DETERMINING THE IMPACT OF HINTERLAND DISTANCE ON SHIPPERS' BUSINESS PERFORMANCE IN LAGOS AND OGUN STATES, NIGERIA.

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Abstract

The more we understand the sphere of influence of a port, the better the decision on business location; especially in the hinterland. This study therefore examines the impact of hinterland distance relative to seaport on shippers' business performance in Lagos and Ogun states, Nigeria. Data were collected through questionnaire survey of 23 publicly quoted manufacturing companies whose containers are regularly shipped through Lagos Seaports. The 23 companies were purposively selected from import-dependent manufacturing sub-sectors namely; Consumer Goods, Industrial Goods and Healthcare Business. Panel Vector Error Correction Model estimations were conducted on a panel data that span for 10years duration. Study results show that there is an overall significant relationship between hinterland distance relative to Lagos seaports and shippers' business performance. In the short run, it was found that hinterland distance relative to Lagos seaport has positive and significant impact on turnover and cost of sales. On the long run relationship, hinterland distance relative to Lagos seaports are likely to negatively and significant impact on business performance of the sampled firms. The study demonstrates that hinterland distance works as an indicator to determine the sphere of influence of a seaport on its hinterland.

Key words: Hinterland distance, transport cost, shippers, business performance.

1.0 Introduction

The hinterland is an area around or beyond a major port, which is connected to the port by freight transport corridors from where it largely draws its customers. The ports' hinterland serves as the base (geographical entity) where general economic activities occur. Inland movement of goods to and from the seaport in the context of maritime transport is often called hinterland transport (Toluwase, 2005). It is defined relative to the seaport. Studies have contended that hinterland transport is the most costly aspect of international container transportation (Beresford et al. (2012) and Behdani, (2020).

The seaports' immediate environs, -(main hinterlands) are often affected by different logistics challenges such as road congestions and traffic gridlock due to large volume of cargo moving in and out of the seaports to various hinterland destinations (Noteboom, 2008). In Nigeria, the related challenges include ageing hinterland transport infrastructure, overdependence on the road mode of transport, ineffective rail transport and the absence of inland water transport that connects seaports with their hinterlands (Financial Times, 2020; Stephen and Ukepere, 2011).

As trend in growth of container transport is expected to continue both locally and globally (Fan et al 2019), the implication is that the conditions under which cargoes are moved from the seaports to shippers' business locations within the hinterland are likely to be worsened. In fact, a local report revealed that the cost of moving containers from Apapa and Tin Can Ports to destinations within the country increased in recent years by 400 percent for the first time in four decades since the 1970s, (Nigerian Logistics Sector Reports, 2017). The implication of this situation on businesses presupposes the need to have a clear understanding of how hinterland scope or influence will help in determining the 'optimal or appropriate' location of businesses relative to the seaport. In most of previous researches on port-hinterland interaction, the scope of hinterland of a seaport was not delimited (De Lange and Chouly; 2004; Stephen and Ukepere, 2011; Kotut and Mugambi 2012; Alamoush, 2016; and Khaslavskaya and Rosso, 2019); There is, therefore, a need for more hinterland scope specific case studies, due to the unique characteristics of each segment of hinterland. Distance as element to measure transport cost is a variable frequently used to study the scope of hinterland of a seaport (Tongzon, 2009; Ticiana, 2019), but has not been

studied in relation to the effect of hinterland distance relative to Lagos Seaports on shippers business performance in Nigeria. Thus, this study analyzed the effects of hinterland distance (based on transport cost) relative to Lagos seaports on shippers' business in Lagos and Ogun states, Nigeria.

2.0 Literature Review

2.1 The Hinterland of a Seaport

According to Toluwase (2005), Inland movement of goods to and from the seaport in the context of maritime transport is often called hinterland transport. In other word, the hinterland is defined relative to the seaport. Hence, hinterland transport occurs both before the commodities reach the export port and after the goods have reached the foreign port. Hinterland transport occurs on various modes of transport the most important being: road, rail and water. Hinterland transport by road is carried out by trucks etc. Hinterland transport on water is carried out on inland waterways by barges and lighters, or as coastal traffic by local ships services (Toluwase, 2005).

Based on Notteboom, (2008) definition, the hinterland is the area over which a port draws the majority of its business based on types of commodities, the time and transport mode. Rodrigue and Notteboom, (2010) defined hinterland as the area of which the greater part of the trade passes through the port. They explained that hinterland, as part of the port system is defined by a group of locations connected to the port through related goods flows and usually, the connections are involving various modes of transportation such as road, rail and barge.

In their account on the hinterland of a seaport, Rodrigue and Notteboom, (2010) argued that the seaport is a part of a larger system comprising of foreland, seaport itself and hinterland which generally represent its function on seaborne leg and inland leg activities. While the seaport serves as the main gateway to facilitate goods or cargo transfer activities (which include among others; loading, discharging and stacking; transit area through which goods and people move from and to the sea; places of contact between land and maritime spaces; a node where ocean and inland transport lines meet and intertwine and an intermodal place of convergence); the seaports' hinterland serves as the base (geographical entity) where general economic activities occur. Hence, the seaport serves as a critical national infrastructure and logistics asset which attract many production centers to it to support and facilitate the flows of goods and general economic development. In fact, the

geographical connection between seaports and their hinterland provides potential benefits to the surrounding environments.

Muller et al. (2020) defined the hinterland as an area around or beyond a major port, from which it draws its customers, connected to the port by freight transport corridors. The hinterland consists of the port, the transportation infrastructure (rail, truck and inland waterways), inland ports directly connected to the port and the final customers' locations. Parts of a port's hinterland are shaped by the structure of transportation networks. It has been investigated and reported that hinterland transport represents between 60 percent of the costs of the global maritime supply chain (Beresford et al. 2012, and Behdani, 2020).

2.1.2 Shippers Business Performance

Holzer and Peci, (2009), defined business performance as the measurement of business actual results against it predetermined goals. The predetermined goals focus mainly on such terms as profitability, liquidity growth, turnover growth and stock market. Business performance is about identifying and measuring the inputs and outcomes of processes so that the organization will know how well is doing. Meanwhile, studies have investigated and reported that transportation of materials have influence on firm performance. Emeghara, (1998) argued that an efficient transport system put in place for the marketing of a product is a key factor to successful sales. Ogwu and Agu, (2016) noted that efficient transportation systems provide various opportunities in terms of economic and social opportunities and benefits. Where transport of goods, (including the seaport-hinterland network) is efficient, certain opportunities such as faster accessibility to markets, incentives for additional investments, reduced cost of business operation and on-time delivery of product are made available.

Uzonwanne et al (2020) examined the impact of transportation cost on the prices of consumable commodities in Anambra state. The result shows that high transportation cost which is linked to bad roads, high price of motor spare parts and high fuel prices contributes to the continuous rise in prices of consumable commodities in Anambra state of Nigeria. Tuong et al, (2019) estimated the impact of road infrastructure on firm performance through empirical research in Cuu Long delta area, Vietnam using firm revenue as proxy for performance of enterprises. The study showed a positive relationship between road infrastructure and firm performance. Thus, it is clear from

literature that business performance can be determined through profitability, liquidity growth, turnover growth and stock market, revenue and sales.

3.0 Study Area and Methodology

3.1 Theoretical Framework and Model Specification

This study hinges on an economic theory of production, which explains the principles by which an enterprise or a business firm decides how much of its products it will produce with its factors of production such as labour, raw material, fixed capital good, and so on that it employs. The theory is premised on principles that relate to the relationship between the prices of commodities and the prices of the productive factors used to produce them as well as the relationships between the prices of commodities and productive factors, on the one hand, and the quantities of these commodities and productive factors that are produced or used, on the other.

The shipper, who is a manufacturer of goods in this context, employs resources or factors of production. Hinterland transport costs are factor inputs in the production function of their businesses. These costs are considered in conjunction with other inputs to produce shippers' goods as the case may be. Presenting hinterland transport costs as input of production, by the theory of production, depicts the relationship between hinterland transport and shippers business performance.

Following the theoretical framework, the hypothetical link between hinterland location and shippers' business performance is functionally stated as:

$$sbp_{i,t} = f(dfp_{i,t})$$

(1)

In an econometric form, the empirical model of this research study is stated as:

$$sbp_{i,t} = \pi_0 + \pi_{1dfp_{i,t}} + \mu_{i,t}$$

(2)

Where: *sbp* is a vector of shippers' business performance indices which are turnover (*tover*), cost of sales (*csales*) and profit (*profit*); dfp denotes distance from port measuring hinterland location; π_0, π_1 are parameters; *i* represents firms; *t* denotes time; and μ is error term. The aim of the empirical equation is to estimates the parameters which represent the long run elasticity of distance from port.

3.2 Data and Variable Description

Out of 30 companies purposively selected from list of quoted manufacturers on Nigerian Stock Exchange (NSE) (2020), 23

companies filled the questionnaires and constituted the publicly quoted companies selected and which regularly import containers through Lagos Seaports. This number represents 77 percent of the population. It is also noteworthy that for a company to be selected, it must have a minimum of 20 Customs declarations in a year. These companies are located at Ilupeju, Agbara, Ewekoro, Ikeja, Ikorodu, Isolo, Oregun Ota and Shagamu (which are industrial estates in Lagos and Ogun States.

The questionnaire was divided into three sections (A, B, C,). Section A was used to collect demographic information such as educational qualifications, years of work experience, area of work, factory location and distance from Lagos ports. Section B was designed to collect data on container transportation from Lagos Seaports which comprise of Apapa and Tin Can Ports and companies' import history. Such data included the; total cost of transportation from seaports to premises of the company etc. Section C collected information on the total number of container imported per year. In addition to primary data, time series data were gathered from secondary sources which span a period of ten years.

3.3 Estimation Techniques

First, the study tests for the integration order of the series i.e., distance from port, turnover, cost of sales, and profit using the panel unit root tests, (Levin, Lin and Chin 2002) and Breitung (2001) techniques. The reason for employing the estimators is to ensure assessment and validation of result with the aim of ensuring consistency. Afterwards, the cointegation test using the Kao cointegration test by Kao (1999) was employed to determine if there exists a long run relationship among the variables. To sum up, the causal relations of hinterland location and shippers' business performance was estimated using the panel Vector Error Correction (VECM) estimator. The panel VECM of the empirical model specified in equation (2) is presented as:

$$\Delta sbp_{i,t} = \alpha_{1_j} + \sum_{j=1}^{m} \beta_{11,i_j} \Delta sbp_{i,t-_j} + \sum_{k=1}^{m} \beta_{12,ik} \Delta dfp_{i,t-_k} + \emptyset_{1i} ECT_{i,_{t-1}} + \mu_{11,t} \quad (3)$$

$$\Delta dfp_{i,t} = \alpha_{2_j} + \sum_{j=1}^{m} \beta_{21,i_j} \Delta sbp_{i,t-_j} + \sum_{k=1}^{m} \beta_{22,i_k} \Delta dfp_{i,t-k} + \emptyset_{2_i} \; ECT_{i,t-1} + \mu_{21,t} \quad (4)$$

The variables remained as earlier discussed. Thus, Δ represents the first differences; k, j are the determined optimal lag length; $\beta's$ are the short run parameters; $\phi's$ are the coefficients of the error correction terms; and $\mu's$ are the disturbance terms.

4.0 Results and Discussions

This section provides the estimation findings of the effects of hinterland distance relative to the Lagos seaports on shippers' business performance in Lagos and Ogun states, Nigeria. The study reported the results of pre-estimation tests, using descriptive statistics, correlation analysis, cross-sectional dependence, unit root test and co-integration test accordingly before reporting the estimation findings of short run and long run estimates.

4.1 Descriptive Statistics

The indicators of hinterland distance relative to Lagos seaport and shippers' business performance are discussed here. Table 1 shows their respective average, maximum, minimum, standard deviation, Kurtosis and skewness values obtained from our survey. The average value of hinterland distance relative to Lagos seaport stands at 85.846km whereas the maximum and minimum kilometers were 140 and 50 respectively. The maximum and minimum values show that there is large variation between the series of hinterland distance relative to Lagos seaports which is further indicated in standard deviation value. The data is not normally distributed owing to the fact that the Kurtosis value is less than 3, which thereby implies platykurtic. Likewise, the series is positively skewed as its skewness value stand at 0.7518.

	Variable Signs and Description			
	Distance from Port (KM) (dfp)	Turnover (tover)	Cost of sales (csales)	Profit (profit)
Mean	85.846	62359843188	41821513216	20431789321
Standard Deviation	32.359	70248911210	46656350909	25497368514
Minimum	50	1460728000	604670000	684666000
Maximum	140	2.840E+11	2.004E+11	1.275E+11
Kurtosis	-0.7799	1.748524	1.794938	3.859194
Skewness	0.7518	1.5408	1.499562	1.962812
Count	130	230	230	230

Table 1: Descriptive statistics
Source: Author's computation (2022).

Concerning the shippers' business performance indicators, the averages of turnover, cost of sales and profit are ₦62,359,843,188, ₦46,656,350,909 and ₦25,497,368,514 respectively. The average profit of the sampled firms over the periods understudied shows that there is improved performance in the business activities of the manufacturing industry. Also, the high variability in the series was revealed in their respective standard deviation. From Table 1, the summary statistics equally showed the skewness and Kurtosis position of the series.

4.2 Relationship between Hinterland Distance relative to Lagos Seaport and Shippers' Business Performance Indicators

In Table 2, it shows the partial correlation coefficients of the relationship between hinterland distance relative to Lagos seaport and shippers' business performance indicators.

Table 2: Correlation Matrix

	Dfp	Tover	Csales	Profit
Distance from Port (KM) (dfp)	1			
Turnover (tover)	0.55755	1		
Cost of sales (csales)	0.58251	0.88596	1	
Profit (profit)	0.45770	0.85359	0.79045	1

Source: Author's computation (2022).

The correlation coefficients of hinterland distance relative to Lagos seaport and shippers' business performance indicators are positive values. The findings revealed that there exists a direct level of association between hinterland distance relative to Lagos seaport and shippers' business performance variables (turnover cost of sales and profit). Correspondingly, the correlation coefficients of hinterland distance relative to Lagos seaport with turnover, cost of sales and profit are 0.5576, 0.5825, and 0.4577. Regarding the indicators of shippers' business performance, there is a strong positive level of association among turnover, cost of sales and profit. Even as the positive correlation coefficients of shippers' business performance indicators are strong, the chances of running into multicollinearity are avoided as the variables are not run in the same equation. As a result, the problem of multicollinearity is avoided in the empirical analysis. Thus, the results of the correlation coefficients are just preliminary analyses that

are being put through confirmation in section 4.5 after considering the determinants of hinterland distance relative to Lagos seaports together.

Table 3: Cross-Sectional Dependence Test Results (d.f. = 130)

	Statistics	Probability
Model 1: profit dfp		
Breusch-Pagan LM	314.7730	0.0000
Pesaran scaled LM	18.95702	0.0000
Pesaran CD	15.76685	0.0000
Model 2: tover dfp		
Breusch-Pagan LM	361.8691	0.0000
Pesaran scaled LM	22.72772	0.0000
Pesaran CD	15.41851	0.0000
Model 3: csales dfp		
Breusch-Pagan LM	383.5708	0.0000
Pesaran scaled LM	24.46525	0.0000
Pesaran CD	13.61493	0.0000

Source: Author's computation (2022).

4.4 Cross-Sectional Dependence, Stationery and Co-integration Tests

In this sub-section, the research study presents the results of cross-sectional dependence test; (Table 3). The test statistics were performed for the companies' annual reports from 23 manufacturing firms (consumer goods, health care, and industrial goods) for a period of ten years (2010-2019). The Breusch-Pagan LM test results of hinterland distance relative to Lagos seaport and the respective shippers' business performance (turnover, cost of sales and profit) were reported in Table 3. The findings from the Breusch-Pagan LM test confirm the rejection of null hypothesis (that states that hinterland distance relative to the seaport has no significant effect on shippers' business performance) of no correlation at some points. The Pesaran scaled LM test results are asymptotically standard normal and the statistical values strongly reject the null hypotheses at 5% significance level. As for the test statistic values of standard normal Pesaran CD test, their statistical values are significantly below the values of LM tests and they still reject the null hypotheses at 5% level of significance.

Table 4: Panel Unit Root Test Results

Variables	Levels		1st Difference		Decision
	LLC	Breit	LLC	Breit	
Distance from Port (dfp)	-14.354***	-2.1890**	-	-	I(0)
Turnover (tover)	-1.9671**	1.4176	-	-3.6335***	I(1)
Cost of sales (csales)	-2.5050***	1.4406	-	-1.9767**	I(1)
Profit (profit)	-4.6104***	2.8721	-	-2.0324**	I(1)

Note: LLC denotes Levin, Lin & Chin (2002); Breit represents Breitung (2001); ***, ** & * denote 1%, 5% & 10% significance levels.
Source: Author's computation (2022).

Additionally, the study reports the results of the panel unit root and cointegration tests which are reported in Tables 4 and 5 respectively. The unit root test results of Levin, Lin and Chin (2002) and Breitung (2001) techniques are presented in Table 4. With respect to the Levin, Lin and Chin unit root test, it confirms that the null hypotheses of unit root presence for hinterland distance relative to seaport, turnover, cost of sales and profit were not accepted at 5% significance level. Based on the unit root estimation approach, the series of hinterland distance from seaport, turnover, cost of sales and profit are stationary at levels [I(0)]. Afterwards, the use of Breitung approach only found that the series of hinterland distance relative to seaport to be stationary at levels while others are not. Therefore, the series were differenced and the null hypotheses of unit root of the variables were rejected at the conventional level. Using Breitung methods, It therefore implies that the series of turnover, cost of sales and profit are stationary at first difference [I(1)]. Based on the unit root test results of Levin, Lin and Chin (2002) and Breitung (2001), the study concludes that the series of hinterland distance relative to seaport is stationary at levels while the series of turnover, cost of sales and profit are stationary at first difference.

Table 5: KAO Residual Test for Cointegration

	t-Statistics	Probability
Model 1: profit dfp		
ADF	-3.48294	0.0003
Residual variance	0.082934	
HAC variance	0.072840	
Model 2: tover dfp		
ADF	-3.247923	0.0004
Residual variance	0.054920	
HAC variance	0.049637	
Model 3: csales dfp		
ADF	-3.692773	0.0001
Residual variance	0.095282	
HAC variance	0.090193	

Source: Author's computation (2022).

In Table 5, we report the KAO Residual test results for cointegration (following Kao, 1999). Based on the conventional probability test criteria, the table reveals a rejection of the null hypotheses of no cointegration for the models at 5% level of significance. The implication is that there exist a long-run relationship among the regressand and regressors across all the estimated models in the study. It therefore confirms that the presence of co-integration or a long-run relationship between hinterland distance relative to Lagos seaports and shippers business performance indicators (turnover, cost of sales and profit) of manufacturing firms in Lagos and Ogun state, Nigeria. Thus, there exists a long run relationship between hinterland distance relative to Lagos seaports and shippers' business performance in Lagos and Ogun state, Nigeria.

4.5 Effects of Distance on Business Performance

The empirical result of both the short run and long run effects of hinterland distance relative to Lagos seaport on shippers' business performance in Lagos and Ogun state, are presented using the error correction model (ECM) estimation approach. Concerning the selection of optimal lag lengths; the lag lengths of the variables were selected using the Akaike Information Criterion (AIC) after setting it at three in order to ensure sufficient degree of freedom. Tables 6 and 7 present the result of short-run and long-run parameter estimates respectively. In Table 6, the coefficients of error correction term are found to be negative and statistically significant at the conventional level. In specific term, the coefficients of the error correction terms are

negative and the probability values of their t-statistic are less than 1%. It implies that the empirical models of shippers' business performance in terms of turnover, cost of sales and profit correct its short-run disequilibrium by at 12.68%, 38.25% and 56.49% speed of adjustment in order to return to the long run equilibrium. This further confirms that there exists a long-run relationship between hinterland distance relative to Lagos seaport and shippers' business performance in Lagos and Ogun state, Nigeria. Thus, it confirmed that the models' equilibrium nature is valid in the long run.

Table 6: Short-Run Estimates

	Dependent Variables		
Variables	Δ(log(turnover))	Δ(log(cost of sales))	Δ(log(profit))
Δ(log(Distance from Port))	34.814***	58.266***	2.6394
	(15.354)	(15.601)	(18.098)
Error Correction Term(-1)	-0.1268***	-0.3825***	-0.5649***
	(0.0446)	(0.0529)	(0.0658)
Constant	-0.9509***	-1.5159***	-0.1102
	(0.3884)	(0.3944)	(0.4581)
Adjusted R-squared	0.1922	0.2327	0.2555
F-Statistics	1.8720	3.6032	3.9462
Prob(F-Stat)	(0.0113)	(0.0000)	(0.0000)

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10.
Source: Author's computation (2022).

As regards the short-run coefficients reported (see Table 6), the result shows that hinterland distance relative to Lagos seaport has positive impact on turnover, cost of sales and profit. The impact of hinterland distance relative to Lagos seaport significantly impacted on turnover and cost of sales at 5% level. In magnitude, the results show that with 1% changes in hinterland distance relative to Lagos seaport, the growth rate in turnover, cost of sales and profit changes by 34.81%, 58.27% and 2.64% respectively. Based on the significance of the parameter estimates, hinterland distance relative to Lagos seaport has significant effect on shippers' turnover and cost of sales in the short run.

Table 7: Long-Run Estimates

Variables	Dependent Variables		
	log(turnover)	log(cost of sales)	log(profit)
log(Distance from Port)	-10.480***	-8.9819***	-11.005***
	(0.7728)	(1.1105)	(0.8491)
Constant	21.141***	21.090***	19.903***
	(0.2166)	(0.3112)	(0.2380)
Adjusted R-squared	0.7830	0.7804	0.7709
F-Statistics	579.61	497.68	333.39
Prob(F-Stat)	(0.0000)	(0.0000)	(0.0000)

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10.
Source: Author's computation (2022).

Table 7 shows that the long-run relationship between hinterland distance relative to Lagos seaport and shippers' business performance of 23 manufacturing firms in Lagos and Ogun states, Nigeria for the periods of 2010-2019. The study found that total hinterland distance relative to Lagos seaport negatively and significant impacted on business performance of the sampled firms. In magnitude terms, a 1% increase in hinterland distance relative to Lagos seaport will lead to a decline in the growth rate of turnover, cost of sales and profit by 10.48%, 8.98% and 11.01%. The results show that hinterland distance relative to Lagos seaport affects the profit of the sampled manufacturing firms more, compared to, turnover and cost of sales respectively in the long run. Also, the adjusted R-squared shows that hinterland distance relative to Lagos seaport explains about 78.3%, 78.04% and 77.09% total variations in turnover, cost of sales and profit correspondingly. Furthermore, the F-statistics show that there is overall significance relationship between hinterland distance relative to Lagos seaport and shippers' business performance.

4.6 Discussion

This paper investigates impact of hinterland distance relative to Lagos Seaports on Shippers' business performance. The results of the Panel Vector Error Correction Model estimation show that hinterland distance relative to Lagos seaport has significant effect on shippers' turnover and cost of sales in the short run. Furthermore, it was confirmed that hinterland distance relative to

Lagos seaport negatively and significant impacted on business performance of the sampled firms on the long run. The results show on the long run that hinterland distance relative to Lagos seaport explains about 78.3%, 78.04% and 77.09% total variations in turnover, cost of sales and profit correspondingly.

The results of the study are in agreement with some past researches. Among these is the study of (Ticiana, 2019) which showed that it is possible to determine the scope of influence of a port in the hinterland based on distance from port's location. Similarly, the results agree with the study of Wang et al (2017) who pointed out that the flow of cargo from a large port to its hinterland increase with distance below a certain threshold, until the threshold is exceeded. Whereas in past researches, hinterland of a seaport was not delimited; in the current study however, hinterland distance relative to the seaport was delimited to ports' immediate environs (average of 85km from seaport's location). These areas are often affected by different logistics challenges such as road congestions and traffic gridlock due to large volume of cargo moving in and out of the seaports to various hinterland destinations (Noteboom, 2008). Thus, this study has contributed to literature by investigating the effects of hinterland distance relative to Lagos Seaports on Shippers' business performance with reference to Lagos Seaports' main hinterland.

5.0 Recommendations and Conclusion

The study demonstrates that hinterland distance works as an indicator to delimit the scope of influence of a port in the hinterland. It provides the basis for effective hinterland planning. Thus, port managers, policy makers and shippers are advised to consider hinterland distance on decisions concerning port-hinterland management.

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