

An Evaluation of Parking Demand and Supply on Freight Vehicles at Apapa Port in Lagos State.

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Date of Submission: 18-04-2024

Date of Acceptance: 28-04-2024

ABSTRACT

In many Nigerian cities, parking has long been an issue for people's freedom of movement. Lagos has a number of obstacles, including poor traffic management, signage and a lack of off-street parking spots provided by the government, in addition to the lack of contemporary automobile parking management systems. The study evaluates the relationship between freight vehicles and parking demand at Apapaseaport and analyzes the parking demand of freight vehicles at Apapaseaport areas of Lagos state.

The heterogeneous population was divided into homogenous strata using the stratify technique, and the questionnaire was distributed across port users within the strata using the random technique. The study used a sample size of 150 people using well-structured questionnaires to obtain primary data.

The study revealed that, 34% of the sample size was made up of respondents who were between the ages of 35 and 40. The majority of respondents, comprising 57.6% of the sample, were of the male gender. The study also showed that another component in evaluating parking management is payment mechanism, which accounts for 19.3% of the sample size and determines how long the vehicle owner must spend for parking. In order to examine the relationship and consequences of freight truck parking demand on the unhindered flow of traffic, the study used multiple regression analysis and correlation. The parking system is significant to the parking demand at Apapa Port, as shown by the correlation analysis, with a Pearson correlation value of 0.931. The combined effect of the independent variables on the dependent parking demand is demonstrated by the multiple regression analysis, with an R² of 0.619 at the 0.000 level of significance.

The study found that there are advantages to traffic delays at the port because of the high demand for

parking, which has a detrimental effect on Apapa port's growth and productivity. It was also determined that, in a scenario where every minute of parking is paid for, the length of the parking period has no bearing on the freedom of movement of traffic. It is advised that the Nigerian Port Authority create a suitable policy or structure to control the parking system so that trucks can move freely.

Keywords: Parking demand, Traffic flow, Vehicle demand.

I. INTRODUCTION

In most societies, transportation is the foundation for economic, social, and political development because it closely reflects the lifestyle and standard of living of the community. Growing urban populations and car ownership rates have been accompanied by a rise in the need for people to move around for a variety of reasons. Vehicles that park frequently demand expensive space, and the irregular allocation of parking spaces has a detrimental effect on traffic flow and general city pattern order, before the occupants go anywhere, their vehicles are parked. Therefore, parking lots' importance in regional and national planning and policy should be taken into account before embarking on any journey. Cars typically take up more than 95% of the land space in urban areas and are parked for most of the time (Zhang & Wang, 2020). Parking is the act of coming to a stop, getting out of your car, and leaving it unattended. Because parking is an essential component of a transportation system, cars are parked in convenient locations. Convenient parking has an effect on destinations' ease of access, which affects accessibility as a whole. Lanzendorf & Kirschner, (2020). Cars have a "zone of influence" that expands as traffic speed and quality increase, reducing the efficacy and engagement level of the

exchange space rather than taking up an excessive amount of space when traveling. Parking laws are the responsibility of the government and are based on local needs. In order to maintain traffic flow and ensure that a development has adequate parking places to avoid spilling over onto surrounding streets and properties, municipalities enforce minimum parking rules (Tercan, 2023).

The science of creating parking laws is quite complex since it is often difficult to forecast the actual demand for parking that a construction would create. The parking lot operator finds that location is essential. The likelihood of a parking lot turning a profit increases with proximity to the city center. The city center draws a large number of drivers for several reasons, such as the shopping, job, and service options offered. In the meantime, parking regulations usually use parking costs as a way to control the number of vehicles in urban areas (short stay parking). The economics of parking shows that location and cost have a significant impact on drivers' decisions. Grahnet al. (2004) asserts that location is important, particularly when talking about the city center. Lagos boasts the biggest bus corridor public transportation system in Africa, which has allowed the city to increase usage and speeds for passengers. If parking is to be restricted, an equivalent substitute must be offered. Additionally, buses are able to travel when vehicles are trapped in traffic because Lagos has blocked corridors on some of its bus routes, such as BRT bus lanes. This creates an appealing image for drivers to pick an other form of transportation. (Otunola et al., 2019).

The issue of parking has grown significantly in the Apapa and Wharf axis of Lagos State. Although several routes in Lagos offer on-street parking, the rising number of cars on the road has made these spaces woefully inadequate. The issue of parking is particularly severe on main highways that lead to hubs of activity such as Mile-II and Leventis area within the city. It is expected that establishments such as government offices, public buildings, hospitals, schools, and shopping centers will provide parking facilities on, above, or below the ground. However, visitors to these establishments are typically refused parking, forcing them to park on the streets and being forced to pay for short-term stays.

In many Nigerian urban areas, parking has long been an issue. This is because many of our cities lack parking spaces that are clearly marked. Delays and traffic congestion are the results of this. Wen et al. (2019) claim that transportation planning and development lags much behind the

demand for automobile activities, with the exception of constructing fundamental infrastructure and highways. In most emerging nations, the availability of parking facilities in residential neighborhoods and central business districts (CBDs) has been disregarded, which could have an impact on future economic activity and environmental quality. According to research by Assemiet al. (2020), there are some circumstances in which drivers are more likely to search for on-street parking rather than off-street parking. The cost of fuel may be low, on-street parking may be inexpensive, or both, yet the automobile owner wants to park for as long as possible to complete all tasks. According to Assemiet al., it usually takes three to fourteen minutes to find a spot on the street. According to this study, if there aren't enough off-street parking spaces, people will park on the street. It makes it very evident that if off-street parking is no longer an option, users should use on-street parking as a last resort.

Lagos State's urbanization trend has become so significant both inside the state and across Nigeria that it deserves special attention due to its numerous issues, one of which is transportation. While Victoria Island serves as Lagos' primary business and financial hub, Ikeja and Apapa Axis are home to a concentration of workplaces and activity centers. These areas are among the busiest for banking and commerce, which draws cars and causes traffic jams and delays that aggravate the environment's air pollution and narrow roads. The free movement of people and vehicles in different Lagos (Ikeja and Victoria Island) is hindered by the lack of contemporary car parking management systems as well as by a number of other issues, including insufficient traffic management signage, the government's refusal to provide off-street parking spaces, the introduction of paid parking permits, issues with park service delivery to drivers and commuters, and the introduction of parking policies. The main roadways leading to the country's seaports, the Apapa/Wharf/Oshodi/Tin Can axis, have become infamous bottleneck locations due to the volume of traffic and poor road conditions. This investigation aims to close this information gap.

The study primarily examines the demand for parking cars in the Apapa port areas of Lagos State, Nigeria. The study will evaluate the relationship between freight vehicles and parking demand at Apapa port in order to accomplish this.

II. LITERATURE REVIEW

According to Bhende and Wagh (2015), an automobile parking system is a mechanical apparatus that increases the amount of space available for parking in a lot. Vehicles in parking systems are often moved into a storage position using hydraulic pumps or electric motors. Traditional and automated parking systems are the two varieties. When weighed against conventional parking garages, automated vehicle parking systems are probably going to be more economical in the long run. Since automatic multi-story automated Parking Park systems often require less building volume and ground area than a conventional facility with the same capacity, they are less expensive per parking space. Autonomous parking garage and car parking systems both cut down on pollution since they prevent cars from running or circling as drivers search for a spot. Automated parking systems employ a comparable technology to that which is employed in document retrieval and mechanical parcel handling. The motorist parks the vehicle in a defined spot after leaving it inside an entrance area. (Chrestet al., 2012).

Car lifters, whether hydraulic or mechanical, raise the car to a higher level so that it can be stored properly. The car can be moved to an empty parking spot in both vertical and horizontal directions until it is needed once more. The procedure is reversed when the vehicle is needed and the vehicle is returned to the driver's original location using automobile lifts. According to Pivoet al. (2002), a turntable may occasionally be used to position the vehicle so that the driver can leave comfortably without having to reverse.

As demonstrated by Geurset al. (2004), competitiveness is measured in relation to regional accessibility. A key idea in transportation research is accessibility. Similar to the notion of "competitiveness," there is debate about how to define "accessibility," as there are multiple definitions. "Accessibility is a slippery notion...one of those common terms that everyone uses until faced with the problem of defining and measuring it," write Geurs & van Wee (2013). Some ideas about the concept of "accessibility" and its measurement in connection to competitiveness are presented in this section. Stopping, disengaging, and leaving a car unattended is known as parking.

Parking is frequently allowed on one or both sides of the road, though occasionally there are limitations. Because every vehicle needs a place to be stored while it is not in use, parking is crucial to the functioning of the transportation system. As

opposed to parking your car in a garage, on-street parking entails leaving it anywhere on the street or along the curb. While parking on the street is always permitted in certain areas, there are occasional limitations. These restrictions are typically shown on traffic signs. There are situations when parking is only permitted on one side of the street and situations when it is not permitted at all. Additionally, there are instances where parking on the street requires permission. Cities use enforcement agents to ensure that citizens abide by these laws and regulations. The following is a list of common forms of on-street parking. The way the cars are parked in relation to the alignment of the road determines which category they belong in. Based on how vehicles are arranged, there are three fundamental parking techniques for the majority of motorized vehicles: parallel parking, perpendicular parking, and angle parking. In these self-park setups, the driver of the car can approach the parking space on their own.

Traffic flow theory has undergone numerous noteworthy advancements, as reported by Eleftheriadou (2014). While certain uses of these breakthroughs have not been all that helpful, others have resulted in quite useful relationships. The establishment of the relationship between the macroscopic factors of traffic stream flow (flow rate, speed, and density) is perhaps the most valuable outcome of traffic flow theory, he continued. The level of services idea in traffic engineering is developed using the flow theory. But there has been there has been criticism of the traffic flow theory work over the delay in applying parts of the flow theory work to practice compared to its theoretical development. Most traffic flow theories focus on the fundamental relationship—or the reasons behind why things happen. These theorists are physicists and mathematicians, therefore the traffic engineers owe them a lot.

According to Chipili (2019), rates for curbside parking—the most sought-after spots—are kept high, particularly near busy roadways; they are somewhat lower on side streets and roads, and they are kept low for off-street parking. If an area's parking occupancy is higher than 85%, it is considered congested and requires a price rise. Similarly, if the occupancy rate on the same block is lower than average (i.e., 85%), it indicates that the space is underutilized and that the rate needs to be lowered.

Parking and retail expansion have a distinct and typically beneficial relationship, according to Rossmore (2023). As early as the 1930s, in fact, off-street parking regulations were

considered a way to stimulate economic growth in key business districts. For instance, Smith discusses in *The Dimensions of Parking* how property values and the economic return on investments made by the public and private sectors are impacted by the availability of parking. Enhancing parking would be the most significant adjustment to boost their business, according to one-third of respondents to a poll of central business area shops performed by the Philadelphia Center City area and the Federal Reserve Bank of Philadelphia in an earlier research. This opinion was expressed during the peer-to-peer exchange session on on-street parking on June 12, 2002, despite the fact that the majority of studies on the connection between parking and economic development concentrates on off-street parking. According to a parking official, one of the best methods to support businesses in the face of parking and traffic congestion on roadways is through on-street parking.

The realization that cities could not handle an unchecked rise in automobile traffic has led to management goals that, according to Hörcher&Tirachini (2021), have included a consideration of the extent to which parking policies contribute to wider economic, environmental, and social policies. These policies, in turn, support the promotion of more inclusive urban design, lower emissions, higher densities, and more efficient use of the transportation network. Policies that are poorly thought out can have the opposite effect.

III. METHODOLOGY

Apapa, Lagos, in Nigeria's Rivers Province, is the study area. Apapa, one of the nation's administrative local government areas, is situated across the harbor from the city and west of Lagos Island. Tin Can Island, Apapa, and Lagos are the three main parts of Lagos Port. The study's sample size consists of 240 participants, including port users, employees, and security personnel at the

Apapa port. A random technique was used to administer the questionnaire within the strata that include port users, employees, and security personnel of Apapa Port in Lagos, Nigeria. A stratified technique was used to divide the heterogeneous population into homogeneous strata.

IV. RESULTS AND DISCUSSIONS

The sampled respondents' demographic details are displayed in Table 1. It was found that 42.4 percent of the sample size consisted of female respondents, with men making up the majority of respondents (57.6 percent). Similar to the age pattern in the survey, the bulk of the sample size from the study region belongs to the group of people between the ages of 35 and 40, which accounts for 34% of the total sample size. The group of people over 60 years old comprises 22.7% of the respondents. Similarly, the age range of 25 to 30 years accounted for 18% of the sample size, while the age range of 15 to 20 years accounted for 8% of the responder population. This suggests that the majority of the sample were older and within the reproductive age range. Additionally, the pattern clarified that the majority of study area respondents 68% of the sample size were married. Single respondents made up 22.7 percent of the sample, while the remaining 9.3% of respondents fell into the category of divorce and widow. The majority of respondents (62 percent of the sample size) to the poll had post-secondary education, followed by primary education (8 percent of the sample) and tertiary education (30 percent of the sample). This indicates that a higher percentage of respondents in the research area were literate. The distribution table below shows that, of the respondents in the study area, the majority was civil servants, accounting for 40.7 percent of the sample size; business men and women made up 26.7 percent; students accounted for 3.33 percent; and the remaining 17.9 percent were made up of members of the military, those in the private sector, and others.

Table1.1: Respondents Demographic Characteristics.

S/N	Variables	Frequency	Percentage
1	SEX		
	Male	86	57.4
	Female	64	42.6

2	AGE15-20		
	25-30	12	8.0
	35-40	27	18
	45-60	51	34
	Above60	26	17.3
		34	22.7
3	MARITALSTATUS		
	Married	102	68
	SingleOthers	34	22.7
		14	9.3
4	EDUCATION		
	Primary	12	8
	SecondaryTertiary	45	30
		93	62
5	OCCUPATION		
	CivilservantsBusiness	70	46.7
	Students	48	32
	Others	5	3.33
		27	17.9

Source: Author Fieldwork, (2024).

Parking Management System

Providing real-time vehicle parking information such as vehicle counts, available slots display, reserved parking, pay-and-park alternatives, and soon, parking management systems optimize available space and streamline processes. The responses elucidated the various aspects of the parking management system that impact the unhindered flow of traffic, contingent on the evaluation of the system. Based on the study area's results, the majority of respondents, who made up 45.3% of the sample size, considered enforcement. Option as the best method of using military soldiers to manage parking of heavy vehicles at Apapa port. For example, in the Tin-Can port instance, the government employed

Nigerian Navy officers to enforce right-parking. The next payment option, which makes up 19.3% of the sample, requires the owner of the car to pay for the number of hours the vehicle is parked. This will discourage long parking at a site, which will have an adverse effect on the free flow of traffic at the port. The other 18.7% of the sample size from the study area focused on access control by designating specific groups of people to monitor parking both inside and outside the port in order to have complete control over traffic flow. In a similar vein, reporting illegal parking to the security is another method of controlling the parking system. As a result, the port's everyday operations will be improved and productivity will rise.

Table1.2: Distribution of Parking Management System

Frequency	Percent	Valid Percent	Cumulative Percent
Enforcement 68	45.0	45.3	45.3
Access Control 25	16.6	16.7	36.0
Reporting 28	18.5	18.7	54.7
Payment Method 29	19.2	19.3	100
Total 150	99.3	100	

Source: Author Fieldwork, (2024).

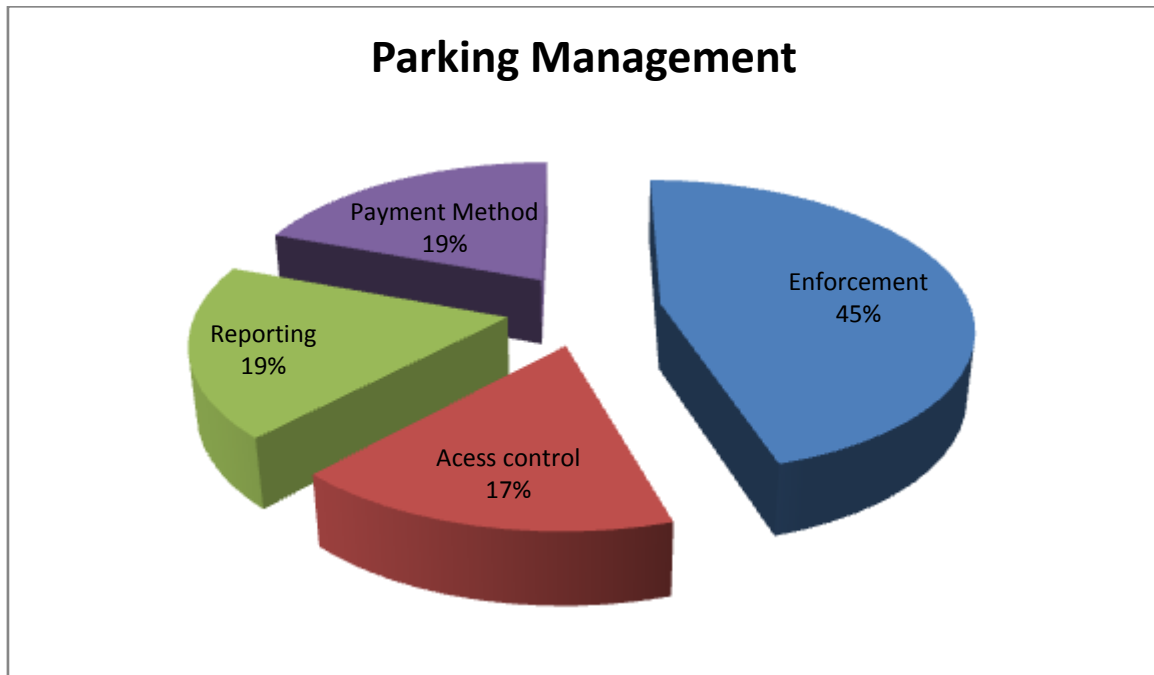


Fig1.1: Chart representing Parking management.

Source: Author Fieldwork, (2024).

Connection between Parking Demand and Freight Vehicles

A few variables in the link between freight vehicles and parking demand at Apapa port were estimated in this study. The summary of the regression indicates that there is a positive correlation between the amount of parking demanded and all the independent variables, including loading bay, parking garage, on-street parking, and parking time. At $p < 0.05$, the F-ratio is statistically significant at 58.831. The results indicate that the availability of parking spaces at Papa Port affected the demand for freight vehicle parking; these were the elements on which the independent variable depended. The combined

effect of the independent variables on the dependent variable, parking garage, on-street parking, and loading bay, with beta values of 0.535, 0.579, and 0.169, respectively, are significant at $p < 0.05$, while the parking period is not significant at $p < 0.05$, having a value of 0.176. The multiple correlation coefficient R has a value of 0.787, while the R^2 is 0.619. According to the report, productivity at Apapa Port and the availability of parking systems affect the demand for freight vehicle parking. The port's productivity is enhanced and operating expenses are decreased by parking garage, parking duration, and on-street parking.

Table1.3: Model Summary of Connection between Freight Vehicle and Parking Demand

Model	R	R Square	Adjusted R Square	Std.Error of The Estimate
1	.787 ^a	.619	.608	.89405

Source: Author Fieldwork, (2024).

Table 1.4: ANOVA of Connection between Freight Vehicle and Parking Demand

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	188.099	4	47.025	58.831	.000 ^b
	Residual	115.901	145	.799		
	Total	304.000	149			

Source: Author Fieldwork, (2024).

Table 1.5: Coefficients of connection between freight vehicle and parking demand

Unstandardized Coefficients		Standardized Coefficients		t	Sig.	
Model	B	Std. Error	Beta			
1	(Constant)	.454	.190		2.388	.018
	parking influence on Flow	.661	.153	.535	4.309	.000
	Parking influence on parking Demand	.213	.156	.188	1.360	.176
	Loading bay	.747	.199	.579	3.763	.000
	On-street parking	.189	.094	.169	2.004	.047

Source: Author Fieldwork, (2024).

V. SUMMARY, CONCLUSION AND RECOMMENDATION

The act of stopping, getting out of a car, and leaving it unattended is the concept of parking. Parking is a persistent issue in many Nigerian urban centers. The lack of contemporary parking management systems, along with other issues like poor traffic management signage and the government's refusal to provide off-street parking spaces, make it difficult for people to move freely and drive in various parts of Lagos. The survey found that the majority of respondents 57.6% of the sample size was men and that the bulk of them fell into the category of people between the ages of 35 and 40, which accounted for 34% of the sample size overall. Additionally, the results indicate that the majority of study area respondents thought that the best way to regulate freight vehicle parking at Apapa port was through enforcement. The study also showed that another factor in evaluating parking management is the payment mechanism, which accounts for 19.3% of the sample size and requires the car owner to pay for the amount of hours the vehicle is parked. This study recommended that the Nigerian Port Authority create a suitable policy or framework to manage the parking system in order to have a free movement of freight vehicles in order to have an efficient system for parking freight vehicles. Additionally, these freight vehicle operators should be encouraged to decrease the number of parking periods by payment and enforcement methods.

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