was explained in Table 4. The Chi-square test of the relationship between them is explained in Table 5.

Table 4: Contingency table for Hypothesis 2

QUESTION	RESPONSE				
	SA	A	D	SD	TOTAL
6	100	60	28	20	208
7	120	75	8	5	208
8	128	67	9	4	208
9	150	50	6	2	208
10	114	75	10	9	208
TOTAL	612	282	61	40	

Table 5: Test of Hypothesis 2

Cell	O	E	O - E	(O - E) ²	(O - E) ² /E
A	100	122.4	-22.4	501.76	4.099
B	60	56.4	3.6	12.96	0.229
C	28	12.2	15.8	249.64	20.462
D	20	8	12	144	18
E	120	122.4	-2.4	5.76	0.047
F	75	56.4	18.6	345.96	6.134
G	8	12.2	-4.2	17.64	1.445
H	5	8	-3	9	1.125
I	128	122.4	5.6	31.36	0.256
J	67	56.4	10.6	112.36	1.992
K	9	12.2	-3.2	10.24	0.839
L	4	8	-4	16	2
M	150	122.4	27.6	761.76	6.223
N	50	56.4	-6.4	40.96	0.726
O	6	12.2	-6.2	38.44	3.150
P	2	8	-6	36	4.5
Q	114	122.4	-8.4	70.56	0.578
R	75	56.4	18.6	345.96	6.134
S	10	12.2	-2.2	4.84	0.396
T	9	8	1	1	0.125
TOTAL					78.46

From the table 5, we can obtain the chi-squared (X^2) is 78.46. The critical value at a significance level (a) of 5% that is equal to 0.05. The Degree of freedom in 12 where $r=5$ and $c=4$, X^2 tab at 5% level of significance at 12 that is equal to 21.0261.

From the analysis above, X^2 the calculated value is 78.46 while X^2 the tabulated value is 21.0261. This shows that X^2 the calculated, 78.46 is greater than X^2 the tabulated 21.0261.

i.e. $X^2 \text{ calculated (78.46)} > X^2 \text{ tabulated of 21.0261}$

Therefore, we reject H_0 which states that there is no significant relationship between excursion train services and improved education.

5.3 Hypothesis 3

The null hypothesis of no significant relationship between passenger service and urbanization was explained in Table 6. The Chi-square test of the relationship between them is explained in Table 7.

Table 6: Contingency Hypothesis 3

QUESTION	RESPONSE				
	SA	A	D	SD	TOTAL
11	130	65	8	5	208
12	100	89	10	9	208
13	120	62	16	10	208
14	124	84	0	0	208
15	126	72	5	5	208
TOTAL	600	372	39	29	

Table 7: Test of Hypothesis 3

Cell	O	E	O - E	(O - E) ²	(O - E) ² /E
A	130	120	10	100	0.833
B	65	74.4	-9.4	88.36	1.187
C	8	7.8	0.2	0.04	0.005
D	5	5.8	0.8	0.64	0.110
E	100	130	-30	900	6.923
F	89	74.4	14.6	213.16	2.865
G	10	7.8	2.2	4.84	0.620
H	9	5.8	3.2	10.24	1.765
I	120	120	0	0	0
J	62	74.4	-12.4	153.76	2.066
K	16	7.8	8.2	67.24	8.620
L	10	5.8	4.2	17.64	3.041
M	124	120	4	16	0.133
N	84	74.4	9.6	92.16	1.238
O	0	7.8	-7.8	60.84	7.8
P	0	5.8	-5.8	33.64	5.8
Q	126	120	6	36	0.3
R	72	74.4	-2.4	5.76	0.077
S	5	7.8	-2.8	7.84	1.005
T	5	5.8	-0.8	0.64	0.110
TOTAL					44.496

From the table 7, we can obtain the chi-squared (χ^2) is 44.496. The critical value at a significance level (α) of 5% that is equal to 0.05. The Degree of freedom in 12 where $r=5$ and $C=4$. χ^2 tab at 5% level of significance at 12 that is equal to 21.0261.

From the analysis above, χ^2 the calculated value is 44.496 while χ^2 the tabulated value is 21.0261. This shows that χ^2 the calculated 44.496 is greater than χ^2 the tabulated 21.0261

$$\text{i.e. } \chi^2_{\text{calculated}} (44.496) > \chi^2_{\text{tabulated}} \text{ of } 21.0261$$

Therefore, we reject H0 which states that there is no significant relationship between rail services and job creation.

6. Discussion of Findings

The findings were represented graphically from Tables 2,4,and 6. Fig 1 represents the hypothesis of train freight service and market development.

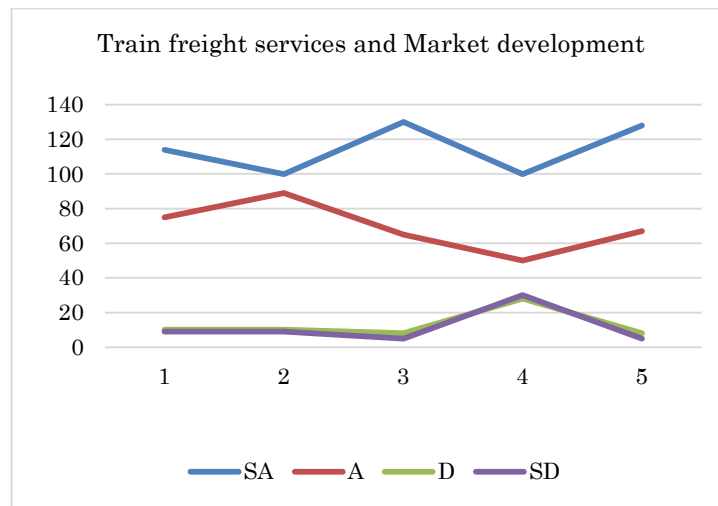


Fig. 1. Graphical representation of the train freight service and market development

The first hypothesis revealed that the majority of the respondents agreed that the presence of train freight services has contributed to increased activities in markets. It also discovered that the majority of the respondents agreed that train freight services improve the transportation of heavy bulk goods over long distances. It also shows that the majority of the respondents agreed that train freight services have contributed to improved business between manufacturers and consumers efficiently. It is also true that train freight services have helped to increase the size of the market and it revealed that the majority of the respondents agreed that train freight services have contributed to an increase in the quantity of production. Fig. 2 represents the hypothesis of excursion services and improved education.

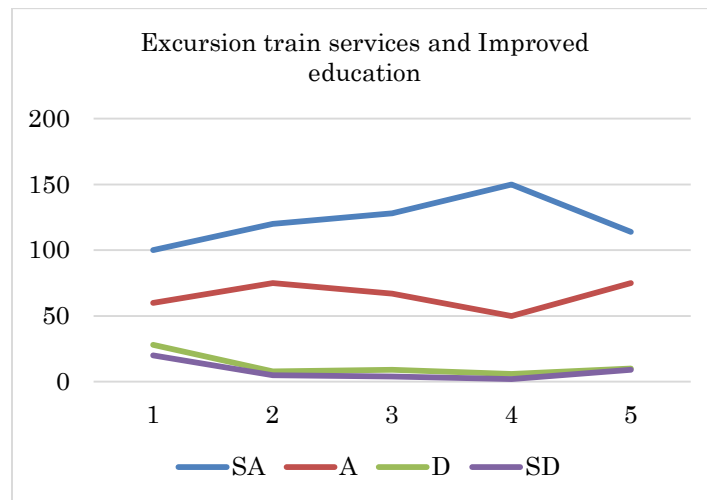


Fig. 2. Graphical representation of the Excursion train service and Improved education

The Second hypothesis revealed that the majority of the respondents agreed that train excursion services offer educational experience. The majority of the respondents agreed that excursion train services provide a direct source of knowledge and acquaint the people with first-hand information on rail transportation. It also offers new experiences and allows people to observe innovations in rail transportation. They provide package trips that offer rail knowledge to schools, clubs as well as societies and the majority of the respondents agreed that excursion train services have contributed to the improved understanding of how rail transportation works. Fig. 3 represents the hypothesis of rail services and job creation.

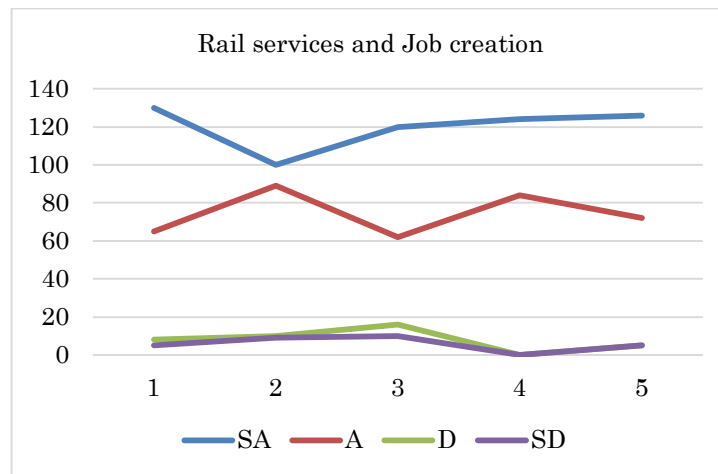


Fig. 3. Graphical representation of the rail services and job creation

Lastly, hypothesis three revealed in Fig. 3 shows that the majority of the respondents agreed that rail transportation enables people to travel long distances for jobs. It revealed that the majority of the respondents agreed that rail services attract new business to the community. The majority of the respondents agreed that rail services have contributed to the efficiency of transit efficiency between two or more cities. It revealed that the majority of the respondents agreed that rail services create job opportunities for people and it revealed that the majority of the respondents agreed that rail services have contributed to the increase in mass transit between cities.

Whereas hypothesis one revealed jointly a strong relationship between train freight services and market development the null hypothesis was rejected as the calculated value of 79.903 is greater than the tabulated value of 21.0261. Hypothesis two revealed that excursion train services played a vital role in improving education as the calculated value of 78.46 is greater than the tabulated value of 21.0261 rejecting the null hypothesis and hypothesis three also confirmed that rail services contributed positively in fostering job creation as the calculated value 44.496 is greater than tabulated value 21.0261 therefore also rejecting the null hypothesis.

7. Advantages and Disadvantages

Advantage

- The Chi-square test is robust and easy for computation.
- This method helps to conduct the test in a single analysis without increasing the errors.
- The results help other researchers to get various insights into data and also act as an action planner for the Government's economic development.

Disadvantages

- This method can produce only accurate results when the sample size is too large.
- It is difficult to interpret when the variables have many categories.

8. Conclusions and Recommendations

It can be seen that rail transportation has the potential to develop any economy. The research has also shown that rail transport services affect the economic development of Lagos Mainland and Agege Local Government. The three indices of economic development were market production, improved education, and urbanization. Freight, excursion, and passenger services are the rail transport services provided by the NRC. Following the economic development, it is clear that the individuals prefer the services of rail transportation with higher satisfaction that benefits the development of their economy. Therefore, the government should put in place policies for the development of rail transportation in terms of market development employment opportunities, and improved education. Furthermore, with the increased awareness of the rail transport services the individuals can better understand its economic benefits. It is necessary to spend a greater effort to enhance market development, improve education and urbanization, and then go a further step to improve freight, excursion trains, and passenger services.

Based on the results of the analyses, the following recommendations were presented below:

- This research confirms that train freight services have improved market development, the researcher recommends that the government should prioritize the construction of rail infrastructure and increase access as this will make rail transport a viable means of movement of goods and services across the country; and facilitate trade and commerce for producers, middlemen, and consumers.
- This research reveals that excursion train services affect improved education, the researcher recommends that more excursion packages be created to give proper enlightenment to individuals about rail transportation and that enough time be allocated to excursionists or tourists to gather enough information and better enjoy the train ride experience.
- This research also confirms that rail services increase job creation, the researcher recommends that more train stations be constructed as well as creating shop space within the station for lease to attract new business.

Compliance with Ethical Standards

Conflicts of interest: Authors declared that they have no conflict of interest.

Human participants: The conducted research follows the ethical standards and the authors ensured that they have not conducted any studies with human participants or animals.

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