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Impact of Haulage Transportation on Service Delivery: Evidence from Nigeria

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Abstract

This study investigates the impact of haulage transportation on service delivery in Nigeria employing survey evidence from GPC Energy and Logistics Ltd. Haulage transportation was captured by cost of haulage, productivity, and quality. The role of supply chain management (SCM) was measured by customer relationship, degree and quality of information sharing, and services delay. The survey involved a sample population of 310 respondents disaggregated into 110 staff and 200 customers of GPC Energy and Logistics Ltd., using a systematically developed questionnaire in 2022. The locations cut across Abuja, Lagos, Aba, Onitsha and Otta, in Nigeria. The data analysis includes descriptive and inferential statistics of mean ratings and binary logit regression model among others. The mean ratings showed that respondents affirmed that all the indicators of haulage transportation affect service delivery. The respondents also identified turnaround per prime mover and total number of trips per driver as the determinants of service delivery. The estimated logistics model revealed that cost of haulage and productivity of operations increased service delivery potential. It also found that logistics regression increases SCM, implying that customer relationship and degree of information sharing increases the possibility of service delivery. The marginal effects results demonstrated that increase in haulage transportation increases the probability of service delivery. Given these findings, this study recommends among others, that the management of GPC Energy and Logistics Ltd., should prioritize transport management in its haulage operations to increase overall cost efficiency and reduce lead time to create more opportunities for sustainable service delivery in Nigeria.

Keywords: Haulage, Transportation, Logistics, Supply chain management, Service delivery, Productivity, Logit, and Probit.

1. Introduction

Transportation is fundamental to operational efficiency, regardless of a country or business's size, technology, or production capacity. Businesses globally prioritize efficient delivery of goods and services to their customers through transportation. Therefore, transportation cannot be complete without logistics and supply chain management (SCM) which are essential aspects of any transportation study. Also, transportation provides the substance for pushing manufacturing to a new revolution (Frazzon et al., 2019; Ugoani & Ugoani, 1998). Recent technological advancements associated with the Fourth Industrial Revolution (IR4.0) are driving a transformational change in the transportation sector to a forward-thinking level. This shift is moving the industry from its traditional model towards a more efficient, interconnected, and environmentally sustainable system (Esmaeilian et al., 2020). Given this background, a robust supply chain and transportation management structure are fundamental to customer satisfaction (Ugoani & Ugoani, 2018).

Transport management involves planning, establishment, control, and maintenance of adequate haulage services to meet individual and organizational needs (Ajiboye, 2007; Nnadi and Ogwude, 2007). These needs are applicable to shipments, vehicles, infrastructure, transactions, records, traffic, weather, and city conditions (Gupta et al., 2019; Ma et al., 2020; Molka-Danielsen et al., 2018; Sołtysik-Piorunkiewicz and Zdonek, 2021; Frazzon et al., 2019; Aydın, 2020). It involves making certain the timely delivery of information, freight services, and people to the right place, at the right time, and at a cost-efficient manner. Logistics involves complex deployment of personnel, information and communication, technology, maintenance, operations, facility, construction and control systems necessary in today's corporate environment (Gera et al., 2022; Tukamuhabwa et al., 2021). In determining the definition, growth and approaches of supply chain management, Gera et al. (2022); Tukamuhabwa et al., 2021; and Larson & Rogers (1998) put together collections of studies from various researchers in the field of Transport and SCM. They refer to transportation as a logistic and supply chain management idea of transfer and movement of raw materials and finished goods from origin of manufacturer and or trader to the end user who is the final consumer. Wong et al., 2024 assert that Transportation 4.0 would enable businesses to become more resilient and competitive to handle the complex demands of operating in a competitive market, providing excellent customer service, maintaining operational excellence, and addressing environmental issues (Du et al., 2023; Ordieres-Meré et al., 2020; Frazzon et al., 2019; Liu et al., 2019; Bányai, 2018; Gružauskas et al., 2018; Hofmann and Prause, 2018; Barreto et al., 2017).

From an economic perspective, the production process remains incomplete until goods and services get to their final customers (Pandian, 2024; Ajiboye & Afolayan, 2009; Ajiboye & Ayantoyinbo, 2009). Hence, transportation plays a pivotal role as it bridges the gap between efficient service delivery and effective customer satisfaction. Thus, effective long term relationship management is fundamental to the success of SCM (Bratić, 2011; Maat et al., 2020; & Linda & Thabrani, 2021 cited in the work of Menesha & Mwanaumo, 2023).

Emphatically, factories are shifting from vertical to horizontal integration due to innovation

and technological improvements (Esmaeilian et al., 2020). This transition underlines the growing importance of transportation in logistics and SCM (Frazzon et al., 2019; Adeshina, 2014). Transportation system administration play vital roles in logistics by facilitating planning, implementation, and control processes. This results in competitive advantages, improved time and place utility, and efficient customer movement (Lambert & Stock, 2013).

Global debates from scholars and stakeholders on the long-term effect of transportation and SCM are bounds. Some analysts view the impact of transportation on effective service delivery as a fundamental component in service delivery while others are of the opinion that SCM is a veritable pass-through tool.

Key technical actions in SCM encompassing projections, procurement, scheduling, manufacturing, dissemination, shipment, and client support are critical to industrialization. (Hofmann and Prause 2018; Stevenson, 2002). Also, vehicles, storage facilities, processing and fabrication plants, distribution hubs, retail stores, and workspaces are essential components of SCM ecosystem (Copacino, 1997; Marshall, 1997; Handfield et al., 1999). Every organization's supply chain comprises a supply and a demand element, with the demand chain dealing with sales and distribution (supply) to final consumer (Stevenson, 2002). Regardless of their position in the supply and demand chain, all businesses must address these issues as they are integral to logistics and SCM (Tukamuhabwa, 2021).

Transportation and SCM in Nigeria face various logistics challenges which hinders its ability to effectively and timely deliver services and meet customer needs. This jeopardizes business competitiveness and impedes the shift to an ethical supply chain management ecosystem for effective service delivery (Wong et al., 2024). Also, quality control issues and the lack of standardization hinder its efficiency (Akanwa & Agu, 2005). Igwe, Oyelola, Ajiboshin & Raheem (2013), observed that Nigeria's low infrastructure ranking globally impacts business operations. Additionally, that insufficient investments and poor management contribute to infrastructure gaps. Consequently, inadequate logistics and quality controls in transport and SCM is a significant lacuna that must be filled (Li et al., 2006; Walker & Alber, 1998). Also, the body of existing literature shows that business competitiveness is impacted by several supply chain challenges (Tukamuhabwa et al., 2021). Lastly, inadequate studies covering this subject area has created some gaps that has to be filled.

Given this background, this study aims to examine the effect of haulage transportation and SCM on service delivery in Nigeria, using GPC Energy and Logistics as a case study. This paper contributes to the body of knowledge in transportation literature and practice. It also addresses fundamental gaps as few studies have been conducted in this area, thus, making this study unique and novel.

From the foregoing, the rest of this paper is as follows. The second chapter reviews relevant literature, including the theoretical and conceptual framework of transportation, logistics, and SCM in Nigeria. The third chapter outlines the methodology for data presentation with the application of primary and secondary data employed for the estimation. Findings, interpretation, and analysis are discussed in the fourth chapter, while the fifth chapter offers conclusions, summary, and recommendations.

2. Literature Review

2.1 Theoretical Framework

This chapter engages various scholarly works from different studies. As outlined in the preceding chapter, the study contributes original and unique insights to the existing body of knowledge, thereby addressing identified gaps.

Many academics, with unique point of view, have examined transportation from a variety of angles. Adams (1981) posits that political bargaining, economic and environmental controls should all be considered when discussing investments in transportation infrastructure in developed, growing, and developing economies. Hoyle (1994) and Owen (1987) assert the hypothesis that contemporary economics involve and presuppose relatively complex transit systems.

The study and management of transportation systems is essential to the knowledge of many other systems that operate on other dimensions. Local transport to rural markets is a fundamental factor in changing the dynamic of socioeconomic structures in many parts of the third world (Barke and O'Hare (1984), Mabogunje (1989), Todaro (1989) cited in Hoyle and Knowles (1994). On the one hand, intercontinental transport makes it easier for people in the developed, emerging, and developing worlds to communicate with one another. The viewpoint on the nexus between transport and development at numerous stages in the development spectrum continues to evolve in ecosystem. Nonetheless, the difficulties of today require an approach that is multidimensional. Therefore, relevant theories such as Stakeholder and General Systems Theories would be discussed.

Stakeholder theory considers both a company's internal and external stakeholders (Freeman and McVea, 2001). The theory asserts that it is paramount to consider, economic and ethical factors while generating value for a business entity (Freeman, Wicks, and Parmar, 2004). The coordination of organizational processes in a complex, dynamic framework is another feature of stakeholder theory (Freeman, 1984 cited in Freeman et al., 2004).

General Systems theory, on the other hand, focuses on viewing and examining organized entities rather than isolating certain components. This is done with the context of a larger investigation of a phenomenon (Bertalanffy, 1972). The entirety of a self-regulating system with numerous interactions between various agents that integrate various points of view to accomplish a shared goal is the focus of general system theory. Therefore, the broad systems lens enables the bridging of barriers or the fusion of specialties (Boulding, 1956).

2.2 Conceptual Framework

2.2.1 Transport and Service Delivery

Transportation conceptually increases the location utility of the goods produced or services delivered by the enterprise, in conformity with economic theory (Gupta et al., 2019). The meanings of Utility include functionality, usefulness, and the ability to fulfil. Place utility happens when items are put in an area where they can be consumed. By facilitating place utility, transportation contributes to the completion of the service delivery process (Maat et al.,

2020). Additionally, transportation adds temporal utility by enabling activities such as storing goods in warehouses, implementing just-in-time delivery systems, and ensuring goods are available when needed.

2.2.2 Logistics and Supply Chain Management in Service Delivery

The Logistics Services Provider (PLS) concept, which identifies one forwarder in the logistics chain, is a fundamental to service delivery and business competitiveness (Islam et al., 2021; Tukamuhabwa et al., 2021). However, the forwarder's responsibilities extend from distribution in the destination country to procurement in the place of origin. also responsible for compensating any claims resulting from the loss or damage of a container or consignment while it is in the logistics chain.

However, it is important to recognize that businesses favor the idea of logistics service providers for a variety of reasons. In Usoh (2006), Jane E. C. Boyes, the editor of Containerization International, stated that although some businesses consider logistics as a core activity, others see it as a service that supports and complements their core business of point-to-point shipping. Using the PLS Concept, the study further assess ‘one forwarder’ concept briefly.

Forwarder Concept in the Logistics Chain

The Logistics Services Providers (PLS) operate to satisfy the needs of their clients. However, the PLS develop product(s) that would provide its clients sufficient levels of satisfaction. Feng et al. (2020), conclude that transport intensity, haulage distance, industrial structure and economic activities are fundamental components of freight transport in transport logistics management ecosystem. For instance, DHL Ocean Freight Manager (2015), beliefs that ocean freight plays important role within the total supply chain, that include “all mode of transport”.

2.2.3 Transportation in Nigeria

In Nigeria, transportation methods encompass both traditional and modern means. Rural areas often rely on traditional modes like animal-pulled carts, canoes, and walking due to challenges such as poor roads, low demand, and limited profits for farmers (Emielu, 1990). Despite these challenges, Nigeria's transportation sector has seen growth, with the transport and storage industry's value projected to decrease slightly from 2019 to 2020. (NBS, 2020) This sector plays a critical role in connecting large coastal cities with rural villages, contributing to GDP and facilitating economic growth, particularly in non-oil sectors like industry, agriculture, and mining. Various transportation modes are available, including road, rail, air, and water, with this study focusing on automobile transportation component.

2.2.3.1 Road Transportation in Nigeria

Nigeria's roads and highways convey over ninety per cent (90%) of both passenger and cargo traffic flow, making them critical to the country's transportation system (National Integrated Infrastructure Master Plan-NIIMP 2020). Data from the National Bureau of Statistics (NBS) shows that despite this, their contribution to GDP decreased from N3.0 trillion ($8.0 billion)

in 2019 to N2.6 trillion ($6.9 billion) in 2020. The government is prioritizing road maintenance and construction, allocating N168bn ($451.2m) in the 2021 budget for this purpose, along with N54 billion ($144.2 million) for bridge projects, including the rehabilitation of a Lagos mainland bridge with N4 billion ($10.7 million).

Challenges in road transportation include erosion from rain, melting tar due to high temperatures, and road surface bumps caused by temperature fluctuations. Other issues include unsafe driving practices and high construction costs for roads spanning rivers and marshes.

2.3 Empirical Literature

Various studies have been conducted on transportation and its impact at different climes including Nigeria, given the remarkable advancement and transportation literature in recent times. Hence, relevant studies have produced some uniqueness in the literature reviewed below.

Many studies adopted the questionnaire approach to develop their findings, thus, producing comprehensive results. Tukamuhabwa et al., (2021) examined the impact of supply chain management practices, logistics capabilities and logistics integration on developing economies using competitive advantage of Small & Medium Enterprises (SMEs) in Uganda in 2019. The study employed a structural equation model (SEM), using a survey of structured questionnaire. Cross-sectional data obtained from 204 SMEs out of a full sample of 234 found that SCM and logistics integration had positive, significant correlation with SMEs' competitive advantage in Uganda. The results further showed that SCM practices and logistics capabilities positively and significantly impact logistic integration. However, the study also found that logistics integration moderately intermediates in the relationship between SCM practices and competitive advantage as well as logistics capabilities and competitive advantage. Thus, achieving satisfactory logistics performance which further reflect efficient service delivery.

A scenario of service delivery failure was established in the study of Oyeobu, Oyebisi & Olateju (2014) on investigating the impact of Nigerian road transport company's business performance on its service quality. Using ABC Transport, Amuwo Odofin, Lagos as a case study, descriptive and inferential statistics were employed as method for analysing the data, administering 30 item questionaries of operationalization of service quality. The findings reveal that tangibles, dependability, empathy, and customer satisfaction have a strong positive linkage. Though, a negative nexus was established between responsiveness and client satisfaction. A similar outcome was established in the work of Moneke & Echeme (2016). They conducted a study to identify the challenges in Imo state's building construction industry, using a collection of 95 stakeholders from both the public and private sectors. The findings showed that inadequate information sharing and lack of ICT infrastructure in the construction industry led to overall service failure in supply chain and logistics delivery. This was due to lack of understanding of the SCM procedures and processes. This is clarified by the work of Menesha & Mwanaumo (2023) which posit that client relationship, strategic SCM partnership, information sharing, quality of communication and timely delivery are

requisite to measure efficient SCM.

Further, to avoid cases of service failure in haulage transport service, another study suggested that complete outsourcing and contracting out logistics services to specialized haulage entities was the best option and course of action to ensure efficient haulage service delivery in Nigeria (Sumaila, 2014). However, Singh and Singh (2019) embarked on a study to identify and articulate the issues caused by SCM procedures in preventing efficient delivery of service in the Justice and Constitutional Development Department in South Africa. Using a random sample of 132 questionnaires, the findings revealed that the department lacks the required manpower that is fully capable and competent to execute all the SCM tasks that provides vale for the various business units.

Examining the effect of logistics in the level of customer satisfaction at retail establishments in Pakistan using insights from Islamabad and Rawalpindi. Stock levels, timely delivery, freight operations, and logistical coordination were used as criteria for logistics. Results demonstrated a significant relationship between customer experience metrics complemented by stockpile oversight, order cycle durations, freight conveyance modalities, and integrated logistics execution capabilities (Umair, Zhang, Han, and Haq (2019).

2.4 Gap in Empirical Literature

In summary, our literature reviewed that most of the studies conducted in and outside Nigeria employed questionnaire source of data collection method. However, the primary and secondary sources as well as the statistical technique employed in this paper has it peculiarity. More so, there has not been much research on the impact of quality of service in the Nigerian transportation ecosystem, therefore, the study is necessary to aid in academics and further fill the study gap.

3. Empirical Methodology

3.1 Research Design

A research design is a process that a researcher adopts to specify required data type and measure the variables, from a sample of data collection, analysis, methodologies, and test of hypotheses (Van-Wyk, 2012; Thyer, 1993). Given the purpose of this study, “survey” research method which describes a process of gathering data by asking questions is employed. Using strategies such as focus group discussions, interviews, and questionnaires. (Collis and Hussey, 2013) emphasized survey research design as collecting data from a sample and extrapolating the findings to the complete population. The fundamental reason that population and sample for this study are dispersed throughout Nigeria led to adopting this methodology as it offers a channel of contacting the intended respondents in different regions.

3.2 Data Sources

Sources of data include dirct (primary) and indirect (secondary) sources.

3.2.1 Primary Source

Primary data sources, relevant for survey studies as posited by Agresti and Finlay (2009),

include direct observation, variable manipulation, experimental conditions creation, and questionnaire responses from the target respondents for the analysis.

3.2.2 Secondary Source

Secondary data were gathered by reviewing the literature relevant to this investigation including journals, annual reports, and other archival materials on services, particularly in the transport and logistics sector.

3.3 Sample Population in the Study

The target demography in this study comprise 110 staff of GPC Energy and Logistics Ltd., and 200 customers of GPC Energy and Logistics Ltd., in different locations in Nigeria. Additionally, the population include 200 customers of the company in various parts of Nigeria such as Abuja, Lagos, Aba, Onisha and Otta. The distribution of the population is shown in **Table 1.**

Table 1. Distribution of Population Sample

Staff population	110
Customer population	200
Total population of study	**310**

Source: Researcher's compilation (2022)

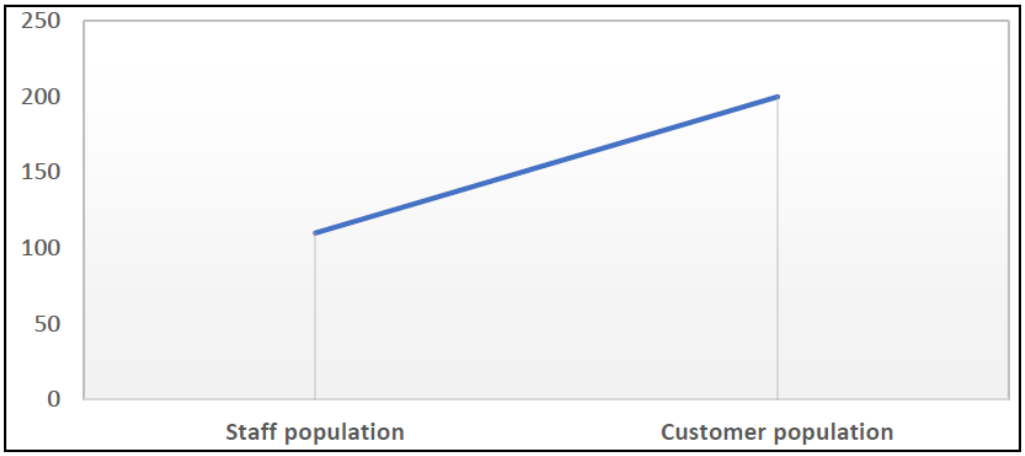

Figure 1. Chart for Distribution of Population Sample

Source: Reseacher's Compilation from Survey

A cursory look at Table 1 reveals a study population of three hundred and ten (310) disaggreagted into 110 staff and 200 customers of GPC Energy and Logistics Ltd. Thus, the target population cuts across the staff of GPC Energy and Logistics Ltd across various locations (Abuja, Lagos, Aba, Onisha and Otta) of the company in Nigeria. Also, this study covered the customers who constantly patronize the company's services in meeting their haulage and logistics needs.

3.4 Sampling Technique and Sample Size Determination

A proportionate stratified sampling method was adopted, thus, disaggregating the population into groups. At the same time, target respondents are segemented into in their various locations such as Abuja, Lagos, Aba, Onisha and Otta. The sample size was determined using the Yamane (1967) formula as follows:

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

where; n = Sample Size

N = Population

e = Error margin (5% = 0.05)

$$n = \frac{310}{1 + 310(0.05)^2}$$

$$n = \frac{310}{1 + 310(0.0025)}$$

$$n = \frac{310}{1.775}$$

$$n = 174.65$$

Minimum sample size = 175

Therefore, a sample of one hundred and seventy-five (175) staff and customers of GPC Energy and Logistics Ltd., is used for this study.

The distribution of the sample size is computed using the following formula:

$$d = \frac{A}{N} \times \frac{n}{1} \quad (2)$$

Where: **d** = the number of sample for each sub-group

A = population of sub-group

N = Total population of study

n = estimated sample size used in the study.

i. Staff of GPC Energy and Logistics Ltd

Number of management /senior staff to be sampled

$$d = \frac{110}{310} \times \frac{175}{1} = 62 \quad (3)$$

ii. Customers of GPC Energy and Logistics Ltd

$$d = \frac{200}{310} \times \frac{175}{1} = 113 \quad (4)$$

The sample size distribution is summarized in Table 2.

Table 2. Sample Size Distribution

Respondent	Population	Sample size
Staff of GPC Energy and Logistics Ltd.	110	62
Customers of GPC Energy and Logistics Ltd.	200	113
Total	**310**	**175**

Source: Researcher's Compilation (2022)

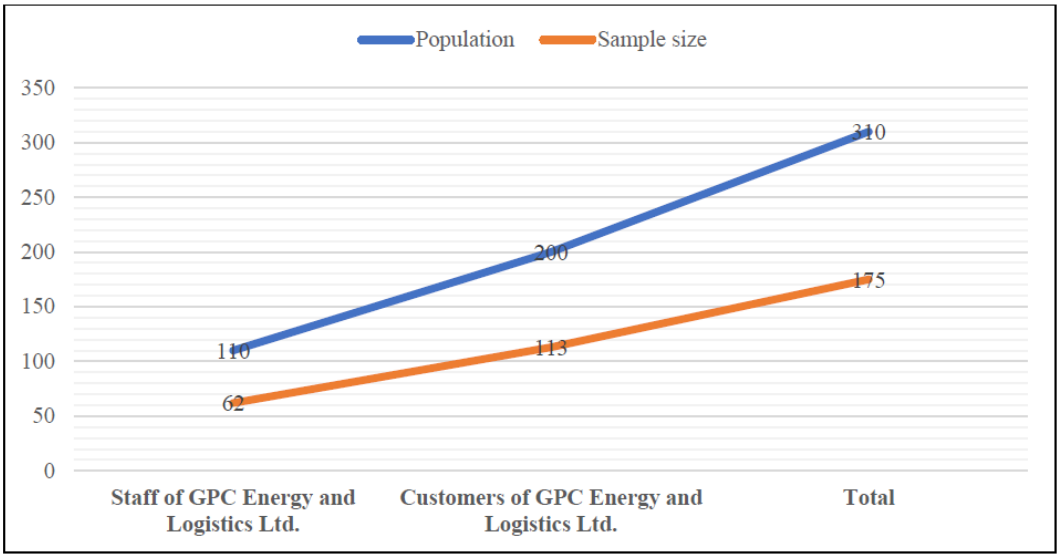

Figure 2. Sample Size Distribution

Source: Researcher's Compilation from Survey

i. Method of Data Collection

A systematically structured questionnaire was used to gather the primary data. The survey was divided into the socioeconomic profiles of the survey respondents provide the basis for every question in section "A." The scope of GPC Energy and Logistics Ltd.'s service delivery was the main topic of Section "B." In addition, the questionnaire's part C was devoted to how much haulage transportation and supply chain management are used. The questionnaire's design must have a four-point Likert scale that includes strongly agreed (SA), agreed (A), disagreed (D), and strongly disagreed (SD). However, Nolinske (2008) assert that, self-administration of the questionnaire gives respondents more time to complete.

ii. Method of Data Analysis

The data analysis (Brink 1996) employed descriptive statistics (Neuman and Kreuger 2003) to allow the researcher to present numerical data in a precise, organized, and concise manner. The mean rating and coefficients of measures of haulage transportation and SCM was adopted while the logit regression analysis will be employed to assess the likelihood of service delivery. Also. Borucka (2020), postulates that logit regression is typically evaluated in the likelihood that the event under study will occur. The possibility of an event happening is primarily defined by the odds. The logit regression model's official specification is as follows:

$$\ln\{P_j/(1-P_j)\} = \alpha + \sum I\, \beta_i X_{ij} \quad (5)$$

The natural log of the chances of receiving a service is represented by the logit variable $\ln\{P_j/(1-P_j)\}$. Estimates of "gives" represent changes in the outcome's log-odds (logarithm of relative probabilities). Maximum Likelihood (ML), not OLS, is used to estimate logit regressions. The likelihood of the sample data set being seen is maximized by ML's computation of coefficient estimates.

3.5 Test of Research Instrument

i. Validity of the Instrument

The extent to which a test accurately assesses what it is intended to measure and afterwards allows for appropriate score interpretation is known as validity (Gill and Johnson, 2002). It entails making notions or constructs necessary for the translation's operative. Face and content validity will be used to evaluate the instrument's validity.

ii. Reliability of the Instrument

The degree to which responses to each question on the instrument are internally consistent defines the reliability of the research data collection instrument (Edmonds and Kennedy, 2012). The reliability of the instrument will be evaluated in this study using the Cronbach's Alpha test. Nunnally and Bernstein (1994) assert that the instrument will be regarded as reliable and internally consistent for the study if its reliability using Cronbach's alpha is 0.700 or higher.

4. Data Presentation and Analysis

4.1 Data Presentation

The questionnaire distribution in this study comprised 175 sampled respondents in five locations of GPC Energy and Logistics Ltd., in Nigeria. The summary of the questionnaire distribution and collection is presented in Table 3.

Table 3. Questionnaire Distribution and Collection

Valid	Frequency	Per cent	Cumulative Percent
Returned	125	71.43	71.43
Not Returned	50	28.57	100.0
Total	**175**	**100.0**	

Source: Researcher Computation, 2022

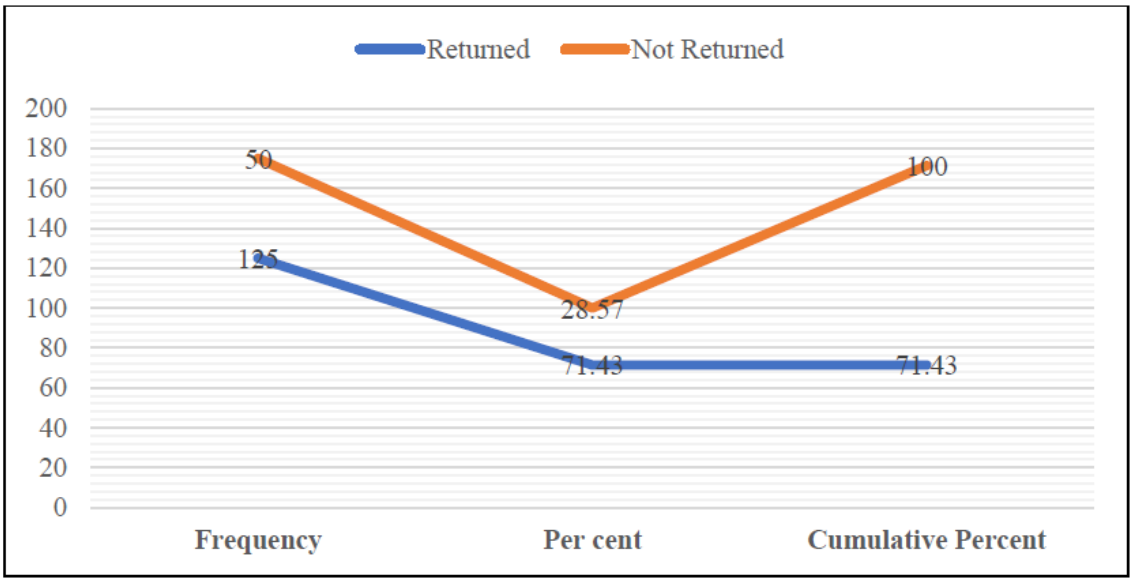

Figure 3. Questionnaire Distribution and Collection

The distribution and collection of the questionnaire from the sample respondents are presented in Table 3. It was found that out of 175 copies of the questionnaire distributed to the sampled respondents, 125 copies (equivalent to 71.43%) were returned while 50 copies (equivalent to 28.57%) were not returned. Thus, the 125 completed and returned copies of the total questionnaire distributed to the sampled respondents formed the basis for the analysis.

4.2 Data Analysis

4.2.1 Socio-economic Characteristics of Sampled Respondents

The socio-economic characteristics of the sampled respondents which cut across gender, age, educational status, household size and income distribution of the respondents. Data of some selected samples are analysed below.

As observed, 83(66.40%) respondents are male while 42 (33.60%) respondents are female. The finding showed that male population are more actively involved in formal organization and equally participate in public opinion representation. Overall, the results showed that majority of the respondents are less than 50 years. It goes further to explain that the age distribution of the respondents is reflection of the population within the labour force. In sum, the results of the educational background of the respondents showed that majority of them are graduates representing 81 (64.80%).

The distribution of the sampled respondents observed that 22 (17.60%) and 29 (23.20%) respondents are based in Onitsha and Otta respectively, while Abuja has 35 (28%), attributable to the growing activities of the company in Abuja which triggered the population of the staff and customers in the area.

4.3 Estimation and Discussion of Results

4.3.1 Model Estimation

To capture the determinants of service delivery in haulage and SCM, the logistic regression model was estimated which provided some insights into the odds ratio. Also, the marginal effect was estimated to determine the probability of haulage and supply chain management service delivery based on the underlying explanatory variables.

4.3.2 Discussion of Results

The results are presented in Table 4-7.

Table 4. Summary of logistic regression results for haulage service delivery

LR chi2(3) = 9.21						
Prob > chi2 = 0.0266						
Log likelihood = -27.74147			Pseudo R^2 = 0.1424			
Haulage	Odds Ratio	Std. Err.	Z	P>|z|	[95% Conf. Interval]	
Cost	1.314636	.5861206	0.61	0.539	5486604	3.149977
Productivity	2.747754	1.41574	1.96	0.050	1.000939	7.543075
Quality	.3531143	.1642798	-2.24	0.025	.1418763	.8788623
_cons	8.543192	16.1626	1.13	0.257	.2095359	348.3228

Source: Researcher's computation (2022) using STATA 15.0

The results further showed that service delivery in haulage increases by 174.8 percent [(2.748-1)*100] as cost of haulage increases while controlling for other factors. This finding suggests that increase in productivity in terms of turnaround per prime mover, total number of trips per driver and number of containers moved was important for promoting the extent of service delivered by the company. However, the possibility of haulage transportation decreased by 64.7 percent [(0.353-1)*100] as a result of an increase in the quality of service. The Pseudo R^2 (0.1424) showed that the explanatory variables jointly explained 14.2 percent of the total variations in haulage service delivery. It was also observed that the probability value (0.0266) of the chi-square statistic (9.21) for the likelihood ratio is less than 0.05. Implying that the estimated logistic regression model for haulage service delivery is reliable at 5 percent significance level.

Table 5. Marginal effect results for haulage service delivery

Variable	**dy/dx**	**Std. Err.**	**Z**	**P>|z|**	**[95% Conf. Interval]**	
Cost	.011634	.0190799	0.61	0.542	-.0257619	.0490298
Productivity	.0429866	.0212378	2.02	0.043	. 0013613	.084612
Quality	-.0442701	.0186293	-2.38	0.017	-.0807829	-.007757

Source: Researcher's computation (2022) using STATA 15.0

The results showed that cost of haulage transportation is associated with a positive, but insignificant coefficient. This implies that increase in the cost of haulage transportation does not significantly increase the probability of service delivery in haulage services. At the same time, the probability of haulage service delivery increased by 4.29 percent for every additional unit increase in productivity. This finding indicates that increase in productivity has the potential of improving the extent haulage services delivered by GPC Energy and Logistics Ltd. On the other hand, it was found that the slope parameter (-.04427) for quality of haulage transportation is negative and significant at 5 percent significant level. This finding indicates that increase in the quality of haulage transportation increases the probability of improving the delivery of haulage services by 4.427 percent. This indicates constraints associated with the transportation network which impaired the intended and desired benefits of improved haulage service delivery

Table 6. Post-estimation test results for haulage service delivery

Group	Prob	Obs_1	Exp_1	Obs_0	Exp_0	Total
1	0.8623	12	11.4	3	3.6	15
2	0.8917	14	14.9	3	2.1	17
3	0.9451	7	6.5	0	0.5	7
4	0.9481	19	19.9	2	1.1	21
5	0.9496	4	3.8	0	0.2	4
6	0.9594	10	10.5	1	0.5	11
7	0.9612	16	15.4	0	0.6	16
8	0.9846	13	12.8	0	0.2	13
9	0.9855	11	10.8	0	0.2	11
10	0.9981	10	10.0	0	0.0	10
number of observations = 125						
number of groups = 10						
Hosmer-Lemeshow chi2(8) = 3.90						
Prob > chi2 = 0.8659						

Source: Researcher's computation (2022) using STATA 15.0

The diagnostics of the estimated logistic regression model for haulage service delivery was carried out using Hosmer-Lemeshow (H-L) to evaluate the goodness-of-fit of the estimated model at 5 percent significance level. Findings revealed that the probability value (0.8659) of the Chi-square statistic (3.90) is greater than 0.05. This necessitated the rejection of the null hypothesis that the estimated logistic regression model for haulage service delivery is not a good fit. It, therefore, provides the basis for the reliability of the model for prediction and policy formulation.

Table 7. Summary of logistic regression results for chain management service delivery

LR chi2(4) =]43.95						
Prob > chi2 = 0.0000						
Pseudo R2 = 0.3190						
Supply chain	Odds Ratio	Std. Err.	Z	P>|z|	[95% Conf. Interval]	
Customer relationship	2.405297	.79034	2.67	0.008	1.263218	4.579933
Degree of info sharing	3.039606	1.104565	3.06	0.002	1.491072	6.196353
Quality of info sharing	.4284764	.1322221	-2.75	0.006	.2340224	.7845062
Postponement	1.011764	.3046223	0.04	0.969	.5607885	1.825405
_cons	.0638859	.0822181	-2.14	0.033	.005128	.7959055

Source: Researcher's computation (2022) using STATA 15.0

It is evident from the results that possibility of service delivery in supply chain management increases by 140.6 percent [(2.406-1)*100] following an increase in customer relationship while other factors constant. This finding revealed that an effective relationship with the customers offers opportunity for GPC Energy and Logistics Ltd to improve the management of its supply chain. At the same time, it was found that increase in the degree of information sharing increases the extent of service delivery in supply chain management by 203.9 percent [(3.039-1)*100] while holding other factors constant. The finding suggests that improving the extent of information sharing promotes the efficiency of the supply chain.

On the contrary, the quality of information sharing decreases the possibility of supply chain management by 57.2 percent [(.428-1)*100]. This finding indicates that the quality of information sharing is not adequately improved the SCM process. However, the results showed that postponement does not significantly improve the supply chain management process given that the associated odd ratio is not statistically significant at 5 percent level. The Pseudo R^2 (0.3190) showed that the explanatory variables (customer relationship, degree of information sharing, quality of information sharing and postponement) jointly explained 31.90 percent of the total variations in supply chain management. Additionally, it was found that the probability value (0.0000) of the chi-square statistic (43.95) for the likelihood ratio is less than 0.05. This implies that the estimated logistic regression model for supply chain management is statistically reliable.

Table 8. Marginal effect results for supply chain management service delivery

Variable	**dy/dx**	**Std. Err.**	**Z**	**P>|z|**	**[95% Conf. Interval]**	
Customer relationship	.1202978	.0478342	2.51	0.012	.0265446	.2140511
Degree of info sharing	.1523784	.049476	3.08	0.002	.0554073	.2493496
Quality of info sharing	-.1161648	.0390083	-2.98	0.003	-.1926197	-.03971
Postponement	.001603	.0412782	0.04	0.969	-.0793007	.0825068

Source: Researcher's computation (2022) using STATA 15.0

The results of the marginal effects showed that the estimated slope parameters for customer relationship and degree of information sharing are positive and significant. Specifically, the customer relationship as a form of supply chain management increased the probability of service delivery by 12.03 percent. Similarly, the degree of information sharing increased the probability of service delivery in GPC Energy and Logistics Ltd by 15.24 percent. On the other hand, quality information sharing decreased the probability of service delivery by 11.62 percent. However, it was evident from the results that postponing does not significantly increase the probability of service delivery.

Table 9. Post-estimation test results for supply chain service delivery

Group	Prob	Obs_1	Exp_1	Obs_0	Exp_0	Total
1	0.3116	3	1.9	10	11.1	13
2	0.6637	6	6.4	7	6.6	13
3	0.7878	6	8.3	6	3.7	12
4	0.8260	13	11.5	1	2.5	14
5	0.8630	17	16.2	2	2.8	19
6	0.8644	5	6.9	3	1.1	8
7	0.9177	8	8.2	1	0.8	9
8	0.9373	12	11.2	0	0.8	12
9	0.9875	19	18.5	0	0.5	19
10	0.9877	6	5.9	0	0.1	6
number of groups = 10						
Hosmer-Lemeshow chi2(8) = 9.62						
Prob > chi2 = 0.2925						

Source: Researcher's computation (2022) using STATA 15.0

The post-estimation test results showed that the probability value (0.2925) of the Chi-square statistic (9.62) for H-L test is greater than 0.05. This provided the empirical basis for rejecting the null hypothesis that the estimated logistic regression model for service delivery in supply chain management is not a good fit. In other words, the model is considered as very reliable for predicting changes in service delivery.

4.4 Analysis of the Mean Responses on Barriers to Haulage Transportation and Supply Chain Management

The respondents' opinion on each of the items is summarized in Table 10.

Item	**VSB**	**SB**	**LSB**	**NB**	**Mean score**	**Std. Dev.**
Frequent breakdowns of per prime movers and other operational vehicles	74	31	13	7	3.376	0.885
Bad road network	71	35	14	5	3.376	0.8392
Delay at police and military check points	38	48	29	10	2.912	0.9247
Traffic congestion	42	56	23	4	3.088	0.8034

Source: Researcher's computation (2022) using STATA 15.0

The results showed that the respondents affirmed that frequent breakdown of per prime movers and other operational vehicles constituted a major constrain to haulage transportation and SCM given that the associated mean value (3.376) is greater than the critical mean of 2.5. Also, the respondents agreed that bad road network and delay at police and military check points posed a challenge to the process of haulage transportation and SCM. This is based on the fact that their corresponding mean values (3.376 and 2.912) exceeded the critical mean score (2.5). It is also evident from the results that the respondents agreed that traffic congestion is notable barrier to haulage transportation and SCM. In sum, the results showed that the barriers faced in the process of haulage transportation and SCM cut across vehicular breakdown, deplorable road infrastructure and systemic corruption by the police and military personnel. Thus, consistent with the results of Igwe et al. (2013) which highlighted that the Nigerian transport networks were badly built from the start and are unable to expand to meet increased demand. However, the barriers highlighted in the results are distinct from the findings of Moneke & Echeme (2016) which showed that lack of investment in ICT, inadequate communication, lack of understanding of the SCM procedures and processes amongst other factors were responsible for service failure in the construction industry.

5. Conclusion and Recommendations

5.1 Conclusion

The thrust of this study is to examine the impact of haulage transportation on service delivery with a focus on GPC Energy and Logistics Ltd. It utilized a systematically structured questionnaire to elicit data from 125 sampled survey participants. The data sourced were analysed using descriptive and inferential statistical methods such as mean rating and binary logit regression. The descriptive statistics showed that 83(66.40%) respondents are male while 42 (33.60%) respondents are female. The extrapolation of this outcome is that male population are more actively involved in formal organization and equally participate in public opinion representation. It further highlights the poor participation of women in formal employment and business activities in Nigeria.

The results also showed that 81 (64.80%) respondents have tertiary education, which implies that majority of them are graduates. It further explains that the company prioritize the employment of graduates. The distribution of the sampled respondents based on their various location showed that 35 (28.00%) and 24 (19.20%) respondents are based in Abuja and Lagos respectively while 15 (12.00%), 22 (17.60%) and 29 (23.20%) respondents are based in Aba, Onitsha and Otta respectively.

It was also found from the logistics regression result that increase in SCM in the forms of customer relationship and quality of information sharing increases the possibility of service delivery. Therefore, it is concluded that haulage transportation and SCM are prerequisites for ensuring efficient service delivery in GPC Energy and Logistics Ltd.

5.2 Recommendations

Given the findings, management of GPC Energy and Logistics Ltd. should prioritize transport management in its haulage operations to increase overall cost efficiency and reduce lead time

for sustainable service delivery. GPC should improve the productivity of haulage transportation by enhancing its inventory management for improved service delivery. Investing in information technology gadgets and systems to improve the rate of customer relationship and degree of information sharing for more effective service delivery to customers should be priotized by the company.

Finally, Government should provide an enabling environment for haulage transportation to thrive by building and maintaining quality road infrastructure, enhancing communication infrastructure and addressing the issue of multiple police and military check points. These would help to promote cost efficient and overall effective service delivery in Nigeria.

7. Suggestions for Future Studies

Conducting a cross-sectional study of haulage transport companies in Nigeria to deepen the understanding of the industry performance in service delivery is key.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

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The Publication Ethics Committee of the Macrothink Institute.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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