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Road Infrastructure and Development of Small and Medium Enterprises (SMEs) in Delta State, Nigeria

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Abstract
This study investigated the effect of road infrastructure on the development of SMEs in Delta State, Nigeria. Specifically, the study examined how accessibility of transport networks and the condition and maintenance of transport facilities influence SME development. Two research questions were raised in line with the two objectives of the study, and two research hypotheses were formulated and tested. The population of the study comprised 53,540 SMEs, from which a sample size was determined using the Morgan table. The research adopted a descriptive survey design, and data was collected through a structured questionnaire whose reliability yielded a Cronbach Alpha of 0.82, indicating strong internal consistency. The data was analyzed using descriptive statistics, correlation, and multiple regression analysis. The findings showed that accessibility of transport networks ($\beta = 0.237$, $p < 0.05$) and the condition and maintenance of transport facilities ($\beta = 0.499$, $p < 0.05$) had significant positive effects on the development of SMEs. The model was statistically significant with an F-statistic of 149.27 ($p < 0.05$) and an R-squared value of 0.476, suggesting that the independent variables explained 47.6% of variations in SME development. The study recommended improved road accessibility, regular maintenance, and policy support to enhance SME growth.

Keywords: Accessibility, infrastructure, maintenance, SME development, transport facilities.

Introduction

Road infrastructure plays a fundamental role in enhancing economic productivity, facilitating trade, and improving market connectivity. In developing economies, investment in transport infrastructure is widely recognized as a catalyst for business expansion and regional development (Adenikinju, 2021). Efficient transport networks reduce travel time, lower distribution costs, and improve the flow of goods and services. However, in many parts of Nigeria with particular focus on Delta State, the state of road networks often falls below the standard required to support sustainable economic activities. Poor road accessibility and deteriorating transport facilities continue to hinder socio-economic progress and limit the ability of businesses to operate efficiently

(Okafor & Umeadi, 2022).

Small and Medium Enterprises (SMEs) constitute an essential driver of economic growth, innovation, and employment generation in Nigeria. They contribute significantly to local production capacities and serve as a platform for entrepreneurial activities (Ojo & Oduwole, 2023; Omoye, 2025). Despite their potential, SMEs in Delta State often face operational challenges that stem from inadequate infrastructure (Agbamu & Irogbo, 2024). The absence of reliable and accessible transport routes increases the cost of logistics, disrupts supply chains, restricts customer reach, and slows down business expansion. These challenges undermine the competitiveness and long-term sustainability of SMEs within the region.

Improved road infrastructure directly influences SME performance by easing mobility, enhancing access to raw materials, and reducing operational delays. Studies have shown that SMEs located in areas with better transport facilities tend to record higher productivity levels and stronger market linkages (Eze & Nwokoye, 2021; Eruvwe, 2024). Good-quality roads not only facilitate intra-regional commerce but also enable SMEs to expand their activities to larger domestic and international markets. As such, infrastructure development remains central to government policies aimed at promoting entrepreneurship and stimulating economic diversification in Nigeria.

In Delta State, the interplay between transport infrastructure and SME development is particularly significant due to the state's industrial potential and diverse economic activities. While several initiatives have been introduced to rehabilitate and upgrade road networks, the impact of these efforts on SME development remains insufficiently documented. This study therefore seeks to explore how accessibility of transport networks and the condition of transport facilities influence the development of SMEs in Delta State. The findings are expected to provide evidence-based insights that can inform policy planning, infrastructural investment, and strategic interventions to enhance the business environment for SMEs in the state.

Statement of the Problem

Despite the recognized role of transport infrastructure in supporting business activities, many areas in Delta State continue to experience inadequate and poorly maintained transport networks. Limited accessibility to major transport corridors, coupled with deteriorating surfaces and insufficient maintenance, often results in delays, high transportation costs, and reduced mobility for business owners (Okafor & Umeadi, 2022). These infrastructural constraints hinder the operational efficiency of SMEs, particularly those relying on timely movement of goods and access to markets. The persistent challenges associated with transport facilities create an unfriendly business environment that restricts the growth potential of SMEs and increases the cost of doing business in the state (Adenikinju, 2021).

Furthermore, while SMEs remain vital to job creation, innovation, and economic development, their contributions in Delta State appear undermined by inefficiencies arising from infrastructural deficits. Studies have shown that SMEs located in regions with poor transport conditions experience reduced productivity, limited market access, and slower business expansion compared to those operating in well-connected areas (Eze & Nwokoye, 2021). Yet, empirical evidence specifically examining how transport accessibility and the condition of transport facilities affect SME development in Delta State remains scarce. This gap in empirical research creates uncertainty about the actual extent to which transport infrastructure challenges impede SME growth, thereby necessitating a systematic investigation into the relationship between infrastructure quality and SME development in the state.

Objectives of the Study

The main objective of this study is to examine the influence of road infrastructure on the development of small and medium enterprises (SMEs) in Delta State. The specific objectives are:

1. To assess the extent to which accessibility of transport networks influences the development of SMEs in Delta State.
2. To examine the effect of the condition and maintenance of transport facilities on the development of SMEs in Delta State.

Research Hypotheses

Based on the research objectives and questions formulated for this study, the following hypotheses were developed to guide the investigation:

H_{01}: There is no significant relationship between the accessibility of transport networks and the development of SMEs in Delta State.

H_{02}: The condition and maintenance of transport facilities have no significant effect on the development of SMEs in Delta State.

Review of Related Literature

This study conceptualizes that the quality of transport infrastructure significantly affects the development of small and medium enterprises (SMEs) by influencing their operational efficiency, cost of logistics, and access to markets. Improved transport infrastructure, manifested in accessible and well-maintained networks reflected in reduces transit times, lowers transportation and delivery costs, and enhances supply-chain linkages and market reach for SMEs (Ohalete, Anyanwu, Azuka & Ohalete, 2023; Suwilanji & Kapotwe, 2022). Empirical studies in Nigeria and other African contexts suggest that SMEs operating in areas with better transport systems report higher productivity, smoother distribution processes, and greater competitive advantage compared to those in regions with poor infrastructure (Hassan, Akor & Bamiduro, 2021; Shettima & Ahmed, 2020). Moreover, national-level transport investment has been shown to foster broader economic growth, increasing employment and enabling SMEs to leverage improved infrastructure for expansion (Ohalete et al., 2023; Oboro & Agbamu, 2024). Hence, by focusing on transport network accessibility and maintenance as key infrastructure-quality dimensions, this research frames these as critical latent factors that shape SMEs' observable performance outcomes, including business growth, market penetration, and long-term sustainability.

Accessibility of Transport Networks

Accessibility of transport networks refers to how easily businesses, suppliers, and customers can reach a location, and it has been widely acknowledged as a critical determinant of SME performance. In emerging economies, firms located in areas with better connectivity and reliable logistics linkages are more likely to experience improved business outcomes, including enhanced market reach, knowledge spillovers, and stronger supply-chain linkages (Oke, Ogbuabor, & Okeke, 2023). In Nigeria, recent studies indicate that the accessibility of transport networks significantly influences SME growth, as well-connected routes reduce logistics bottlenecks, facilitate timely delivery of goods, and expand customer reach (Chukwuemeka & Eze, 2022). Improved accessibility not only reduces travel time and transportation costs but also enhances operational efficiency, allowing SMEs to allocate resources more effectively toward expansion and

competitiveness (Ogunleye & Oladipo, 2021).

Condition and Maintenance of Transport Facilities

The physical condition and maintenance of transport facilities, such as road surfaces, drainage systems, and overall reliability, critically affect the ability of SMEs to exploit transport accessibility. Studies in African contexts show that well-maintained roads improve financial performance and operational efficiency by reducing vehicle wear-and-tear, minimizing delivery delays, and lowering logistics costs (Mwaura & Kihara, 2022). Conversely, poor maintenance and deteriorating transport facilities increase operational challenges for SMEs, including higher transport charges, delays in supply chains, and unpredictability in accessing markets, which collectively hinder business growth (Adeleke & Adegboye, 2023). Adequate maintenance of infrastructure has been identified as a key factor in enhancing trade competitiveness and fostering SME development, as reliable transport networks enable smoother flow of goods and services and support sustainable business expansion (Bello & Yakubu, 2021).

Development of SMEs

Small and Medium Enterprises (SMEs) play a critical role in fostering economic growth, employment generation, and poverty reduction in Nigeria and other developing economies (Gumel & Bardai, 2023; Ibok Ogbonna, Izuchukwu, & Obi-Nwosu, 2023). SMEs contribute significantly to national output and provide a platform for entrepreneurial activities, innovation, and local production. Development of SMEs is not merely about survival; it encompasses growth in business scale, improved productivity, market expansion, and long-term sustainability. It is a multidimensional process that includes business growth, enhanced financial performance, diversification, innovation, and the ability to withstand macroeconomic fluctuations and market pressures (Anoke, Onu, & Agagbo, 2022; Anoke, Nzewi, & Olorunfemi, 2024).

The development of SMEs depends on both internal capabilities and external enabling factors. Managerial competencies, including technical and personal skills, have been shown to positively influence SME growth and operational performance (Anoke, Onu, & Agagbo, 2022). Additionally, adoption of innovation in management, processes, products, and market strategies enhances competitiveness, fosters expansion, and strengthens resilience (Anoke, Nzewi, & Olorunfemi, 2024). However, macroeconomic conditions such as inflation, regulatory environment, and institutional quality can constrain SME development. For instance, rising inflation and unstable economic policies in Nigeria have been linked to challenges in SME growth and sustainability (Ibok Ogbonna et al., 2023). Therefore, the meaningful development of SMEs requires a combination of firm-level capabilities and a supportive macroeconomic and infrastructural environment.

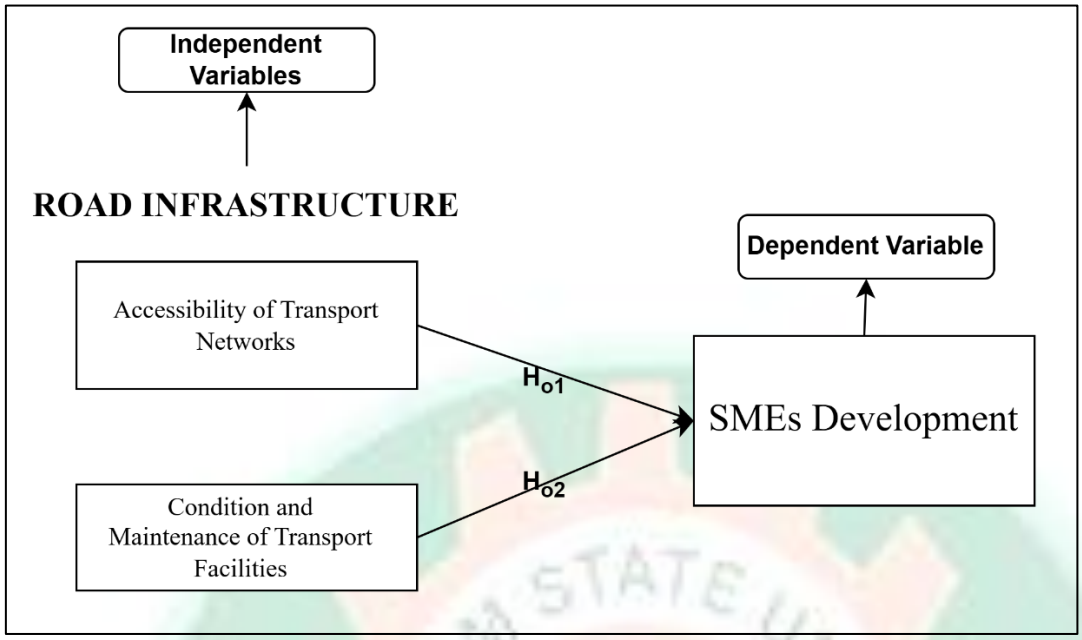


Fig. 1: Conceptual framework of Road infrastructure and development of SMEs in Delta State (Source, Researcher's Construct, 2025)

Theoretical Review

The Growth Pole Theory, first advanced by Perroux (1950), posits that economic development is not uniform across regions but occurs around specific "poles" or centers of growth, which stimulate development in surrounding areas through the spread of economic activities. In the context of SMEs and infrastructure, this theory suggests that regions with strategically developed transport networks and well-maintained roads can serve as growth poles, attracting businesses and fostering SME development in the surrounding areas (Onwudiwe & Nwafor, 2021). Improved accessibility and infrastructure create clusters of economic activities, enabling SMEs to benefit from agglomeration economies, such as reduced transaction costs, enhanced market linkages, and knowledge spillovers (Okafor & Eze, 2022). Recent studies highlight that transport infrastructure, when concentrated in strategic hubs, can significantly accelerate SME growth, facilitate market expansion, and promote regional economic integration in emerging economies like Nigeria (Nwachukwu & Chukwuma, 2023).

The Location Theory complements the Growth Pole perspective by emphasizing that the geographical positioning of businesses, relative to resources, markets, and infrastructure, is crucial to their performance and sustainability (Mbakwe & Uzo, 2022). According to this theory, SMEs located near accessible transport networks and maintained roads are better positioned to reduce operational costs, access inputs efficiently, and reach larger markets (Oluwaseun & Adeniyi, 2021). The theory further explains variations in SME development across regions based on the spatial distribution of infrastructure and other locational advantages. Recent empirical research underscores that strategic location near transport hubs enhances SMEs' competitiveness and supports long-term growth, suggesting that infrastructure-led agglomeration can optimize SME development in Delta State (Chukwudi & Eze, 2023).

This study is anchored on the Growth Pole Theory, which posits that economic development is concentrated around specific hubs or "poles" that stimulate growth in surrounding areas (Perroux,

1950). In the context of Delta State, regions with well-developed and accessible transport infrastructure can be viewed as growth poles that attract business activities, foster clustering of SMEs, and enhance market linkages. By improving connectivity and reducing operational costs, these infrastructural poles create agglomeration economies that enable SMEs to expand, increase productivity, and achieve sustainable development. Anchoring the study on this theory allows for an examination of how strategically located and maintained transport networks influence SME performance and regional economic development.

Empirical Review

Recent empirical studies have highlighted the critical role of transport infrastructure in enhancing the performance and development of SMEs in emerging economies. For instance, Mwombeki (2023) examined the effect of road infrastructure improvements on SME sales performance in Dodoma City, Tanzania, using data from 89 firms and a Difference-in-Differences technique to compare performance before and after the infrastructure enhancements. The study found that improved accessibility, better roads, and reduced travel time significantly increased SMEs' sales revenue and profits. However, the study focused on a single urban area with a small sample and did not differentiate the impacts of road accessibility versus maintenance, leaving scope for research in broader contexts, such as rural or semi-urban areas. Similarly, Maziku and Fungo (2024) investigated how urban road network improvements influence the financial performance of SMEs in Dodoma. Utilizing a cross-sectional design with data collected from 89 SMEs through questionnaires and multiple regression analysis, they found that accessible roads and market access positively affected revenue, profit, and operational efficiency. Despite these insights, the cross-sectional nature of the study limits causal inference, and the focus on urban SMEs leaves rural areas unexplored.

In addition, Suwilanji and Kapotwe (2025) assessed the impact of road infrastructure on market accessibility for 240 manufacturing MSMEs in Lusaka, Zambia, using a mixed-method approach that combined surveys and purposive interviews. The findings revealed that improved roads reduced transport costs, shortened delivery times, and enhanced market opportunities for MSMEs. Nonetheless, the study concentrated on manufacturing firms and market accessibility without examining firm-level outcomes such as growth or profitability, limiting the generalizability to other SME sectors. In the Nigerian context, Okechukwu and Akpoghomeh (2025) explored how transport infrastructural challenges affect the logistics performance of manufacturing firms in the South-South region. By employing surveys and inferential statistical analysis, they demonstrated that poor road conditions and traffic challenges increased transport costs and delivery delays, adversely affecting logistics efficiency. However, the study did not specifically focus on SMEs and failed to link infrastructure challenges directly to firm growth or market expansion.

Furthermore, Wahab (2024) analyzed the effect of trade-related infrastructure, including roads and logistics, on Nigeria's trade flows using panel data and an augmented gravity model from 2005 to 2021. The study found that improved infrastructure reduces trade costs and enhances trade integration, indirectly benefiting SMEs engaged in supply chains. Despite its valuable macro-level insights, the study did not examine SME-level performance or growth, highlighting the need for micro-level analyses. Similarly, Hansen-Addy, Parrilli, and Tingbani (2024) investigated the impact of trade facilitation, encompassing infrastructure and logistics, on African SMEs' performance using econometric analysis of multi-country SME data. The study concluded that improved infrastructure enhances profitability, market access, and competitiveness. Nevertheless, because it focused on multiple countries, regional differences and the influence of specific

infrastructure dimensions, such as accessibility versus maintenance, were not addressed. Collectively, these studies demonstrate the importance of transport infrastructure for SME development but reveal gaps in geographic specificity, differentiation of infrastructure quality dimensions, and direct links to SME growth and performance, which the current study seeks to address in the context of Delta State, Nigeria.

Methods and Materials

The study adopted a descriptive survey research design, which was deemed appropriate because it enabled the collection of data from respondents in their natural settings without manipulation, while allowing for the examination of relationships between transport infrastructure and the development of SMEs in Delta State. The population of the study comprised 53,540 registered SMEs in Delta State, Nigeria as shown by Small and Medium Enterprises Development Agency of Nigeria (SMEDAN, 2024). Using Krejcie and Morgan's table, an appropriate sample size of 381 was determined. To ensure representativeness, respondents were selected through a stratified random sampling technique to capture variations across sectors and locations. Data were collected using a structured questionnaire designed to elicit information on transport network accessibility, condition and maintenance of transport facilities, and indicators of SME development such as business growth, market expansion, and profitability. The questionnaire was carefully developed based on existing literature and adapted to the local context, ensuring that the items were clear, unambiguous, and relevant to the research objectives.

To ensure the validity of the instrument, the questionnaire was subjected to expert review by academics and professionals in business management and infrastructure planning, who assessed its content coverage, clarity, and alignment with the study objectives. Reliability was determined through a pilot test, and the instrument yielded a Cronbach's alpha coefficient of 0.82, indicating a high level of internal consistency and reliability. Data collected were analyzed using both descriptive and inferential statistical techniques with the help of EViews Statistics tool. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were employed to summarize respondents' demographic characteristics and responses. Inferential statistics, specifically multiple regression analysis, were applied to test the relationships between the independent variables (accessibility of transport networks and condition and maintenance of transport facilities) and the dependent variable (SME development), providing evidence of the strength, direction, and significance of these relationships. This methodological approach allowed the study to generate credible, generalizable findings and to draw meaningful conclusions regarding the impact of transport infrastructure on SME development in Delta State.

The study employed a multiple regression model to examine the relationship between the independent variables, accessibility of transport networks (ATN) and condition and maintenance of transport facilities (CMT), and the dependent variable, which is the development of SMEs (SME_Dev). The model was designed to quantify the extent to which variations in transport infrastructure predict changes in SME development while accounting for other unobserved factors. The general form of the regression model was expressed as follows:

$$SME_Dev = \beta_0 + \beta_1 ATN + \beta_2 CMT + \epsilon$$

Where:

SME_Dev (Dependent Variable): Development of SMEs, measured through indicators such as business growth, market expansion, profitability, and sustainability.

ATN: Accessibility of Transport Networks, measured by road connectivity, ease of reaching

suppliers and customers, travel time, and transport availability.

CMT: Condition and Maintenance of Transport Facilities, measured by road surface quality, frequency of maintenance, reliability of routes, and infrastructure deterioration.

β_0 (Intercept): The expected value of SME development when all independent variables are zero.

β_1, β_2 (Coefficients): Measure the change in SME development resulting from a one-unit change in the respective independent variable.

ε (Error Term): Captures other factors affecting SME development that are not included in the model.

Result Presentation

This section focused on the analysis of data and testing of hypotheses formulated and the summary findings are being presented in tables as follows:

Data Presentation

Table 1: Analysis of Questionnaire

Questionnaire	Frequency	Percentage
Not returned	34	8.92%
Invalid	16	4.20%
Valid	331	86.88%
Total Distributed	**381**	**100%**

Source: Researcher's compilation, 2025

Table 1 present the analysis of questionnaire which shows that out of the 381 questionnaires distributed, 331 were valid, representing 86.88%, which indicates a very high response rate suitable for meaningful statistical analysis. A total of 34 questionnaires (8.92%) were not returned, while 16 (4.20%) were returned but considered invalid due to improper completion or missing data. Overall, the high proportion of valid responses demonstrates strong participation from the respondents and provides a reliable basis for drawing conclusions in the study.

Table 2: Percentage Rate of Responses to Question items

S/N	Questionnaire item	SA	A	UN	D	SD
	Accessibility of Transport Networks (ATN)					
1	My business has easy access to major roads and transport routes.	120 (38.7%)	91 (29.3%)	87 (28.1%)	23 (7.4%)	10 (3.2%)
2	Transportation of goods and services to customers is convenient and timely.	132 (41.0%)	97 (30.1%)	91 (28.2%)	4 (1.2%)	7 (2.2%)
3	The transport network in my area allows for efficient access to suppliers.	144 (44.7%)	101 (31.4%)	75 (23.3%)	3 (0.9%)	8 (2.5%)
4	Travel time for business activities is reasonable due to accessible transport routes.	102 (28.1%)	124 (34.1%)	88 (24.2%)	6 (1.7%)	11 (3.0%)
5	Public and private transport options are readily available for my business operations.	98 (27.2%)	93 (25.8%)	124 (34.4%)	8 (2.2%)	8 (2.2%)
	Condition and Maintenance of					

	Transport Facilities (CMT)					
6	Roads in my area are well-maintained and free from major potholes.	115 (36.3%)	93 (29.3%)	52 (16.4%)	65 (20.5%)	6 (1.9%)
7	Transport routes used for my business are regularly serviced and repaired.	105 (31.4%)	66 (19.7%)	80 (23.9%)	73 (21.8%)	7 (2.1%)
8	Poor road conditions rarely affect my business operations.	95 (27.0%)	57 (16.2%)	87 (24.7%)	86 (24.5%)	6 (1.7%)
9	Infrastructure maintenance in my area supports timely delivery of goods and services.	112 (34.3%)	52 (15.9%)	77 (23.6%)	86 (26.3%)	4 (1.2%)
10	The quality of transport facilities is sufficient to meet my business needs.	82 (27.3%)	93 (30.9%)	75 (25.0%)	75 (25.0%)	6 (2.0%)
	Development of SMEs (SME_Dev)					
11	My business has experienced growth in sales and revenue over the past year.	218 (69.5%)	71 (22.6%)	31 (9.9%)	5 (1.6%)	6 (1.9%)
12	Our business has expanded to new markets or locations recently.	182 (61.0%)	93 (31.1%)	46 (15.4%)	7 (2.3%)	3 (1.0%)
13	My business has increased the number of employees in the past year.	180 (60.3%)	110 (36.9%)	33 (11.1%)	2 (0.7%)	6 (2.0%)
14	My business has improved its overall profitability over the past year.	168 (54.5%)	112 (36.4%)	45 (14.6%)	4 (1.3%)	2 (0.6%)
15	Our business operations have become more sustainable and efficient over time.	160 (49.2%)	130 (40.0%)	26 (8.0%)	3 (0.9%)	12 (3.7%)

Source: Researcher's Computation, 2025

The results presented in table 2: Percentage Rate of Responses to Question Items show respondents' perceptions of Accessibility of Transport Networks (ATN). For the first item, a sizable proportion indicated that their businesses have easy access to major roads, with 120 (38.7%) strongly agreeing and 91 (29.3%) agreeing, while only 23 (7.4%) disagreed and 10 (3.2%) strongly disagreed. A similar trend appears in item two, where 132 (41.0%) strongly agreed and 97 (30.1%) agreed that transportation of goods is convenient, reflecting strong support for efficient mobility. For item three, a large majority, 144 (44.7%) strongly agreed and 101 (31.4%) agreed that the transport network aids access to suppliers. Responses for item four also reflect positive sentiment, as 102 (28.1%) strongly agreed and 124 (34.1%) agreed that travel time for business activities is reasonable. However, item five shows a more evenly distributed response pattern, with 98 (27.2%) strongly agreeing, 93 (25.8%) agreeing, and a notable 124 (34.4%) undecided, indicating mixed perceptions regarding availability of transport options.

Regarding the second construct, Condition and Maintenance of Transport Facilities (CMT), results indicate a more varied respondent experience. For item six, 115 (36.3%) strongly agreed and 93 (29.3%) agreed that roads are well maintained, but 65 (20.5%) disagreed, reflecting concerns about road quality in certain areas. Item seven shows declining confidence, with only 105 (31.4%) strongly agreeing and 66 (19.7%) agreeing that routes are regularly repaired, while 73 (21.8%) disagreed, suggesting irregular maintenance. Responses to item eight show that poor road conditions still significantly affect many businesses: 86 (24.5%) disagreed and 87 (24.7%) were

undecided, indicating that improvements remain inconsistent. Item nine shows moderate approval of infrastructure maintenance supporting timely deliveries, with 112 (34.3%) strongly agreeing and 52 (15.9%) agreeing, contrasted by 86 (26.3%) who disagreed. Similarly, item ten reveals mixed perceptions of facility quality, with 82 (27.3%) strongly agreeing and 93 (30.9%) agreeing, but an equally notable 75 (25.0%) disagreeing, demonstrating notable variation among respondents.

For the dependent variable, Development of SMEs (SME_Dev), Table 2 shows overwhelmingly positive responses across all items. Concerning business growth in sales and revenue (item eleven), 218 (69.5%) strongly agreed and 71 (22.6%) agreed, indicating robust growth among SMEs. Similarly, item twelve reveals expansion into new markets, with 182 (61.0%) strongly agreeing and 93 (31.1%) agreeing. The trend continues in item thirteen, where staff strength increased in many firms, as 180 (60.3%) strongly agreed and 110 (36.9%) agreed. Profitability improvement, addressed in item fourteen, shows strong positive responses with 168 (54.5%) strongly agreeing and 112 (36.4%) agreeing. Finally, item fifteen reflects enhanced sustainability and operational efficiency, evidenced by 160 (49.2%) strongly agreeing and 130 (40.0%) agreeing. These results collectively show that the majority of SMEs in the study area reported considerable development in multiple performance dimensions.

Table 3: Descriptive Statistics of Study Variable

Parameters	ATN	CMT	SME_Dev
Mean	3.946	3.566	4.361
Std. Dev.	0.443	0.487	0.372
Median	4.000	3.600	4.400
Maximum	4.800	4.600	5.000
Minimum	2.600	2.400	2.600
Skewness	-0.431	-0.015	-0.577
Kurtosis	2.790	2.502	4.181
Jarque-Bera	10.848	3.428	37.610
Probability	0.004	0.180	0.000
Observations	331	331	331

Source: EViews 12v output, 2025

Table 3 presents the descriptive statistics for Accessibility of Transport Networks (ATN), Condition and Maintenance of Transport Facilities (CMT), and Development of SMEs (SME_Dev), based on 331 observations. The mean scores show that SME_Dev recorded the highest average value (4.361), indicating a generally high level of SME development among respondents, followed by ATN (3.946) and CMT (3.566), suggesting that transport networks were rated more favourably than the condition and maintenance of facilities. The standard deviations for all variables are relatively small (0.443 for ATN, 0.487 for CMT, and 0.372 for SME_Dev), indicating low variability in responses. The skewness values for the three variables are negative (–0.431, –0.015, and –0.577 respectively), showing a slight left-tail distribution, meaning more respondents rated the variables on the higher end of the scale. Kurtosis values indicate that SME_Dev (4.181) is more peaked than a normal distribution, while ATN (2.790) and CMT (2.502) are close to normality. The Jarque-Bera probability values show that ATN ($p = 0.004$) and SME_Dev ($p = 0.000$) deviate significantly from normality, while CMT ($p = 0.180$) does not. Overall, these descriptive patterns indicate strong SME development and generally favourable

perceptions of transport accessibility, although the maintenance of transport facilities appears comparatively less satisfactory.

Table 4: Correlation Matrix of the Study Variables

Variable	ATN	CMT	SME_Dev
ATN	1.000		
CMT	-0.083	1.000	
SME_Dev.	0.229	0.630	1.000

Source: EViews 12v output, 2025

Table 4 presents the correlation matrix showing the strength and direction of relationships among Accessibility of Transport Networks (ATN), Condition and Maintenance of Transport Facilities (CMT), and Development of SMEs (SME_Dev). The correlation coefficient between ATN and SME_Dev is 0.229, indicating a positive but weak relationship, which suggests that improvements in transport network accessibility were associated with slight increases in SME development. The correlation between CMT and SME_Dev is 0.630, showing a strong positive relationship, implying that better-maintained transport facilities substantially enhanced SME growth and performance. Meanwhile, the correlation between ATN and CMT is –0.083, demonstrating a very weak and negative relationship, suggesting that accessibility and maintenance conditions varied independently in the study area. Overall, the matrix indicates that while both independent variables are relevant, CMT had a much stronger association with SME development compared to ATN, as reflected in Table 4.

Testing of Hypotheses

Table 5: Summary of Multiple Regression Analysis Result of the Hypotheses

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.642778	0.179483	9.152816	0.0000
ATN	0.237425	0.033663	7.053026	0.0000
CMT	0.499675	0.030649	16.30334	0.0000
R-squared	0.476490	Mean dependent var		4.361329
Adjusted R-squared	0.473298	S.D. dependent var		0.371993
S.E. of regression	0.269971	Akaike info criterion		0.228018
Sum squared resid	23.90608	Schwarz criterion		0.262479
Log likelihood	-34.73706	Hannan-Quinn criter.		0.241763
F-statistic	149.2702	Durbin-Watson stat		2.032886
Prob(F-statistic)	0.000000			

Source: EViews 12v output, 2025

The results presented in Table 5: Summary of Multiple Regression Analysis Result of the Hypotheses show that both independent variables, Accessibility of Transport Networks (ATN) and Condition and Maintenance of Transport Facilities (CMT), had statistically significant effects on the Development of SMEs (SME_Dev) in Delta State. The constant term (C = 1.642778, p = 0.0000) indicates that even when both ATN and CMT are held at zero, SME development maintains a positive baseline value. The coefficient for ATN (β = 0.237425, p = 0.0000) revealed a positive and significant relationship, implying that improvements in transport accessibility led to increased SME development. This means that for every unit increase in ATN, SME development increases by approximately 0.237 units, all else being equal. Likewise, the coefficient for CMT (β

= 0.499675, p = 0.0000) showed the strongest influence on SME development, establishing that better-maintained transport infrastructure significantly enhances operational efficiency, market access, and business growth.

Furthermore, the model's explanatory power is demonstrated by the R-squared value of 0.476, indicating that 47.6% of the variation in SME development is explained jointly by ATN and CMT. The Adjusted R-squared of 0.473 confirms that the model is robust even after adjusting for the number of predictors. The F-statistic of 149.2702 (p = 0.000000) shows that the overall model is statistically significant, confirming that the independent variables collectively provide meaningful explanatory power. Additionally, the Durbin-Watson statistic of 2.03 suggests no autocorrelation problem, meaning the residuals are independent and the model is reliable. The low standard error of regression (0.269971) and stable information criteria (Akaike, Schwarz, and Hannan-Quinn) further validate the model's goodness of fit. Overall, the regression results establish that improvements in both transport accessibility and maintenance significantly drive the development of SMEs in Delta State.

Table 6: Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.032214	146.2990	NA
ATN	0.001133	81.14832	1.006911
CMT	0.000939	55.24085	1.006911

Source: EViews 12v output, 2025

Table 6 presents the Variance Inflation Factors (VIF) used to assess multicollinearity among the independent variables, Accessibility of Transport Networks (ATN) and Condition and Maintenance of Transport Facilities (CMT). The centered VIF values for both ATN (1.006911) and CMT (1.006911) are far below the conventional threshold of 10, indicating the absence of multicollinearity and confirming that the predictors were not highly correlated with one another. This suggests that each independent variable contributed uniquely to explaining variations in SME development, and the regression coefficients are stable and reliable. Although the uncentered VIF values appear high due to the inclusion of the intercept term, they do not affect the interpretation of multicollinearity. Overall, the VIF results validate the suitability of the model for regression analysis and ensure that the statistical inferences drawn from the coefficients are credible.

Discussion of Findings

Accessibility of Transport Networks (ATN) and SME development

The analysis showed that accessibility of transport networks had a positive and statistically significant effect on SME development ($\beta = 0.237$, $p < 0.001$), indicating that improvements in connectivity and ease of movement were associated with higher levels of business growth, market reach and operational efficiency among respondents. This finding aligned with several recent empirical studies which reported that better transport connectivity reduced logistics bottlenecks, shortened delivery times and expanded market opportunities for small firms (Mwombeki, 2023; Maziku & Fungo, 2024; Omoye, 2025; Suwilanji & Kapotwe, 2025). Conversely, some authors who worked at broader macro or mixed-method levels had drawn more mixed conclusions, for example, Wahab (2024) emphasized that macro trade-flow improvements do not automatically translate into uniform SME gains without complementary firm-level enablers, and Okechukwu and Akpoghomeh (2025) noted that accessibility alone could be undermined by other local

constraints (traffic management, insecurity) that blunt potential benefits. The implication for this study, and in line with the stated objective to assess how transport accessibility influences SME development, was that policy should prioritise targeted connectivity improvements (feeder links, reliable routes to markets) as part of a package that also addresses contextual barriers; theoretically, the result supported Growth Pole Theory by showing that better-connected infrastructural hubs stimulated SME activity in adjacent areas, and it also resonated with Location Theory by demonstrating that proximity to efficient transport networks conferred tangible locational advantages for firms.

Condition and Maintenance of Transport Facilities (CMT) and SME development
Results indicated that the condition and maintenance of transport facilities exerted a stronger positive influence on SME development ($\beta = 0.500$, $p < 0.001$), suggesting that not only access but the quality and upkeep of transport infrastructure substantially affected SMEs' sales, profitability and capacity to sustain operations. This finding corroborated studies that linked road quality and regular maintenance to reduced vehicle operating costs, fewer delivery delays and improved firm performance (Mwaura & Kihara, 2022; Adeleke & Adegboye, 2023; Bello & Yakubu, 2021; Eruvwe et al, 2024). In contrast, cross-country analyses that bundled maintenance with other trade facilitation measures sometimes reported that maintenance by itself was insufficient unless accompanied by regulatory and institutional reforms (Hansen-Addy, Parrilli & Tingbani, 2024), underscoring that infrastructure quality must be paired with governance and logistics improvements. The practical implication for this study which sought to disentangle accessibility from maintenance effects, was that investments in routine maintenance and rehabilitation should be prioritized alongside new construction; this outcome reinforced the Growth Pole argument that well-maintained infrastructural poles generate stronger spillovers to nearby SMEs and, from a Location Theory perspective, showed that locational advantage derives not only from being near transport links but from being near reliable, well-kept links that minimize transaction costs and uncertainty.

Conclusion

Based on the findings of the study, it can be concluded that transport infrastructure, specifically the accessibility of transport networks and the condition and maintenance of transport facilities, has a significant and positive impact on the development of SMEs in Delta State. The results indicate that businesses with better access to major roads, efficient transport routes, and well-maintained infrastructure are more likely to experience growth in sales, market expansion, profitability, and operational efficiency. This underscores the critical role of road and transport infrastructure in facilitating economic activities, reducing business costs, and enhancing market competitiveness for SMEs. Therefore, policymakers and relevant stakeholders should prioritize the development and regular maintenance of transport networks to create a conducive environment for SME growth, aligning with the Growth Pole and Location theories that emphasize the role of infrastructure in stimulating regional economic development.

Recommendations

Based on the findings and conclusion of the study, the following recommendations were made:

1. To enhance Transport Network Accessibility- Government and local authorities should prioritize the expansion and improvement of road networks to ensure that SMEs have efficient access to markets, suppliers, and customers. Improved accessibility will reduce

transportation costs, shorten delivery times, and stimulate business growth, aligning with the study's findings and the Growth Pole Theory.

2. Road maintenance programs should be implemented consistently to ensure that existing transport infrastructure remains functional and reliable. Proper maintenance minimizes disruptions to business operations, enhances logistics efficiency, and supports the sustainability and profitability of SMEs.
3. Policymakers should develop targeted policies that support SMEs in leveraging improved transport infrastructure, such as tax incentives, grants for logistics optimization, and training programs for efficient supply chain management. This will strengthen SMEs' capacity to expand, increase revenue, and contribute to regional economic development, as highlighted by the study's objectives and theoretical framework.

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