11-3-2019

Port selection criteria from logistics service providers' perspective: a case study of West Africa

Blessing Abimbola Simeon

WORLD MARITIME UNIVERSITY

Malmö, Sweden

PORT SELECTION CRITERIA FROM LOGISTICS SERVICE PROVIDERS' PERSPECTIVE: A CASE STUDY OF WEST AFRICA

By

BLESSING ABIMBOLA SIMEON

Nigeria

A dissertation submitted to the World Maritime University in partial fulfilment of the requirement for the award of the degree of

MASTER OF SCIENCE

In

MARITIME AFFAIRS

(SHIPPING MANAGEMENT & LOGISTICS)

2019

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): ……..

(Date): ……

Supervised by: **Professor Dong-Wook Song**

Supervisor's affiliation **SML**

Acknowledgements

To the Giver of all good and perfect gift I return all thanks.

My sincere gratitude goes to my Uncle and Mentor, Mr Oluseyi Osho for the invaluable moral support and motivation he gave me throughout the duration of my studies at the World Maritime University.

I extend my special appreciation to Professor Dong Song for the supervision and guidance he provided through insightful comments and suggestions.

I am deeply indebted to my parents and siblings for their moral support while being away from home.

ABSTRACT

Title of Dissertation: **Port Selection Criteria from Logistics Service Providers' Perspectives: A Case Study of West Africa**

Degree: **Master of Science**

Ports are economic gateways that play pivotal roles in international trade. Recent trends in global seaborne have changed the roles of ports and their manner of operations. The implications are evidenced by numerous investments and restructuring projects geared towards improving infrastructure , overall quality of its performance in order to meet its users' expectation.

This research investigates the expectations of Logistics service providers through the identification of criteria they consider in choosing a port for shipments. To this end, a survey-questionnaire containing multiple port selection criteria was developed and sent to Logistics service providers in West Africa. Through factor analysis, the results obtained were statistically explained by a lesser number of factors Based on the empirical findings and discussion, some recommendations were made which could be considered by port authorities in West Africa in order to improve their performance.

KEYWORDS: Port choice, Logistics service providers, Factor Analysis, West Africa.

Table of Contents

DECLARATION ..... **ii**

Acknowledgements ..... **iii**

ABSTRACT ..... **iv**

Table of Contents ..... **v**

Table of Figures ..... **viii**

List of Tables ..... **ix**

List of Abbreviations ..... **x**

CHAPTER 1. INTRODUCTION **1**

1.1 Background **2**

1.2 Problem Statement **3**

1.3 Objective of the Study **4**

1.4 Dissertation structure **4**

Chapter 2. REVIEW OF CONTAINER PORTS IN WEST AFRICA **6**

2.1 The Evolution of Maritime Transport Infrastructures in West Africa **6**

2.2 Containerized Trade in West African Ports **10**

2.3 Major Container Ports in West Africa **12**

2.3.1 Port of Tema, Ghana 12

2.3.2 Port of Abidjan, Ivory Coast. 13

2.3.3 Port of Lagos, Nigeria 15

2.3.4 Port of Dakar, Senegal 17

CHAPTER 3. LITERATURE REVIEW ON PORT SELECTION CRITERIA **19**

3.1 Port Choice **19**

3.2 Port Users **19**

3.3 Decision Makers on Port Choice **19**

3.3.1 Shippers' Perspective 21

3.3.2 Shipping Lines' Perspective 23

3.3.3 Logistics Service Providers' Perspective 24

CHAPTER 4. RESEARCH METHODOLOGY 28

4.1 Survey Questionnaire Design 28

4.2Factor Analysis 29

4.3 Exploratory Factor Analysis 30

4.3.1 Preliminary Requirements 31

4.3.2 Correlation Matrix 32

4.3.3 Factor Extraction 33

4.3.4 Factor Retention 34

4.3.5 Factor Rotation 36

Chapter 5. EMPIRICAL ANALYSIS 37

5.1 Data Collection 37

5.2 Factor Analysis Result Presentation 38

5.2.1 Data Validation Tests 38

5.2.2 Factors Extracted 40

5.2.3 Factors Retained 41

5.2.4 Factor Rotation 45

5.3 Discussions on Factor 1 and 3. 47

5.4. Factor1: Quality of Intangible Port Services 47

5.4.1. Reliability of port services and risks of delays. 48

5.4.2 Convenience of Custom Processes. 48

5.4.3 Information Services in Port 49

5.4.4 Prompt Response to User's Needs and Complaints 49

5.5 Factor 3 -Geographical Advantage 50

5.5.1 Proximity of Port to Cargo Destination 50

5.5.2 Hinterland and Intermodal Connectivity to Port 50

5.5.3 Road Transportation 51

5.5.4 Rail Transportation 51

5.5.5 Inland Waterways Transport 52

5.6 Implications 52

5.6.1 Recommendations 52

CHAPTER 6. SUMMARY 54

6.1 Summary 54

6.2 Limitations **54**

References **56**

Appendix 1 ..... **62**

Appendix 2 ..... **65**

Appendix 2a **66**

Table of Figures

Figure 2. 1 Evolution of Seaports in West Africa..... 8
Figure2. 2: West African container terminals..... 10
Figure2. 3. Growth of containerized trade in West Africa 11
Figure 2.3 1: Overview of Tema container terminal ……12
Figure 2.3 2: Container traffic in TEU at port of Tema (2008-2017)..... 13
Figure 2.3 3. Container traffic growth in port Abidjan..... 15
Figure 2.3 4: Container traffic of Lagos Apapa container port 2007 - 2017 17
Figure 2.3 5: Container traffic in port of Dakar..... 18
Figure 4. 1: General procedures for EFA…….....31
Figure 4. 2: Scree plot..... 36
Figure 5. 1: Scree plot output ……43

List of Tables

Table 2. 1: Container terminal concessions in West Africa 9
Table 5. 1: Frequency table of respondents' companies…….37
Table 5. 2: Results of KMO and Bartlett's test 38
Table 5. 3: Second output of KMO and Bartlett test 39
Table 5. 4: Initial eigenvalues output..... 40
Table 5. 5: Communalities output..... 42
Table 5. 6: Retained factors output..... 44
Table 5. 7: Rotated factor matrix output..... 45

List of Abbreviations

AfCFTA	African Continental Free Trade Area
ASYCUDA	Automated Systems for Customs Data
BOT	Build Operate Transfer
CADF	China African Development Fund
CFA	Confirmatory Factor Analysis
CMHI	China Merchant Holding International
DP	Dubai Ports World
EFA	Exploratory Factor Analysis
GCNet	Ghana Community Network
GPHA	Ghana Ports and Harbours Authority
IMF	International Monetary Fund
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
LSPs	Logistics Service Providers
LCT	Lome Container Terminal
MLTC	Maritime Logistics & Trade Consulting
MSA	Measure of Sampling Adequacy
PAF	Principal Axis Factoring
PCA	Principal Component Analysis
PwC	PricewatrehouseCoopers
SETV	Societe d'Exploitation du Terminal de Vridi
SPSS	Statistical Package for Social Sciences
SYDNAM	Système de Déodouanement Automatisé des Marchandises
TIL	Terminal Investment Limited
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economy Commission for Africa

CHAPTER 1. INTRODUCTION

Global economy and world trade continue to grow at a steady pace over the past several decades. In 2017, global merchandise trade grew at an impressive annual rate of 10% as compared to 2016 (UNCTAD, 2018) with value of exports and imports amounting to US$19.4 billion and US$19.8 billion respectively (World Trade Organisation, 2018). This growth is attributed to increasing globalization and trade liberalization which has led to a rapid and sustained growth in the emerging economies of Asia and Africa. (Shuo, 2018). Arguably, globalisation, reduced tariffs and increasing efficiency in maritime trade, have contributed to lowered cost of goods and services around the world, thus fuelling global prosperity and increasing consumption. Indisputably, world economy, international trade and maritime transport are correlated.

Similarly, the performance of African economy which has been growing annually by 4.7% since 2000 is heavily dependent on the flow of seaborne trade (Global Maritime Forum, 2019). Recent economic trends shows Africa's dependence on maritime transport which is facilitated by Africa's perpetual import of containerised cargo to meet the demand of its ever increasing population combined with Africa's trade access to large global consumers of natural resources like crude oil, agricultural products, coals and minerals which are the major shipments from Africa. Presently, there is a significant rapid increase in percentage volumes of exports to 16%, doubling imports in 2017 (UNCTAD, 2018). As Asia's economy is gradually approaching maturity, there is a tendency that it may become expensive in production of goods. Thus arguably, the world may turn in the future to Africa as a production centre, just as is the present case with Asia. This will be a double gain for Africa as it must also produce to meet the needs of its ever growing population and possibly for the rest of the world. This justifies that Africa will be a major playing centre or focus of global maritime trade in decades to come.

Another major positive development that has the prospects of boosting Africa's trade flows is the recently signed multilateral trade agreement known as African Continental Free Trade Area (AfCFTA) which has been ratified by twenty-two African countries. The objective of the agreement is to create a single continental market for goods and services, with free movement of business people and investments. Based on UNECA's (2018) report, it is projected that AfCFTA agreement would boost intra-African trade by 52% by 2022 with US$16.1 billion as annual revenue generated. Without doubts, this would positively affect Africa's portion of world seaborne trade and port traffic volumes.

1.1 Background

The role of seaport in international supply chain cannot be undermined. Seaports are economic gateways providing inland access and intermodal connections, which serve as a link between shipped goods and other modes of transportation (Branch, 1986). Onwuegbuchunam (2013), describes seaports as "critical nodal points in international maritime transport network". The growth experienced in seaborne trade has directly impacted on ports as global port activities and cargo handling increased rapidly with significant impacts on ports of developing countries as two thirds of the total of tons of goods transported by sea were handled in these ports.

In view of the trends in global seaborne trade, ports have evolved from providing basic traditional functions of loading and unloading cargoes to offering value added services. Furthermore, the implications have prompted ports to invest in restructuring projects that would help develop their ports' infrastructure and handling capacity with focus on improving their overall performance thus positioning them to attract more cargoes (van Dyck G. K., 2015). Presently in Africa, there are numerous ongoing development projects in ports facilitated by aids from financial institutions and foreign direct investments which are aimed at expanding and modernizing the ports. For example, the World Bank recently gave a grant of US$12 million and US$345 million credit to Dar es Salam port in Tanzania for its port development project. Likewise port

of Tema's (Ghana) investment on green field port is financed through FDI. However, investments and formulation of strategies geared towards enhancing the attractiveness of ports without insights on what influence or attract port users in choosing a port could result in waste of resources (Sanchez and Alonso, 2011). Hence the need to investigate the factors which is the motivation for this study.

1.2 Problem Statement

As previously highlighted, there is a booming wave of investment in port sector in Africa aimed towards fostering the development of African ports. However, despite this African ports still lag significantly behind average international performance and advancement level. For example, using container port dwell time as benchmark for measuring berth productivity, quality of performance of African port in this aspect has degenerated than it was in 1996 (UNCTAD, 2017). This has given rise to inability to cope with growth in cargo traffic and mega trends affecting the ports industry. This is attributed to several factors like crippling congestions, delays, high freight rates, lack of adequate and quality infrastructure, unreliability of port services which are typical of West African ports (African Development Bank, 2010). For port users, all these translate to additional transportation costs which often discourage them from using West African ports. Furthermore, this has often led to diversion of cargoes to ports of neighbouring regions where the bottlenecks are minimal. Also, most of the West African ports remain on the list of most expensive ports with minimal efficiency to possibly justify the costs.

However, in recent years, container traffic continued to increase in main ports in West Africa despite these shortcomings. An increase of 2.2 million TEUs was recorded from 2010 to 2015 (Institute of Shipping Economics and Logistics, 2016). A study on the drive for a regional hub in West Africa by Van Dyck (2015), estimated that container throughputs would be around 11 million TEU by 2022. In addition, there is a promising trend in port demand volume which is projected to grow by approximately 6 to 8 times in 2040 (PwC, 2018). All of these are pointers indicating the potentiality

of the handling capacity of West African ports to grow than it is presently. The challenge is how West African ports would able to harness this potential and cope with current demand and projected future growth.

In addressing this, it is imperative to take a cue from key decision makers in port selection on what appeals them to a port and the criteria they consider in choosing a port as this would provide guide on what needs to be improved in order to better position the ports within the region to capture potential traffic. These factors would be deemed relevant and deserving ports authorities' attention. This study therefore would examine and provide analysis on factors considered by Logistics service providers in port selection.

There is extant literature on port selection criteria but only few have investigated from the perspective of Logistics services provider. The available literature in West Africa on the subject, mainly concentrate on shippers and shipping lines. Although Ugboma et al (2016) in his studies used a small sample of transport intermediaries (Nigerian freight forwarders) whom he broadly categorize as shippers primarily due to the fact that quite a number of Nigerian shippers are represented by freight forwarders. Arguably, the responses of the selected few included in his sample may not have fully represented the perspective of majority of the freight forwarders in West Africa. Hence the need to use a larger sample which would be the focus of this research.

1.3 Objective of the Study

The main purpose of this research is to determine the factors Logistics service providers in West Africa consider in choosing a port of call for shipments.

1.4 Dissertation structure

This thesis is structured into six chapters. Chapter one provides a general introduction, background of the study with a description of the identified problem and objective of the study. Chapter two gives an overview of development of maritime transport in

West Africa with information on the major container ports in West Africa. Chapter three reviews existing literature on port selection criteria. The subject was discussed from the perspectives of three major port users; Shippers, shipping lines and logistics service providers. Chapter four describes the research methodology used to collect and analyse data. Chapter five, present the empirical findings, discussions and implications of study. Chapter six concludes the dissertation by summarizing the study and highlighting the limitations of the study.

Chapter 2. REVIEW OF CONTAINER PORTS IN WEST AFRICA

2.1 The Evolution of Maritime Transport Infrastructures in West Africa

The evolution of transport infrastructure in West Africa is strongly affiliated with European contacts with the West African coast in the fifteenth century which was followed by a long period of colonial dependence. In the early days of trade in West Africa, the trading along the coast involved the importations of manufactured products like cloths, domestic equipment, brass bracelets, corals by the Europeans in exchange for gold, pepper, palm oil, and ivory which were exported from West Africa (Davies, 2000). At that point in time, the quantity of both imports and exports on ocean- going ships plying the West African coastline were small and thus less elaborate port infrastructure were required as the cargoes could be easily handled from ship to shore. Thus ships anchored at sheltered landing places like beach that were protected by forts which served the purpose of warehousing for the imports and exports as most of the trade were done on ships' deck (Hilling, 1969).

Dependence on maritime transport in West Africa increased in the nineteenth century as the Europeans interest in West African commerce deepened. The need for functional seaports grew more as the nineteenth century progressed following the 1884 treaty of Berlin which extended the sovereignty of the Europeans to inland areas thus making the development of maritime transport a necessity to ensure the continuity of their direct political control. However, due to lack of major indentations, ports sites on the West African coastline lacked good natural harbours as they had shallow entrances from the sea except for Dakar and Freetown (White, 1970). This suggested the need for dredging in other seaport sites along the coast. Although locations like Elmina forts had frequent ship visits regardless of its shallow draught. Being one of the major trading centres, at regular intervals ships of not more than 300 tons anchored in its shallow draught (Lawrence, 1963).

As described by Lawrence (1963), one of the earliest modifications of what could be branded as port facilities was done at one of the forts at Elmina where goods were unloaded from ships at a quay wall in front of a lagoon by the land side of the fort. In order to lift the goods from the quay into the fort, a hoist was used. Consequently, marginal investments were made on other few ports even though the ports were not evenly distributed along the coast. The ports include St. Louis port in Dakar, Old Calabar, Bonny and Lagos ports in Nigeria, Gold coasts and Sierra Leone ports which at some point served as major points of contacts between Africans and the Europeans for exportations of palm oil (Lynn, 2002).

Notably, introduction of regular steamships to West Africa in 1832 constituted a degree of change in trade in the region as volume of palm oil commodity traded between Britain and West Africa increased from223tons from 223tons in1800 to a peak of 90,196tons in1885 (Lynn, 1989). The effects of this resulted in the creation and development of other smaller ports in West Africa that were used in exportation of palm oil and kernels to Europe (fig.1.1). These ports have since then been serving as organizing force for West African economies which pulled trade and foreign markets to the region (Gugler, 1978). Since the development of these ports were mainly driven by economic exploitations of the region, inadequate attention was paid to expansion of the handling capacity of the existing infrastructure as well as good hinterland accessibility. Hence, lack of effective and sufficient loading facilities, navigable waterways, roads for inland connections, remained major setbacks during the nineteenth century.

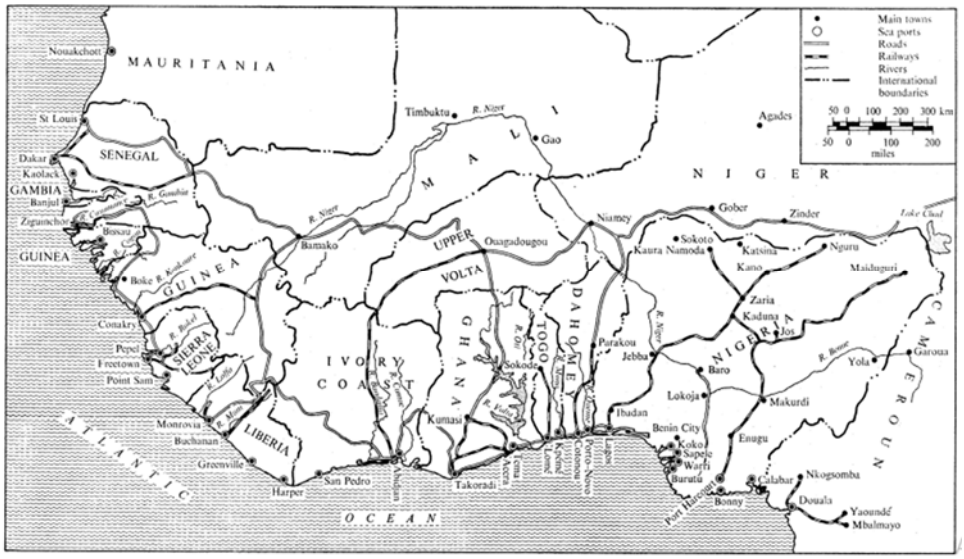

Figure 2. 1 Evolution of Seaports in West Africa.
Source: Ogundana, 1976.

The colonial epoch was characterized by an era of rudimentary port development that left the countries at independence with few functioning ports with poor port infrastructure and weak facilities which required huge investments and extensive engineering works to create new port facilities and expand the existing ones(Olukoju,2014). After emancipation from colonization, government was faced with rehabilitation and rebuilding of seaports which required massive financial support. In the 1960s, there was expansion of transport facilities which included the rehabilitation of port infrastructure funded by the government (Lancaster, 1983). As time progressed, the governments and port authorities realized they lacked sufficient financial and human resources (managerial ability) to successfully drive a modern port. Hence, their decision to withdraw (albeit partially) from port operations and services while they involve the private sector through concession and leasing of port infrastructure in return for the exploitations of port services.

The process of involving private sector participation and expertise was preceded by deregulation characterized by withdrawal of the government in different sectors in

1980s (Debrie, 2012) caused by constrained public sector budgetary system following economic downturns in African countries in 1970s - 1980s (Overseas Development Institute, 1982). In order to mitigate the adverse effects of the economic crisis, the World Bank together with IMF initiated structural and financial adjustment plans targeted at increasing private involvement in the deregulated sectors. A BOT (Build, Operate and Transfer) system was introduced by World Bank to promote and encourage private participation in building and financing of infrastructure (Augenblick and Custer, 1990). This system following its adoption at national levels attracted international private investors to the region who through debt financing and sponsorship from partners both locally and internationally commenced construction projects most of which are related to port infrastructures.

The beginning of twenty-first century marked the widespread of concessions of port infrastructure in West Africa (table 2.1) which led to increase in private investments in terminal operations. This has significantly enhanced port performance and quality of service provided to port users, even though the level of port performance in these ports varies.

Table 2. 1: Container terminal concessions in West Africa

PORTS	CONCESSIONAIRE(S)	SPAN OF CONCESSIONS
Abidjan	SETV (Bolloré / AP Moller Maersk)	2004 (15 years)
Lagos-Apapa	AP Moller (Maersk)	2006 (25years)
Lagos-TinCan	TICT (Bolloré, CMHI & CADF)	2006 (15 years)
Tema	MPS (GPHA,Bolloré & AP Moller Maersk)	2007 (20years)
Dakar	Dubai Ports World (DP)	2008 (25years)
Lomé	LCT (TIL/MSC & CMHI)	2009 (35years)
Cotonou	Bolloré	2009 (25years)
Freetown	Bolloré	2010 (20 years)
Monrovia	AP Moller (Maersk)	2010 (25years)

Conakry	Bolloré	2011 (25years)

Source: Port Authorities

2.2 Containerized Trade in West African Ports

The spread of containerization along the West African coast has been fueled by the growth in GDP of the region and improvement on its integration into global liner shipping network. Out of the 25 commercial ports along the coast between Dakar and Lagos, 20 of them handle general cargo and container trafffic. The ports on this coastline are connected to global liner-shipping network and major industralized nations of Asia, Europe, and North America through a combination of end to end (ETE) and transhipment services via hubs (World Bank, 2016).

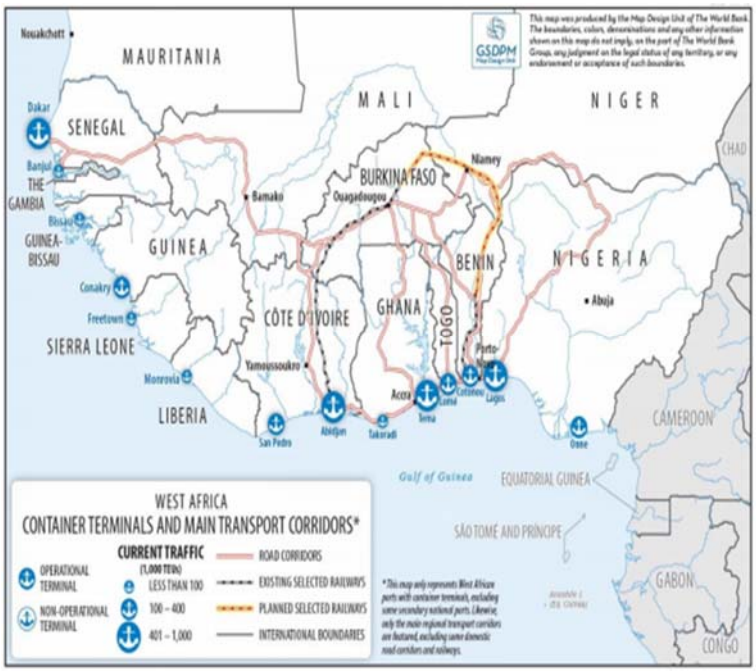

Figure2. 2: West African container terminals

Source: World Bank, 2016.

Historically, West Africa had a poor liner connectivity to the world but has improved in recents years with Togo being the first within the region to appear on the top global 50 in 2016 with a value of 30.29 while Nigeria and Ghana ranked 63 and 65 respectively (UNCTAD LSCI, 2017). Owing to this improvement, the frequency of ship visit have increased.

Presently,containerized trade in West Africa is growing rapidly as indicated by annual average growth rate of 10% in container throughput from 2002 to 2012(Van Dyck and Ishmael, 2015). This corresponds with World Bank's calculation of growth (using a base 100) in container volume in West Africa which rate is faster in Africa than other regions as depicted in figure 4. From 2010 to 2015, the total container throughput rose from 5 million to 7.2 million TEUs (Institute of Shipping Economics and Logistics, 2016). Conatainerized traffic within the region is expected to grow by five percent in 2021, creating new demand for port infrastructure to accommodate large containerships and productivity and quality of operations in ports.

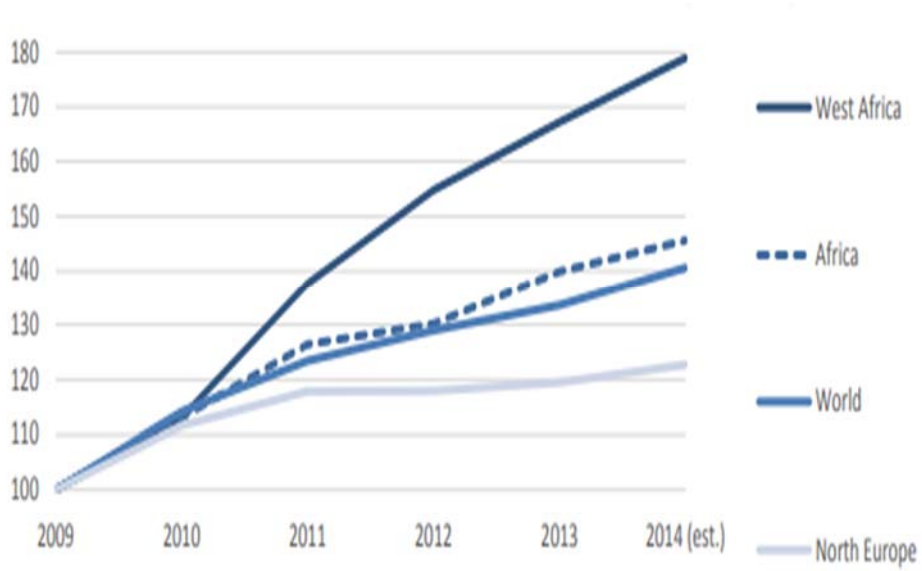

Figure2. 3. Growth of containerized trade in West Africa
Source: World Bank, 2016

2.3 Major Container Ports in West Africa

This section provides information on four major container ports leading in West Africa by volume of containerized cargo.

2.3.1 Port of Tema, Ghana

The port of Tema is the largest port in Ghana located on the eastern coast of the country. Built in 1962, the port handles 14 million tons of cargo annually and serves 85% of the country's international trade. The port has over the years, invested in the port infrastructure in order to improve port efficiency and place it in a better position to serve as a leading container port in West Africa.

Presently, the container terminal has a capacity of handling approximately 1 million TEU (fig. 2.31). The ongoing construction of its new container terminal spearheaded by its concessionaire MPS, would increase the container handling capacity to 3.5 million TEU.

Figure 2.3 1: Overview of Tema container terminal

Source: Ghana Ports & Harbours Authority

Figure 2.3 2: Container traffic in TEU at port of Tema (2008-2017)
Source: GPHA

Figure 2.32 shows the conatiner traffic in Tema port. As depicted in the figure, container traffic increased between 2011 to 2013. However, the pace of growth receeded in 2014. This could be attributed to significant drop in volume of oil export in West Africa which served as a major source of revenue for the economy. The shrinkage in oil exportation led to a decline in the volume and value of merchanise trade in West Africa. However, statistics of 2015 shows a recovery in Tema' container traffic and it has since continued to grow at a steady pace.

2.3.2 Port of Abidjan, Ivory Coast.

Abidjan became the capital of the French Colony in 1934 till 1960 and during this period port facilities were built to meet the maritime needs of the French colonial epoch. In 1951, the port of Abidjan officially commenced operational activities following the construction of the Virdi canal in 1950 which connected the city to the Atlantic shores thus making the port to be a major shipping and financial centre in West Africa.

By the following decade, the port experienced a remarkable growth as cargo traffic increased from an annual operating volume of 650, 000tons in 1950 to 2, 378, 366 tons (1, 320, 827 tons loaded and 1, 057, 539 tons unloaded) in 1961 (Peterec, 1962). As highlighted by Peterec (1962, p.3) in his report, this growth was facilitated by the favourable geographical location for the construction of the deep sea port of Abidjan which substituted the two existing wharfs at Port- Bouet and Grand- Bassam. This is coupled with the proximity of the productive hinterland backing the port where majority of its agricultural exports (cocoa, coffee, bananas) were cultivated. The port traffic experienced steady growth in container traffic till 1999 when there was a political unrest that led the economy into distress. Just when the country was about recovering, it witnessed a major political unrest caused by civil war in 2002-2007 followed by another one in 2010-2011.

Since the beginning of operations till the end of the twentieth century, the port authority has developed three master plans (Port Authoriy of Abidjan, n.d.). Two have been successfully implemented and executed between 1951 – 1967, and 1967-1980 respectively. The execution of the second master plan birthed the construction of the port's container terminal with four berths. Although the port had its third master plan prepared in 1985 but was thwarted by the 1980s economic crises which affected the country's economy. However, the port instead invested in projects of rehabilitation, and modernization of port infrastructure including the acquisition of advanced equipment.

The port constructed at an initial cost of approximately 20 million dollars (Peterec, 1962) has undergone several expansion projects which includes a port expansion project worth $2.5 billion aimed at accommodating the influx of cargo volume passing through the port. Approximately 50% of international shipping services of the landlocked countries of Mali, Burkina Faso and Niger pass through the port of Abidjan. This is facilitated by rail access connecting the Abidjan to Burkina Faso.

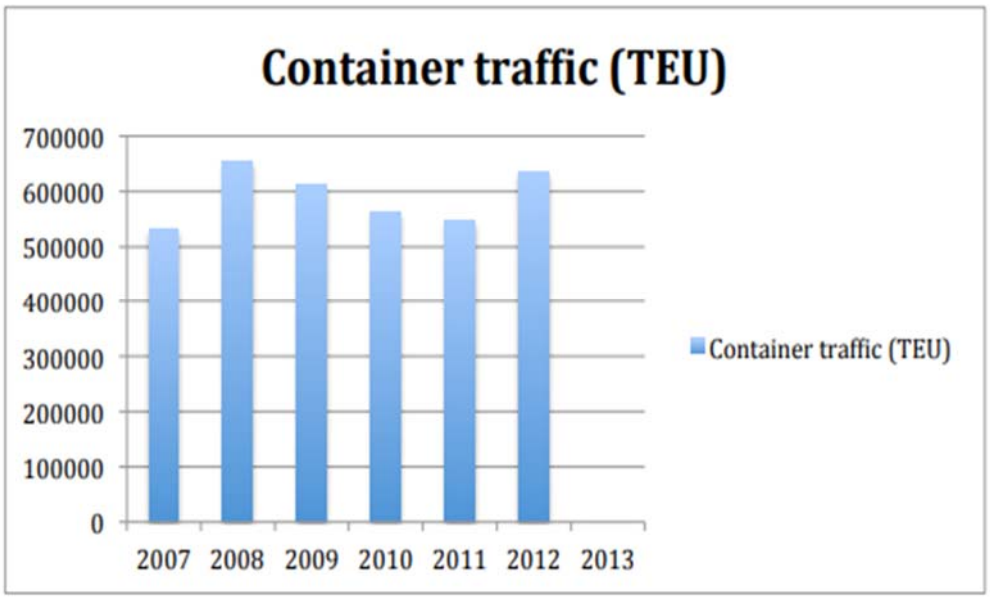

Figure 2.3 3. Container traffic growth in port Abidjan

Source: (MLTC/CATRAM , 2013)

As shown in fig.2.33, the container traffic growth grew significantly in 2008 after its recovery from civil war but reduced in subsequent years .The significant decline in 2010-2011 is due to the second civil war of 2010 to 2011 that weakened port activities in the country. However, since its recovery in 2012 the container traffic has continued to marginally increase. The port Authority recorded a volume of 674, 624 TEUs in 2018**.**

2.3.3 Port of Lagos, Nigeria

The history of port operations in Lagos dates back to the mid nineteenth century when it was a centre for transatlantic slave trade and exportations of agricultural products. Subsequently the value of export and import trade of Lagos port expanded substantially thus representing an average of 60% of Nigeria's total trade in 1914 (Olukoju, 1992)**.** In the early twentieth century, port development in Lagos started with efforts to provide facilities for oceangoing vessels. Followed by a decision to develop the Apapa port in 1913, the construction of its four deep water berths with a length of

1,800ft was done in 1921 and in 1948, berths of 2,500ft were installed in addition to the pre-existing four.

In 1954, the Nigerian Ports Authority was established as an autonomous public corporation to implement a framework that would ensure the maintenance and control of operations at Nigerian seaports. Being one of the major gateways for imports and exports for the county, the Lagos ports enjoyed a steady growth in cargo traffic till the break out of Nigerian civil war of 1967 to 1970. This resulted to heavy congestions in Lagos port as it was the only port serving the nations' maritime transport needs following the shutdown of other ports during the period. Right after the war, the government through the implementation and execution of a national development plan (1970 -1974), rehabilitated and reconstructed the ports. Additional port facilities were acquired to address the challenge of shortage in port capacity.

As a part of its reform program, the Nigerian government adopted a Landlord port model in 2005 as an initiative to improve efficiency with its ports' reform programme by transferring cargo operational obligations to private sectors while retaining public ownership and control of port infrastructure. With this development, majority of the seaport terminals in Nigeria including the Apapa container terminal were given out on concession on a basis of long term lease plan that spans for a period of 10 to 25years. Currently, the Lagos port has a container handling capacity of 3.9 million TEU and 21 berths for handling various categories of cargoes out of which 6 are dedicated to the Apapa container terminal. Fig.2.34, shows the container traffic and cargo throughput at the Lagos port from 2007 to 2017.

Figure 2.3 4: Container traffic of Lagos Apapa container port 2007 - 2017

Source: NPA (Nigerian Port Authority)

2.3.4 Port of Dakar, Senegal.

The history can be traced to 1857 when port infrastructure was built by the French colonial Maters. The construction of rail road connecting Dakar to the French capital made it made it gain more importance as a port city with inland connection. The railway network around Dakar was further developed in early 19th century when the capital of French Colony in West Africa was moved to the city. In 1987, the Port Authority of Dakar (Port Autonome de Dakar) was established as a national company to create efficiency through the integration of the operations running in the port. In 2007, its container terminal was concessioned to DP World. The concession of the terminal facilitated investment by the terminal operator to increase the capacity of the container terminal.

Figure 8 shows the container traffic statistics of port of Dakar. It can be observed that the container traffic was at high level in 2007, 2010 and 2012.The growth in those years could be traced to increase in transit cargo to Mali due to the crisis in Abidjan during those periods.

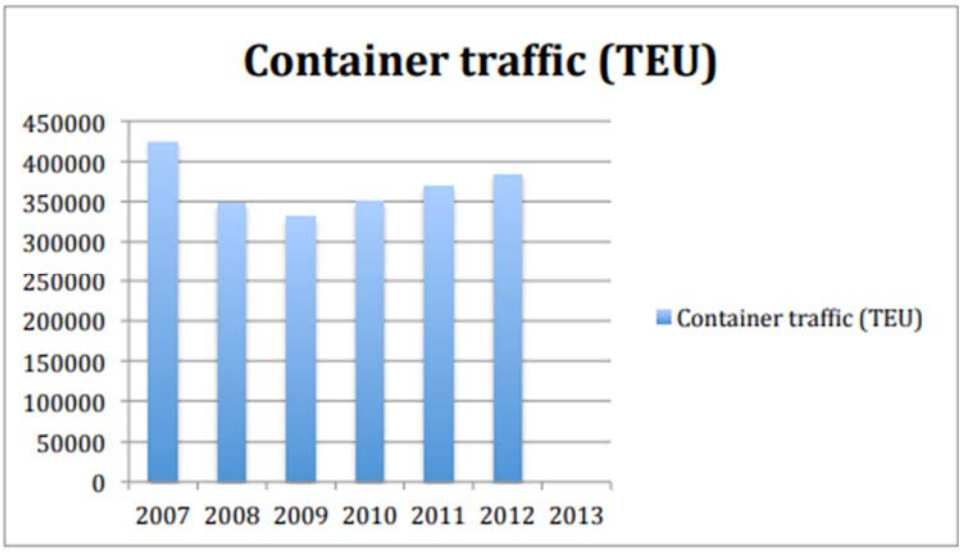

Figure 2.3 5: Container traffic in port of Dakar

Source: (MLTC/CATRAM , 2013).

CHAPTER 3. LITERATURE REVIEW ON PORT SELECTION CRITERIA

3.1 Port Choice

Port selection process could be a complex one that comprise of multiple criteria from different decision makers on port choice as identified in literatures. The disparity in conclusions reflects the complexity of the subject. This might be attributed to the category of sample population and the level of response from them (Sanchez et al, 2011).

3.2 Port Users

'Port users' refers to those who use the services of a port. The term can also be examined from different perceptions of a port either as a service provider or as a part of supply chain. As the former, port can have users who use port services and or its infrastructure while as the latter, port users consist of actors involved in supply chain activities that take place within the port-sea interface, port area or the port-land interface (Vaggelas and Pallis, 2015). A list of port users thus include shipping lines/carriers, shippers (cargo owners), freight forwarders, terminal operators, port-services providers, logistics service provider and port authorities.

3.3 Decision Makers on Port Choice

Different port users involved in port choice process are shippers, shipping lines, freight forwarders, terminal operators, port-services providers, Logistics service provider and port authorities. For this purpose of this section, port users to be considered are in categories of users who regularly use port services for making or receiving shipments and are involved in port choice decision making process which are shipping lines, shippers, logistics service providers.

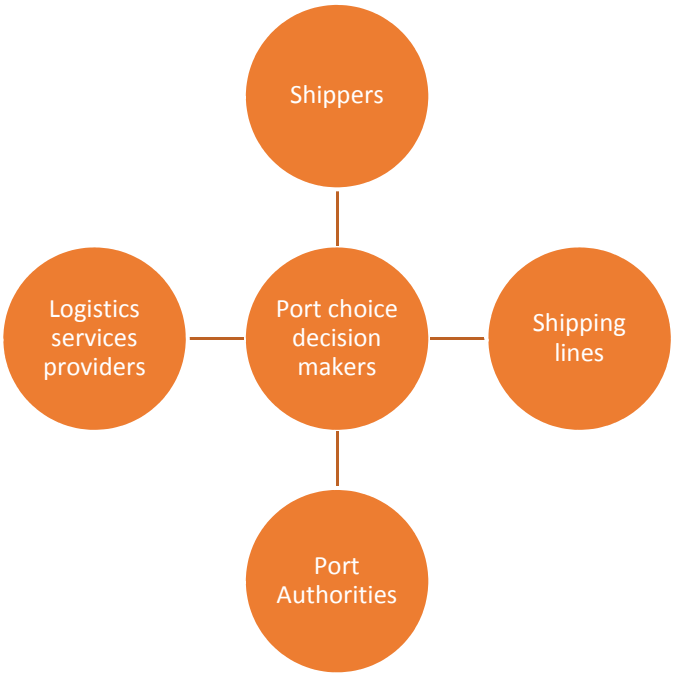

Figure 3. 1: Decision makers on port choice

Source: Author

The choice on what port to use are made based on the criteria deemed relevant by the users which could vary between them. To an extent, the volume of cargo throughput in a port is dependent on the choice of the users on the port that offers the criteria. The frequency at which the ports are used by the users could as well be linked with the quality of services rendered at the port. It is therefore important for port authorities to know these factors so it can serve as a guide in policy formulation geared towards improving services at port and the market share. Policies formulated on these improves the quality of services rendered by the ports and increase the level of satisfaction derived by clients.

There is a considerable amount of literature that have produced criteria important in determining a port of call. Generally, the common objective of port users is an effective and efficient transport of cargo which largely depends on location, cost and timeliness.

Ugboma et al (2006) grouped the criteria into quantitative and qualitative factors Quantitative factors include factors relating to monetary expenses and can be measured

and compared in an objective way. Qualitative factors on the other hand are subjective factors that influence decision making and are not necessarily related to costs of maritime transport services. The distinction between both may be vague because the perception by port users may vary from the actual case and in some scenarios, the perception may be valued than the actual performance (D'este and Meyrick, 1992).

As reflected in literature, the criteria are often evaluated differently among port users. This is established by Murphy et al (1991, 1992,) whose respondents consist of shippers, international water carriers, international water ports, international freight forwarders. The results reveal the differences in choice and the ranking of criteria between the respondents. The remaining section of this chapter would discuss the factors from the perspectives of the aforementioned three categories of port users (shippers, shipping lines, and logistics service providers).

3.3.1 Shippers' Perspective

Shippers are the main beneficiary of port services. Cargo owners or shippers could either be independent shippers, those with long term contracts with shipping lines or those who outsource to freight forwarders (Tongzon, 2002). As identified in Onwuegbuchunam's (2013) survey population, independent shippers can be further be divided into trading firms owned and managed by private entities, corporate shippers (government departments or multinational companies) and shipping agents or companies handling imports and exports on behalf of their clients. In addition to this are individuals who import goods for personal use.

The movement of cargoes by sea from one point to the other is facilitated by a demand for it by cargo owners (shippers). Consequently, the process of port selection begins either directly or indirectly the moment the service of a carrier is employed by the shipper. As the case may be, the shipper may or may not necessarily nominate a port but the information regarding the destination of the cargo provides the carrier with

choices of port within that region. Small sized or individual importers often lack the power to choose a port probably due to the volume of the cargo in relation to the size of the vessel. They depend on the port chosen by the shipping line. Shippers may however, choose a carrier that provide services through their ports of preference (Kananfani and Malchow, 2004).

Factors affecting shipper's preference of a port have been examined in different port selection literatures. The early works of Foster (1978.a) on what shippers look in a port for shows that shippers' decisions are majorly influenced by service related factors. The perspective changed in his subsequent work (1979) as focus of shippers shifted to cost of transport and port charges as the important factors. His findings are consistent with studies of Slack (1985), as costs (inland freight rates) and number of voyages are relevant criteria. Shippers however may become price inelastic for the risk of delay in other ports and choose an expensive port (De Langen, 2007). In addition, shippers may pass the extra costs to their customers through price fixing strategies.

Subsequent studies on shipper's choice of port identify factors other than costs. Tiwari et al (2003) analysis of containerized Chinese cargo shippers' behaviour shows that the consideration on distance of the shipper from the port, distance to destination (for exports), distance from origin (imports), and port congestions play vital role in selection of port. The findings of Malchow and Kanafani (2004) in distribution of shipments among US ports identifies geographical location, port characteristic as the most significant criteria. These literatures similarly establish that geographical location of ports is an important factor. The proximity of a cargo to its destination is relatively a function of the location of the port of discharge. Lirn et al (2004) argue that services related factors like port facilities can be improved but geographical location are accepted as they are. However, the government of a country can include in its development plan the construction of a new port for which a different location would be chosen (as it is the case in some countries that have more than one seaport).

There is a shift in weight of criteria ranked in order importance by shippers in West Africa. In this context, Ugboma et al (2006) discuss the perspectives of Nigerian shippers on port selection. He found port efficiency to be the most important factor, followed by frequency of ship call and adequate infrastructure. Likewise, His studies are consistent with Tongzon (2002), whose findings also reveals port efficiency, adequate infrastructure, shipping frequency and geographical location as the most considered factors. Other selection criteria identified from this perspective include high level and better utilization of terminal facilities, crane efficiency (Onwuegbuchunam, 2013).

3.3.2 Shipping Lines' Perspective

Shipping lines are contracted by shippers or their representatives for movement of goods from the port of origin to destination. Shipping lines are constantly faced with port selection decisions hence, it forms a part of their operational business strategies. Studies by Lirn et al (2014), Guy and Urli (2006), Ha (2003), De Martino and Morvillo (2008), Ng (2006), Chang et al (2008), Lirn et al (2004), focus on shipping lines as one of the decision makers. The aggregate factors produced by their findings include costs, port location, port facilities, quality of port operations, time, port efficiency, range of operations. Common to their findings are factors relating to port location, costs, and infrastructure.

Contemporary shipping lines are characterized by increasing size of ships for exploitation of economies of scale. The effect of this is the concentration of vessel calls in limited number of ports that can accommodate mega vessels (Notteboom, 2009). This implies the need for improvement on port infrastructure by those lagging and sustenance of the quality of service rendered by ports whose port infrastructure can accommodate the ships.

In West Africa, socio- political factors are significant criteria considered by shipping lines. It can lead to inaccessibility or a shut-down of seaports (example of Nigeria in

1967-1970). Terminal operations are threatened by risk of social and political conflicts prevalent in the region as there are records of civil wars in countries like Abidjan, Nigeria. Nigeria for example still faces socio conflicts like Boko Haram that threatens the political stability of the country. This is established in Gohomene et al (2016) findings on the attractiveness of West African ports in which port infrastructure, port draught, and political stability was identified as an important criterion specific to West Africa. Another criteria specific to West Africa is Piracy in West Africa. Although this criteria has rarely been mentioned in port selection literatures but carriers often consider it due to the impact it may on driving up premium paid on vessels trading along the region.

3.3.3 Logistics Service Providers' Perspective

Logistics service providers (LSP), Third party Logistics Provider (3PL) have been used interchangeably in literatures (Li et al, 2012; Xiu and Chen, 2012) to refer to outsourcing companies that manage logistics and distribution chains on behalf of their clients. Similarly, the terms LSPs (3PL) and freight forwarders have been used interchangeably in port selection literatures although there is a form of distinction between both parties as business units in terms of business and operating models used which determines the extensiveness of the services they offer.

However, third party logistics provider and freight forwarders services may overlap when considered as individual units in a supply chain. In this paper, both are considered as Logistics service providers acting as transportation intermediaries between shippers, ports and carriers. LSPs are instrumental to the movement of freight from the origin to its final destination via various modes of transportation (Magala and Sammons, 2008). They offer wide range of services that cover different network of activities incorporated in a supply chain (fig. 3.2).

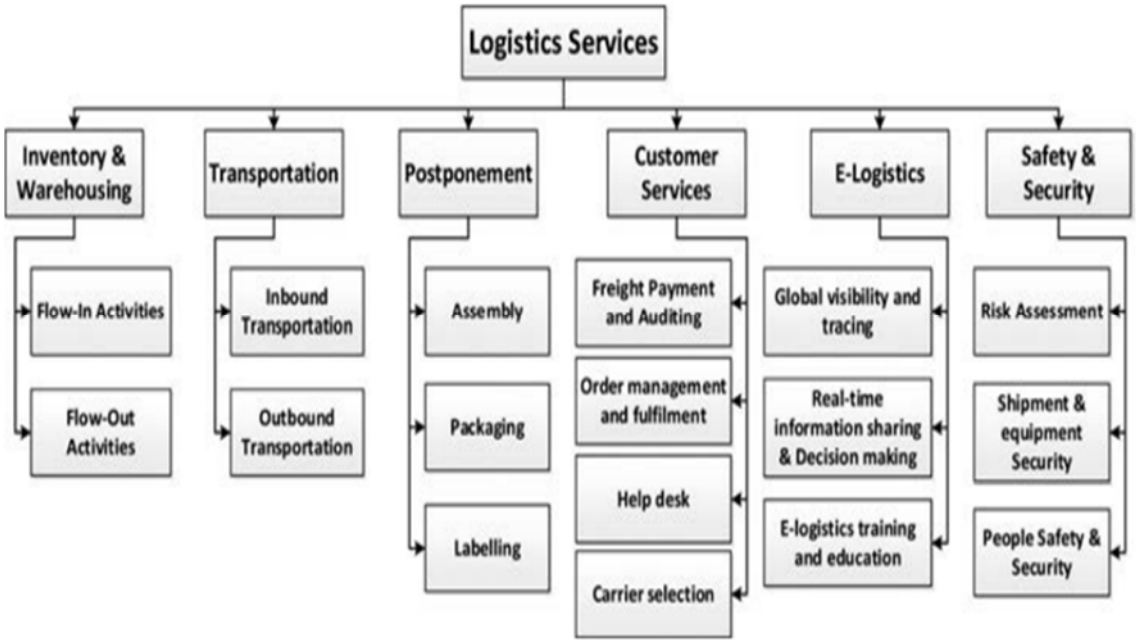

Figure 3. 2: Logistics service providers' dimension of services
Source (Alkhatib et al, 2015).

In a global supply chain, customers expect services of intermediaries to be flexible and less expensive. In the context of maritime transportation, cargo owners expect delivery to be reliable, and non-costly. On this basis, Logistics services providers' focus on designing an efficient method in which ports advantageous to minimization of costs overall transport costs are preferred. In light of this, port choice then becomes a function of the aggregate of the network cost and performance (Notteboom, 2009).

The results of previous studies focusing on freight forwarders by Slack (1985), Murphy et al (1992), Tongzon and Sawant (2007), De Langen (2007), Grosso and Monteiro (2009) present us with a number of criteria considered by LSP. These include location, costs, frequency of ship visits, time, hinterland connections, reliability of port services, quality of operations, reputation, and information system at the port.
Reliability of port services can be associated with the time cargo spend in port. Time can be affected by various factors like port congestion, non-availability of adequate handling equipment, bureaucratic and administration bottlenecks. The presence of

these factors in a port would increase the aggregate time of freight distribution. Also, Logistics service providers have a need for storage capacity for holding inventory. Capacity shortages in ports and reliability constraints can make a LSP to opt for alternatives (albeit they come with their costs too). This puts ports that are congested and lacking efficient capacity at disadvantageous positions.

Logistics service providers have keen interest on information regarding the location of goods in transit. Grosso and Monteiro (2009) in their studies identify electronic information as an important criteria taken into consideration by freight forwarders when deciding a port to choose. Information technology facilitates a seamless exchange of information between ports and users. Replacement of paper works with electronic procedures in ports speed up operations.

Slack (1985), Notteboom (2009), De Langen (2007), mentioned hinterland connections as a determinant of port choice. The development of intermodal corridors improve hinterland connectivity of a port. Port hinterlands are key components linking sea and inland transport. As discussed by Notteboom (2009), accessibility to good hinterlands can offset other costs LPS incur in the course of transporting and delivery of goods.

The criteria highlighted in port selection literatures from this perspectives corroborate the need of a port to be integrated in a supply chain system. Logistics service providers are important elements of the global supply chain. The effects of globalized production and distribution have gradual metamorphosis roles of ports. To this end, ports are essential elements embedded in a value chain driven system of a collaborative intermodal hub networks where logistics related costs in a supply chain are reduced in such a manner that the level of quality of the delivery of their logistics function is not affected (Panayides, 2006). Notteboom (2009) argues that ports that are well integrated into a supply chain systems are more preferred by Logistics service providers.

Presently, little work has been done on investigating logistics service providers' decision making process in port selection as existing literatures largely concentrate on shipping lines and shippers. According to Hesse and Rodrigue (2004), supply chain power lies with third party logistics service provider. This establishes the fact that Logistics service providers are a set of important actors in port selection decision. Against this backdrop, this study would contribute to the existing literature on port selection from Logistics service providers' perspective.

CHAPTER 4. RESEARCH METHODOLOGY

The aim of this research is to identify the factors considered by Logistics services providers, in selecting a port of call in West Africa. In order to achieve this objective, a qualitative method of data collection was used.

4.1 Survey Questionnaire Design

The primary method of data collection of this research is a survey-questionnaire sent by email to Logistics services provides in West Africa. A draft questionnaire was designed by compiling 20 port choice criteria adopted in previous studies. The questionnaire was pre-tested by sending it to 5 freight forwarding companies in Nigeria to check if any important criterion was missing or not. From the pre-test, three criteria; corruption perception, personal contacts in ports and convenience of customs processes were recommended to be added to the questionnaire.

Afterwards, the questionnaire was modified by adding the recommended criteria and sent by email to the respective companies. The final survey questionnaire is divided into two sections. The first section include general information about the respondent's company (see appendices). The second section compose of 23 port selection factors The main forms of response adopted in this study are closed format using five point Likert scales technique; where '1' indicate not importance while '5' represent the highest priority.

4.2Factor Analysis

The origin of factor analysis dates back to the early 1990s stemming from Charles Spearman's development of the Two- Factor theory coupled with the contributions of Karl Pearson (1901) in his paper on the "method of principal axes" which formed the basis for the statistical aspects and fundamental mathematical principles of factor analysis (Harman 1976, pg. 4). This technique is commonly used in behavioural and social sciences fields, medicine, economics, education for interpreting questionnaires. Factor analysis is a multivariate statistical approach composing of a structured analysing procedures used to identify the relationship existing in a large set of variables to a group of smaller set of observed variables (also referred to as factors)of dimensions possessing common characteristics through data reduction process (Pett et al, 2003). In factor analysis, a large set of data is reduced to a smaller subset of measurement variables while generating composite variables. Factor analysis measures how underlying constructs influence the responses on a number of measured variables. The method ensures retaining as much original information as possible while reducing the data. This technique extracts maximum common variance from all variables and puts them into a common score which can be used for further analysis.

A factor is depicted by a linear combination or cluster of related observed variables representing underlying dimension of a construct (Pett et al, 2003). The presence of clusters of large correlation between variables could suggest that the variables measure same underlying dimension. These underlying dimensions could be referred to as latent variables (Field A. , 2009). Depending on the design of the study, a factor is expected to have 3 variables (Tabachnick and Fidell, 2007). Factors can be described in a graphical and mathematical representation. Factors as statistical entities in its graphical form are visualized as axes along which variables can be plotted. The position of a given variable is dependent on its correlation with the factor as it is plotted according to the extent which the variable relates with a given factor. The strength of relationship between the variable and each factor are represented by the coordinates of variables along the axis.

Mathematically, factors can be represented by equations on a straight line as depicted below, where, b values represent the factor loadings for each variable.

$Y_i = b_1X_1i + b_2X_{2i} + ... + b_nX_ni + \varepsilon_i$

$Factor_i = b_1Variable_{1i} + b_2Variable_{2i} + ... + b_nVariable_{ni} + \varepsilon_i$

Although, it is assumed that the algebraic factors are representations of real world dimensions whose nature is guessed by inspecting variables with high loadings on the same factor.

4.3 Exploratory Factor Analysis

There are two major types of factor analysis which are Confirmatory Factor Analysis (CFA) and Explanatory Factor Analysis (EFA). Confirmatory factor analysis tests hypothesis regarding factor structures for a set of variables. Exploratory factor analysis on the other hand, does not require hypothesis testing and is recommended when the researcher have no hypotheses about the nature of the underlying structure of their measures (Newsom, 2005). The research is using explanatory factor analysis as an analytical tool in the absence of hypotheses.

Explanatory factor analysis is a widely used statistical technique which determines the number of common factors influencing a set of measures. The objectives for using EFA vary and could be dependent on the aim of application by the researcher. As identified by Williams et al (2010), the objectives of using EFA include reduction of number of variables, examining the structure of relationships between the variables, detecting and assessing the unidimensionality of a theoretical construct, addressing multicollinearity between variables.

There are different steps involved in conducting an exploratory factor analysis (fig4.1). When conducting an EFA the researcher is faced with the decision on the number of factors to be retained, extraction method and rotation methods to be used.

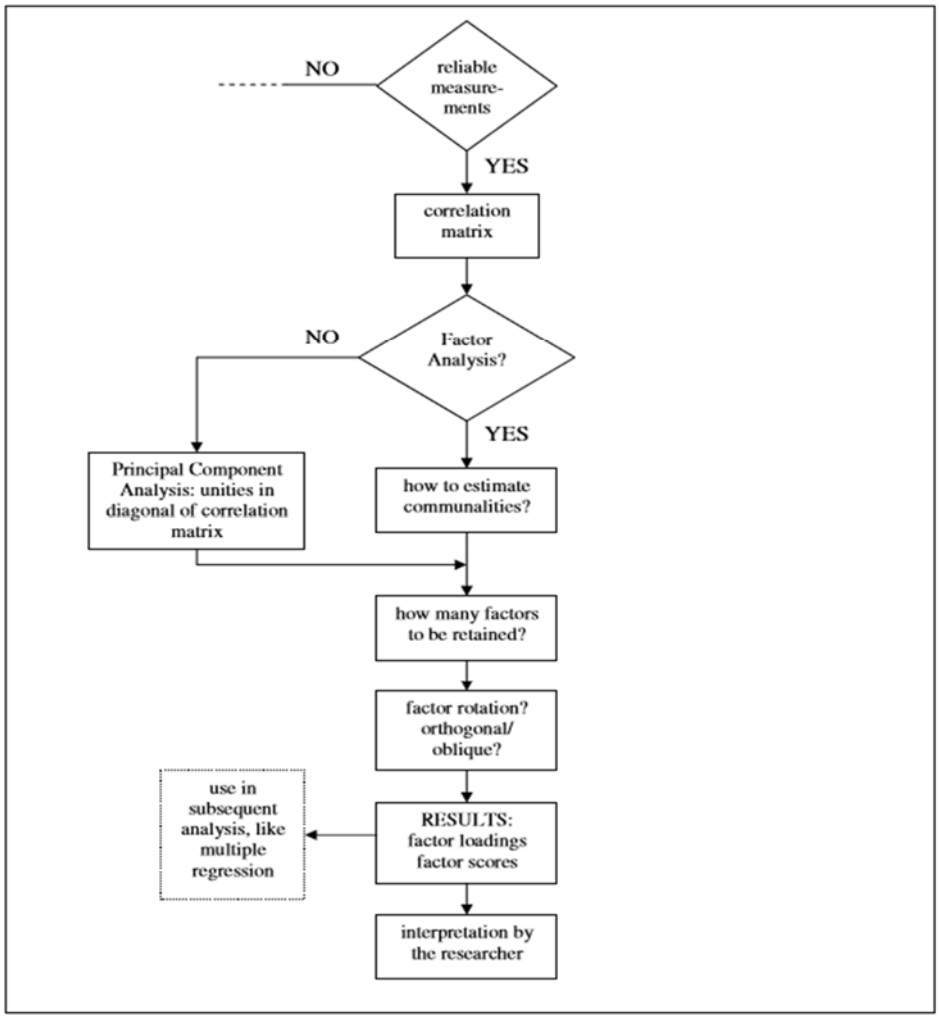

Figure 4. 1: General procedures for EFA

Source: Rietveld & Van Hout (1993)

4.3.1 Preliminary Requirements

To conduct an explanatory factor analysis, some preliminary steps need to be taken. The variables to be used must first be measured at interval level and should be normally distributed in order to be able to generalize the results of the analysis beyond the sample collected (Field 2009, p.650). The reliability of the factor analysis can be influenced by the sample size. Hence the sample size should also be taken into consideration. Different arguments regarding the necessary sample size have been

made by different writers. Field (2000, p.443) states that the rule of thumb is that a researcher should have a minimum of 10-15 participants per variable. However, Hair et al (1995) suggested a sample size of 100 or greater. A recent study by de Winter et al (2009) conclude that sample sizes below 50 can be reliable for factor analysis. There is disparity in recommendations regarding the sample size as cited in literatures but the conclusion drawn is that the requirement is more based on the sample size and the magnitude of the factor loadings.

A reliability measurement test is can be conducted on statistical software (SPSS) using the Kaiser-Meyer-Olkin measure of sampling adequacy. The KMO value ranges from 0 to1. For a sample to be considered adequate, the value of KMO test should be greater than 0.5 (Williams et al, 2010). In order words, KMO value of 0.6 upwards validates the adequacy of the test.

4.3.2 Correlation Matrix

A correlation matrix shows the relationship between the variables. Technically, it forms the starting point for running a factor analysis once the sample has been confirmed adequate. The intercorrelations between the variables are presented in the matrix. The dimensionality can be reduced by examining variables that highly correlate with other group of variables (Field 2000, p.424). The variables with high intercorrelations may suggest that they measure one underlying construct.

The correlationship between variables is arranged in R-matrix and is reduced by looking for factors that cluster. It is important that intercorrelation exists between the variables in a correlation matrix however, there are two potential problems when inspecting the R-matrix which are is a possibility extremely high correlation and extremely low correlation. Field in his book (2000, p.444) recommend that the correlation should not be extremely high and too low in order to avoid difficulties posed by extreme multicollinearity and singularity in determining the unique contribution of the variables to the factors that are highly correlated. Hair et al (1995)

categorised correlation coefficients as loadings of 0.30 as minimum, 0.40 as important and .50 as significant. Thus the value of *r* should not be less than 0.30 as it implies a weak relationship between the variables.

Low correlations can be tested by scanning through the matrix for variables with correlations lower than 0.30 and exclude them. Another alternative is performing the Bartlett's test of sphericity available in SPSS. Bartlett test checks if the variables are lowly correlated by testing the null hypothesis that the original correlation matrix is an identity matrix. An identity matrix means the variables are badly correlated and the correlation is close to zero (Field 2009, pg.648). If the result of the test is significant value of probability is below.05. It means that there exists correlation between the items, and the null hypothesis should be rejected. In the event of extreme multicollinearity, it can be detected by visually scanning through for variables that correlate highly with one or more other variables ($r = .8$). Alternatively, it can be done by checking the determinant of R-matrix greater than 0.000001. This result means there is no multicollinearity and can proceed to the next stage of factor extraction.

4.3.3 Factor Extraction

The aim of factor extraction is to reduce a large number of items into factors. The process is used to determine the number of initial factors that represent the dimensions of construct being measured. There are two approaches to factor extraction Principal Components Analysis (PCA) and common factor analysis. PCA is the default method of factor extraction in statistical software applications like SPSS, SAS. Techniques used in common factor analysis approach include Principal axis factoring (PAF), maximum likelihood, unweighted least squares, generalized least squares, alpha factoring and image factoring.

Choosing from the methods of common factor analysis can be confusing due to the fact that literatures discussing these techniques in details are scarce compared to studies on PCA thus making PCA the most commonly used method by researchers

(Costello and Osborne, 2005). However, Principal axis factoring is the most preferred by researchers using common factor analysis method.

Principal component analysis was developed by Pearson in 1901 and adapted by Hotteling in 1933 for factor analysis (Harman, 1976). Principal Component Analysis is referred to as data reduction technique used to derive a smaller number of component from a large set of measures. As pointed out by Costello and Osborne (2005), PCA and factor analysis are not the same. Although the difference between both may be difficult to conceptualize, PCA is believed to be conceptually less complex than factor analysis (Field 2009, p.638). Guadagnoli and Velicer (1988) conclude that the results obtained from PCA tend to differ from those obtained through the application of factor analytic techniques. Field (2009, p.636) on the contrary, argued that using both PCA and PFA techniques of extraction produce similar results. However, choosing between both methods could be based on the purpose of the research. Although both approaches are used for data reduction, but common factor analysis is computed with regards to measuring underlying constructs caused by latent variables.

4.3.4 Factor Retention

Not all factors would be retained after extraction, so the researcher must decide on how many factors would be retained for rotation. The rule of thumb is to retain factors with large eigenvalues. There are two major methods used to measure the statistical importance of factors to be retained which are Kaiser-Guttmann's Criterion (Kaiser's criterion) and scree test (plot) while the alternate methods are parallel analysis and Velicer's Map (Velicer and Jackson, 1990). Field (2009, p.641) refer to Parallel analysis as a "complex" but "best" way to determine factors to be retained. However, both parallel analysis and Velicer's Map methods are not available in most of the statistical software packages used for factor analysis, which means the need to be manually calculated (Costello & Osborne, 2005). For this reason, researchers mostly opt for either Kaiser's criterion or Cattel's scree-plot.

Kaiser- Criterion proposed by Kaiser (1960) is the default in most statistical software that retains factors with eigenvalue above 1.0. An Eigenvalue also referred to as "characteristics value/roots", "latent/invariant roots" is a single value (which could be close to zero or one) that represents the amount of variance that can be explained by a given principal component or factor (Pett et al., 2011). Eigen value is a measure of the substantive importance of the factor used to calculate eigenvectors (Field 2009, p.639). Pett el al. (2011) define eigenvector of a correlation matrix as a column of weights each of which is associated to an item in the matrix. Principal components / factors loadings of a correlation matrix are generated by multiplying eigenvectors by the square roots of eigenvalue. Using the Kaiser's criterion, eigenvalues above 1 are considered statistically significant and should be extracted and retained.

The accuracy of the number of factors retained could be questionable because Kaiser's criterion may overestimate the number of factors to retain. As discussed by Field (2009, p.641), the accuracy can be tested in two scenarios. The first requires that the number of variables used is below 30 and the values for extracted communalities are all greater than 0.7. Communalities represent the proportion of each variable's variance explained by the factors. The other option requires that the sample size is greater than 250 and the calculated average communality is 0.6 or above. The average communality is calculated by adding all the reproduced communalities at extraction and dividing the sum by the number.

Other than the Kaiser's criterion, scree plot can serve as a guide for factor retention. Scree plot was introduced by Cattel (1966). A scree plot is generated by plotting a graph of each eigenvalue on the y-axis against the factor with which is associated on the x-axis. The relative importance of eigenvalues become apparent when it is visualized in a graph. On the graph would be factors with high eigenvalues as well as factors with low values. Factors are selected at the point of inflexion where the slope and the line change dramatically. The point of inflexion is the data point at which the horizontal and vertical lines meet. To select factors, the ones to the left of the point of

inflexion are retained (they account for most of the variance) leaving out the factors to right and the one at the point of inflexion (see figure 4.2).

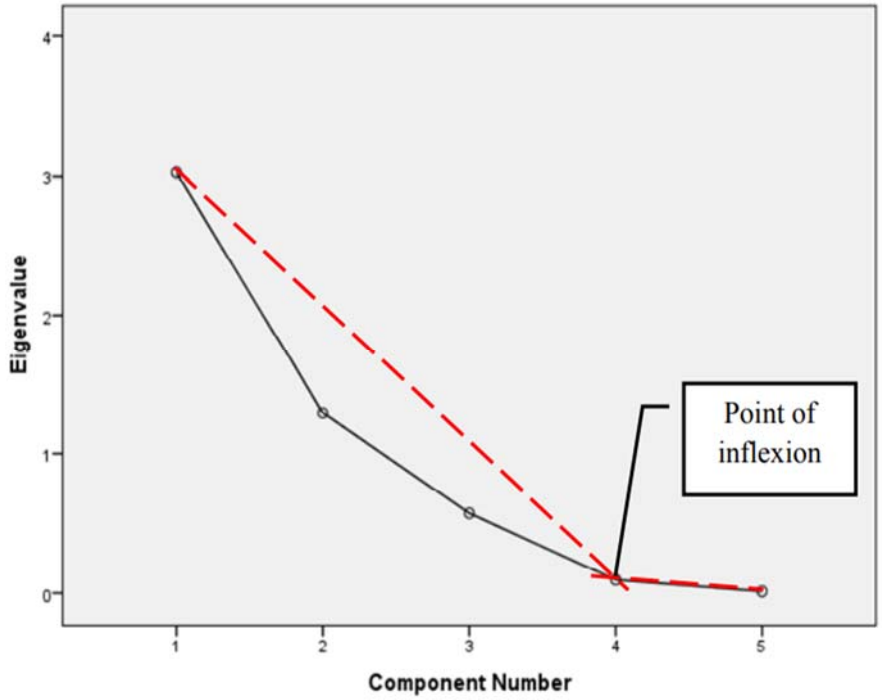

Figure 4. 2: Scree plot

Source: Yong and Pearce (2013).

4.3.5 Factor Rotation

Factor rotation is a technique used to improve the interpretability of factor by simplifying and clarifying the data structure. After extracting and retaining factors, it is necessary to determine the degree at which the variables load on to the retained factors as their interpretation is based on the items that load on them (Field A. , 2009). There are two types of rotation one is orthogonal method of rotation and the other oblique rotation. Orthogonal technique of rotation is used when the factors measuring the underlying construct are assumed to be independent. Based on this assumption, factors produced through this method are uncorrelated. Oblique method is used with an underlying construct that the factors are intercorrelated. There is formal rule on what method must be used, the decision is for the researcher to make.

Chapter 5. EMPIRICAL ANALYSIS

5.1 Data Collection

The survey questionnaire (see appendix) was distributed to the population sample which consist of third party logistics services providers and freight forwarders through email. The anonymity of the names of the respondents and the names of their companies is respected. The questionnaire was emailed to seventy respondents whose companies are located in West Africa. The data collection process was slow and disappointing at the beginning as a meagre amount (10) of responses were received. This difficulty was overcome by continuous sending of email and calls to remind the respondents about the filling the survey questionnaire. At the time of empirical analysis, the responses amount to 50 which represents 71%. Although this is considered low for the methodology used but it was still feasible for the purpose of this research.

The table of frequency (table5.1) presents a summarized data on the type of companies where the respondents work. Most of the respondents (85%) work in freight forwarding companies while a fraction of 15% are operating in third party logistics companies.

Table 5. 1: Frequency table of respondents' companies

Frequency table

Company

	Frequency	Percent	Cumulative percent
Freight forwarding	41	85.0	85.0

3PL	9	15.0	100.0
Total	**50**	**100.0**	

Source: Author

5.2 Factor Analysis Result Presentation

The researcher's purpose of using factor analysis is to explain multiple variables used in the questionnaire by a lesser number of factors. To conduct the analysis, the data obtained from the responses were computed in SPSS using the principal axis factoring (PAF) method**.**

5.2.1 Data Validation Tests

In order to conduct a factor analysis, it is necessary that the data meets some certain prerequisites like sample size, interval measurement which influence the factorability of the data and the reliability of the analysis. The reliability of the data was tested using Kaiser-Meyer-Olkin (KMO) measure of sampling. The results for the test is shown in the table below.

Table 5. 2: Results of KMO and Bartlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.479
Bartlett's Test of Sphericity	Approx. Chi-Square	391.406
	Df	253
	Sig.	.000

Source: Author

For a set of data to be considered adequate, the value of KMO must be greater than 0.5 and the significance value for Bartlett's test should be less than 0.5. In this case, our data passed the Bartlett's test with a significance (Sig.) value less than 0.5 (0.000). Unfortunately, the value of KMO is below the required value (0.479). This could be

explained by the size of the sample used which is 50. Field (2013), explained that if there are too many variables against few cases of data, it might cause the correlation matrix to be unstable thus affecting the value of KMO. The alternative to solving this problem is selectively removing the variables to observe the changes (increase) in the value. This step was followed in improving the validity of the data for factor analysis.

Initially, a total of twenty-three variables (port selection criteria) were used but some of the variables were dropped to check for improvement. The selective elimination was guided by scanning through the Measuring Sampling Adequacy (MSA) values for each variables produced on the diagonal of anti-image correlation matrix. Field (2013) recommended that the values of the individual variables should be greater than 0.5 and variables with low values should be excluded from the analysis as this would affect the value of KMO for all of the variables.

The process of eliminating variables was done once. Before excluding the first set of variables, while scanning through the values produced on the diagonal of anti-image correlation matrix for the variables (see appendix), it was discovered that some of the variables scored lower than 0.5, but there were two variables with the lowest values: Information Technology (0.249), port dues and terminal handling charges (0.326). After excluding these two items, the overall KMO improved to .621 (as shown in table 5.3).

Table 5. 3: Second output of KMO and Bartlett test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.621
Bartlett's Test of Sphericity	Approx. Chi-Square	371.451
	Df	190
	Sig.	.000

Source: Author (2019)

The exclusion of the variables does not only improve the overall KMO, it also affect the values of Measurement Sampling Adequacy (MSA) for each variable on the diagonal matrix. The KMO value shows that the data is adequate for factor analysis so we can proceed to the next step.

The next stage involves checking the correlation matrix of the remaining variables to see if our matrix is an identity matrix or there is issue of multicollinearity. In table 4, Bartlett's test of sphericity test is significant with a value of 0.000 meaning our correlation matrix is not poorly correlated. Likewise, there is no issue of multicollinearity as the determinant of the correlation matrix is 0.005. On the basis of these tests, we can proceed to the next stage.

5.2.2 Factors Extracted

The initial step taken is identification of the linear factors in the data set. Table 5 shows that SPSS identified 21 linear factors (in the first column) with a list of eigenvalues associated with the factors. Each eigenvalue represent the variance explained by a particular linear factor. The eigenvalues are also displayed in terms of percentage of variance they explain. The default factor criteria of SPSS for factor extraction is extracting factors with eigenvalues greater than 1 (Kaiser's criterion). By observing the table, the first eight factors have been extracted by default because their eigenvalues are greater than one. These extracted factors account for a cumulative variance of 72%.

Table 5. 4: Initial eigenvalues output

	Initial Eigenvalues		
Factor	Total	% of Variance	Cumulative %
1	3.071	14.622	14.622
2	2.567	12.223	26.845
3	2.167	10.318	37.163
4	1.961	9.339	46.502

5	1.770	8.429	54.931
6	1.271	6.053	60.984
7	1.239	5.899	66.883
8	1.148	5.468	72.351
9	.850	4.048	76.399
10	.785	3.740	80.139
11	.640	3.050	83.189
12	.613	2.919	86.108
13	.572	2.722	88.830
14	.560	2.666	91.496
15	.406	1.934	93.429
16	.343	1.635	95.064
17	.295	1.404	96.468
18	.227	1.082	97.550
19	.193	.921	98.471
20	.182	.869	99.340
21	.139	.660	100.000

Source: Author

5.2.3 Factors Retained

The factors extracted as displayed in table 5 are eight based on Kaiser's criterion. Not all these factors would be retained. In order to choose the number of factors to be retained, the accuracy of the numbers of factors extracted based on Kaiser's Criterion must be tested using the options offered by Field (2009). For this purpose, the output for communalities displayed in table 6 should be examined. In the first option, the number of variables are 21 but by observing the communalities (table 5.4) 90% of the items communalities are lower than 0.7.

In the second option, our sample size is below 250 and the calculated average of the communality at extraction is 0.4 which is less than 0.6. This confirms that the number of factors extracted does not equate the numbers to be retained. On this basis we would use the scree plot as a guide.

Table 5. 5: Communalities output

Communalities		
	Initial	Extraction
Availability and capacity of port facilities	.311	.433
Quality of container handling equipment	.411	.308
Location of the port	.443	.190
Proximity of the port to cargo destination	.470	.403
Frequency of ship calls	.426	.360
Volume of cargo handled	.470	.462
Cargo expenses	.563	.387
Risk of delays	.362	.325
Intermodal connectivity to port	.577	.603
Cargo loss and damage performance	.548	.513
Safety of cargoes in port	.520	.467
Convenience of custom processes	.777	.790
Reliability of port services	.570	.534
Information services in port (shipment information)	.515	.334
Intermodal transportation costs	.440	.409
Personal contacts in port	.670	.660
Service flexibility (for special cargo)	.572	.432
Corruption perception	.425	.289
Prompt response to users' needs and complaints	.580	.778

Hinterland condition	.395	.433
Port storage capacity	.539	.465

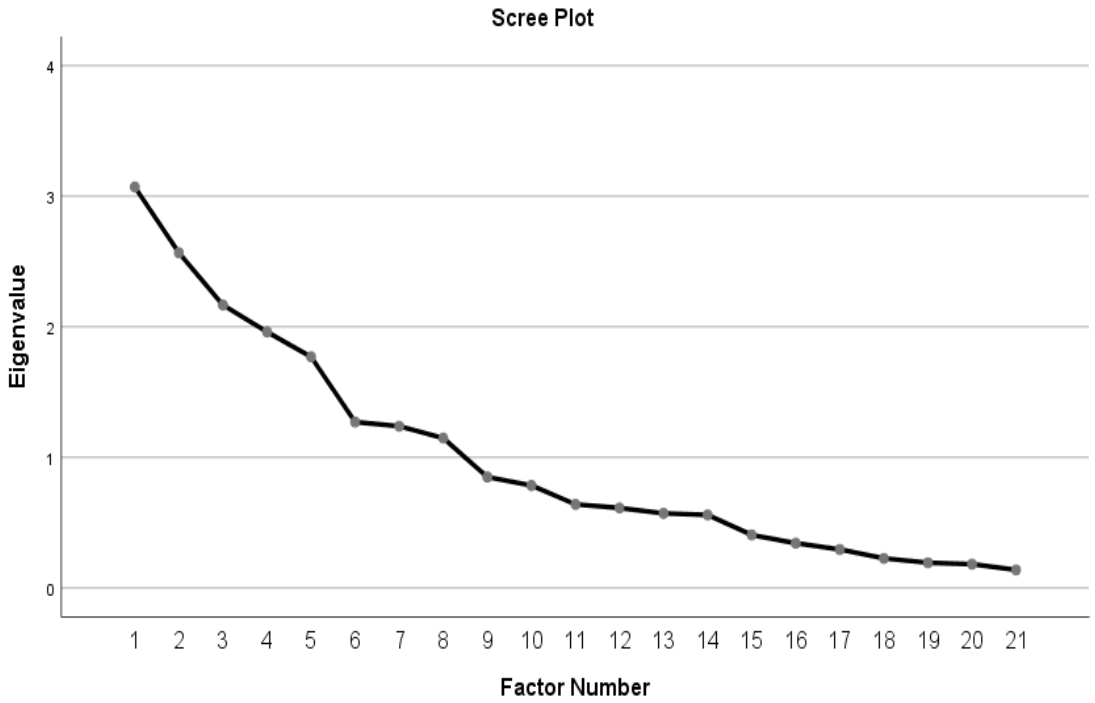

Figure 5. 1: Scree plot output

Source: Author.

In the above figure, the scree plot has major points of reflection at factor 6 and 9. This explains why 8 factors were initially extracted. However, the plot shows the first tail off of the curve is on six factors, so five factors would be retained. In order to justify this choice and double-check, the analysis was re-run specifying 5 (in SPSS) as the number of factors to be extracted and retained (table 5.6). All the five factors retained have eigenvalues greater than 1. The five factors explains a cumulative variance of 54.9% compared to the initial extracted factors that explain a cumulative variance of 72% (table 5.7).

Table 5. 6: Retained factors output

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.071	14.622	14.622	2.628	12.513	12.513	2.395	11.403	11.403
2	2.567	12.223	26.845	2.002	9.535	22.048	1.772	8.436	19.839
3	2.167	10.318	37.163	1.645	7.835	29.884	1.699	8.092	27.931
4	1.961	9.339	46.502	1.457	6.939	36.823	1.644	7.830	35.761
5	1.770	8.429	54.931	1.243	5.918	42.741	1.466	6.980	42.741
6	1.271	6.053	60.984						
7	1.239	5.899	66.883						
8	1.148	5.468	72.351						
9	.850	4.048	76.399						
10	.785	3.740	80.139						
11	.640	3.050	83.189						
12	.613	2.919	86.108						
13	.572	2.722	88.830						
14	.560	2.666	91.496						
15	.406	1.934	93.429						
16	.343	1.635	95.064						
17	.295	1.404	96.468						
18	.227	1.082	97.550						
19	.193	.921	98.471						
20	.182	.869	99.340						
21	.139	.660	100.000						
Extraction Method: Principal Axis Factoring.									

Source: Author

The column labelled ‘Extraction sums of squared loadings’ in the table above contains the sum of values of the retained factors. In other words, the table does not acknowledge the values of factors that were not extracted and retained.

5.2.4 Factor Rotation

The rotation method used is varimax (orthogonal). Table 9 displays the results of rotated factor loadings for each variable on retained factors.

Table 5. 7: Rotated factor matrix output

Rotated Factor Matrix[a]					
	Factor				
	1	2	3	4	5
Reliability of port services	.752				
Risk of delays	.642				
Convenience of custom processes	.577				
Information services in port (shipment information)	.569				
Prompt response to users' needs and complaints	.533				
Safety of cargo in port	.352				
Corruption perception	.311				
Personal contacts in port	.305				
Quality of container handling equipment		.555			
Frequency of ship calls		.336			
Cargo loss and damage performance		.309			
Service flexibility (for special cargo)		.302			
Proximity of port to cargo destination			.653		
Intermodal connectivity to port			.561		
Hinterland condition			.519		
Location of port			.340		
Availability and capacity of port facilities				.492	
Port storage capacity				.331	

Intermodal transportation costs					.429
Cargo expenses					.420
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 18 iterations.					

Source: Author

By observing the matrix, it is evident that there are no factor loadings below 0.3. The reason is factor loadings below 0.3 were suppressed in SPSS. Also, the variables are listed in the matrix in order of size of their factor loadings. This was set by the researcher in SPSS so that the factor loadings can be presented in descending order. This way, one can easily identify the significant and insignificant loadings.

As displayed in the table, Factor 1 has the highest number (8) of variables loading on it. Followed by factor 2 with 5 variables, factor 3 with four variables and factors 4 and 5 with two variables loading on each.

5.2.5 Interpretation of Factors

To interpret the factors, it is required that a minimum of three variables load on a factor and each of the variables should have loadings of 0.50 as the minimum (Costello and Osborne, 2005). The results of the rotated factor matrix **(**table 5.7) shows that the number of variables loaded on each factor varies.

Factor 1 has 8 variables loading on it with factor loadings ranging from .752 to .305. Out of the variables only five of them which are reliability of port services, Risk of delays; convenience of customs' processes; information services and ; prompt response to users' needs and complaints; have loadings of 0.5 and above. The remaining three variables (safety of cargo in port, corruption perception and personal contact in port) score less than 0.5. These five variables with factor loading of 0.5 and above are statistically significant. They seem to measure one construct which is the Quality of intangible port services.

Factor 2 has 5 variables loading on it but only one of them (Quality of container handling equipment) has factor loading of 0.555 while the rest have insignificant factor loadings. Due to this, factor 2 would be considered statistically irrelevant for this study. Factor 3 has a cluster of four variables and first three are statistically significant. This means that factor 3 is relevant to our study, hence would be further discussed in the remaining part of this chapter.

Factors 4 and 5 have two variables loaded on each with factor loadings less than 0.5. Although, the factor loadings of these variables are insignificant but in reality they play pivotal roles in port choice. For example, the two variables loading on factor 5 measure costs and LSPs making frequent shipments are cost sensitive. However costs factor may be overridden if the quality port services are up to standard.

5.3 Discussions on Factor 1 and 3.

The discussion on the two factors are narrowed down to the statistically significant variables under the two factors in relation to the situation in the described ports in chapter two.

5.4. Factor1: Quality of Intangible Port Services

The overall quality of intangible services provided by ports have significant impact on logistics chain. As supply chain actors, the operations of LSPs are expected to add value and thus their performance to a degree can be affected by port operations. In other words, the magnitude of quality added in ports affects the value LSPs services add to the supply chain. On this note, it is safe to conclude that the quality of port services can enhance the business and operations of LSPs. Hence, great demand are placed on the port industry to continually improve their services in order to meet the expectation of the users.

The variables with significant loadings under this construct are pointers to intangible port services affecting the operations of LSPs. It is noteworthy that discussions of these

variables are interwoven. As the discussion of a variable incorporates one or two more variables. Hence, they would be examined based on their interrelationship.

5.4.1. Reliability of port services and risks of delays.

Reliability of services and the potentiality of delays in a port are important to LSPs whose aim is to minimize complaints from their clients while ensuring that their services are fully utilized. How reliable port services are could be measured by available and uninterrupted services. However, uninterrupted services cannot be guaranteed in ports of developing economies like West Africa. Thus, activities in the ports are unreliable owing majorly to delay factors like port congestion (within the port and landside i.e port gates), unavailability of free berths, industrial actions (strikes), cumbersome registration and documentation process, efficiency of cargo handling equipment. In the event of any of these scenarios, timely delivery of cargoes to customers becomes impeded leaving negative consequences on logistics and supply chain. It creates a level of uncertainties and lack of predictability for cargo movement and exchange of accurate information between LSPs and the shippers whom they represent. In addition, it translate to extra operating costs for LSPs and loss of time for shippers.

5.4.2 Convenience of Custom Processes.

As a result of fast technological advancement experienced globally, custom procedures have gone digital. Digitalisation of custom procedures were introduced in order to simplify cumbersome custom processes coupled with opaque procedural requirements in ports. The shift from paper to paperless procedures increases efficiency and ease of doing trades. The adoption of automated custom processes and clearance of cargoes in port makes it attractive to LSPs.

In order to meet up with this trend, West African ports have adopted different automated systems for custom documentation and clearance. Port of Ghana uses GCNet, Port of Dakar uses GAINDE, while port of Abidjan and Lagos-Apapa ports

adopted a program established by UNCTAD named ASYCUDA (Automated System for Customs Data). Although port of Abidjan has renamed it SYDAM but it still functions under the same mandate of automating custom processes. These systems however seem to be not fully implemented in the ports partially due to lack of skilled staff to operate the systems. As a result of this, there is a duplication of processes by various units of customs existing within the port. Physical examination of cargoes prolongs custom clearance and the time cargoes spend within the port. Likewise, incessant interception on goods few meter away from ports are all indicators that computerized custom clearance are not fully implemented in West African ports. The adverse effect of these on productivity of LSPs cannot be overemphasized.

5.4.3 Information Services in Port

Information service has always been an important criterion port users look out for in ports. The importance of availability of information on shipments makes it a priority for ports to adopt IT. There are various technological system that can be used in ports to improve the visibility of cargo status as well provide cargo tracking capabilities. This enable users to have access to accurate information of movement of container and delivery order. LSPs rely on information on cargo status to plan their activities and improve service delivery.

5.4.4 Prompt Response to User's Needs and Complaints

Responding to clients' needs is essential to business looking to improve their customers' satisfaction. There is a link between customers' satisfaction and timeliness in response to their complaints. Just like business organisations, ports are obliged to create an avenue for users to lodge complaints and respond to them in a timely manner in order to improve users' satisfaction and experience. Needless to say that responding to clients' complaints is an opportunity to improve the goodwill of the port with their customers' base. Communication between customers and port staff is a key construct in managing complaints.

5.5 Factor 3 -Geographical Advantage

Based on our findings, the second factor is Geographical advantage. The three variables (proximity of port to cargo destination, hinterland condition and intermodal connectivity to port) with significant factor loadings are discussed below.

5.5.1 Proximity of Port to Cargo Destination

Ports are strategically located to function as gateways to trade and its location is relative to its proximity to cargo destination. Proximity could be analysed based on the distance from the port's location to where the cargo is needed. When LSPs design a transportation chain for the delivery of cargo (imports), it is logical to pick a node with logistics convenience. Furthermore, considering the operational costs incurred by LSPs, it is uneconomical to select a port that is far from their clients' location as it might imply extra costs (intermodal transportation costs) .For example, using Dakar port for cargoes bound for Nigeria, would be considered an illogical and uneconomical choice.

5.5.2 Hinterland and Intermodal Connectivity to Port

Port hinterland covers the area where the port sells its services to its customers (users).The hinterland served by a port is of interest to LSP as it determines the extensiveness of their operations in a region. In the case of the container ports described in chapter two, the hinterlands served include the states where they are located and the landlocked countries of Niger, Mali and Burkina Faso. The distance from each port to the hinterland varies. For example Dakar is closer to Burkina Faso than Niger. In reality, the distance of a port is often overlooked by Logistics service providers in the presence of effective intermodal links connecting the port to the hinterlands.

According to statistics, the growth in economy of the region is driven by increasing imports by fast growing businesses. When considering the inland movement of cargoes from West African ports to the hinterlands, the available intermodal connections are waterways, rail and road, although not all these alternatives are fully utilized.

5.5.3 Road Transportation

The West African hinterland traffic is largely dominated by truck primarily due to investments in road transportation by the Governments of the countries thus making it a viable option for inland cargo transportation coupled with the advantage road transportation offers in terms of delivering cargo directly to customers' location (door-to-door services). There are different road networks which offer access to local and landlocked markets. In Senegal, there is a highway connecting Dakar to N'Djamena, also trans-Saharan highway from Lagos to Niger. Likewise in Ghana, there are two major routes linking Tema to Mali and Burkina Faso.

However, the overall quality of roads are poor and some of the routes are patchy and often unusable during rainy season. Asides the physical conditions of the roads, the movement of cargoes by road are often impeded by road blocks and extortion of illegal fees cumulating to extra operating costs and delays.

5.5.4 Rail Transportation

Rail transport is often considered a relatively cheaper alternative by Logistics service providers than road for transporting large quantity of cargo at once. Furthermore, it is of logistics convenience as it constitute an effective solution to movement of cargoes over a long distance with less controls enroute.

Currently, there are two international railway networks in Abidjan and Dakar (Dakar-Bamako and Abidjan –Ouagadougou). Except for these two, railway services in other West African coastal countries are limited to national scope. Notably, both international railway networks and local are characterized by deficient performance and erratic services. The operations of the railways are still at the standard they were constructed which is below modern railways. Lack of proper maintenance has led to further deterioration of the rail tracks.

5.5.5 Inland Waterways Transport

Inland waterways transport has always been considered a better option for cargo movement due to its affordability, less environmental impacts and relief on road congestions.

In Europe, waterway transport accounted for transportation of 554 million tonnes of cargoes in 2016 (Eurostat, 2019). Meanwhile in West Africa, inland waterway transportation is underutilized due to shallow inland waters and inconsistent rainfall to maintain the water level of the rivers and lakes. For example River Niger running through Nigeria, Mali, Benin and the Volta Lake in Ghana are shallow and thus require dredging for easy transportation of goods to isolated settlements.

5.6 Implications

In the context of the findings and discussion on the two major factors, some gaps were identified and this point at the need for a lot of improvements in West African ports. For West African ports to meet the requirements of global logistics and supply chain network the following recommendations should be considered by port authorities.

5.6.1 Recommendations

- Port congestions is a major problem in West African ports. Deliberate efforts must be made by Port Authorities to eradicate port practices that induce congestion in port.
- The existing platforms for automating custom processes of cargo control and clearance should be modernized in order to effect the use of paperless custom clearance in ports.
- Intermodal connectivity is a key to increasing trade and cargo flows. Hence lack of effective interconnecting railway network linking the ports to hinterland should be addressed at regional level. Governmental bodies of the landlocked countries and port authorities of the coastal states need to agree on new scheme that will facilitate cross-border trade along transnational corridors. Modernization of rail networks would necessitate training for

personnel to maintain the operational efficiency of the train. This should be incorporated in the scheme.

CHAPTER 6. SUMMARY

6.1 Summary

Ports are economic gateways playing major role in international trade. The trends in global seaborne and wave of development across the maritime industry have effects on ports. In order for ports to meet up with these trends, numerous investments are being made. Port authorities are also developing strategies in order for them to adapt to the changes and meet up with their clients' expectations. However, in order to adequately meet port users' requirements, it is necessary to understand what attracts port users to use a port.

The research focused on port selection criteria considered in choosing a port of call from Logistics service providers. Through literature review, a list of criteria were compiled and questionnaire was developed and sent through email to Logistics service providers in West Africa. Through the use of factor analysis, the data obtained were analysed. The results of factor analysis reveal quality of intangible port services and geographical advantage as the most important factors

After the empirical findings, the relevant factors were discussed in relation to West African ports. As implication of the discussion, some identified gaps were addressed and the researcher came up with recommendations which could serve as guideline for port authorities when formulating strategies that will help them maximize the potentiality of increasing port traffic and increased patronage from port users.

6.2 Limitations

Generally, researchers interested in maritime related studies in Africa are faced with the challenge of limited literature. This research is not exempted from this limitation owing to insufficient literatures relating to the research topic in West Africa.

Also, the scope of research at the inception of this study was intended to cover the functioning container ports in West Africa, however, this was impossible to achieve due to unavailability of relevant information and statistics of those ports.

The analytical method used requires a large sample for reliable and stable results. However the sample domain used is not big enough to meet this requirement. For future studies, it is recommended to use a large sample that would improve the results. Furthermore, the significant variables under the discussed factors may not accurately reflect the underlying construct they measure.

References

African Development Bank. (2010). *African Development Bank Report* . Oxford University Press.

Alkhatib, S. F. (2015). Logistics Service Providers (LSPs) evaluation and selection: Literature review and framework development. *Strategic Outsourcing: An* International Journal, 8(1), 102-134.

Augenblick, M. &. (1990). The build, operate, and transfer (" BOT") approach to infrastructure projects in developing countries (No. 498). The World Bank.

Bird, J. (1988). Freight forwarders speak: The perception of route competition via seaports in the European communities' research project—Part II.Maritime Policy & Management, 15(2), 107-125.

Branch, A.E. (1986) Elements of Port Operation and Management. London, Chapman and Hall Ltd.

Chang, Y., Lee, S., & Tongzon, J. L. (2008). Port selection factors by shipping lines: Different perspectives between trunk liners and feeder service providers. Marine Policy,32(6), 877-885.

Cattell, R. B. (1966). The scree test for the number of factors. Multivariate behavioral research, 1(2), 245-276.

Davies, P. N. (2000). The Trade Makers: Elder Dempster in West Africa, 1852-1972*, 1973-1989* (Vol. 19). Oxford University Press.

De Langen, P. W. (2007). Port competition and selection in contestable hinterlands; the case of Austria. European Journal of Transport and Infrastructure Research, 7(1).

de Winter, J. D. (2009). Exploratory factor analysis with small sample sizes. Multivariate behavioral research, 44(2), 147-181.

Debrie, J. (2012). The West African port system: global insertion and regional particularities. *EchoGéo, 20*.

D'este, G. M., & Meyrick, S. (1992). Carrier selection in a RO/RO ferry trade Part 1. Decision factors and attitudes. Maritime Policy & Management, 19(2), 115-126.

Field, A. (2000). Discovering statistics using SPSS:(and sex, drugs and rock'n'roll) (1st ed.). London: SAGE.

Field, A. (2009). Discovering Statistics Using SPSS (Third ed.). London: SAGE Publications Inc.

Field, A. (2013). Discovering Statistics Using IBM SPSS Statistics. SAGE.

Foster, T. (1978a). Ports: what shippers should look for. Distribution worldwide, 77(1), 41-48.

Foster, T. (1978b). What's important in a port. Distribution Worldwide, 78(1), 33-36.

Global Maritime Forum. (2019, February 10). The maritime industry can unlock growth with Africa. Retrieved from Global Maritime Forum: https://www.globalmaritimeforum.org/news/the-maritime-industry-can-unlock-growth-with-africa

Gohomene, D. A., Yang, Z. L., Bonsal, S., Maistralis, E., Wang, J., & Li, K. X. (2016). The attractiveness of ports in West Africa: Some lessons from shipping lines' port selection.Growth and Change,47(3), 416-426.

Grosso, M., & Monteiro, F. (2009). Relevant strategic criteria when choosing a container port-the case of the port of genoa. *Research in Transport and Logistics, 299*

Guadagnoli, E. &. (1988). Relation of sample size to the stability of component patterns. *Psychological bulletin, 103*(2), 265-275.

Gugler, J. &. (1978). *Urbanization and social change in West Africa* (Vol. 2). London: Cabridge University Press.

Hair, J. F. (1995). *Multivariate data analysis* (4th ed.). New Jersey: Prentice-Hall Inc.

Harman, H. H. (1976). *Modern factor analysis* (3rd ed.). University of Chicago press.

Hilling, D. (1969). The evolution of the major ports of West Africa. *The Geographical Journal, 135*(3), 365-378.

Institute of Shipping Economics and Logistics. (2016). *ISL Shipping Statistics and Market Review (SSMR) Vol. 60.* Bremen: ISL Institute of Shipping Economics and Logistics.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and psychological measurement, 20*(1), 141-151.

Lancaster, C. (1983). Africa's Economic Crisis. *Foreign Policy, 52*, 149-166.

Lawrence, A. W. (1963). *Trade castles & forts of West Africa.* London.

Li, F., Li, L., Jin, C., Wang, R., Wang, H., & Yang, L (2012). A 3PL supplier selection model based on fuzzy sets. *omputers & Operations Research, 39*(8), 1879-1884.

Lirn, T. C; Thanapoulou H. A; Beynon,M. J., & Beresford, A. K.C (2004). An application of AHP on transhipment port selection: a global perspective. *Maritime Economics & Logistics, 6*(1), 70-91.

Lynn, M. (1989). From Sail to Steam: the Impact of the Steamship Services on the British Palm Oil Trade with West Africa, 1850–1890. *The Journal of African History, 30*(2), 227-245.

Lynn, M. (2002). *Commerce and economic change in West Africa: The palm oil trade in the nineteenth century* (Vol. 93). United Kingdom: Cambridge University Press.

Magala, M. & Sammons, A (2008). A new approach to port choice modelling. *Maritime Economics & Logistics, 10*(1-2), 9-34.

Malchow, M. B. & Kanafani, A. (2004). A disaggregate analysis of port selection. *Transportation Research Part E: Logistics and Transportation Review, 40*(4), 317-337.

MLTC/CATRAM . (2013). *Market study on container terminals.*

Murphy, P. R., Daley, J. M., & Dalenberg, D. R. (1991). Selecting links and nodes in international transportation: An intermediary's perspective. *Transportation Journal*, 33-40.

Murphy, P. R., Daley, J. M., & Dalenberg, D. R. (1992). Port selection criteria: An application of a transportation. *Logistics and Transportation Review, 28*(3), 237

Murphy, P.R. and Daley, J.M. (1994) A comparative analysis of port selection factors. Transportation Journal 34(1), 15-21

Newsom, J. (2005). A quick primer on exploratory factor analysis. Retrieved from https://web.cortland.edu/andersmd/psy341/efa.pdf

Notteboom, T. (2009). The relationship between seaports and the intermodal hinterland in light of global supply chains.

Ogundana, B. (1974). Seaport Development–Multi-National Co-operation in West Africa. *he Journal of Modern African Studies, 12*(3), 395-407.

Olukoju, A. (1992). The Development of the Port of Lagos, c. 1892–1946. *The Journal of Transport History, 13*(1), 59-78.

Olukoju, A. (2014). The Port of Lagos, 1850–1929: The Rise of West Africa's Leading Seaport. In *Atlantic Ports and the First Globalisation, c. 1850–1930* (pp. 112-129). London: Palgrave Macmillan.

Onwuegbuchunam, D. E. (2013). Port selection criteria by shippers in Nigeria: a discrete choice analysis. *International Journal of Shipping and Transport Logistics, 5*(4/5), 532-550.

Costello, A. B., & Osborne, J. W. (2005). Best Practices in Exploratory Factor Analysis: Four Reccomendations for Getting the Most From Your Analysis. *Practical Assessment, Research & Evaluation, 10*(7).

Overseas Development Institute. (1982). *Africa's economic crisis - ODI Briefing Papers 2.* London: Overseas Development Institute.

Panayides, P. (2006). Maritime Logistics and Global Supply Chains: Towards a Research Agenda. *Maritime Economics & Logistics, 8*, 3-18.

Peterec, R. J. (1962). *The Port of Abidjan: An Important Factor in the Economic Development of the Ivory Coast.* New York: COLUMBIA UNIVERSITY.

Pett, M. A., Lackey, N. R., & Sullivan, J. J (2003). *Making Sense of Factor Analysis: The use of factor analysis for instrument development in health care research.* Retrieved from SAGE: https://dx.doi.org/10.4135/9781412984898.n1

Port Authoriy of Abidjan. (n.d.). *History, port authority*. Retrieved from http://www.portabidjan.ci/en/autorite-portuaire/historique

PwC. (2018). *Strengthening Africa's gateways to trade.* PricewaterhouseCoopers.

Rietveld, T., & Van Houtt, R. (2011). *Statistical techniques for the study of language and language behaviour.* Berlin: Walter De Gryuter & Co.

Sanchez, R. J., Ng, A. K., & Garcia-Alonso, L. (2011). Port selection factors and attractiveness: the service providers' perspective. *Transportation journal, 50*(2), 141-161.

Shuo, M. (2018). *Maritime Economics.* Malmö: WMU.

Slack, B. (1985). Containerization, inter-port competition, and port selection. *Maritime Policy and Mnagement, 12*(4), 293-303.

Song, D.-W. (2019). Martime Logistics and Marketing.

Tabachnick, B. G. (2001). *Using Multivariate Statistics* (4th ed.). Boston: Allyn and Bacon.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics Boston.* (5th ed.). Boston: MA: Allyn & Bacon.

Tiwari, P., Itoh, H., & Doi, M. (2003). Shippers' Port and Carrier Selection Behaviour in China: A Discrete Choice Analysis. *Maritime Economics & Logistics, 5*(1), 23-39.

Tongzon, J. (2002). Port Choice Determinants in a Competitive Environment. *IAME Panama 2002 Conference Proceedings.* Panama.

Ugboma, C., Ugboma, O., & Ogwude, I. C. (2006). An analytic hierarchy process (AHP) approach to port selection decisions–empirical evidence from Nigerian ports. *Maritime Economics & Logistics, 8*(3), Maritime Economics & Logistics.

UNCTAD. (2017). *Review of Maritime Transport.* New York: United Nations Publications.

UNCTAD. (2017). *UNCTAD Liner Shipping Connectivity Index .*

UNCTAD. (2018). *Hand Book Of Statistics.* New York: United Nations Publications.

US International Trade Commission. (2009). *Sub-Saharan Africa: Effects of Infrastructure Condition on Export Competitiveness, Third Annual Report.* Washington, DC.

Vaggelas, K. G. & Pallis, A. A(2015). Port Performance: Criteria for measuring users perceptions in different port markets Port Performance: Criteria for measuring users perceptions in different port markets. *European Conference on Shipping, Intermodalism and Ports (ECONSHIP) .* Chios.

van Dyck, G. K. & Ismael, H. M. (2015). Multi-criteria evaluation of port competitiveness in West Africa using analytic hierarchy process (AHP). *American Journal of Industrial and Business Management, 5*(06), 432-446.

van Dyck, G. K. (2015). The Drive For a Regional Hub Port for West Africa: General Requirements and Capacity Forecast. *International Journal of Business and Economics Research*, 36-44.

Velicer, W. F., & Jackson, D. N. (1990). Component analysis versus common factor analysis: Some issues in selecting an appropriate procedure. *Multivariate behavioral research, 25*(1), 1-28.

White, H. P. (1970). The Morphological Development of West African Seaports. In *In Seaports and Development in Tropical Africa* (pp. 11-25). London: Palgrave Macmillan.

Williams, B. O. (2010). Exploratory factor analysis: A five-step guide for novices. *Journal of Emergency Primary Health Care (JEPHC), 8*(3).

World Bank. (2016). *Making the Most of Ports in West Africa.* Washington DC: The World Bank.

World Trade Organisation. (2018). *International Trade and Market Access Data*. Retrieved from World Trade Organisation: https://www.wto.org/english/res_e/statis_e/statis_bis_e.htm?solution=WTO&path=/Dashboards/MAPS&file=Map.wcdf&bookmarkState={%22impl%22:%22client%22,%22params%22:{%22langParam%22:%22en%22}}

Xiu, G. & Chen, X. (2012). The Third Party Logistics Supplier Selection and Evaluation. *JSW, 7*(8), 1783-1790.

Yong, A. G. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in quantitative methods for psychology, 9*(2), 97-94.

Appendix 1

SECTION ONE – BACKGROUND AND GENERAL INFORMATION

Name: _____

Company: _____

Country: _____

Email: _____

1. Which of these best describes the company you work?

   ☐ Freight forwarding

   ☐ Third party logistics provider

   ☐ Other

2. Does your company use West African ports for shipments?
   ☐ Yes ☐ No ☐ Other

3. If yes, how often do you use West African ports for shipments?
   ☐ Very often ☐ Once in a while ☐ other

4. SECTION TWO – PORT SELECTION CRITERIA

This section contains port selection criteria compiled through literature review. To answer this section, you are required to rank how important you consider these criteria when making decision on port for shipments by indicating on a scale of 1 – 5 (where 1 Not important; 2 less important; 3 neutral; 4 important; 5 very important).

Criteria	Not important	Less important	Neutral	Important	Very important
	1	2	3	4	5
1. Availability and capacity of port facilities					
2. Quality of container handling equipment					
3. Location of port					
4. Proximity to cargo destination					
5. Ship calls frequency					
6. Volume of cargo handled					
7. Port dues and terminal handling charges					
8. Cargo dues					
9. Risk of delays					
10. Intermodal connectivity to port					
11. Cargo loss and damage performance					
12. Safety of cargoes in port					
13. Convenience of custom processes					
14. Reliability of port services					
15. Information services in port (shipment information)					
16. Intermodal transportation costs					
17. Personal contacts in port					
18. Service flexibility (for special cargo)					
19. Corruption perception					
20. Prompt response to users' needs and complaints					
21. Information Technology					

22. Hinterland condition					
23. Port storage capacity					

5. What other criteria do you consider important not mentioned that you would like to add?

   _____

   _____

Thank you very much for your time and participation!

Researcher's name: Blessing Abimbola Simeon

Specialization: Shipping Management and Logistics

Email address:

w1802891@wmu.se

Appendix 2

	Availabilit	Quality of	Location c	Proximity	Frequency	Volume o	Port dues	Cargo exp	Risk of de	Intermod	Cargo loss	Safety of	Convenie	Reliabilty	Informati	Intermod	Personal c	Service fle	Corruptio	Prompt re	Informati	Hinterlan	Port storage capacity
Availability and capacity of port facilities	0.63	-0.078	-0.069	0.036	-0.034	0.006	0.151	-0.082	-0.054	0.041	0.08	-0.064	-0.028	-0.099	-0.13	-0.009	0.037	0.147	-0.007	-0.054	0.081	-0.066	-0.072
Quality of conatiner handling equipment	-0.078	0.531	0.048	-0.011	0.034	0.01	-0.099	0.118	-0.046	-0.049	-0.066	0.114	-0.019	0.017	0.073	-0.042	-0.072	-0.144	0.014	-0.128	-0.144	0.055	0.143
Location of the port	-0.069	0.048	0.541	0.15	-0.073	-0.072	0.072	0.081	-0.13	0.094	0.054	0.021	0.049	-0.018	-0.078	-0.141	0.124	-0.096	-0.065	-0.001	-0.054	0.002	-0.064
Proximity of the port to cargo destination	0.036	-0.011	0.15	0.467	-0.082	-0.072	0.14	0.103	-0.156	0.008	0.133	-0.118	-0.036	-0.003	-0.127	0.037	0.1	0.085	0.06	-0.006	0.105	-0.039	-0.031
Frequency of ship calls	-0.034	0.034	-0.073	-0.082	0.552	0.018	-0.046	0.122	-0.007	0.025	-0.054	0.099	-0.093	-0.093	0.043	-0.027	-9.13E-05	0.061	-0.051	-0.009	-0.102	-0.039	0.088
Volume of cargo handled	0.006	0.01	-0.072	-0.072	0.018	0.494	-0.012	-0.04	0.045	0.149	0.002	0.012	0.11	-0.178	-0.016	-0.07	-0.007	0.062	-0.065	-0.003	-0.141	0.013	0.016
Port dues and terminal handling charges	0.151	-0.099	0.072	0.14	-0.046	-0.012	0.509	0.073	-0.053	0.11	0.151	0.015	0.047	-0.068	-0.062	0.106	0.161	-0.005	-0.116	0.059	0.014	-0.048	-0.049
Cargo expenses	-0.082	0.118	0.081	0.103	0.122	-0.04	0.073	0.414	-0.019	0.074	-0.088	0.029	-0.095	0.002	0.084	0.082	0.113	-0.057	0.019	-0.067	-0.081	0.103	0.076
Risk of delays	-0.054	-0.046	-0.13	-0.156	-0.007	0.045	-0.053	-0.019	0.632	-0.051	0.011	-0.084	0.027	0.031	0.052	0.023	-0.144	0.036	0.037	0.011	0.019	-0.026	0.115
Intermodal connectivity to port	0.041	-0.049	0.094	0.008	0.025	0.149	0.11	0.074	-0.051	0.324	-0.063	-0.002	0.084	-0.116	-0.06	-0.062	0.124	-0.087	-0.067	-0.028	-0.175	0.09	0.051
Cargo loss and damage performance	0.08	-0.066	0.054	0.133	-0.054	0.002	0.151	-0.088	0.011	-0.063	0.359	-0.073	0.055	-0.044	-0.212	0.035	0.023	0.118	-0.093	0.087	0.138	-0.131	-0.108
Safety of cargoes in port	-0.064	0.114	0.021	-0.118	0.099	0.012	0.015	0.029	-0.084	-0.002	-0.073	0.463	0.054	0.043	0.119	-0.002	-0.01	-0.13	-0.184	0.125	-0.097	-0.08	0.079
Convenience of custom processes	-0.028	-0.019	0.049	-0.036	-0.093	0.11	0.047	-0.095	0.027	0.084	0.055	0.054	0.215	-0.074	-0.092	0.03	-0.041	-0.095	-0.139	-0.008	-0.041	-0.005	0.066
Reliabilty of port services	-0.099	0.017	-0.018	-0.003	-0.093	-0.178	-0.068	0.002	0.031	-0.116	-0.044	0.043	-0.074	0.388	0.057	0.111	0.001	-0.037	0.047	0.164	0.131	0.047	0.02
Information services in port (shipment information)	-0.13	0.073	-0.078	-0.127	0.043	-0.016	-0.062	0.084	0.052	-0.06	-0.212	0.119	-0.092	0.057	0.459	0.051	-0.037	-0.034	0.047	-0.005	-0.104	0.021	0.089
Intermodal transportation costs	-0.009	-0.042	-0.141	0.037	-0.027	-0.07	0.106	0.082	0.023	-0.062	0.035	-0.002	0.03	0.111	0.051	0.52	0.017	-0.008	0.025	0.039	0.1	-0.023	0.065
Personal contacts in pport	0.037	-0.072	0.124	0.1	-9.13E-05	-0.007	0.161	0.113	-0.144	0.124	0.023	-0.01	-0.041	0.001	-0.037	0.017	0.266	-0.031	-0.055	0.081	-0.019	0.094	-0.12
Service flexibility (for special cargo)	0.147	-0.144	-0.096	0.085	0.061	0.062	-0.005	-0.057	0.036	-0.087	0.118	-0.13	-0.095	-0.037	-0.034	-0.008	-0.031	0.404	0.029	0.036	0.114	-0.136	-0.12
Corruption perception	-0.007	0.014	-0.065	0.06	-0.051	-0.065	-0.116	0.019	0.037	-0.067	-0.093	-0.184	-0.139	0.047	0.047	0.025	-0.055	0.029	0.547	-0.114	0.004	0.046	-0.018
Prompt response to users' needs and complaints	-0.054	-0.128	-0.001	-0.006	-0.009	-0.003	0.059	-0.067	0.011	-0.028	0.087	0.125	-0.008	0.164	-0.005	0.039	0.081	0.036	-0.114	0.409	0.053	-0.11	-0.103
Information Technology	0.081	-0.144	-0.054	0.105	-0.102	-0.141	0.014	-0.081	0.019	-0.175	0.138	-0.097	-0.041	0.131	-0.104	0.1	-0.019	0.114	0.004	0.053	0.604	-0.075	-0.11
Hinterland connection condition	-0.066	0.055	0.002	-0.039	-0.039	0.013	-0.048	0.103	-0.026	0.09	-0.131	-0.08	-0.005	0.047	0.021	-0.023	0.094	-0.136	0.046	-0.11	-0.075	0.591	0.108
Port storage capacity	-0.072	0.143	-0.064	-0.031	0.088	0.016	-0.049	0.076	0.115	0.051	-0.108	0.079	0.066	0.02	0.089	0.065	-0.12	-0.12	-0.018	-0.103	-0.11	0.108	0.436
Availability and capacity of port facilities	.521a	-0.134	-0.118	0.067	-0.057	0.011	0.267	-0.161	-0.085	0.09	0.169	-0.119	-0.076	-0.201	-0.241	-0.016	0.092	0.291	-0.012	-0.106	0.131	-0.108	-0.138
Quality of conatiner handling equipment	-0.134	.486a	0.089	-0.022	0.063	0.02	-0.191	0.252	-0.079	-0.117	-0.152	0.229	-0.057	0.037	0.149	-0.08	-0.191	-0.311	0.025	-0.276	-0.254	0.099	0.297
Location of the port	-0.118	0.089	.475a	0.298	-0.133	-0.139	0.138	0.171	-0.222	0.224	0.123	0.041	0.145	-0.039	-0.157	-0.266	0.326	-0.205	-0.119	-0.003	-0.094	0.004	-0.132
Proximity of the port to cargo destination	0.067	-0.022	0.298	.452a	-0.162	-0.151	0.288	0.235	-0.288	0.02	0.325	-0.254	-0.112	-0.007	-0.274	0.076	0.284	0.194	0.118	-0.014	0.198	-0.075	-0.069
Frequency of ship calls	-0.057	0.063	-0.133	-0.162	.605a	0.035	-0.087	0.256	-0.012	0.06	-0.122	0.195	-0.269	-0.201	0.086	-0.051	0	0.128	-0.093	-0.02	-0.176	-0.069	0.18
Volume of cargo handled	0.011	0.02	-0.139	-0.151	0.035	.523a	-0.023	-0.089	0.08	0.374	0.004	0.025	0.337	-0.407	-0.033	-0.138	-0.019	0.14	-0.125	-0.008	-0.259	0.025	0.034
Port dues and terminal handling charges	0.267	-0.191	0.138	0.288	-0.087	-0.023	.326a	0.159	-0.093	0.27	0.353	0.03	0.142	-0.152	-0.128	0.206	0.436	-0.011	-0.22	0.129	0.026	-0.087	-0.103
Cargo expenses	-0.161	0.252	0.171	0.235	0.256	-0.089	0.159	.480a	-0.036	0.202	-0.229	0.066	-0.318	0.005	0.193	0.176	0.341	-0.139	0.039	-0.163	-0.161	0.208	0.178
Risk of delays	-0.085	-0.079	-0.222	-0.288	-0.012	0.08	-0.093	-0.036	.530a	-0.113	0.022	-0.156	0.073	0.062	0.096	0.041	-0.351	0.072	0.064	0.022	0.031	-0.043	0.219
Intermodal connectivity to port	0.09	-0.117	0.224	0.02	0.06	0.374	0.27	0.202	-0.113	.411a	-0.184	-0.006	0.32	-0.327	-0.155	-0.152	0.422	-0.24	-0.16	-0.078	-0.397	0.207	0.137
Cargo loss and damage performance	0.169	-0.152	0.123	0.325	-0.122	0.004	0.353	-0.229	0.022	-0.184	.364a	-0.179	0.196	-0.118	-0.522	0.081	0.076	0.309	-0.211	0.228	0.296	-0.285	-0.272
Safety of cargoes in port	-0.119	0.229	0.041	-0.254	0.195	0.025	0.03	0.066	-0.156	-0.006	-0.179	.446a	0.172	0.102	0.258	-0.004	-0.03	-0.299	-0.366	0.286	-0.183	-0.153	0.176
Convenience of custom processes	-0.076	-0.057	0.145	-0.112	-0.269	0.337	0.142	-0.318	0.073	0.32	0.196	0.172	.594a	-0.258	-0.292	0.091	-0.173	-0.323	-0.404	-0.028	-0.115	-0.015	0.215
Reliabilty of port services	-0.201	0.037	-0.039	-0.007	-0.201	-0.407	-0.152	0.005	0.062	-0.327	-0.118	0.102	-0.258	.499a	0.134	0.247	0.003	-0.093	0.102	0.413	0.271	0.098	0.049
Information services in port (shipment information)	-0.241	0.149	-0.157	-0.274	0.086	-0.033	-0.128	0.193	0.096	-0.155	-0.522	0.258	-0.292	0.134	.461a	0.104	-0.105	-0.079	0.093	-0.011	-0.197	0.041	0.199
Intermodal transportation costs	-0.016	-0.08	-0.266	0.076	-0.051	-0.138	0.206	0.176	0.041	-0.152	0.081	-0.004	0.091	0.247	0.104	.728a	0.044	-0.018	0.047	0.085	0.179	-0.041	0.137
Personal contacts in pport	0.092	-0.191	0.326	0.284	0	-0.019	0.436	0.341	-0.351	0.422	0.076	-0.03	-0.173	0.003	-0.105	0.044	.466a	-0.095	-0.145	0.246	-0.048	0.238	-0.352
Service flexibility (for special cargo)	0.291	-0.311	-0.205	0.194	0.128	0.14	-0.011	-0.139	0.072	-0.24	0.309	-0.299	-0.323	-0.093	-0.079	-0.018	-0.095	.452a	0.061	0.088	0.232	-0.278	-0.285
Corruption perception	-0.012	0.025	-0.119	0.118	-0.093	-0.125	-0.22	0.039	0.064	-0.16	-0.211	-0.366	-0.404	0.102	0.093	0.047	-0.145	0.061	.486a	-0.24	0.007	0.081	-0.037
Prompt response to users' needs and complaints	-0.106	-0.276	-0.003	-0.014	-0.02	-0.008	0.129	-0.163	0.022	-0.078	0.228	0.286	-0.028	0.413	-0.011	0.085	0.246	0.088	-0.24	.507a	0.106	-0.224	-0.244
Information Technology	0.131	-0.254	-0.094	0.198	-0.176	-0.259	0.026	-0.161	0.031	-0.397	0.296	-0.183	-0.115	0.271	-0.197	0.179	-0.048	0.232	0.007	0.106	.249a	-0.126	-0.214
Hinterland connection condition	-0.108	0.099	0.004	-0.075	-0.069	0.025	-0.087	0.208	-0.043	0.207	-0.285	-0.153	-0.015	0.098	0.041	-0.041	0.238	-0.278	0.081	-0.224	-0.126	.503a	0.212
Port storage capacity	-0.138	0.297	-0.132	-0.069	0.18	0.034	-0.103	0.178	0.219	0.137	-0.272	0.176	0.215	0.049	0.199	0.137	-0.352	-0.285	-0.037	-0.244	-0.214	0.212	.459a

Appendix 2a

e Matrices																					
	Availabilit	Quality of	Location c	Proximity	Frequency	Volume o	Cargo exp	Risk of de	Intermod	Cargo loss	Safety of	Convenie	Reliabilty	Informati	Intermod	Personal	Service fle	Corruptio	Prompt re	Hinterlan	Port storage capacity
Availability and capacit	0.689	-0.037	-0.094	-0.023	-0.008	0.032	-0.108	-0.045	0.044	0.026	-0.064	-0.041	-0.117	-0.114	-0.062	-0.01	0.155	0.03	-0.087	-0.048	-0.051
Quality of conatiner ha	-0.037	0.589	0.056	0.05	0.002	-0.03	0.132	-0.057	-0.1	-0.008	0.108	-0.023	0.043	0.044	0.002	-0.063	-0.139	-0.009	-0.12	0.033	0.127
Location of the port	-0.094	0.056	0.557	0.163	-0.081	-0.092	0.069	-0.125	0.083	0.059	0.01	0.041	0.005	-0.086	-0.163	0.126	-0.092	-0.051	-0.005	0.002	-0.073
Proximity of the port to	-0.023	0.05	0.163	0.53	-0.062	-0.056	0.116	-0.167	0.011	0.099	-0.125	-0.049	-0.008	-0.112	-0.01	0.084	0.08	0.108	-0.036	-0.016	0
Frequency of ship calls	-0.008	0.002	-0.081	-0.062	0.574	-0.007	0.126	-0.009	0.008	-0.024	0.09	-0.103	-0.089	0.023	-0.002	0.013	0.087	-0.066	0.005	-0.06	0.072
Volume of cargo handl	0.032	-0.03	-0.092	-0.056	-0.007	0.53	-0.066	0.052	0.155	0.049	-0.011	0.112	-0.177	-0.046	-0.052	-0.012	0.101	-0.074	0.011	-0.005	-0.012
Cargo expenses	-0.108	0.132	0.069	0.116	0.126	-0.066	0.437	-0.009	0.047	-0.122	0.015	-0.117	0.035	0.088	0.091	0.114	-0.045	0.04	-0.074	0.108	0.076
Risk of delays	-0.045	-0.057	-0.125	-0.167	-0.009	0.052	-0.009	0.638	-0.045	0.028	-0.083	0.035	0.021	0.052	0.034	-0.159	0.034	0.027	0.016	-0.029	0.121
Intermodal connectivit	0.044	-0.1	0.083	0.011	0.008	0.155	0.047	-0.045	0.423	-0.092	-0.046	0.083	-0.09	-0.106	-0.079	0.134	-0.072	-0.055	-0.035	0.106	0.041
Cargo loss and damage	0.026	-0.008	0.059	0.099	-0.024	0.049	-0.122	0.028	-0.092	0.452	-0.073	0.065	-0.075	-0.228	-0.024	-0.03	0.125	-0.08	0.076	-0.13	-0.093
Safety of cargoes in po	-0.064	0.108	0.01	-0.125	0.09	-0.011	0.015	-0.083	-0.046	-0.073	0.48	0.049	0.077	0.114	0.012	-0.024	-0.121	-0.196	0.14	-0.096	0.069
Convenience of custon	-0.041	-0.023	0.041	-0.049	-0.103	0.112	-0.117	0.035	0.083	0.065	0.049	0.223	-0.068	-0.102	0.031	-0.075	-0.095	-0.139	-0.011	-0.006	0.069
Reliabilty of port servic	-0.117	0.043	0.005	-0.008	-0.089	-0.177	0.035	0.021	-0.09	-0.075	0.077	-0.068	0.43	0.083	0.124	0.038	-0.074	0.035	0.184	0.065	0.044
Information services in	-0.114	0.044	-0.086	-0.112	0.023	-0.046	0.088	0.052	-0.106	-0.228	0.114	-0.102	0.083	0.485	0.091	-0.028	-0.017	0.037	0.012	0.003	0.073
Intermodal transportat	-0.062	0.002	-0.163	-0.01	-0.002	-0.052	0.091	0.034	-0.079	-0.024	0.012	0.031	0.124	0.091	0.56	-0.017	-0.029	0.054	0.021	-0.001	0.106
Personal contacts in pp	-0.01	-0.063	0.126	0.084	0.013	-0.012	0.114	-0.159	0.134	-0.03	-0.024	-0.075	0.038	-0.028	-0.017	0.33	-0.033	-0.024	0.082	0.135	-0.143
Service flexibility (for s	0.155	-0.139	-0.092	0.08	0.087	0.101	-0.045	0.034	-0.072	0.125	-0.121	-0.095	-0.074	-0.017	-0.029	-0.033	0.428	0.029	0.029	-0.132	-0.111
Corruption perception	0.03	-0.009	-0.051	0.108	-0.066	-0.074	0.04	0.027	-0.055	-0.08	-0.196	-0.139	0.035	0.037	0.054	-0.024	0.029	0.575	-0.109	0.039	-0.031
Prompt response to us	-0.087	-0.12	-0.005	-0.036	0.005	0.011	-0.074	0.016	-0.035	0.076	0.14	-0.011	0.184	0.012	0.021	0.082	0.029	-0.109	0.42	-0.104	-0.096
Hinterland connection	-0.048	0.033	0.002	-0.016	-0.06	-0.005	0.108	-0.029	0.106	-0.13	-0.096	-0.006	0.065	0.003	-0.001	0.135	-0.132	0.039	-0.104	0.605	0.097
Port storage capacity	-0.051	0.127	-0.073	0	0.072	-0.012	0.076	0.121	0.041	-0.093	0.069	0.069	0.044	0.073	0.106	-0.143	-0.111	-0.031	-0.096	0.097	0.461
Availability and capacit	.564a	-0.058	-0.152	-0.038	-0.013	0.053	-0.197	-0.068	0.082	0.046	-0.111	-0.105	-0.215	-0.197	-0.1	-0.021	0.285	0.048	-0.162	-0.074	-0.091
Quality of conatiner ha	-0.058	.655a	0.098	0.09	0.003	-0.053	0.261	-0.094	-0.2	-0.015	0.203	-0.064	0.085	0.082	0.003	-0.144	-0.276	-0.015	-0.241	0.055	0.244
Location of the port	-0.152	0.098	.597a	0.299	-0.143	-0.169	0.139	-0.21	0.171	0.117	0.02	0.117	0.01	-0.165	-0.292	0.294	-0.189	-0.091	-0.011	0.004	-0.144
Proximity of the port to	-0.038	0.09	0.299	.634a	-0.113	-0.105	0.242	-0.286	0.023	0.202	-0.247	-0.142	-0.018	-0.22	-0.018	0.201	0.168	0.196	-0.077	-0.028	0
Frequency of ship calls	-0.013	0.003	-0.143	-0.113	.652a	-0.013	0.253	-0.015	0.015	-0.047	0.172	-0.287	-0.178	0.043	-0.003	0.031	0.176	-0.114	0.01	-0.101	0.141
Volume of cargo handl	0.053	-0.053	-0.169	-0.105	-0.013	.523a	-0.136	0.09	0.327	0.1	-0.023	0.326	-0.37	-0.091	-0.095	-0.028	0.212	-0.135	0.023	-0.009	-0.024
Cargo expenses	-0.197	0.261	0.139	0.242	0.253	-0.136	.582a	-0.017	0.109	-0.274	0.032	-0.376	0.081	0.191	0.184	0.3	-0.104	0.08	-0.173	0.21	0.168
Risk of delays	-0.068	-0.094	-0.21	-0.286	-0.015	0.09	-0.017	.740a	-0.086	0.051	-0.15	0.092	0.041	0.094	0.056	-0.345	0.065	0.044	0.031	-0.047	0.224
Intermodal connectivit	0.082	-0.2	0.171	0.023	0.015	0.327	0.109	-0.086	.507a	-0.21	-0.103	0.272	-0.21	-0.233	-0.163	0.357	-0.169	-0.112	-0.083	0.209	0.094
Cargo loss and damage	0.046	-0.015	0.117	0.202	-0.047	0.1	-0.274	0.051	-0.21	.528a	-0.156	0.206	-0.169	-0.486	-0.048	-0.076	0.284	-0.157	0.174	-0.249	-0.203
Safety of cargoes in po	-0.111	0.203	0.02	-0.247	0.172	-0.023	0.032	-0.15	-0.103	-0.156	.562a	0.151	0.169	0.237	0.023	-0.061	-0.268	-0.373	0.311	-0.178	0.147
Convenience of custom	-0.105	-0.064	0.117	-0.142	-0.287	0.326	-0.376	0.092	0.272	0.206	0.151	.592a	-0.218	-0.311	0.087	-0.275	-0.308	-0.387	-0.036	-0.017	0.215
Reliabilty of port servic	-0.215	0.085	0.01	-0.018	-0.178	-0.37	0.081	0.041	-0.21	-0.169	0.169	-0.218	.514a	0.182	0.252	0.101	-0.171	0.07	0.432	0.126	0.099
Information services in	-0.197	0.082	-0.165	-0.22	0.043	-0.091	0.191	0.094	-0.233	-0.486	0.237	-0.311	0.182	.579a	0.175	-0.069	-0.038	0.071	0.027	0.006	0.153
Intermodal transportat	-0.1	0.003	-0.292	-0.018	-0.003	-0.095	0.184	0.056	-0.163	-0.048	0.023	0.087	0.252	0.175	.737a	-0.041	-0.06	0.095	0.043	-0.002	0.208
Personal contacts in pp	-0.021	-0.144	0.294	0.201	0.031	-0.028	0.3	-0.345	0.357	-0.076	-0.061	-0.275	0.101	-0.069	-0.041	.526a	-0.087	-0.055	0.221	0.302	-0.366
Service flexibility (for s	0.285	-0.276	-0.189	0.168	0.176	0.212	-0.104	0.065	-0.169	0.284	-0.268	-0.308	-0.171	-0.038	-0.06	-0.087	.593a	0.059	0.069	-0.26	-0.251
Corruption perception	0.048	-0.015	-0.091	0.196	-0.114	-0.135	0.08	0.044	-0.112	-0.157	-0.373	-0.387	0.07	0.071	0.095	-0.055	0.059	.517a	-0.221	0.066	-0.06
Prompt response to us	-0.162	-0.241	-0.011	-0.077	0.01	0.023	-0.173	0.031	-0.083	0.174	0.311	-0.036	0.432	0.027	0.043	0.221	0.069	-0.221	.652a	-0.206	-0.218
Hinterland connection	-0.074	0.055	0.004	-0.028	-0.101	-0.009	0.21	-0.047	0.209	-0.249	-0.178	-0.017	0.126	0.006	-0.002	0.302	-0.26	0.066	-0.206	.519a	0.184
Port storage capacity	-0.091	0.244	-0.144	0	0.141	-0.024	0.168	0.224	0.094	-0.203	0.147	0.215	0.099	0.153	0.208	-0.366	-0.251	-0.06	-0.218	0.184	.616a