ANALYSIS OF CARGO PILFERAGE IN NIGERIAN SEAPORTS:
PRE AND POST CONCESSION ERAS

BY

UNEGBU, VICTOR ONYEDIKACHI (B.TECH)

REG. NO.: 20114842858

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CERTIFICATION

We certify that this thesis was carried out by Unegbu, VictorOnyedikachi, with registration number 20114842858, of the Department of Maritime Management Technology, Federal University of Technology Owerri.

----------------------------------------------------------  ----------------------------------------------------------
Prof. K. U. Nnadi                                              Date
Head of Department/Supervisor

----------------------------------------------------------  ----------------------------------------------------------
Prof. S.M. Nzotta                                              Date
Dean SMAT

----------------------------------------------------------  ----------------------------------------------------------
Engr. Prof. K. B. Oyoh                                       Date
Dean PostGraduate School

----------------------------------------------------------  ----------------------------------------------------------
External Examiner                                             Date
DEDICATION

I dedicate this work to God Almighty whose I am and whom I serve.
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I acknowledge the privilege of being taught and supervised by my erudite and humble head of department, Prof. K.U. Nnadi. To be taught by the most erudite brains in the field of maritime studies such as Late Dr. Ekwenna D.U., Dr. Nwokoro A.I., Dr. Ndikom Obed, Dr. Emeaghara G.C., Dr. Onyemaechi C., Mr. Onwuegbuchularn D., Mr. Nze I.C.; is a great honor done me. I am also indebted to the love shown me by the Vice Chancellor FUTO, Prof C. C. Asiabaka, the Deputy Vice Chancellor Administration, Prof F. C. Eze, the Dean of SMAT, Prof. S.M. Nzotta, the Associate Dean Dr. (Mrs.) G. Okeudo and the Dean of Postgraduate School, Engr. Prof. K. B. Oyoh. Not also forgetting Mr. S. I. Ukaegbu who supervised my undergraduate project and gave relevant corrections to this work. My appreciation goes to my class adviser in my undergraduate days Mr. Chris Ikeogu for his unalloyed love, and Pastor Ejem for his counsel.

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May God bless you all in Jesus Name.

Unegbu, Victor Onyedikachi
ABSTRACT

This research was conducted to analyse the incidence and trend of cargo pilferage from 1999 – 2012. In order to do this, the periods were segmented into pre concession years (1999 - 2005) and post concession (2006 - 2012). The effect of concession policy on cargo pilferage was duly considered. To analyse the trend of cargo pilferage for both the pre and post concession era, four hypotheses were formulated. The first hypothesis was tested using the cumulative moving averages (CMA) technique of trend analysis \( CMA_n = \frac{x_1 + x_2 + \ldots + x_n}{n} \), the mathematical model \( CMA_n \frac{y_1 + y_2 + y_3 + \ldots + y_n}{N} \) was formulated, to calculate the triannual trend of both eras. Whereas the student’s difference of means t-test with the aid of computer based software known as SPSS version 20 was employed for the other three hypotheses, the autoregressive integrated moving average ARIMA model was used to forecast the trend of cargo pilferage in Nigeria Ports. It was discovered among other findings: that the trend of cargo pilferage was on steady increase during the pre-concession era, but experienced a steady progressive decrease during the post concession era, that the steady progressive decrease in the trend of cargo pilferage was forecasted to continue even till 2018; that cargo pilferage had no significant impact on ports’ revenue earnings which made the authorities to attend to it with lip service, that the volume and incidents of cargo pilferage has decreased significantly due largely to the impact of concession, that cargo pilferage had significant impact on cargo security, ports image and perception among others; that cargo security has improved significantly following the advent of port concession policy. It was recommended, among others; that port concessionaires and port authorities should collaborate with relevant port security agencies to ensure that cargo pilferage is fully eradicated in Nigerian seaport; that concessionaires should endeavour to live up to the agreement on the concession policy as regards providing highly sophisticated equipment and facilities for cargo security within their terminals. It was therefore concluded that concession policy has been a veritable tool for dealing with the problem of cargo pilferage in Nigeria seaports.
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CHAPTER ONE

INTRODUCTION

1.0 Background Information
The seaports are very important to the Nigerian trade as practically all imports and exports move through the ports. The importance of the seaports is attested to by the fact that approximately 99% by volume of Nigeria total imports and exports are seaborne; Nigeria ports control 60% of import into West and Central Africa. The ports have served as a major determinant of how economic activities are distributed. The volume of cargo-throughout at the ports is an important measure of the level of economic development of a country (Chioma, 2011).

The volume and value of cargo received by ports pay a vital role in ports revenue earnings as such cargoes must be handled seriously. Cargoes safety is a very important function of any port system that drives the ports economy and the nation’s economy concomitantly. Therefore, it becomes necessary that cargo pilferage or theft which happens to be an age-long disease affecting ports especially ports of developing countries be tackled to ensure a more efficient port in terms of cargo friendliness.
It was in view of this problem mentioned above and other related issues that precipitated the move to concession the Nigeria Seaports so as to allow for efficiency in ports operation viz-a-viz cargo safety during her stay in the ports.

A port is a location on a coast or shore containing one or more harbours where ships can dock and transfer people or cargo to or from land. Port locations are selected to optimize access to land and navigable water, for commercial demand, and for shelter from wind and waves. The use of the sea as a means of transfer in Nigeria dates back to the 15th century (1458) when the Portuguese sailed into Lagos with their vessels basically to trade on artifacts in Benin City. From the pre-independence era till date, the nation’s maritime industry is characterized by the domination of foreign vessels and/or carriers from the developed market economies of Western Europe and America. In order to control this scenario, subsequent developments led to the opening of ports at Apapa and Port Harcourt, rolling in the creation of the Nigerian Ports Authority (NPA) by the provision of Ports Act 1954 to load and discharge as well as maintain and develop the ports (Njoku, 2009).
From the commencement of operation of the NPA in 1956, Nigeria had operated a service port model. This was fraught with a lot of challenges which informed the idea of switching over to a landlord port model or port concession. The port concession programme was completed in 2006 after an international competitive bidding process. This led to the emergence of 26 terminals which were concessioned to private terminal operators on the Build, Operate and Transfer (BOT) model. The reform brought about ceding of cargo handling operations at the port to private terminal operators, leaving NPA as the landlord. The Nigerian ports witnessed a rapid transformation as a result of this reform in which Nigerian ports were concession to the port operators called concessionaires.

Ports always play a strategic role in the development of domestic and international trade of a country whether it is developing or developed country. However in a globalized world where distances are becoming squeezed ports play active roles in sustaining the economic growth of a country. In a modern world of a fast growing technological era, ports are playing the role of an industry, not just passive actor in transportation but also in complete supply chain management (Okeudo, 2013). Ports are more than just a piers, that
is they are more than just an infrastructure or a complex infrastructure (Prakash, 2005). Ports are industries and major economic stimulator globally. Ports are not only a chain in transportation for inter-change, but they function as self-sustaining industry that is linked with domestic and international trade.

Cargo safety and security must therefore, be a major concern of ports functions, since the existence of a ports is principally necessitated by the availability of cargoes. The volume and value of cargo that called at ports has been a major determinant of the outlook of such port in terms of competitiveness, efficiency, and performance evaluations. An efficient port will always have cargo security and safety within the port premises as a high point of duty in her operations. Cargoes are the regular callers at ports, no cargo no port adage is an age long altruism, therefore the level of hospitality meted to cargoes at their ports of call must be treated with high level sophistication and approach. A port must be equipped with all it takes to handle cargoes that call at her domain, be it human, electronic and mechanical. These port cargo handling facilities must be efficient, sophisticated and technologically up-to-date (Buxton, et al, 1978).
In order for Nigerian seaports to attain the level of world-class ports, the Nigerian government in 2006 decided to concession the operations of the ports to several private concerns; this move was partly facilitated by the growing spate of poor cargo handling facilities that will aid in cargo security and safety within the port premises (Ndikom, 2008).

Chioma,( 2005) conducted an extensive temporal – spatial study on cargo pilferage in Nigerian seaports. She said in her findings that the trend in cargo pilfering in Nigerian ports between 1993-2003 increased steadily. According to her, the volume of cargo pilfered at the ports decreased steadily from 114.9 tons in 1993 to 84 tons in 1996. This is followed by a steady increase to 159.2 tons in 2000 and subsequent decline to 86.3 tons in 2003. The spatial pattern of cargo pilfered according from to her, shows that volume of cargo pilfered was highest at the Apapa port with an average of 50.2 metric tons of cargo pilfered annually. The seaport with the least incidence of pilfered are Onne and Calabar ports with an annual average of 0.5 metric tons each. When compared with the volume of cargo pilfered, Onne was the most secured port in Nigeria, In terms
of cargo security with 1 metric ton of cargo pilfered compared by Calabar and Tin can Island ports. The least secured port was Warri port where 1- metric ton of goods was pilfered in every 43, 382.9 metric tons of Cargo discharged. This is followed by RO/RO and Port Harcourt ports. She went ahead to opine that the reduction in the level of cargo pilfering at the ports may be attributed to the ownership structure of the ports which in turn influence port activities. Whereas Onne port is Landlord port, Port Harcourt port is an operating port. The Operating port system is where the port authority provides the superstructure and carries out the functions of cargo delivery and discharge. A mixed port is a combination of both port systems. She finally suggested that privatization by way of concessioning of the ports which involves a change of the ownership structure from operating to landlord port system could significantly reduce cargo crimes and other security problems in ports.

Berk (2008) also lists insecurity of cargo as one of the ills that bedeviled Nigerian ports before port concession. Chioma(2011) also in her trend analysis of cargo pilferage in Nigerian seaports between the era of pre-concession opines that cargo pilferage was high in the various ports, as such contributed to the ills that bedeviled the
ports system. Ndikom (2006) states that many ports premises and quay aprons had fallen to disuse and failed road section inside the ports made movement of goods within ports ground cumbersome and very slow. Following the seaports congestions, complaints of untraceable or missing cargoes were being regularly lodged against the NPA, all to no avail. Security inside Nigerian seaports was compromised by the relentless ingress of multitude of all shades of persons into the seaports. As a result, miscreants called wharf rats easily gained access into the ports and pilferage goods in storage or vehicle parts. In fact security within ports ground was at the mercy of an elusive racket.

1.2 Problem Statement
Before the advent of port concession (1956-2005), the Nigerian ports system suffered from numerous ills which included, principally though innate, the issue of cargo security viz –a –viz cargo pilferage and/ or theft. This problem gave the Nigerian Ports Authoritya poor image in the global supply chain network. It however precipitated other ills such as cargo diversion, congestion, high cost of port tariff and charges, preference of neighbouring countries’ ports to Nigerian ports as desired ports of
call, long dwell time of cargoes and vessels, etc. This is as a result of the activities of some persons regarded as ‘wharf rats’ who perpetrated this ill act of cargo pilferage in Nigerian ports. In the pre-concession era, cargo pilferage was on the increase and was almost accepted as norms in Nigerian ports and in the Nigerian maritime community. As a result of this singular act and other inefficiencies, the Nigerian ports were exposed and thus rated as one of the cargo unfriendly ports. This consequently affected adversely the patronage of our seaports.

Therefore the introduction of concession policy is expected to address this issue of cargo pilferage and insecurity within the Nigerian seaport.

Consequently this study is focused on finding out the extent at which concession has impacted on the volume and incidents of cargo pilferage. It will be research worthy and industry benefiting to empirically ascertain via relevant statistical tools and models, the significant impact concession has had on the Nigerian ports system in terms of cargo crime reduction and or eradication viz a viz cargo pilferage.
1.3 Objectives
This research was carried out, with the main objective of analysing the impact of concession on the problem of cargo pilferage in the Nigeria seaports. However, the under listed are the specific objectives of this study.

(1) To analyze the trend of cargo pilferage in the Nigeria seaports from 1999-2012.

(2) To assess the impact of concession on the volume and incident of cargo pilferage in the Nigeria ports.

(3) To analyze the impact of cargo pilferage on the Nigeria ports’ economy for pre-concession era (1999-2005) and post concession era (2006-2012).

(4) To assess the impact of concession on cargo security within the Nigeria ports and terminals.
1.4 Research Questions.
This research aims to provide analytical and quantitative answers to the following questions;

1. What was the trend of cargo pilferage in the Nigeria port system from 1999-2005 and 2006-2012; is it increasing or decreasing?

2. With the advent of concession policy in Nigerian ports, has the volume and incidents of cargo pilferage decreased significantly?

3. Does cargo pilferage in the Nigerian ports have significant impact on the economy of the Nigerian ports with regards to revenue earnings?

4. Has cargo security within the Nigerian ports improved significantly since the advent of concession?
1.5 Statistical Hypotheses
In order to proffer solutions to the research questions of this study, three hypotheses were formulated. They included:

1. \( H_0: \) The trend of cargo pilferage in the Nigeria ports has not decreased from 1999-2012.

2. \( H_0: \) The volume and incidents of cargo pilferage has not significantly decreased following the concession of Nigeria ports.

3. \( H_0: \) Cargo pilferage has had no significant impact on the revenue earnings of the Nigeria ports.

4. \( H_0: \) Cargo Security has not significantly improved following the concession of the Nigerian seaports.
1.6 Significance of Study

The significance of this work lies in the ability of this research to identify cargo pilferage as a major yet innate problem of the Nigeria seaports in the pre and post concession eras of the Nigerian ports system. It seeks to show how the concession of the Nigerian ports has affected cargo pilferage in Nigerian ports. It seeks to expose cargo pilferage as a fundamental challenge to port productivity and efficiency in terms of cargo security, safety and handling within the period it stays at the port. This work tends to reveal cargo pilferage as a global challenge affecting the global supply chain and logistics management.

It is also significant in the sense that will help to reveal the trend of cargo pilferage and its impact on the ports economy; and recommend solutions to the problem of cargo security within the ports.
1.7 **Scope of Research**
This research work is interested in the analysis of cargo pilferage in Nigeria seaports so as to ascertain the impact of concession on the volume of cargo pilferage in Nigerian Seaports. In this work, cargo pilferage and cargo theft will be used interchangeably and will mean the same thing. Cargo pilferage in this study will be limited only to non-oil cargoes.

1.8 **Limitation of Study**
Very limited academic analysis or research work has been done on cargo pilferage or theft as such limited relevant published works were made available for the literature review, segment of this study. This posed a great limitation to the study. Likewise the secondary data used as regarding the incidence and volume of cargo pilferage in Nigeria ports were unpublished data but were collected in pieces and compiled by the researcher. This is because concessionaires for some private reasons don’t keep records of reported cases except the port police or other port security agency. This also posed a great limitation to this study.


CHAPTER TWO

2.0 REVIEW OF RELEVANT LITERATURES

Introduction; Definition of Cargo Pilferage
To define cargo pilferage we must first define the individual words that make up the word. Cargo is defined simply as freight carried by any vehicle of transportation. It is the goods carried from a point of departure to a point of destination. While, pilferage is stealing in small quantities. It is stealing a part of a whole of a goods or commodity. Pilfering is not defined in the volume alone but in the volume as related to the volume of the whole. That means one who steals one car out of hundred cars in a unit can be said to have pilfered, and one who steals one car out of two cars in a unit cannot be said to have pilfered.

Therefore cargo pilferage is the stealing of a fraction of cargo(es) from a unit cargo. Cargo pilferage reduces the volume of that Unit cargo. Therefore in this study cargo pilferage will be regarded and used interchangeably with cargo theft.

However, chioma (2011), defines cargo pilferage as the act of stealing cargo in small quantity. She reiterated that it involves the broaching of containers and vandalizing cargoes in the ports. Cargo
pilferers also known as ‘wharf rats’ damage vehicle to steal parts, food items such as bags of rice, cartons of sugar, cartons of fish, electronic equipment and clothings. They also remove cargo in whole without going through normal procedure. Cargo pilfering is the act of stealing rather insignificant volume of goods but when taken cumulatively it becomes significant. This act is carried out by miscreants who have no legal business within the port premise but to steal, loot and pilfer. They sometimes work in alliance with some port workers.

In his own contribution, Claire (2001) infers that cargoes can be stolen either by dock workers or external offenders often referred to as ‘wharf rats’
2.1 CONCEPTUAL FRAMEWORK

2.1.1 Maritime Cargo Crime
Maritime cargo crime occurs in ports on vessels at sea, and on offshore platform. The losses are significant. For example, just one companies—the American institute of Marine underwriters-reported cargo losses of US245 million in 1994 (Claire, 2001).

2.1.2 Types of Maritime Cargo Crime
There are four (4) types of maritime cargo crime:

1. Theft from docks and clearing cargo loading and unloading operations. This kind of crime on cargo is common in Nigeria seaports. Plezens (2009) estimates that about 35% of the cargos from ships landing on the Lagos ports area are tampered with especially consumables. Although there is the decrease of this kind of crime but not in expected proportion following the high hopes of promises of concessionaires.

The introduction of containers reduced pilfering, but now the containers themselves are being stolen and sold back to the black market, particularly the expensive refrigerated ones. Secure controls over access to port facilities are crucial, including cargo handling areas, docks and terminal buildings. A “model port”
guideline for security and controls has been in the United States (ICC, 2000: 244-247). Port security personnel and customs authorities should be aware of all vessel movements, have up-to-date detailed cargo information (destination, consignee, special handling) and be alert to unusual documents because discrepancies may indicate illegal activity (De Genets, et al 1994). Close liaison between port authorities and local police is essential as the handover of illegally acquired cargoes may occur outside port authority areas.

Shipping companies that have strictly controlled cargo handling systems and tight cargo sealing discipline are likely to have reduced levels of cargo crime (De Genets, et al 1994). Officers are usually well trained in cargo tracking systems and in the use of technological aids for searching containers (Hollings, 1999).

2. Thefts from In-Port Vessels: This typically involves cash consumables, electronics pharmaceuticals, mechanical Auto spare parts, petty goods like used cloths in their palletized unit form and other high value goods. This is done at the point where the cargoes are kept at transit sheds, warehouses or other storage facilities written the Port areas. Organized crime gangs sometimes hid, illicit
arms, or drugs inside the listed cargo and later stolen by their syndicate members in the port (Hollings, 1999).

3. Piracy: Vessels at sea may be hijacked for off-loading of cargo by sea pirate and animal. Nigeria rank among the top in the incidence of piracy due largely to our porous marine territorial borders (Aigun, 2013).

4. Document-related cargo crime: This involves sale of non-existed goods, substitution scuttling for insurance fraud (usually in area where retrieval is difficult), illegal diversion or charter fraud where freight fees are pre-paid but no vessel is chartered to forward the cargo. (chalk, 1998). Even with tight document security professional offenders may be able to anticipated container contents that are worth stealing because of loading principles that place certain cargo in certain areas of a ship.

### 2.1.3 Cargoes; Types and Handling

Cargoes are freight transported by ships from point of departure to point of destination. Cargoes are goods, and a wide variety of goods enter international trade and many types of ship are used to transport them. Below are the types of cargoes:
2.1.3.1 Dry Bulk: These are basic raw materials such as ores, coal and food-gains that are usually transport in bulk. Recently, the volume of dry bulk cargoes entry international trade has increased rapidly. The unit value of many bulk commodities is low, typically less than $100 per tone and trade in them is particularly sensitive to transport costs. Ship operating in the dry bulk cargoes carriage must have good deadweight carrying capacity; they usually have wide hatch and clear holds to facilities loading and discharging. In most bulk trade the cost of time spent in port forms a significant proportion of the overall cost of transportation. Bulk carries spend roughly half of their time in ballast since most raw materials are exported from areas requiring little return of cargoes. [Buxton, et al 1978].

2.1.3.2 Bulk Liquid: Bulk liquids cargoes have been transported by sea for nearly a century. Today oil (both crude and refined products) is the most important single commodity carried in ships exceeding in volume the combined total of all other commodities entering international trade. Crude oil tankers are now the largest ships afloat with deadweight capacity exceeding 550,000 tones.
2.1.3.3 Break-Bulk General Cargo: Manufactured, semi-finished and many other general goods commonly constitute liner cargoes which have traditionally been transported in “break bulk form. Each item is individually packaged in a carton, crate or bale and must be handled separately at its destination.

Scheduled liner services have been offered for a little more than 100 years and are now operated over many routes throughout the world. Individual consignments of cargo are small, usually considerably less than a shipload. Thus on any voyage a cargo liner might carry a wide range of goods for many different trades are extremely diverse and on single trade can be regarded as typical of liner service in general. Most of the general cargo carried now is of a type that cannot be readily packed into containers.

General cargo is loaded from the dock by traditional dock wide cranes weight precludes this. Most ships used to have their own cargo handling gears in the form of derricks or cranes and between deck, but these days not many are fitted with these, due largely to containerization.
2.1.3.4 **Unitized Cargoes:** Many of the handling problems associated with break bulk cargoes have disappeared with the introduction of unitization. Ships specially designed for the purpose of carrying are now common. Many of them are much larger than the break-bulk vessels that they have replaced because higher handling rate has given rise to significant economics of scale. Moreover, by the means of unitization International transportation may be regarded as an integrated system each element of much can be designed to achieve minimum overall transport cost. To handle this kind of cargo ships rely on shore facilities provided by persons [private or public] running the part. These unitized goods include; containers, RORO, palletized goods, barges.

2.1.4 **Port Cargo Handling Facilities**
In recent years the advances which have been made in ship design and transportation technology as influenced by cargo type and handling have led to radical changes in the facilities offered by ports and have rendered a large number of traditionally arranged and equipped berths obsolete. The great lengths of quay space, with lines of cranes and transit great shed, which were chief characteristics of every major general cargo port, until recently
have been largely superseded by unit load berths whose most outstanding features is an extensive parking and marshaling area, mainly for containers.

The loading and discharging of break-bulk general cargo is not materially affected by the existence or absence of adequate quayside facilities. Shore cranes may be more convenient to use than ship’s derrick but they do not speed up the transfer process to any significant extent since so much time is spent in making up breaking down and sorting slings of cargo in transit sheds and holds and securing for passage. There is almost no limit to the variety of packages and goods that can be handled at a traditional general cargo berth but this degree of flexibility is achieved only at the expense of handling rates which rarely exceed 500 tonnes per day. In contrast the high handling rates that are possible at container berths where only standard sized container units can be accepted are achieved at the expense of flexibility.

Containers awaiting trans-shipment are stored until required in parking areas adjacent to the berth where they are usually arrange in accordance with some predetermined plan so that they may be loaded in the correct order-allowing for weight, content and port of
destination. They are moved between quayside and parking area by straddle carriers or other purpose built vehicles or trailers and transferred to the ship by large container cranes. A typical berth might have two such cranes each with a capacity of third or more loaded containers per hour, corresponding to a daily rate of some 10-1500-tonnes

Specialized facilities for handling bulk materials have long been available at many ports, but during the last two decades advances comparable to those which have so changed the handling of general cargo have also been precipitated by the increase in world new ports have been constructed to promote particular trades. Many of them are capable of handling large vessels although only a fairly small proportion can accommodate the very largest that are now in service with drafts of more than 15m (50 ft) unlike general cargo and container berths bulk terminals are usually employed either for loading or for discharging but not usually for both such is the nature of bulk trades. Chutes and conveyors, fed by railway wagons or linked directly to adjacent stockyards, provide the most common means of loading bulk commodities arrangements which are in principle, often similar to those which have been employed
at coal strait for over a century. Relatively simple facilities can offer high handling rates, 50,000 tons per day or more.

Discharging terminals are often sited close to the plant where the bulk materials will be processed, for example, steel works, sugar refineries, or flour mills, and high handling rates are necessary if large vessels are to be turned round in a reasonable time. For all the development that has taken place in recent years, the standard of facilities both equipment and labor offered by different ports around the world varies enormously. At some condition may still be primitive while at others congestion may be perennial problem, which renders theoretical estimates of potential cargo handling rates of shipboard or other equipment of little more than academic interest.

2.1.4.1 Ports Cargo Handling
Although the majority of dry cargo vessels have always been equipped with their own cargo handling gear in the past, today many ships rely entirely on shore facilities. Whether or not shipboard cargo gear is necessary depends very much upon the trades in which a particular vessel is likely to be employed, the port facilities and the attitudes of individual operators.
The largest bulk and ore carriers are often employed on long-term charter and, because of their size, can only call at a relatively small number of loading and discharging terminals where extensive handling facilities exist. Thus there is noneed for them to have their own cargo-handling equipment. Small-and medium-sized bulk carries, however, may be employed in a variety trades requiring them to call at a range of ports, some with adequate facilities, and some without. The availability of derricks or canes increases the flexibility of such ships, allowing them, perhaps, to accept charters which otherwise they would have to refuse. This flexibility is achieved only at the cost of having handling equipment idle for much of its life and it is a matter for the operator’s judgment to determine an acceptable level for such cost.

General cargo vessels have invariably been well endowed with cargo-handling equipment in the past but many of the container ships have replaced them have none at all. Purpose-built container berths have been established in most important ports of the world and special cranes and other facilities with which they are equipped have rendered shipboard container handling gear largely unnecessary, although sometimes it may be fitted temporarily while
port facilities are under construction. Moreover, because of the speed and precision with which heavy containers must be transferred between ship and shore, container cranes are complicated pieces of equipment and hence initially expensive. Thus, in many services, the low utilization of shipboard installation is normally unacceptable.

2.1.4.2 TEMPORARY CARGO GEAR

Gearless ships, calling at ports with inadequate quayside facilities, may sometimes make use of a variety of temporary cargo-handling equipment including small mobile cranes and portable pneumatic grain elevators. The use of such equipment can never be regarded as more than an occasional expedient, however.

![Diagram of cargo handling system by links](image)

**Fig 2.1**: Cargo Handling System by Links; **Source**: Burton, et al (1978).
2.2 THEORETICAL FRAMEWORK

2.2.1 Historical Background of Port Development in Nigeria
The history of port development in Nigeria can be dated back to the 19th century. This was after the onset of sea borne trade and transactions which followed the adventure of early exploration on the Africa coats.

Initial efforts towards provision of facilities for ocean going vessels were the attempt to open up the entrance of the Lagoon. Considerable littoral drift occurred along the coast and the constantly shifting channels in the bar at the entrance made entry very difficult. On February 1, 1914, the first mail-steamer-Akoko drawing (vessel) 5.64 meters entered to Lagos harbor. Months later, vessels began to use the facilities provided at the customs wharf on Lagos Island. Prior to this time, exploration and trade activities involving European Missionaries and businessmen in Africa made the existence of the port on a wide coastal stretch from Calabar to Lagos imperative.

Specifically, in the 15th century the European opened marine contract and discovered the rich natural resources in the west and central region that were need for their economic and industrial
revolution. The first major breakthrough in opening the Lagos lagoon was in 1906 when orders were placed for dredgers to work at the bar. During the same year approval was given for the construction of the first length of the east mole (massive wall).

The construction of railway from Lagos to Ota and then to Abeokuta provided easy transportation of stone needed for the construction of the mole. Depth over the bar increase steadily as the entrance moles were pushed further seawards. The development of water transportation in Nigeria also brought about the development of other modes of transport such as a rail road networks.

The decision to develop Apapa port was taken in 1913 and construction of the four deepwater berths of 548.64 meters long at Apapa began in 1921. Twenty seven years later (1948) an additional 762 meters of berth age were constructed as continuation downstream of the first four berths and around 41 hectares of reclamation behind the warehouse and marshalling yards. The discovery of coal at Enugu motivated the building of ports in the eastern flank of the country; work commenced on the building of Port Harcourt wharf during the first quarter of this century.
In 1913, Port Harcourt was opened to shipping by Lord Luggard, the governor general. The railway line to Enugu was completed three years later in 1916. A berth for colliers (coal miners) was dredged out and constructed as a place where loading could be effected (Ogunsanya, 2010).

Within the first eleven years (1955-1966) of its existence as a corporate body, the NPA focused on fundamental issues vital to the success of the port industry and equally relevant to the overall development of the national economy. In recognition of the importance of having trained hands on its payroll and in response to the policy of Nigerianization in the years preceding independence in 1960, the NPA embarked on an elaborate manpower development through cadetship training awards. Emphasis was on marine Engineering, Accountancy, General Management, Civil, Mechanical and Electrical Engineering. By the early sixties, beneficiaries of this training award had begun to graduate and to form the core of Nigerian professionals to shape the future of the ports industry.

The authority within this period, continued to sustain the efforts already made towards expansion of port facilities in Lagos and Port Harcourt. In Lagos, six berths of 945m quay length were added to
the existing ones, while four berths with a total quay length of 506m were added to the facilities and steps were taken to mechanize the traffic operations in these ports. In this era, port development approach became tailored along declared national objectives.

The Authority’s development strategy became programmed to fall in line with the first National Development plan 1962-1968. The second Apapa wharf extension was executed and so also were further improvements of port facilities in Port Harcourt.

The civil War era (1967-1970) had tremendous impact on the ports industry in Nigeria. The security aspect of port came into sharp focus. Port Harcourt (Rivers Ports) was closed to foreign traffic. Lagos thus became the only available port serving the country’s maritime transport needs.

The Federal Military government enacted a special decree which empowered NPA to acquire port of Warri, Burutu and Calabar, previously operated by private entrepreneurs. Holts transport were former owners of Warri port, UAC owned Burutu port. Calabar port was originally owned by five operators. Lagos port with its comparatively limited capacity was made to bear the weight and
burden of the tremendous flow of war time cargoes and other goods coming into the country.

The Federal government drew up its second National Development plan (1970-1974) which was the first major policy thrust in reconstructing and rehabilitated the civil war damaged economy. The sum of #4.1million was initially made available for the rehabilitation of port infrastructures and necessary mechanical handling equipment. The rehabilitated and reconstructed ports include Port Harcourt, Bonny, Calabar, Koko and Lagos.

After the civil war, port congestion was experience in two different dimensions; ship congestion and cargo congestion. One of the adverse effects of the port congestion was on the nation’s external reserves. A demurrage estimated at US4.1200 per day for each cement vessels for delays in excess of ten days was paid by the Federal government. The period can rightly be described as a major turning point in the history of ports development as the ports management ceased to be just an NPA affairs, it became a national issue. The nation also witnessed enormous growth and development in port owing to the oil boom days of 1970s and 1980s. On October 14, 1977, the ultra modern Tin can Island was commissioned. Two
years later, (16th June 1979) the new Warri port was commissioned together with the new Calabar port (19th June 1979) bringing the number to eight (8) with a total annual capacity of 25 metric tons. The Federal Ocean Terminals at Onne with a maximum draft of 13 meters was constructed to cater for sub-regional transshipment trade and also the old Apapa Port was upgrades to cater for more than general cargo trade (Ogunsanya, 2010).

The eight major ports controlled by the Nigerian ports Authority are:

1. Apapa
2. Container
3. RORO
4. Tin can
5. Warri
6. Port Harcourt
7. Calabar
8. Onne Ocean and Lighter Terminal

And in sum, they have the following facilities
• 93 general cargo berths
• 5 RORO berths
• 7 bulk solid berths
• 11 bulk liquid cargo berths
• 63 buoy berths
• Numerous private jetties.

Cargo storage facilities include:

• 63 transitsshed.
• 22 back sheds, 1 airconditioned sheds
• Over 40 warehouses with a total storage area of over 460,400 square meters.

Also available in the ports are:

A fleet of 54 harbor craft and over 600 different types of cargo-handling equipment.

These plants and equipment are, as a matter of policy, upgraded continually in accordance with international standards and in line with maritime developments (NPA, Ports Statistics and Abstract. 2007).
2.2.2 Background on Nigerian Ports Concession

The magnitude, scope and persistence of failure of Nigeria’s public enterprises (PEs) including the ports became alarming as these enterprises required continuous massive subsidies but delivered only intermittent and substandard service. The return on these large investments were generally poor, and in some cases negative, with an especially low rate of return relative to the large amount of resources invested in them (FGN, 1986 in Jerome, 2008). Netoutflows from the government to the public enterprises sector were estimated at US$2 billion annually (Callaghan, et al. 1988; Jerome, 2008). All these pointed to the inefficiencies of the public enterprises of which the ports are part of.

The reasons for the poor performance of Nigerian ports and other public enterprises from history tend to have a uniform pattern globally and range from the presence of conflicting and interwoven roles determined by politicians, prevalence of uncompleted contracts and subsidies from government. These more or less aid internal inefficiencies, issues of excessive bureaucratic controls, to government interference and intervention, and other public service culture of undermining and compromising efficiency and optimum productivity (Ogunsiji and Ogunsiji, 2010; Jerome, 2008).
Concessions were born out of the needs for one reform or another. Concession may be considered analogous to public private partnerships (PPPs) and Private Finance Initiatives (PFLs) and or seen as an arm of privatization (if defined broadly). Privatization of state-owned enterprises (SOEs) has become a key component of the structural reform process and globalization strategy in many economies (Jerome, 2008). It gained popularity in recent times but is an old innovation as it was practiced by the French government as can be seen in the water project of 1776 (Idornigie, 2006).

Section 168 of the draft ports and Harbor Authorities Bill defines a ‘concession’ as an arrangement between an Authority and a third party pursuant to which such third party shall be authorized to provide a port service or operate a port facility in accordance with the bill (Idornigie, 2006). It is argued that privatization of terminals through concession contracts would be a valuable option if port competition is effective, but not necessarily in cases where competition needs to be created by regulation (Niekerk, et al 2005). It is not the plan of this paper to discuss the suitability or not concession as a method.
The FGN embarked on the concession of Nigerian ports essentially to solve the protracted problems of inefficiency, corruption, mismanagement, and huge debts that characterize the Nigerian port concession includes the $34 Million indebtedness of the NPA, the redundancy of 24 out of 83 managers as well as its poor management structure. Emphatically concessions of Nigerian ports refer to lease of port terminals and re-organization of stevedoring companies. About 110 applications were received in December 2003 and out of 94 pre-qualified concessionaries, only 20 were granted to operate Nigeria seaport terminals for 10-25 years (Lie gland et al, 2007; Kieran 2005; Cameron, 2004 Akinwale et al 2010).

The concept of efficiency is very vague and proves difficult to apply in a typical port organization extending across production, trading and service industries. Ports are complex and mult-parts organization in which institutions and functions often interest at various levels (Bichou et al, 2004). There are many ways of measuring port efficiency although reduced to three board categories-physical indicates, factor productivity indicates and economic and financial indicators (trugillo et al, 1999).
Physical indicators refer generally to time measures concerned with the ship e.g ship turnaround time, ship waiting time, berths occupancy rate, waiting time at berth). It can sometimes measure coordination with land modes e.g cargo dwell time or how long it takes for unloaded cargo to leave the port. Factor productivity indicators focuses on maritime side of the port as it measures both labor and capital required to load goods from a ship. In the same vein, economic and financial indicators are usually related to the sea access, for example, operating surplus or total income and expenditure related to gross registered tons (GRT) or net registered tones (NRT) or charge per twenty foot equivalent (TEUs). Port impacts on the economy are sometimes measured to assess the economic and social impacts of a seaport on its respective hinterland or foreland. The importance of logistics to port operations and achievement of efficiency cannot understand (Itami, 1980; Yaticchia et al, 2008).

Most developing countries like Nigeria lack the expertise required for crafting environment conducive for good logistics system (Fawcett et al 1993). As an important element in a concession scheme, strategy refers to the plans, investments, and actions taken
to achieve sustainable competitive advantage and both superior economic and social performance (Husted and Allen, 2001). Strategy management-planning which could have clearly define the port’s mission, specify achievable objectives, develop strategies and set policy guidelines would be available; it did appear this was absent in the concession scheme (Hitt et al, 2009). An example is the fact that it wasn’t clear if the ports should operate as a public enterprise, an infrastructural enterprise, a social service or a profit making business enterprises (Ogunsiji, 2004; Ogunsiji and Ogunsiji, 2010).

The location and characteristics of the various major ports before the concession. The Apapa port for instance after the concession culminated into six terminals owned by three concessionaries or terminal operators.
Table 2.1: **Location Of Ports And Characteristics Of The Various Major Ports**

*Before Concession.*

<table>
<thead>
<tr>
<th>S/N</th>
<th>Port</th>
<th>Location</th>
<th>Maximum depth</th>
<th>Quay length of berth (Meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apapa Port</td>
<td>Lagos</td>
<td>9.0</td>
<td>2459</td>
</tr>
<tr>
<td>2</td>
<td>Tin Can Island port</td>
<td>Lagos</td>
<td>11.5</td>
<td>2045</td>
</tr>
<tr>
<td>3</td>
<td>RORO port</td>
<td>Lagos</td>
<td>11.5</td>
<td>705</td>
</tr>
<tr>
<td>4</td>
<td>Container Terminal</td>
<td>Lagos</td>
<td>10.5</td>
<td>1005</td>
</tr>
<tr>
<td>5</td>
<td>Port Harcourt Port</td>
<td>Port Harcourt</td>
<td>7.8</td>
<td>1877</td>
</tr>
<tr>
<td>6</td>
<td>Delta Ports</td>
<td>Warri</td>
<td>11.5</td>
<td>2506</td>
</tr>
<tr>
<td>7</td>
<td>Calabar Port</td>
<td>Calabar</td>
<td>11.0</td>
<td>1137</td>
</tr>
<tr>
<td>8</td>
<td>Federal Lighter Terminal</td>
<td>Onne</td>
<td>5.7</td>
<td>1185</td>
</tr>
</tbody>
</table>

*Source: Nigeria Ports Authority, Service Charter (2001).*
Table 2.2: **Ports Terminals and Operators**

<table>
<thead>
<tr>
<th>S/N</th>
<th>Berth/Area Occupied</th>
<th>Terminal Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apapa Terminal B; Berths 4 – 5</td>
<td>Apapa Bulk Terminal Ltd.</td>
</tr>
<tr>
<td>2</td>
<td>Apapa Terminal B; Berths 4 – 5</td>
<td>Apapa Bulk Terminal Ltd.</td>
</tr>
<tr>
<td>3</td>
<td>Apapa Terminal C; Berths 6 – 12</td>
<td>ENL Consortium Ltd</td>
</tr>
<tr>
<td>4</td>
<td>Apapa Terminal D; Berths 13 (Bullnose)</td>
<td>ENL Consortium Ltd</td>
</tr>
<tr>
<td>5</td>
<td>Apapa Terminal E; Berths 19 – 20</td>
<td>Green View Dev. Nig. Ltd.</td>
</tr>
<tr>
<td>6</td>
<td>Apapa Container Terminal B; Berth 15 – 18A</td>
<td>APM Terminal Ltd.</td>
</tr>
<tr>
<td>7</td>
<td>Lilypondljora Container Depot</td>
<td>A.P Moller</td>
</tr>
<tr>
<td>8</td>
<td>TinCan Island Port Terminal A</td>
<td>JosepDan Ports Services Ltd.</td>
</tr>
<tr>
<td>9</td>
<td>TinCan Island Port Terminal B</td>
<td>Tin Can Islan Terminal Ltd</td>
</tr>
<tr>
<td>10</td>
<td>TinCan Island Port Terminal C</td>
<td>Ports and Cargo Handling Services</td>
</tr>
<tr>
<td>11</td>
<td>TinCan Island Port RoRo Terminal</td>
<td>Five Star Logistics</td>
</tr>
<tr>
<td>12</td>
<td>Port Harcourt Terminal B; Berths 1 – 4</td>
<td>Ports and Terminal Operators Ltd.</td>
</tr>
<tr>
<td>13</td>
<td>Port Harcourt Terminal B; Berths 5 – 8</td>
<td>Bua Ports &amp; Terminal Ltd.</td>
</tr>
<tr>
<td>14</td>
<td>Onne FOT A Onne FOTA</td>
<td>Intels Nig. Ltd.</td>
</tr>
<tr>
<td>15</td>
<td>Onne FLT A</td>
<td>Brawal Oil Services Ltd.</td>
</tr>
<tr>
<td>16</td>
<td>Onne FLT B</td>
<td>Intels Nig. Ltd.</td>
</tr>
<tr>
<td>17</td>
<td>Onne FOT Jetty</td>
<td>Atlas Cement Co. Ltd.</td>
</tr>
<tr>
<td>18</td>
<td>Warri Old Terminal A</td>
<td>Intels Nig. Ltd.</td>
</tr>
<tr>
<td>19</td>
<td>Warri Old Terminal A</td>
<td>Associated Maritime Services Ltd.</td>
</tr>
<tr>
<td>20</td>
<td>Warri Old Terminal B</td>
<td>Intels Nig. Ltd.</td>
</tr>
<tr>
<td>21</td>
<td>Warri Terminal C</td>
<td>Julius Berger</td>
</tr>
<tr>
<td>22</td>
<td>Warri New Terminal A</td>
<td>Global Infrastructure Nig. Ltd.</td>
</tr>
<tr>
<td>23</td>
<td>Koko Terminal</td>
<td>Gulfinger Ltd.</td>
</tr>
<tr>
<td>24</td>
<td>Calabar New Terminal A; Berths 1-2</td>
<td>Intels Nig. Ltd.</td>
</tr>
<tr>
<td>25</td>
<td>Calabar New Terminal B; Berths 3-6</td>
<td>Ecomarine</td>
</tr>
<tr>
<td>26</td>
<td>Calabar New Terminal C</td>
<td>Addax Logistics Nig. Ltd.</td>
</tr>
</tbody>
</table>

**Source Yusuf Suleiman, 2010**
2.2.3 The Nigerian Port Concession
Going by the supposed vision statement of the Nigerian ports, it wishes to be leading port in Africa, to deliver efficient port service in a safe, secure and customer-friendly environment. Its core value includes Efficiency, Customer Satisfaction, Safety and security, Innovation. However, business at the Nigerian Seaports was bedeviled with difficulties summarized below by Razak,(2005) which necessitated the concession or reform programme:

- Turnaround time for ships was too long and usually calculated in weeks, sometimes months, depending on the cargo being loaded or discharged.

- Cargo-handling plants and equipment owned by the NPA were few and mostly unserviceable, leading to shipping companies hiring these machines from private sector sources after having paid NPA.

- Dwell time for goods in ports was prolonged due to poor port management and that led to port congestion.

- Corruption soared high among labor contractors and various service providers at the port.
• Nigerian seaports were rated as one of the costliest seaports in the world, as a result of the compounded problems.

• Many port premises and quay aprons had fallen to disuse and failed road sections inside the ports made movement of goods within port grounds cumbersome and very slow.

• Following the seaport congestion, complaints of untraceable or missing cargoes were being regularly lodged against the NPA, all to no avail.

• Security inside Nigerian seaports was compromised by the activities of miscreants as theft and pilferage became the order of the day.
<table>
<thead>
<tr>
<th>Year</th>
<th>Inward</th>
<th>Outward</th>
<th>Throughput</th>
<th>waitingturnarnds</th>
<th>Berth occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time</td>
<td>Time</td>
<td>Throughput</td>
<td>Time (days)</td>
<td>(%)</td>
</tr>
<tr>
<td>1995</td>
<td>9,289,971</td>
<td>3,983,082</td>
<td>13,273,053</td>
<td>0.47</td>
<td>27.76</td>
</tr>
<tr>
<td>1996</td>
<td>10,224,300</td>
<td>5,251,001</td>
<td>15,475,301</td>
<td>0.46</td>
<td>36.68</td>
</tr>
<tr>
<td>1997</td>
<td>11,213,624</td>
<td>5,396,181</td>
<td>16,609,805</td>
<td>0.47</td>
<td>36.73</td>
</tr>
<tr>
<td>1998</td>
<td>14,286,864</td>
<td>5,038,854</td>
<td>19,325,718</td>
<td>0.39</td>
<td>41.39</td>
</tr>
<tr>
<td>1999</td>
<td>15,751,331</td>
<td>6,481,605</td>
<td>22,232,936</td>
<td>0.36</td>
<td>47.09</td>
</tr>
<tr>
<td>2000</td>
<td>19,230,496</td>
<td>9,702,384</td>
<td>28,932,880</td>
<td>0.34</td>
<td>44.76</td>
</tr>
<tr>
<td>2001</td>
<td>24,668,791</td>
<td>11,271,901</td>
<td>35,940,692</td>
<td>1.27</td>
<td>51.78</td>
</tr>
<tr>
<td>2002</td>
<td>25,206,380</td>
<td>11,780,861</td>
<td>36,987,241</td>
<td>3.99</td>
<td>56.58</td>
</tr>
<tr>
<td>2003</td>
<td>26,907,075</td>
<td>11,926,652</td>
<td>39,766,725</td>
<td>2.17</td>
<td>52.75</td>
</tr>
<tr>
<td>2004</td>
<td>26,907,075</td>
<td>13,909,870</td>
<td>40,816,947</td>
<td>1.44</td>
<td>50.93</td>
</tr>
<tr>
<td>2005</td>
<td>29,254,766</td>
<td>15,697,312</td>
<td>44,952,078</td>
<td>2.60</td>
<td>49.70</td>
</tr>
<tr>
<td>2006</td>
<td>33,722,488</td>
<td>20,918,560</td>
<td>54,641,048</td>
<td>1.00</td>
<td>47.43</td>
</tr>
<tr>
<td>2007</td>
<td>31,937,804</td>
<td>17,235,520</td>
<td>49,173,324</td>
<td>2.00</td>
<td>46.93</td>
</tr>
<tr>
<td>TOTAL</td>
<td>279,333,183</td>
<td>138,593,785</td>
<td>418,126,968</td>
<td>1.30</td>
<td>45.3</td>
</tr>
</tbody>
</table>

**Source:** Nigeria Ports Authority, Ports Statistics (2007).
2.2.4 Objectives of the Port Concession

The objectives of the port concession or reform was to increase efficiency in port operation, decrease cost of port service to stakeholders, decrease cost to the government for the support of port sector and attract private sector participation so as to free public resources for public services (Mohammed, 2008).

Given the recommendation of the project monitors (CPCS, World Bank and Royal Haskoning), the Landlord port model was chosen. The landlord port model in essence entailed the public sector being responsible for port planning and regulatory tasks (related to safety, security and environment), and maintains ownership of port-related land and basic infrastructure and divide the Nigerian ports Authority into several autonomous port authorities, each responsible for a different geographical zone.

Under this arrangement, the private sector would be responsible for marine and terminal operations, construction, cargo handling operations, dock labour management, purchase and ownership of superstructure and equipment (NPA Brand Manual, 2005). Pay suitable compensation to the port Authority for concessioning the land and the operations, manage commercial risks associated with
their concession operations, and maintain direct contacts (and contracts) with shippers, who would pay the operators directly without interference from the port authority, finance and implement investments and maintenance for superstructure and equipment.

The proposed concession took effect in 2006 and the ports were divided and the following terminals were handed over to their successful bidders as shown below.
Table 2.4: Terminals and Their Successful Bidders.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Company Name</th>
<th>Lease Terms (Years)</th>
<th>Handover date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apapa Terminal A</td>
<td>Apapa Bulk Terminal LTd</td>
<td>25</td>
<td>3rd April, 2006</td>
</tr>
<tr>
<td>Apapa Terminal B</td>
<td>Apapa Bulk Terminal Ltd</td>
<td>25</td>
<td>3rd April, 2006</td>
</tr>
<tr>
<td>Apapa Terminal C</td>
<td>ENL Concession</td>
<td>10</td>
<td>3rd April, 2006</td>
</tr>
<tr>
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2.3 EMPIRICAL FRAMEWORK

2.3.1 The Detection and Prevention of Cargo Theft: a Global View on Cargo Theft/Pilferage.
Cargo theft creates substantial economic losses, however many incidents are not formally reported and media attention is rare. Cargo can be stolen either by employees or by external offenders.

The modus operandi can involve hold-up, theft from freight yards, theft from containers, theft off trucks, or documentary fraud. The cargo can be legitimately in transit, already illegally in the possession of other offenders, or being transported in a way that avoids excise duty or other taxes.

Theft of “hot products” is common (Clarks, 1999:38). “Hot products” are those that are easily disposed of yet retain in high black market value, such as computers, entertainment equipment, name-brand clothing and footwear, perfume, Jewellery, cigarettes and prescription drugs (Atkinson 2001; Huska, 1998). The resale of “hot products” cargo may be as lucrative as drugs dealing but has far fewer risks. For example, a single truckload of cigarettes may be worth up to A$3 million. A container-load of computer hard drives
may be worth US$1 million dollars (Badman, 2000; Hume 1996: 19).

Worldwide, cargo losses have been estimated at US$30 billion a year, and the incidence is probable increasing (Salk in 1999). Organized crime is responsible for nearly half of these losses (RICCS, 2000: 46). Annual cargo loss estimates for the United States alone range between US$3 billion and $10 billion (Gooley 1999; Salzano and Hartman, 1997: 40) indirect costs-such as investigation and insurance payments can cost between two and five times the direct losses; that is US$20-60 billion (US General Accounting Office 1980). Road transport is associated with about 87 percent of the total direct-cost value of lost cargo. Maritime cargo accounts for eight per cent, rail cargo for four per cent and air cargo for one per cent (base on figures cited in DeGeneste and Sullivan 1994:40-43) in other words, the overwhelming majority of cargo theft occurs in trucking (ICCS 2000: 46; Salzano and Hartman, 1997).Because reported cargo thefts can be recorded in several ways, unequivocal data do not exist.
2.3.2 Causes and solutions to cargo pilferage/ theft.

Cargo is vulnerable when procedures break down, rules are not followed and errors are made. Sound management is needed to forge the chain that will link together all the parts of an operational security system.

2.3.3 Solutions

Comprehensive prevention requires target-hardening procedural and inventory controls. Hardening Security Measures includes;

i. Freight storage and forwarding facilities should be secured in fenced grounds with locks fitted to doors, windows and skylights, manhole access restricted, heavy doors placed at all passage points, strong roller shutters on entrances and bollards or crash-proof gate inserted.

ii. Electronic security systems with infrared sensors should be installed to record all personnel movements. Visual gate systems with optical readers can record truck registration and container numbers, and photograph the driver, the truck and the container.

iii. Surveillance systems can include closed circuit television and motion-sensitive lighting. Lighting should be “glare” projection
across grounds and exterior walls to prevent dark corners or hidden storage racks.

iv. Seals that are difficult to re-secure after breaking should be fixed on all cargo containers and be regularly allow “track and trace” and identify where and when a container has been opened. Access to unused seals should be tightly controlled.

v. Loose cargo should be securely stacked, tagged and /or sprayed with marks that can be detected under ultraviolet light.

vi. Containers should be stored with doors facing each other so that cargo is difficult to remove. High value goods in a container can be placed on top of a container stack.

vii. Expensive cargo should have higher-security protection, such as being placed in mesh cages or safes built into solid-walled vaults, or secured with electronic keys. Vehicles should be fitted with immobilizers.

viii. Security experts should conduct comprehensive risk vulnerability audits at least twice each year, one of which should be unannounced (Atkinson 2001; Adams 1994).
2.3.4 Tight Freight-Forwarding Security Procedures

I. The amount of time vehicles are left waiting should be minimized.

II. Loading and unloading should be carefully supervised, with no new trucks admitted when docks are congested or when staffs are not available.

III. Merchandise should never be left on loading docks for long periods of time.

IV. All employee and contractor vehicles should be parked outside the grounds.

V. Empty containers should be stored in a separate area to cargo. Also, imported, exported and domestic cargo should be separated.

VI. Rubbish containers should be regularly checked as they may be used to remove cargo from the yard.

VII. When unloading vehicles, checks should be made for “forgotten” cartons, despite the fact that this process may be time consuming (particularly with courier vehicles which typically have a number of packages with different destinations).
VIII. Visiting drivers should be restricted to market areas where cold drinking water and toilet facilities are provided (if possible).

IX. Security should be upgraded during lunchtime and other breaks.

X. Outbound vehicles should be randomly allocated to security check unloading. A supervisor should be stationed at the gate at the end of shifts to check all departing staff-including the chief executive officer.

XI. Undercover professional investigators may occasionally be used to identify security weak spots.

XII. An anonymous “cargo crime-tip line” can be installed with rewards paid following convictions.

XIII. Staff and contractors should be screened before hiring.

XIV. Organisational policies should state that offenders will be firmly dealt with. Penalties should include termination and prosecution (Luton, 1999; Ackerman, 1997; Adams, 1994; Tyska et al, 1983).
2.3.5 Detailed Cargo Inventory and Movement Trails to Prevent Documentary Fraud

Clear documentation of cargo inventory and movements are essential, with audit trails being a strict separation of three internal financial responsibilities; authorization of transactions, cash collection or payments, and maintenance of accounting records (Dickson and Tully, 1998; Ernst and Young, 1989). Since fraud always involves subterfuge and deception, surprise transaction audits and vehicles searches are warranted (Frank, 2001). It is important to remember that once an insider devises a successfully system for stealing cargo, losses may remain undetected for a very long time with “fences” often encouraging offenders to stealing more and more (Sakkin, 1999). Yet if insure believe they are not liable, investigations may not be covered (Luck, 1992).

Additional fraud prevention measures include the following:

i. Security procedures in cargo contracts should be clearly specified.

ii. Cargo with questionable paperwork or any package that appear tampered with should not be accepted.
iii. It security systems can be installed, such as digital signatures and encryption to reduce the risks of documentary fraud.

iv. Incidents of theft should be subject to immediate in-depth investigation.

v. Cargo should be reconciled with documentary records and signing/sign out dispatch records.

vi. “Shrikes” estimated should be tracked to their sources (Ackerman, 1997).

vii. Electronic cargo management systems with computer raised stock and accounting procedures can be implemented in larger organizations. For smaller freight businesses, the cost of implementing these systems may take some years to recoup.

viii. To assist with more secure international movement of cargo, the customs Legislation Amendment and Repeal (International Trade Modernization) bill 2000 provides a new Australian legal framework. All users of the Customs Integrated cargo system will be use a public key systems employing encrypted digital certificate that are linked with the Australian business Number system (Stonebridge, 2001). This
system should facilitate more secure international business transactions.

2.3.6 Container Security

i. Insurance companies may argue that a seal placed by the consignor that is still intact at point of discharge is prima facie evidence that goods have not been tampered with—even if the goods are missing. Thus, seal integrity is crucial. While seals are now usually of a high standard, the system of application and recording can fall short, particularly if seal numbers do not appear on interchange records, the bill of lading or on the manifest.

ii. It should not be possible for container doors to be opened during transit without it being immediately identifiable. Bolting mechanisms on doors and panel security are also crucial.

iii. The bill of lading should show the weight of the container, based on original documents. Regular weighing and checking of any discrepancy may quickly highlight losses (Luck 1992).
2.3.7. Global Cargo Supply Risk
Dan purtell and Jane B. Rice, Jr conducted an extensive global assessment research on Cargo Supply risk, as published in security management (http://www.securitymanagement.com). Below are the contents of that publication.

“The largest and fastest growing global economies around the world include Brazil, Russia, India, and China (BRIC). These countries, along with other high-tech manufacturing centers such as Malaysia and Indonesia, are attractive to companies both as a source of supply and as new markets to sell into.

However, before companies enter these inviting markets, they must understand the risks of operating supply lines in these environments and how to counter them. These issues have been the subject of a multiyear study that was completed earlier this year by our company, First Advantage.

The study examined countries to see what risks they represent, and it looked at the measures being implemented by companies to see whether indeed they are mitigating those risks. The study, which covered 45 countries, specifically focused on transportation route risk. Supply chain risk assessments typically included a review of
companies' manufacturing locations, trucking operations, freight forwarders, third-party logistics warehouses, container stuffing operations, and the supporting seaports and airports. We found that certain Security gaps were common across the study group.

2.3.7.1 Top Vulnerabilities
Among the vulnerabilities were that most companies failed to conduct container security inspections; containers often arrived at the seaport with no seals; there were no background investigations on employees; and there was no security or threat awareness training for workers. Most companies had no idea what, if any, security procedures had been adopted by their business partners.

Within single businesses, the security equipment and procedures were limited to the main manufacturing facility. Security at other potential weak spots, such as container-stuffing operations or third-party warehousing, was ignored.

When judged against objective standards, such as the U.S. Customs and Border Protection's program, Customs-Trade Partnership Against Terrorism (C-TPAT), many of the facilities rate a poor grade. We estimate that most of the companies studied would
be only 50 percent compliant with C-TPAT security criteria and some would be as low as 10 percent compliant.

I. LACK OF CONSISTENCY. A key contributing factor is the lack of a consistent security methodology across all operations of each company. For C-TPAT certification, the security methodologies must be consistently applied throughout a corporation's in-house and outsourced manufacturing locations and transportation base. For example, the study found that when companies conducted assessments of their own security operations, they generally looked only at one or two internal and outsourced facilities and suppliers, sampling them as an auditor would, rather than thoroughly examining security at every single site. This method is unlikely to reveal an accurate state of security for a particular corporation.

II. CORRUPTION. The study also looked at the extent to which corruption was an issue in these environments. The study used an existing indicator, the Transparency International Corruption Index, developed by a German nonprofit group. The index indicates the degree of corruption as seen by
business people and country analysts and uses a scale that ranges between 10 (highly clean) and 0 (highly corrupt). The calculation includes police corruption, business corruption, and political corruption. As a point of reference, the United States has a corruption index rating of 7.6 and Switzerland is rated at 9.1. The study found that the three top-rated countries for corruption—Nigeria, Malaysia, and Indonesia—are also rated as a "severe risk" in terms of anti-American or anti-Western sentiment. When we merge these two variables together, a potential risk emerges. For example, there may be a greater opportunity for something harmful to be introduced to a U.S.-bound container coming from one of these countries.

III. CARGO THEFT. The study also used First Advantage's Global Loss Repository—a database of cargo theft data from around the globe—to create loss rates for cargo transiting through respective countries. The countries are rated as low, guarded, elevated, high, or severe, depending on the number of losses. For simplicity, the survey chose to use the same coding system the Department of Homeland Security applies to terrorism risk levels. Companies operating in countries rated as "severe" can expect armed and violent truck hijackings, armed warehouse
robberies, and frequent heists at airports. Companies operating in countries ranked as low risk should expect only minor losses due to pilferage.

IV. EXPOSURE MATRIX

We also devised a weighted C-TPAT exposure matrix for the survey; it quantifies risks associated with anti-American sentiment or other hostility to Western governments. In this scale, countries rated as "severe" would present the possibility of terrorist attacks against U.S. or Western citizens, possibly have travel restrictions in place, and support high levels of supply chain theft. The study incorporated all of this information to develop a profile of emerging-market country risk. The results were surprising, especially when compared to the Department of Homeland Security's Threat Advisory panel. For example, Russia and Brazil are among two of the highest-risk countries in terms of supply chain theft. Incidents commonly involve government representatives including police, military, and customs officials. However, in terms of C-TPAT, these countries are given a "low" threat rating because the governments and residents are on
amicable terms with the United States and are not hostile to Western culture. China presented a similar situation. The three-year cargo theft trend in China reveals that losses are increasing and higher levels of violence are being used in cargo theft, leading the authors to give the country a "guarded" rating. However, China was rated "low" in their level of C-TPAT exposure because of a low cargo tamper rating and alignment with Western culture. The study also went beyond BRIC countries to places such as Indonesia, Malaysia, and Nigeria. In contrast to countries like China, these countries are rated as risky (severe risk) from a C-TPAT perspective because of the cultural differences and high cargo-tampering rates throughout the country. Some of these countries, which export huge volumes of goods to the United States, present an opportunity for terrorists to use those shipments to smuggle weapons of mass destruction into the U.S. or to use the shipments as cover for an attack.

A significant problem contributing to this risk in Southeast Asia is labor shortages that affect the quality of the work force. To use Malaysia as a specific example, shortages of
manufacturing labor within the country have led to high rates of foreign workers within Malaysian factories.

Some factories may sustain a 75 percent foreign work force, and many workers come from countries with a high rate of anti-American or anti-Western sentiment. These workers are typically not vetted and are working on products bound for U.S. importation.

V. ORGANIZED CRIME: But terrorism, while high consequence, is low probability. The more common risk in these countries is theft from organized crime. For example, in Malaysia, the Mamak gang is a highly organized group of cargo thieves that has plagued Malaysian transportation for over two decades. Members are primarily Southern Indian Muslims who target high-value loads from the central and northern regions of Malaysia. This gang, although smaller today than in previous years, is still active in the region and carries out thefts on a monthly basis.

Land routes are not the only problem. The Strait of Malacca, between Indonesia and Malaysia, suffers the highest rate of sea piracy in the world. Adding to troubles in the region,
experts speculate that Southeast Asia's most wanted terrorist-Noordin Mohammed Top-resides and is active in Malaysia or neighboring Indonesia. Top is the self proclaimed leader of TandzimQoedatul Jihad, commonly referred to as the al Qaeda of the Malay Archipelago. He is believed to be involved in the Bali nightclub bombing, the Marriott Hotel bombing in Jakarta, and the Australian Embassy bombing in Indonesia. Top, a bombmaker by trade, is also believed to be actively recruiting in several Southeast Asia countries with primary targets being the United States or other supporting Western countries.

vi. COMPANY ANALYSIS

Firms that are assessing their supply chain operations should take each of these risk variables into consideration.

However, the study indicated that, within the global supply chain, a cookie-cutter approach to security has led companies to overspend in low-risk countries such as China and underspend in high-risk countries such as Malaysia and Indonesia. This was the case with one high-tech organization that had small facilities in both Malaysia and Indonesia, but
imported 80 percent of its goods through China. The company focused security on its supply lines in China because that country supplied the most goods.

That approach might seem logical, but it is ill advised. Volume-based risk assessment will only identify a company’s largest importer, not necessarily its biggest risk. After reviewing the company for the survey and applying the results to its entire supply chain, we recommended a different approach.

By reviewing all of the supply chain risk variables, no matter what size, we determined the level of inherent risk. For this company, the risk variables included mode of transportation, the country of origin, type of load—consolidated or L TL (less than fullload)—and transshipment locations. We found that several relatively small suppliers in Malaysia represented more risk than all of the suppliers in China. While leaving the security plan for Chinese suppliers in place, the company increased security in Malaysia. It also began security escorts to and from the port, enhanced seal and lock processes at the warehouse, and set out to protect the integrity of the product from factory to port.
The company also ensured that the Malaysia facility implemented basic physical security procedures, such as fencing and surveillance, as well as a background screening program for employees. The new company plan ensured that facilities and practices in China were C-TPAT compliant.

In Malaysia, security procedures exceeded those required under C-TPAT. Security was tiered based on the associated threat in the company's global supply chain. In the end, this new strategy saved the company millions of dollars.

vii. THREAT MITIGATION OPTIONS

An effective threat mitigation policy for supply chains has some key components: The first is to have a basic security program in place at all locations to protect all of the company's operations; second is participation in security programs, whether voluntary or initiated by the government; third is return-on-investment (ROI) analysis; and fourth is benchmarking with companies that have good programs in place. Basic protection a starting point for supply chain security is to ensure that the company has in place the basic traditional security measures, including personnel screening,
physical perimeter and access controls, information security for all facilities and operations, route security for all transportation conveyances, education for awareness, and training for response to incidents. The optimal security program is one that is suited to the specific challenges of the firm and is flexible enough to renew itself as new risks emerge and uncertainties change. Programs.

Active participation in voluntary programs serves several purposes: It helps create a network of secure operations, it establishes a base level of security standards, and it helps raise the overall level of security for global operations. Also, participation in voluntary programs helps build the partnerships between the public sector and private industry necessary to create a secure environment.

The United States has been proactive with initiatives to upgrade trade and transportation security, and many other countries have also passed new legislation or have undertaken new prevention-based initiatives. Most of the initiatives involve approaches similar to those undertaken in the United States. They are based primarily on voluntary efforts by companies to improve
supply chain security and include a benefit for companies in the form of a facilitated customs process.

While participation in C-TPAT is voluntary, the disadvantages for those firms that do not volunteer are significant. For example, the higher rates of inspection for those not in the C-TPAT program can add up to 10 to 12 days in a congested U.S. seaport and uncertainty in U.S. Customs processing.

More than 10,000 companies have applied to the program, and at last count, nearly 1,000 had been validated by U.S. Customs and Border Protection. C-TPAT validation typically includes a security review of one U.S.-based and one foreign-based manufacturing operation. These reviews can also include the corporation's transportation carriers, third-party manufacturers and freight forwarders, or logistics providers. Canada's Partners in Protection, Sweden's StairSec, and the European Union's Authorized Economic Operator program contain the central themes of voluntary actions to improve supply chain security and a benefit of facilitated customs process in exchange for security improvements.
INTERNATIONAL FRAMEWORK. The World Customs Organization is moving toward an international framework for supply chain security and customs processing. This year, it adopted the Resolution on Global Security and Facilitation Measures Concerning the International Trade Supply Chain, which aims to create an international system for identifying businesses that offer a high degree of security in their supply chain operations and to provide customs facilitation for those companies. Return on investment. According to my experience, more than 80 percent of corporate losses due to theft occur within the supply chain, yet supply chain security spending typically accounts for less than 5 percent of a firm’s security budget. Some firms have implemented supply chain risk-modeling tools to identify financial exposures within their global supply chain. These firms are assessing each of their transportation routes to determine the level of financial exposure due to cargo theft contained within the origin, transshipment, and destination countries; transportation modes; product lines; and other pertinent shipping variables. Once the data are gathered, transportation routes
are ranked by relative risk and the value of revenue flowing through that route. The final step involves conducting a cost-benefit analysis to determine where security measures can be implemented to yield the greatest return on investment. In doing these calculations, managers should remember to include the fact that insurance premium reductions will follow the lowering of loss rates. In many cases, insurance savings alone provide the necessary capital to fund these countermeasure programs. Companies must understand, however, that they can negotiate with their insurance company to reduce premiums only if the program can be proven to reduce loss. For example, we recently met with the Brazilian government regulation body IRB and met with underwriters and actuaries on behalf of a Brazilian company. We demonstrated that the company exceeded all security requirements and provided evidence that their insurance premiums were overpriced. The IRB agreed and reduced the rates by 40 percent annually.
C-TPAT LIMITATIONS. When meeting with insurance professionals, proving that a company is C-TPAT compliant is usually not enough to win a reduction in premium payments. That's because companies have not seen a reduction in overall theft because of C-TPAT. What has happened instead is that the program has caused threats to shift. For example, before C-TPAT, theft during warehouse storage and container stuffing accounted for a third of a company's losses. After C-TPAT, in most countries, losses at these specific locations and steps in the process have all but disappeared. However, now 90 percent of loss occurs while the product is being moved cross country by truck. This is because C-TPAT does not require increased security on trucking routes within the company's destination country. Anti terrorism ROI. ROI methodology that could be used for antiterrorism countermeasure spending consists of modeling the financial impact corporations would face should an event occur within their supply chain. There is also data regarding how supply chain disruptions affect stocks. For example, a 2005 industry study of 861 firms over a nine-year period illustrated the significant impact of supply chain glitches. Each glitch had a lasting impact on the stock value of publicly traded firms. Stock value saw a permanent loss of
approximately 9 percent after each event. Benchmarking A valuable but underused resource in addressing supply chain risk is the collective wisdom of companies that are security industry leaders. With that in mind, we'd like to offer a few suggestions from our research on companies that exhibited exceptional security performance. These leaders had three things in common.

They all took a holistic view of security, they learned from prior security incidents, and they remained vigilant.

Holistic view; Companies with good security programs understand that security plays a critical role in the firm. Consequently, they integrate security into the business process in a number of ways. Organizationally, the integration is both formal and informal, manifesting as coordination between business operations and security with regard to issues such as supply chain design and the selection of transportation routes.

This approach is reinforced by regular training exercises that the security organization runs with the business operations end of the company. These exercises engender collaboration between operations and security while giving
both parties a chance to practice response and coordination for successful risk mitigation. Ultimately, this integration builds a security culture that permeates the organization and socializes the concept of secure operations.

Prior incidents. Leaders also learn from past security breaches and near misses, building on past experiences to make the organization stronger. For example, in some European countries, hijackers fake a car accident on a trucking route. The plan is to lure the driver from the truck to help the "victims" of the crash.

Because these thieves use many dry runs to perfect their plan, near misses must be tracked just as closely as actual thefts. For example, in one company a well-informed driver failed to stop at a fake accident scene because he recognized it as a trap. However, the driver had been trained to report such incidents. Dispatchers were able to alert all drivers about the scam, and the company was able to conduct a refresher training course on the various schemes employed by such thieves.

Vigilance Effective security leaders are ever-vigilant to avoid falling into a false sense of security. They know that their supply chain is only as secure as the weakest point in the network.
Security experts live in a world of expanding global operations amid increasing uncertainty and growing threats. The good news is that there are tools and processes that are available to address the challenge.

Operating in emerging markets such as BRIC and dealing with increasing risks can be managed by thoughtfully considering the quantified risks and risk exposure in those particular environments. Successful firms are integrating security into their operations and mitigating exposures before incidents occur.

As the study indicates, security must consider the extended supply chain and expand security to all company sites, internal operations, and perimeters. The entire network must be scrutinized. Finally, it is also important to recognize that the security requirements may vary by the type of market being served-local versus offshore, concentrated versus fragmented distribution base, and robust versus nascent transportation. These measures will make countering vulnerabilities an easier task.

Industry Initiatives There are a number of industry initiatives that
are helping companies find solutions for industry-specific issues. The following are among the initiatives underway today.

TAPA: A nonprofit organization of more than 200 of the largest multinational corporations, the Technology Asset Protection Association (TAPA) has developed cargo security industry standards since 1997. Their Freight Security Requirements (FSR) are contractually mandated by member companies, and freight forwarders are required to have their facility and operations certified by an ISO-certified company trained to conduct the assessments by TAPA under FSR criteria.

Early on, this group realized the security exposures that could come with certifying only main facilities. TAPA, therefore, requires that transportation providers get the designated authority to certify the security of each of their individual facilities, rather than allowing them to get one certification for the corporation as a whole. This program has netted millions of dollars of loss reduction; the average TAPA member company has reduced losses by 40 percent by having its supply chain certified". 
Since, the concessionaires in the case of Nigerian seaports have entered into the operation of the Nigerian seaports and terminals, it is expected that implementing these recommendations from security management as stated above, will be expedient for them, the concessionaires to combat cargo theft/ pilferage in their respective terminals.

**2.3.8 CASES OF CARGO THEFT IN OTHER COUNTRIES**

**2.3.8.1 Brazil**
In Brazil, the southeast region accounts for 81% of all cargo theft in the country. The level of industrialization and high freight volume in Sao Paulo, Minas Gerais and Rio de Janeiro states provide an opportunity for thieves targeting loads traveling along highways connecting major industrial cities, such as Sao Paulo city, Campinas and the city of Rio de Janeiro. The south and northeast regions both experience a high level of risk and account for 8% and 7.5%, respectively, of all cargo theft in Brazil. During 2010, the demand for security escorts increased in Parana, Santa Catarina and Minas Gerais. Industry reports indicate that the demand for escort services in Parana increased by 26% over the last three years. Other dangerous regions within the south and northeast
regions include Porto de Paranagua, Afonso Pena International Airport (Parana state) and the city of Porto Alegre (Rio Grande do Sui state).

The central-west and north regions experience the lowest cargo theft activity, with 2% and 1.5% shares of the total. However, companies in MatoGrosso have experienced major losses as a result of the increase in cargo theft gangs operating around the state. Police estimate an average of 16 cargo thefts per month in MatoGrosso; most hijackings occur at truck stops and highways near dense jungle areas and close to the border with Paraguay.

Cargo Theft Official cargo theft statistics indicate a total of 5,198 cargo thefts in Sao Paulo state, from the period January 1 to September 30, representing a total loss of R$207.8 million ($125.9 million US D). The highest number of incidents, 51%, occurred in the state capital of Sao Paulo, while 21% occurred on highways, 17% in the greater Sao Paulo metropolitan area and 9% in the rest of the state. (The remaining 2% is likely the result of rounding). Official statistics show that cargo theft has been consistent during the past three years, with minor fluctuations in the total of thefts from month to month. The period of high cargo theft activity begins
in March and remains fairly consistent through the end of the year, with a small dip in June.

Despite a total decrease in the number of thefts occurring during the first three quarters of 2010 compared with the same period in 2009, an increase in loss value is reflected in March, April and May - the three months consistently showing slight increases in thefts over the last three years.

2.3.8.2 Venezuela
In addition to political instability, corruption, exchange rate fluctuations and unfavorable economic policies, transporters operating Venezuela face major supply chain challenges. These include infrastructure deficiencies, high crime rates in general and cargo theft specifically. Since 84% of all goods are shipped by road in Venezuela, these problems create extremely elevated transportation and security costs for local and international companies operating in the country. These issues make Venezuela less appealing to foreign investors than some other countries in South America.

Cargo theft
The Venezuelan Logistics Association estimates a yearly average of 2,300 to 2,500 cargo thefts in the country, with 70% of those classified as hijackings. About 25% of all stolen loads are recovered by police. During 2009 and 2010, the states of Miranda, Amazonas, Guarico, Anzoategui and Bolivar experienced an increase in cargo theft rates, putting their risk ratings at severe, high or elevated. On May 12, 2010, a truckload of food products worth VEB160,000 ($37,209 USD) and destined for Bolivar state was hijacked by four armed cargo thieves on El Tigre-Puerto Ordaz highway in Anzoategui state. The thieves reportedly belonged to an organized gang operating in the states of Guarico, Bolivar and Anzoategui. Two days prior to this hijacking, three truckloads of pharmaceuticals valued at VEB1 million ($232,558 USD) also were stolen along the Tigre-Puerto Ordaz highway.

According to industry reports, the product categories most targeted by Venezuelan cargo thieves over the past four years are Food/Drinks (especially sugar) and Building/Industrial materials (mainly steel and wood). Moreover, during 2010 Venezuelan police identified several organized cargo theft gangs specializing in chemical products. These gangs targeted loads of
paint and fertilizer near major commercial seaports such as Puerto Cabello, Maracaibo and La Guaira. Additionally, truckloads of cosmetics, alcoholic beverages, shoes and cell phones were frequently reported stolen during 2010. The majority of thefts in the state of Caracas occur along the Central Regional Highway considered the most important highway in Venezuela, as it connects the capital with the other major cities of La Victoria, Maracay and Valencia. In 2010, Caracas police identified three separate organized cargo theft gangs operating on this highway and using the same M.O. Wearing Venezuelan National Guard (NG) uniforms, these thieves stopped commercial trucks by setting up fake inspection points.

According to police reports, actual NG members were either directly or indirectly involved in a variety of cargo thefts last year. In some cases the NG members loaned military equipment, weapons and official uniforms to cargo thieves in exchange for money obtained from the sale of stolen trucks. However, on May 3, Caracas police captured an NG member along with two other thieves who were attempting to steal a load worth VEB650,000 ($152,000 USD) containing auto parts, office supplies and pharmaceuticals. The
load was fully recovered. Another group of thieves also wore NG uniforms to target trucks, although this gang operated along the Caracas-La Guaira highway connecting the seaport of La Guaira and the Simon Bolivar International Airport in Maiquetia. Within a two-month period in Q2, the gang was responsible for 26 cargo thefts near La Planicie Tunnel (one of three tunnels leading to the airport). Although five gang members were captured, police allege that six additional members remain at large and that they continue to hijack commercial trucks entering and exiting the seaport and airport cargo terminals. Caracas police also identified another group of cargo thieves operating along the Caracas-La Guaira highway in 2010. This gang is believed responsible for millions of bolivars in losses to local and foreign companies.

Venezuela has numerous groups of thieves targeting loads whenever an opportunity arises. However, experienced, organized and sophisticated cargo theft gangs also are operating in the country, and these tend to select only those products most in demand. In fact, most of the goods these groups steal are distributed directly to clients the day of the theft. In some cases,
these gangs ship a portion of a stolen load to another Latin American country, mainly Colombia, Brazil or Ecuador.

2.3.8.3 Canada

Cargo theft in Canada is largely centered in the major cities and hubs of the supply chain industry, most notably the Greater Toronto Area (GTA), Montreal, Edmonton and Vancouver. On a national level, cargo theft reporting comes almost exclusively from the regional police agencies covering the Toronto area. They record thefts rates that rival Los Angeles, Dallas/Fort Worth and the South Florida area. The more rural areas of Canada report virtually no cargo theft activity. While this is not to say that all shipments are arriving untouched, reporting in Canada is extremely sparse, precluding a consistent data stream from which to conduct analysis. In areas of high cargo theft activity, product types targeted by cargo theft gangs in Canada mirror those of the United States. Food/Drinks and Building/Industrial types topped the list of targets in Canada in 2010, although the country experienced a significant number of thefts in the Electronics category as well. Although thefts of pharmaceuticals were uncommon in Canada in
2009, thefts in this category rose in 2010, with several thefts and attempted thefts reported.

The GTA, including Brampton and Mississauga, is known for having the highest rates of cargo theft in Canada, rivaling the major supply chain crime areas of the United States, including Los Angeles, Dallas/Fort Worth and Miami. In 2010, Brampton accounted for approximately 25% of all cargo theft incidents recorded for the province of Ontario. Theft in Brampton was evenly split among the Auto/Parts, Consumer Care, Building/Industrial, Clothing/Shoes, Electronics and Food/Drinks product types.

Also in the GTA, Mississauga faces a high risk of cargo theft, accounting for a number of violent incidents, including several warehouse/facility robberies in the past 24 months. In May of 2009, gang members hijacked a truck loaded with $1.5 million in pharmaceuticals as it transited through Mississauga. In general, trailer thefts in this area are evenly divided between thefts from what are listed as secured lots and thefts from unsecured lots, such as public parking, truck stops, etc. A large number of cargo theft gangs operate in Mississauga and hit the city on a weekly basis, causing this area of the GTA to have the highest risk of anywhere in Canada. Cargo theft data out of Montreal is extremely limited. Montreal, however, is known to Canadian law enforcement and industry personnel as having cargo theft activity comparable to the Greater Toronto Area. In January 2011, a container of pharmaceuticals destined for Australia was hijacked from the Garfield Transport Yard in Montreal. Montreal also saw full-
truckload thefts from secured yards in the Pharmaceutical and Consumer Care product types. This most often occurs as cargo is in-transit to and from the port.

Organized Crime: Cargo theft gangs will travel city to city to follow important loads and even hire licensed commercial drivers to transport lucrative cargo from one end of the country to the other if a buyer can be lined up in advance.

Warehouse Burglary: Criminals target high-value products stored in warehouses. Cargo theft gangs will often conspire with employees at the facility or get one of their own gang members hired at the targeted warehouse in order to obtain unnecessary information on alarms, cameras and other security measures in place.
CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction
This chapter is basically concerned with the description of the methods and procedures used in data collection and analysis. It also refers to the techniques adopted by researchers in collecting data for the purpose of this study.

3.2 Research Design
This research made use of secondary data only which were used to test the formulated hypotheses. The trend analysis was done using the cumulative moving average technique this was employed to test the first hypothesis and the autoregressive integrated moving average was used to forecast the trend of cargo pilferage. The finding for the forecast was discussed as well. The other three hypotheses were tested using the t-student test technique. The result of each test was analysed individually and the findings from each test discussed individually.
The findings from the test and the literature review were later discussed adumbratively and conclusions were drawn inferentially. Recommendations were made and areas of further studies were suggested.

3.3 Sources of Data
In this research work, secondary data were used in the analysis. The data were sourced from journals and statistical records as documented by authorities, such as NPA, UNCTAD, Nigeria Police Force etc.

3.4 Method of Data Analysis
This research made use of; trend analysis and difference of mean test. Trend analysis is the general path which the data had followed over a long period, it was used to analyse the trend of the volume of cargo pilferage (recorded) from period 1999-2005 representing the pre-concession era and period 2006-2012 representing the post concession era.

Whereas, the difference of mean t-student distribution statistical model was used to test the hypothesis formulated using the data akin to the hypothesis. The data was analysed manually and with the use of Statistical Package for Social Sciences SPSS Version 20.
3.4.1 Trend Analysis
When a time series displays a steady tendency of increase or decrease through time, such a tendency is called trend (Amir, D. A, and Jayavel .S.2002). The trend is the general path which the data had followed over a long period. The two methods usually employed in finding the trend of a time series are the calculation of the regression line or least squares and the moving averages (Gujarati et al, 2009).

However, in this research work, the moving averages will be employed to in carrying out the trend analysis. Amir, et al, (2002) defines a moving average of a time series in an average of a fixed number of observations (Say, five observation) that moves as we progress down the series. The method of moving averages is one of the smoothing techniques used in time series analysis to establish a trend. It is based on the mathematical concept of arithmetic mean.
### 3.4.1.1 Cumulative Moving Average (CMA)

Mill et al, (1990) states that in a cumulative moving average, the data arrive in an ordered datum stream and the user would like to get average of all of the data up until the current datum point.

\[
CMA_n = \frac{x_1 + \ldots + x_n}{n}
\]

Therefore since this study involves the cumulative moving average of tri-annual trend of both the pre and post concession years, the below mathematical model was formulated

\[
CMA_n = \frac{Y_1^r + Y_2^r + Y_3^r + \ldots + Y_n^r}{N}
\]

\[
= \frac{Y_{n1}^r + Y_{n2}^r + Y_{n3}^r}{N} \ldots \frac{Y_{n4}^r + Y_{n5}^r}{N} \ldots \frac{Y_{n9}^r + Y_{n10}^r}{N}
\]

Where \( N = 3 \) (tri-annual average)

\( Y^r \) = year

\( n \) = serial number of the year
3.4.1.2 Autoregressive integrated moving average (ARIMA)

In statistic and econometrics, and in particular time series analysis, an autoregressive integrated moving average (ARIMA) model is a generalization of an autoregressive moving average (ARMA) model. These models are fitted to time series data either for better understanding of the data or for forecasting.

The model is generally referred to as an ARIMA(p,d,q) model where parameters p, d and q are non-negative integers that refer to the autoregressive, integrated, and moving average parts of the model respectively. (Asteriou et al, 2001).

Mathematically, given a time series of data $x_t$ where $t$ is an integer index and the $X_t$ are real numbers, then an ARMA (p’, q) model is given as:

$$
\left( 1 - \sum_{i=1}^{p'} a_i L^i \right) X_t = \left( 1 - \sum_{i=1}^{q} \theta_i L^i \right) \epsilon_t
$$

Where $L$ is the lag operator, the $a_i$ are the parameters of the autoregressive part of the model, the $\theta_i$ are the parameters of the moving part and the $\epsilon_t$ are error terms. The error terms $\epsilon_t$ are
generally assumed to be independent, identical distributed variables sampled from a normal distribution with zero mean.

Assume now that the polynomial \(1 - \sum_{i=1}^{p'} a_i L^i\) has a unitary root of multiplicity d. then it can be rewritten as.

\[
= \left(1 - \sum_{i=1}^{p'} \phi_i L^i\right) \left(1 - \sum_{i=1}^{p'-d} \phi_i L^i\right) (1 - L)^d
\]

An ARIMA \((p,d,q)\) process expresses this polynomial factorization property with \(p = p' - d\), and is given by:

\[
\left(1 - \sum_{i=1}^{p} \phi_i L^i\right) (1 - L)^d X_t = \left(1 + \sum_{i=1}^{q} \theta_i L^i\right) \epsilon_t
\]

The above can be generalized as follows:

\[
\left(1 - \sum_{i=1}^{p} \phi_i L^i\right) (1 - L)^d X_t = \delta + \left(1 + \sum_{i=1}^{q} \theta_i L^i\right) \epsilon_t
\]

This defines an ARIMA \((p,d,q)\) process with drift \(\delta / (\Sigma_{\phi_i})\). (Asteriou et al, 1990)
3.4.1.3 Forecasts using ARIMA Models
The ARIMA model can be viewed as a “cascade” of two models. The first is non-stationary:

\[ Y_t = (1 - L)^d X_t \]

while the second is wide-sense stationary:

\[
\left( 1 - \sum_{i=1}^{p} \phi_i L^i \right) Y_t = \left( 1 + \sum_{i=1}^{q} \theta_i L^i \right) \epsilon_t \text{(Percival et al, 1993)}
\]

3.4.2 Difference of Means Test
In any research work, where hypothesis are formulated, a test of significance approach will be necessitated. A test of significance is a procedure by which sample results are used to verify the truth or falsity of a null hypothesis (Gujarati N.D and Dawn, C.P., 2009). In the language of significant if the value of the test statistic lies in the critical region. In this case the null hypothesis is rejected. By the same token, a test is said to be statistically insignificant if the value of the test statistic lies in the acceptance region.

Amir et al (2002), states the formula for calculating difference of means when the true standard deviation of both processes is known.
we use the following conversion of the difference in means to a standard normal distribution

\[ z = \frac{\bar{X}_1 - \bar{X}_2 - \Delta_{1,2}}{\overline{S}} \]  

Eqn 3.1

where \( \Delta_{1,2} \) is the true or expected difference.

Again, the true standard deviation typically are estimated when this is pooled and if the variance are equal we have:

\[ S_p^2 = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}} \]  

Eqn 3.2

And

\[ t = \frac{\bar{X}_1 - \bar{X}_2}{S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \]  

eqn 3.3

In a case where the two samples are drawn from the exact same population but each give different readings we say these are paired samples, so we use the paired t test

\[ t = \frac{\bar{X}_2D - \bar{X}_1D}{sD/\sqrt{n}} \]  

eqn 3.4

Where \( \bar{X}_2D \) is the mean of the differences, and \( sD \) is the standard deviation of the differences
CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION
This chapter dealt with the presentation (tabular), analysis and interpretation of data collected. The research, hypothesis formulated were presented in the order in which they were stated, and data from secondary source were analyzed orderly and economically.

Data were analyzed using both computer based SPSS version 20 and manual calculations.

The trend analysis, with cumulative moving averages was employed to test for the first hypothesis which is the trend of cargo pilferage in the Nigerian ports both for pre-concession era and post-concession era. The autoregressive integrated moving average was employed to forecast the trend.

The difference of mean test, using the student distribution was employed to test the other three formulated hypotheses. Due to the scope and limitations of this work, the researcher made use of data
on volume of cargo pilferage for pre and post concession eras to test the first hypothesis. While data on estimated revenue loss due to cargo pilferage for pre and post concession eras were used to test the second hypothesis. Whereas, for the third hypothesis, data on the volume and reported incidence of cargo pilferage was employed. While, for the fourth hypothesis, data on reported incidence of cargo pilferage from 1999 to 2012 was employed.
Table 4.1: Cargo throughput for Pre and Post Concession Era 1999-2012.

<table>
<thead>
<tr>
<th>Year</th>
<th>PRE Inward</th>
<th>PRE Outward</th>
<th>PRE Throughput</th>
<th>POST Inward</th>
<th>POST Output</th>
<th>POST Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>15,751,331</td>
<td>6,481,605,605</td>
<td>22,232,936</td>
<td>31,937,804</td>
<td>17,235,520</td>
<td>46,150,518</td>
</tr>
<tr>
<td>2001</td>
<td>24,668,791</td>
<td>11,271,901</td>
<td>35,940,692</td>
<td>41,195,616</td>
<td>22,787,133</td>
<td>63,982,749</td>
</tr>
<tr>
<td>2002</td>
<td>25,206,380</td>
<td>11,780,861</td>
<td>36,987,241</td>
<td>45,757,149</td>
<td>20,018,360</td>
<td>65,775,509</td>
</tr>
<tr>
<td>2003</td>
<td>27,839,293</td>
<td>11,926,652</td>
<td>39,765,945</td>
<td>46,928,848</td>
<td>29,815,879</td>
<td>76,744,727</td>
</tr>
<tr>
<td>2004</td>
<td>26,907,075</td>
<td>13,909,872</td>
<td>40,816,947</td>
<td>52,010,440</td>
<td>31,439,592</td>
<td>83,450,032</td>
</tr>
<tr>
<td>2005</td>
<td>29,254,766</td>
<td>15,697,312</td>
<td>44,952,078</td>
<td>46,234,240</td>
<td>30,870,498</td>
<td>77,104,738</td>
</tr>
<tr>
<td>Total</td>
<td>168,858,132</td>
<td>80,770,587</td>
<td>249,628,719</td>
<td>297,756,585</td>
<td>173,085,542</td>
<td>470,681,623</td>
</tr>
</tbody>
</table>

Table 4.1 above, Shows the volume of cargo throughput for post and pre-concession era with 1999-2005 covering the pre-concession era and 2006-2012 covering the post-concession Era. Cargo throughput is the sum of both Inward outward cargo processed by the ports in the given Eras.

4.1 Comparative Analysis of Cargo Throughput During Pre And Post Concession Eras.
From table 4.1, you will note that average cargo throughput in Nigeria ports from 1999-2005, period covering for pre-concession period compare to 2006-2012 covering the post concession period shows a percentage increase of 46.96%. The 7 year under review per period of pre-concession and post-concession shows a total cargo throughput of 249,628,719 tons of cargo for pre-concession era and 470,681,623 tons of cargo for post-concession period. The average cargo throughput from 1999-2005 is 35,661,245.6 tons of cargo and average cargo throughput of 67,240,231.9 tons for period covering 2006-2012, representing the post-concession era.

The yearly average percentage increase in the post-concession era shows an increase of 30.69%. This signifies a remarkable progress made by the in our ports and terminals since the commencement of the implementation of concession policy in Nigerian seaports. The table also shows a more steady increase in cargo throughput in the post concession
period, as against the sinusoidal increase experienced in the pre-concession period. This is as a result model in 2006, which led to the concession of sections of ports to private terminal operators otherwise known as concessionaires, and has resulted in a consistent improvement in cargo throughput.

Table 4.2: **Trend analysis of cargo throughput for pre and post concession eras 1999-2012 (Using the cumulative moving average)**

**N/B average taken tri-annually.**

<table>
<thead>
<tr>
<th>Pre-concession year</th>
<th>Cargo throughput (million tons)</th>
<th>Cargo throughput trend</th>
<th>Post-concession year</th>
<th>Cargo throughput (million tons)</th>
<th>Cargo throughput trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>22.233</td>
<td>-</td>
<td>2006</td>
<td>46.150</td>
<td>49.53</td>
</tr>
<tr>
<td>2000</td>
<td>28.933</td>
<td>29.04</td>
<td>2007</td>
<td>57.473</td>
<td>55.87</td>
</tr>
<tr>
<td>2001</td>
<td>35.941</td>
<td>33.95</td>
<td>2008</td>
<td>63.982</td>
<td>62.41</td>
</tr>
<tr>
<td>2002</td>
<td>36.987</td>
<td>37.56</td>
<td>2009</td>
<td>65.775</td>
<td>68.83</td>
</tr>
<tr>
<td>2003</td>
<td>39.766</td>
<td>39.19</td>
<td>2010</td>
<td>76.744</td>
<td>75.32</td>
</tr>
<tr>
<td>2004</td>
<td>40.817</td>
<td>41.85</td>
<td>2011</td>
<td>83.450</td>
<td>79.10</td>
</tr>
<tr>
<td>2005</td>
<td>44.952</td>
<td>43.973</td>
<td>2012</td>
<td>77.104</td>
<td>-</td>
</tr>
</tbody>
</table>

*Source: Authors trend Analysis*
4.2 Calculating the Trend Using the Cumulative Moving Average (Tri-Annual Average)

In analysis trend of the data shown in table 4.2, the cumulative moving average formulae was adopted and the below developed model for tri-annual average i.e. trend analysis after every successive 3-years.

\[ CM\text{A}_n = \frac{Y_1^r + Y_2^r + Y_3^r + \cdots + Y_n^r}{N} \]

\[ = \frac{Y_{n1}^r + Y_{n2}^r + Y_{n3}^r}{N} \ldots \frac{Y_{n3}^r + Y_{n4}^r + Y_{n5}^r}{N} \ldots \frac{Y_{n5}^r + Y_n^r}{N} \]

Where \( N = 3 \) (tri-annual average)

\( Y^r \) = year  and \( n \) = serial number of the year per era.

The result is as shown in table 4.3 below;
### TABLE 4.3: VOLUME OF CARGO PILFERAGE IN PRE-CONCESSION AND POST CONCESSION ERAS 1999-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>PRE</th>
<th></th>
<th>POST</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vol. of cargo discharged (metric ton)</td>
<td>vol. of cargo pilfered (metric ton) in million</td>
<td>Vol. of cargo discharged (metric ton)</td>
<td>Vol. of cargo pilfered (metric ton) Million</td>
</tr>
<tr>
<td>1999</td>
<td>15,175,331</td>
<td>24,110</td>
<td>31,937,804</td>
<td>51,320</td>
</tr>
<tr>
<td>2001</td>
<td>24,668,791</td>
<td>34,150</td>
<td>41,757,149</td>
<td>33,220</td>
</tr>
<tr>
<td>2002</td>
<td>25,206,380</td>
<td>60,090</td>
<td>45,757,149</td>
<td>49,810</td>
</tr>
<tr>
<td>2003</td>
<td>27,839,293</td>
<td>62,842</td>
<td>46,928,484</td>
<td>30,930</td>
</tr>
<tr>
<td>2004</td>
<td>26,907,075</td>
<td>65,741</td>
<td>52,010,440</td>
<td>18,392</td>
</tr>
<tr>
<td>2005</td>
<td>29,254,766</td>
<td>69,322</td>
<td>46,234,240</td>
<td>11,500</td>
</tr>
<tr>
<td>TOTAL</td>
<td>168,858,132</td>
<td>369,545</td>
<td>297,786,221</td>
<td>23,682</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>24,122,590.3</td>
<td>52,914.3</td>
<td>42,540,888</td>
<td>33811.71</td>
</tr>
</tbody>
</table>

Source: NPA Security Department, Nigeria Ports Police.

### 4.3 A Comparative Analysis of Volume of Cargo Pilferage in Pre and Post –Concession Eras

From table 4.3, we see that the total volume of cargo pilferage in the Nigeria seaports as reported was 42,109 million metric tons of cargo for 7-years covering the period under review representing the pre-concession era.
The average percentage of the volume of cargo pilferage during the pre-concession era was 4.2% and the volume of cargo pilferage during this era rose steadily from 2,411 million metric tons in 1999 to 9,322 million metric tons, making up an average increase of 5,705.6 million metric tons from 1999-2005.

Whereas total cargo pilferage from 2006-2012, period covering the post-concession era was 23,902 metric tons and an average of 3414.6 metric tons, and the average percentage of the volume of cargo pilferage was 1.2% also from the data we see that the volume of cargo pilferage decreases steadily in the post-concession era.

This shows that there was an average percentage difference of 3% between the both eras.
**Table 4.4. Percentage of Volume of Cargo Pilferage 1999-2012**

<table>
<thead>
<tr>
<th>Pre</th>
<th>Vol. of cargo pilferage</th>
<th>Percentage vol. of cargo pilferage</th>
<th>Post</th>
<th>Vol. of cargo pilferage (millions)</th>
<th>Percentage vol. of cargo pilfered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>24,1100</td>
<td>.15%</td>
<td>2006</td>
<td>51320</td>
<td>.16%</td>
</tr>
<tr>
<td>2000</td>
<td>53,690</td>
<td>.27%</td>
<td>2007</td>
<td>41510</td>
<td>.12%</td>
</tr>
<tr>
<td>2001</td>
<td>34,150</td>
<td>.14%</td>
<td>2008</td>
<td>33220</td>
<td>.07%</td>
</tr>
<tr>
<td>2002</td>
<td>60,090</td>
<td>.28%</td>
<td>2009</td>
<td>49,810</td>
<td>.13%</td>
</tr>
<tr>
<td>2003</td>
<td>62,842</td>
<td>.29%</td>
<td>2010</td>
<td>30,930</td>
<td>.6%</td>
</tr>
<tr>
<td>2004</td>
<td>65,741</td>
<td>.31%</td>
<td>2011</td>
<td>18,392</td>
<td>.4%</td>
</tr>
<tr>
<td>2005</td>
<td>69,322</td>
<td>.32%</td>
<td>2012</td>
<td>11,500</td>
<td>.2%</td>
</tr>
<tr>
<td>Total</td>
<td>369,545</td>
<td></td>
<td></td>
<td>236,682</td>
<td></td>
</tr>
</tbody>
</table>

**Source: NPA Security Department, Nigeria Ports Police.**

Table 4.4 shows an average increase in the percentage volume of cargo pilferage from 0.15% in 1999 to 0.32% in 2005 for the pre-concession period and an average percentage decrease from 0.16% in 2006, to 0.2% in 2012 for the post concession period under review.
4.4 Test of Hypotheses

The first hypothesis of this work shall be tested using trend analysis moving average statistical techniques, while the other three hypotheses will be tested using the student t-distribution of difference of means test for paired samples.

4.4.1 Test for First Hypothesis:

The test was done using the computer based statistical analytical tool known as the Statistical Package for Social Sciences SPSS Version 20.

First we stated the hypothesis;

$H_0$: the trend of cargo pilferage in the Nigeria ports has not decreased from 1999-2012.

To test this hypothesis using the SPSS version 20 we inputted the data in table 4.3 into the software for analysis;
Table 4.3: Volume of Cargo Pilferage In Pre-Concession And Post Concession Eras 1999-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>PRE Vol. of cargo discharged (metric ton)</th>
<th>POST Vol. of cargo discharged (metric ton)</th>
<th>vol. of cargo pilfered (metric ton) in million</th>
<th>POST Vol. of cargo pilfered (metric ton) Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>15,175,331</td>
<td>31,937,804</td>
<td>24,110</td>
<td>51,320</td>
</tr>
<tr>
<td>2000</td>
<td>19,230,496</td>
<td>33,722,488</td>
<td>53,690</td>
<td>4,1510</td>
</tr>
<tr>
<td>2001</td>
<td>24,668,791</td>
<td>41,757,149</td>
<td>34,150</td>
<td>3,3220</td>
</tr>
<tr>
<td>2002</td>
<td>25,206,380</td>
<td>45,757,149</td>
<td>60,090</td>
<td>49,810</td>
</tr>
<tr>
<td>2003</td>
<td>27,839,293</td>
<td>46,928,484</td>
<td>62,842</td>
<td>30,930</td>
</tr>
<tr>
<td>2004</td>
<td>26,907,075</td>
<td>52,010,440</td>
<td>65,741</td>
<td>18,392</td>
</tr>
<tr>
<td>2005</td>
<td>29,254,766</td>
<td>46,234,240</td>
<td>69,322</td>
<td>11,500</td>
</tr>
<tr>
<td>TOTAL</td>
<td>168,858,132</td>
<td>297,786,221</td>
<td>369,545</td>
<td>23,682</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>24,122,590.3</td>
<td>42,540,888</td>
<td>52,914.3</td>
<td>33811.71</td>
</tr>
</tbody>
</table>

Source: NPA Security Department, Nigeria Ports Police.

Data in table 4.3 were employed to calculate the trend of cargo pilferage for both pre and post concession era. This was done using the formulated model for cumulative moving average tri-annually;

\[
CMAN = \frac{Y_1^r + Y_2^r + Y_3^r + \cdots + Y_n^r}{N}
\]

Where \(N = 3\) (tri-annual average). \(Y^r\) = year.

\(n\) = serial number of the year per era.
The result of the analysis is shown in table 4.5 below;

### TABLE 4.4: TREND ANALYSIS OF VOLUME OF CARGO PILFERAGE
FOR PRE AND POST CONCESSION ERAS.

<table>
<thead>
<tr>
<th>Pre-concession Year</th>
<th>Vol. of cargo pilferage (metric tons)</th>
<th>Cargo pilferage trend</th>
<th>Post-concession Year</th>
<th>Vol. of cargo pilferage (metric ton)</th>
<th>Cargo pilfered trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>24110</td>
<td>-</td>
<td>2006</td>
<td>51,320</td>
<td>54050.7</td>
</tr>
<tr>
<td>2000</td>
<td>53690</td>
<td>37317.7</td>
<td>2007</td>
<td>41,510</td>
<td>42017.7</td>
</tr>
<tr>
<td>2001</td>
<td>34150</td>
<td>49310.0</td>
<td>2008</td>
<td>33,220</td>
<td>41513.3</td>
</tr>
<tr>
<td>2002</td>
<td>60,090</td>
<td>52360.7</td>
<td>2009</td>
<td>49,810</td>
<td>37987.0</td>
</tr>
<tr>
<td>2003</td>
<td>62,842</td>
<td>62891.0</td>
<td>2010</td>
<td>30,930</td>
<td>33044.0</td>
</tr>
<tr>
<td>2004</td>
<td>65,741</td>
<td>65968.3</td>
<td>2011</td>
<td>18,392</td>
<td>20274.0</td>
</tr>
<tr>
<td>2005</td>
<td>69,322</td>
<td>62127.7</td>
<td>2012</td>
<td>11,500</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Author’s trend analysis using CMA (tri-annual average).

Table 4.5 shows the result of the trend analysis of cargo pilferage from 1999 – 2005 (pre-concession era) and from 2006-2012 [post-concession era]. The trend of cargo pilferage in the pre-concession era moved increasingly all through the period under review except for a drop from 65968.3 metric tons for 2004 to 62127.7 metric tons in 2005.

The trend showed a steady increase in the malaise of cargo pilferage from 37317.7 metric tons in 2000 to 65968.3 Metric tons in 2004.

However in the post-concession period, the trend of cargo pilferage decreased steadily along the line from 54050.7 metric tons in 2006 to
20274.0 metric tons in 2011. It means that the concession of the Nigerian ports and terminals from public to private operators have had significant impact in the decline of cargo pilferage hitherto experienced heavily during the pre-concession era of the Nigerian port system.

4.4.1a: Model Description

<table>
<thead>
<tr>
<th>Model ID: Vol of Cargo Pilfered</th>
<th>Model Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: During Preconcession</td>
<td>ARIMA (0,0,0)</td>
</tr>
</tbody>
</table>

4.4.2b: Model Statistics

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of Predictors</th>
<th>Model fit statistics</th>
<th>Ljung – Box (18)</th>
<th>Number of Outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stationary R-squared</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Statistics</td>
<td>DF</td>
<td>Sig.</td>
</tr>
<tr>
<td>Vol of cargo pilfered during Post concession-Model_1</td>
<td>0</td>
<td>0.023</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

4.4.2c Forecast

<table>
<thead>
<tr>
<th>Model</th>
<th>Forecast 2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of Cargo Proliferate – Model_1</td>
<td>22840.50</td>
<td>22840.50</td>
<td>22840.50</td>
</tr>
<tr>
<td></td>
<td>57320.18</td>
<td>63010.93</td>
<td>67990.02</td>
</tr>
<tr>
<td></td>
<td>-11639.18</td>
<td>-17329.93</td>
<td>-22309.01</td>
</tr>
</tbody>
</table>

Source: SPSS version 20 (computer raw analysis)

Likewise, tables 4.5.1a to 4.5.1c show the SPSS result of the autoregressive integrated moving average ARIMA model forecast for the trend of cargo pilferage for the next three years i.e. 2013-2015. The table shows that the forecast for the three years stood constant at 22840.50. This implies that the trend of cargo pilferage will remain at a steady progressive decrease up to the year 2018.
**DECISION:** From the analysis above we go ahead to assert the alternate hypothesis that; *the trend of cargo pilferage in the Nigeria ports has decreased from 1999-2012.*

**4.4.2 Test for Second Hypothesis**

Likewise, to test for the second hypothesis, the SPSS Version 20 software was employed for the difference of mean t-test. First the hypothesis statement; $H_0^2$: *The volume and incident of cargo pilferage has not significantly decreased following the concession of Nigeria ports.*

In other to test this hypothesis using SPSS Version 20, the data in table 4.3 was inputted into the software for computer based analysis.

**TABLE 4.3: Volume of Cargo Pilferage in Pre-Concession and Post Concession Eras 1999-2012**

<table>
<thead>
<tr>
<th></th>
<th>Vol. of cargo discharged (metric ton)</th>
<th>Vol. of cargo pilfered (metric ton) in million</th>
<th></th>
<th>Vol. of cargo discharged (metric ton)</th>
<th>Vol. of cargo pilfered (metric ton) in Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>15,175,331</td>
<td>24,110</td>
<td>2006</td>
<td>31,937,804</td>
<td>51,320</td>
</tr>
<tr>
<td>2001</td>
<td>24,668,791</td>
<td>34,150</td>
<td>2008</td>
<td>41,757,149</td>
<td>3,3220</td>
</tr>
<tr>
<td>2002</td>
<td>25,206,380</td>
<td>60,090</td>
<td>2009</td>
<td>45,757,149</td>
<td>49,810</td>
</tr>
<tr>
<td>2003</td>
<td>27,839,293</td>
<td>62,842</td>
<td>2010</td>
<td>46,928,484</td>
<td>30,930</td>
</tr>
<tr>
<td>2004</td>
<td>26,907,075</td>
<td>65,741</td>
<td>2011</td>
<td>52,010,440</td>
<td>18,392</td>
</tr>
<tr>
<td>2005</td>
<td>29,254,766</td>
<td>69,322</td>
<td>2012</td>
<td>46,234,240</td>
<td>11,500</td>
</tr>
<tr>
<td>TOTAL</td>
<td>168,858,132</td>
<td>369,545</td>
<td>2012</td>
<td>297,786,221</td>
<td>23,682</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>24,122,590.3</td>
<td>52,914.3</td>
<td></td>
<td>42,540,888</td>
<td>33,811.71</td>
</tr>
</tbody>
</table>

*Source: NPA Security Department, Nigeria Ports Police.*
The results of the t-test using SPSS version 20 are represented herein in table 4.5.1 to 4.5.3

Table 4.5.1: paired sample descriptive statistics for volume of cargo pilferage in Nigerian ports for pre and post concession eras (1999-2012)

<table>
<thead>
<tr>
<th>Pair</th>
<th>Mean</th>
<th>N</th>
<th>Std Deviation</th>
<th>Std Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE</td>
<td>52.9143</td>
<td>7</td>
<td>17.22812</td>
<td>6.51162</td>
</tr>
<tr>
<td>POST</td>
<td>33.7857</td>
<td>7</td>
<td>15.09883</td>
<td>5.70682</td>
</tr>
</tbody>
</table>

Table 4.5.2: Paired samples test

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. deviation</th>
<th>Std. error mean</th>
<th>95%confidence interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LOWER</td>
</tr>
<tr>
<td>Pair 1: pre-post</td>
<td>19.12857</td>
<td>29.11470</td>
<td>11.00432</td>
<td>-7.79803</td>
</tr>
</tbody>
</table>

Table 4.5.3 Paired samples t-test

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>df</th>
<th>Sig. (2. Tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 Pre-post</td>
<td>1.738</td>
<td>6</td>
<td>0.133</td>
</tr>
</tbody>
</table>

Source: SPSS version 20 (computer raw analysis)
Table 4.5.1 gave the descriptive statistic for the volume of cargo pilferage in Nigerian seaports for both the pre-concession era and the post concession era. This represents a period of 7 years for both the pre and post. They have an average of 52,914.3 and 33,785.7 metric tons of cargo pilfered for pre and post concession era respectively. The last column showed the standard error of the mean for each of the two variables.

From table 4.5.2, the paired samples test analysis for the two groups were analyzed this gave a paired mean of 19.12857, standard deviation of 29.11470 and standard error of the paired mean was 11.00432. The last column showed that the analysis was done at 95% confidence interval of difference which gave -7.79803 at the lower and 46.05518 at the upper.

Likewise, table 4.5.3 showed the final result of the t-test analysis for both the pre and post concession era. From the table we saw that the degree of freedom was 6 and the resulting t- value was 1.738.

Therefore, the value of the t-computed is 1.738 but from the t-distribution table (see appendix 2) the critical t-value when df is 6 at 95% confidence interval and at 5% significant level is 1.94

**Computed t – value = 1.738**

**Critical t – value at 0.05 = 1.943**

Likewise for the incident of cargo pilferage in Nigeria ports from 1999-2005 representing the pre concession era and 2006-2012 representing
post concession era. The data in table 4.7 was inputted into the spss version 20 software.

**Table 4.5: Reported Incidents of Cargo Pilferage / Theft In Nigerian Seaports From 1999-2012**

<table>
<thead>
<tr>
<th>Year</th>
<th>No of cargo pilferage /theft incidents reported</th>
<th>Year</th>
<th>No of cargo pilferage/ theft incidents reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>595</td>
<td>2006</td>
<td>833</td>
</tr>
<tr>
<td>2000</td>
<td>715</td>
<td>2007</td>
<td>708</td>
</tr>
<tr>
<td>2001</td>
<td>909</td>
<td>2008</td>
<td>413</td>
</tr>
<tr>
<td>2002</td>
<td>661</td>
<td>2009</td>
<td>369</td>
</tr>
<tr>
<td>2003</td>
<td>586</td>
<td>2010</td>
<td>335</td>
</tr>
<tr>
<td>2004</td>
<td>894</td>
<td>2011</td>
<td>286</td>
</tr>
<tr>
<td>2005</td>
<td>931</td>
<td>2012</td>
<td>204</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5,291</td>
<td></td>
<td>3,148</td>
</tr>
</tbody>
</table>

Source: NPA Security Department Headquarter and Nigeria Port Police

The results of this analysis is as shown in tables 4.7.1 to 4.7.
Table 4.5.1: paired sample descriptive statistics for reported incidence of cargo pilferage in Nigeria Ports for pre and post concession eras (1999-2012)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
<th>Std Deviation</th>
<th>Std Mean Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1PRE</td>
<td>755.86</td>
<td>7</td>
<td>151.990</td>
<td>57.447</td>
</tr>
<tr>
<td>POST</td>
<td>449.71</td>
<td>7</td>
<td>231.596</td>
<td>87.535</td>
</tr>
</tbody>
</table>

Table 4.5.2: Paired samples test

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std.deviation</th>
<th>Std.mean error</th>
<th>95%confidence interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 pre post</td>
<td>306.143</td>
<td>339.878</td>
<td>128.462</td>
<td>-8.192</td>
</tr>
</tbody>
</table>

Table 4.5.3 Paired samples t-test

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>Df</th>
<th>Sig. (2. Tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 Pre-post</td>
<td>2.383</td>
<td>6</td>
<td>0.055</td>
</tr>
</tbody>
</table>

Source: SPSS version 20 (computer raw analysis)

Table 4.5.1: gave the descriptive statistic for the reported incidence of cargo pilferage in Nigeria Ports from 1999-2012. The pre-concession era covering from 1999-2005, and the post-concession era spanning from 2006-2012, each variable having a 7-year period.
The pre-concession era had a mean of 755.86 metric tons and 44.71 metric tons is for the post concession era. While the standard deviation was 151.990 and 231.596 for both eras respectively. Whereas the standard error of mean was shown in the last column of the table.

Table 4.5.2 showed the paired samples test analysis for the both eras. It showed a paired mean of 306.143, and a paired standard deviation of 339.878 and standard error of mean was 128.462 at 95% confidence interval of difference of -8.192 for lower and 620.478 for upper.

Consequently, table 4.5.3 showed the result of the t-test student distribution analysis for both eras.

The value of the computed t at 95% confidence interval and 0.05 significance level with degree of freedom at 6 is given as 2.383.

**Computed t-value = 2.567; Critical t-value at 0.05 = 1.943**

From the above results obtained from the t-test analysis of the volume and incident of cargo pilferage, the computed t-value for both is greater than the critical t-value.

**DECISION:** we reject null hypothesis and accept the alternate.

This implies: *The volume and incident of cargo pilferage has significantly decreased following the concession of Nigeria ports.*
4.4.3 Test for third hypothesis.

Likewise, to test for the third hypothesis, the SPSS Version 20 software was also employed.

First the hypothesis statement;

\[ H_{03}: \textit{Cargo pilferage had no significant impact on the revenue earnings of Nigerian Seaports.} \]

Therefore, to test this hypothesis using SPSS Version 20, the data in table 6 was inputted into the software for computer based analysis.
TABLE 4.6: ESTIMATED REVENUE LOSS DUE TO CARGO PILFERAGE IN NIGERIA PORTS FOR PRE AND POST-CONCESSION ERA [1999-2012]

**PRE -CONCESSION ERA.**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Vol. Of Cargoes Discharged</th>
<th>Vol. Of Cargoes Pilfered</th>
<th>percentage Of Cargoes Pilfered</th>
<th>AGR For Cargoes Discharged</th>
<th>Estimated Revenue Loss Due To Pilferage</th>
<th>Nearest Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>15,751,331</td>
<td>24,110</td>
<td>0.15%</td>
<td>38,076,740</td>
<td>57,115</td>
<td>57.1</td>
</tr>
<tr>
<td>2000</td>
<td>19,230,496</td>
<td>53,690</td>
<td>0.27%</td>
<td>46,420,005</td>
<td>125,334</td>
<td>125.3</td>
</tr>
<tr>
<td>2001</td>
<td>24,668,791</td>
<td>34,150</td>
<td>0.14%</td>
<td>51,930,384</td>
<td>72,702</td>
<td>72.7</td>
</tr>
<tr>
<td>2002</td>
<td>25,206,380</td>
<td>60,090</td>
<td>0.24%</td>
<td>52,301,824</td>
<td>125,524</td>
<td>125.5</td>
</tr>
<tr>
<td>2003</td>
<td>27,839,293</td>
<td>62,842</td>
<td>0.23%</td>
<td>53,631,095</td>
<td>123,351</td>
<td>123.3</td>
</tr>
<tr>
<td>2004</td>
<td>26,907,075</td>
<td>65,741</td>
<td>0.24%</td>
<td>50,909,255</td>
<td>122,182</td>
<td>122.1</td>
</tr>
<tr>
<td>2005</td>
<td>29,254,766</td>
<td>69,322</td>
<td>0.24%</td>
<td>53,420,529</td>
<td>128,209</td>
<td>128.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>369,945</td>
<td></td>
<td></td>
<td>525,331,355</td>
<td>424,335</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author's Estimation

**POST- CONCESSION ERA.**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NO. OF CARGOES DISCHARGED</th>
<th>VOL. OF CARGOES PILFEED</th>
<th>PERCENTAGE OF CARGOES PILFERED</th>
<th>AGR FOR CARGOES DISCHARGED</th>
<th>ESTIMATED REVENUE LOSS DUE TO PILFERAGE</th>
<th>NEAREST DECIMAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>31,937,804</td>
<td>51,320</td>
<td>0.16%</td>
<td>58,231,777</td>
<td>93,170</td>
<td>93.1</td>
</tr>
<tr>
<td>2007</td>
<td>33,722,488</td>
<td>41,510</td>
<td>0.12%</td>
<td>62,919,245</td>
<td>75,503</td>
<td>75.5</td>
</tr>
<tr>
<td>2008</td>
<td>41,195,616</td>
<td>33,220</td>
<td>0.08%</td>
<td>73,250,655</td>
<td>58,600</td>
<td>58.6</td>
</tr>
<tr>
<td>2009</td>
<td>45,757,149</td>
<td>49,810</td>
<td>0.11%</td>
<td>78,295,899</td>
<td>86,125</td>
<td>86.1</td>
</tr>
<tr>
<td>2010</td>
<td>46,928,484</td>
<td>30,930</td>
<td>0.07%</td>
<td>85,150,650</td>
<td>59,605</td>
<td>59.6</td>
</tr>
<tr>
<td>2011</td>
<td>52,010,440</td>
<td>18,392</td>
<td>0.04%</td>
<td>89,180,129</td>
<td>35,672</td>
<td>35.6</td>
</tr>
<tr>
<td>2012</td>
<td>46,234,240</td>
<td>11,500</td>
<td>0.02%</td>
<td>78,303,000</td>
<td>15,660</td>
<td>15.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>297,756,585</td>
<td>236,682</td>
<td></td>
<td>525,331,355</td>
<td>424,335</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author's Estimation.

NB: the researcher wish to state here that this estimate was made in assumption that the cargoes pilfered and the cargoes discharged are of equivalent value and similar nature.
The results of this analysis is as shown in tables 4.6.1 to 4.6.3

**Table 4.6.1**: paired sample descriptive statistics for estimated revenue loss due to cargo pilferage in Nigeria ports for pre and post concession eras (1999-2012)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
<th>Std Deviation</th>
<th>Std Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 PRE</td>
<td>107.7143</td>
<td>7</td>
<td>29.65009</td>
<td>11.20668</td>
</tr>
<tr>
<td>POST</td>
<td>60.5857</td>
<td>7</td>
<td>27.63907</td>
<td>10.4468</td>
</tr>
</tbody>
</table>

**Table 4.6.2**: Paired samples test

<table>
<thead>
<tr>
<th></th>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std.deviation</th>
<th>Std.error mean</th>
<th>95%confidence interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LOWER</td>
<td>UPPER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair 1 pre post</td>
<td></td>
<td>2.21052</td>
<td>92.04662</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 4.6.3**: Paired Samples T-Test

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>df</th>
<th>Sig. (2. Tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 Pre-post</td>
<td>2.567</td>
<td>6</td>
<td>0.042</td>
</tr>
</tbody>
</table>

Source: SPSS version 20 (computer raw analysis)

Table 4.6.1: gave the descriptive statistic for the estimated revenue loss due to cargo pilferage in Nigeria Ports from 1999-2012. The pre-

The pre-concession era had a mean of 107.7143 metric tons and 60.5857 metric tons is for the post concession era. While the standard deviation was 29.65009 and 27.63907 for both eras respectively. Whereas the standard error of mean was shown in the last column of the table.

Table 4.6.2 showed the paired samples test analysis for the both eras. It showed a paired mean of 47.12857, and a paired standard deviation of 48.56816 and standard error of mean was 18.35704 at 95% confidence interval of difference of 2.21052 for lower and 92.04662 for upper.

Consequently, table 4.6.3 showed the result of the t-test student distribution analysis for the estimated revenue loss due to cargo pilferage in Nigeria ports for both eras. The value of the computed t at 95% confidence interval and 0.05 significance level with degree of freedom at 6 is given as 2.567.
**DECISION:** reject null hypothesis if the computed t-value is less than critical t-value.

**Computed t-value = 2.567; Critical t-value at 0.05 = 1.943**

Therefore null hypothesis is accepted. This implies:

*Cargo pilferage had no significant impact on the revenue earnings of Nigerian Seaports.*

The researcher observed from the result of the test of this hypothesis that it is due largely to the insignificance in the impact of cargo pilferage on ports’ revenue earnings that made the ports’ authorities, terminal operators and government to pay lip service to the menace of cargo pilferage/ theft within the ports. Thus they have neglected the other harmful effects of cargo pilferage such as; cargo security, cargo diversion, global image and perception, and constrains on international logistic and supply chain management etc.
4.4.4 Test for Fourth Hypothesis.

Likewise, to test for the fourth hypothesis, the SPSS Version 20 software was employed.

First the hypothesis statement;

\[ H_0^3: \text{Cargo Security has not significantly improved following the concession of the Nigerian seaports.} \]

Therefore, to test this hypothesis using SPSS Version 20, the data in table 6 was inputted into the software for computer based analysis.

Table 4.7: REPORTED INCIDENTS OF CARGO PILFERAGE / THEFT IN NIGERIAN SEAPORTS FROM 1999-2012

<table>
<thead>
<tr>
<th>PRE CONCESSION ERA</th>
<th>POST CONCESSION ERA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>No of cargo pilferage /theft incidents reported</td>
</tr>
<tr>
<td>1999</td>
<td>595</td>
</tr>
<tr>
<td>2000</td>
<td>715</td>
</tr>
<tr>
<td>2001</td>
<td>909</td>
</tr>
<tr>
<td>2002</td>
<td>661</td>
</tr>
<tr>
<td>2003</td>
<td>586</td>
</tr>
<tr>
<td>2004</td>
<td>894</td>
</tr>
<tr>
<td>2005</td>
<td>931</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5,291</td>
</tr>
</tbody>
</table>

Source: NPA Security Department Headquarter and Nigeria Port Police

The results of this analysis is as shown in tables 4.7.1 to 4.7.3
Table 4.7.1: paired sample descriptive statistics for reported incidence of cargo pilferage in Nigeria Ports for pre and post concession eras (1999-2012).

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
<th>Std Deviation</th>
<th>Std Mean Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 PRE</td>
<td>755.86</td>
<td>7</td>
<td>151.990</td>
<td>57.447</td>
</tr>
<tr>
<td>POST</td>
<td>449.71</td>
<td>7</td>
<td>231.596</td>
<td>87.535</td>
</tr>
</tbody>
</table>

Table 4.7.2: Paired samples test

<table>
<thead>
<tr>
<th></th>
<th>Paired Differences</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std.deviation</td>
<td>Std.mean error</td>
<td>95%confidence interval of the Difference</td>
<td>LOWER</td>
</tr>
<tr>
<td>Pair 1 pre post</td>
<td>306.143</td>
<td>339.878</td>
<td>128.462</td>
<td>-8.192</td>
<td>620.478</td>
</tr>
</tbody>
</table>

Table 4.7.3 Paired samples t-test

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>Df</th>
<th>Sig. (2. Tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 Pre-post</td>
<td>2.383</td>
<td>6</td>
<td>0.055</td>
</tr>
</tbody>
</table>

Source: SPSS version 20 (computer raw analysis)
Table 4.7.1: gave the descriptive statistic for the reported incidence of cargo pilferage in Nigeria Ports from 1999-2012. The pre-concession era covering from 1999-2005, and the post-concession era spanning from 2006-2012, each variable having a 7-year period.

The pre-concession era had a mean of 755.86 metric tons and 44.71 metric tons is for the post concession era. While the standard deviation was 151.990 and 231.596 for both eras respectively. Whereas the standard error of mean was shown in the last column of the table.

Table 4.7.2 showed the paired samples test analysis for the both eras. It showed a paired mean of 306.143, and a paired standard deviation of 339.878 and standard error of mean was 128.462 at 95% confidence interval of difference of -8.192 for lower and 620.478 for upper.

Consequently, table 4.7.3 showed the result of the t-test student distribution analysis for the estimated revenue loss due to cargo pilferage in Nigeria ports for both eras.

The value of the computed t at 95% confidence interval and 0.05 significance level with degree of freedom at 6 is given as 2.383.
**DECISION:**- Reject null hypothesis if the computed t-value is less than critical t-value.

**Computed t-value = 2.567**

**Critical t-value at 0.05 = 1.943**

Therefore null hypothesis is rejected. This implies:

*Cargo Security has significantly improved following the concession of the Nigerian seaports.*
5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings
The foregoing has been a quantitative discussion on the analysis of cargo pilferage in Nigerian seaports; pre and post concession era. In order to truly analyse the data collected from secondary sources, relevant statistical tools such as trend (moving average) and difference of mean t-student test were employed both manually and computer-base to analyse the data. The following are the findings of this research work.

1. That cargo pilferage was a hydra-headed problem that bedeviled the Nigerian seaports in the pre-concession era.
2. That the concession of the Nigerian seaports in 2006 was a step in the right direction which has helped effectively in tackling the problems that faced the ports during the long years of pre-concession.
3. That the trend of cargo pilferage has experienced steady progressive decrease since the advent of the concession programme of the Federal Government on the Nigerian seaports. That this experience will continue till 2018.
4. That, cargo pilferage had a direct and indirect negative bearing on the performance of the Nigerian ports system viz-a-viz, port security, cargo security, cargo handling, and port’s global image and perception.
5. That, whenever and wherever, there are labour intensive cargo handling operations, there must certainly be an increase in the volume of cargo pilferage/theft.

6. That concession policy has proved to be a veritable tool for handling and solving even in the nearest future the issue of cargo pilferage/theft.

7. That cargo pilferage has had no significant impact on ports revenue earnings as such the evident neglect of the other negative effects of cargo pilferage on the Nigeria port system by relevant authorities.

8. That the security of cargo in the Nigeria ports has improved since concession policy came into force but needs revitalization due to the continuous incidence of cargo pilferage and theft.

9. That cargo theft/pilferage is not peculiar to Nigerian ports alone, rather it is a global issue, needing global concerted effort to deal with it.
5.2 Conclusion
Cargo pilferage within the ports in Nigeria is a common crime with an uncommon effect. It distorts the door to door aim of global maritime logistic and supply chain thus making it vulnerable. The Nigerian seaports have suffered greatly from this logistic malady as such making the shipping industry suffer huge financial loss as well as the nation at large. However with the advent of the concession of the Nigerian ports system, the menace called cargo pilferage has experienced a steady progressive extinction in Nigerian port systems, and the forecast predicted that this will continue up until 2018.

5.3 Contribution to Knowledge.
The knowledge contributed by this work in the field of maritime studies includes:

1. That concession has helped in the reduction of cargo related crime within the Nigerian ports.

2. That the steady and progressive decrease in the trend of cargo pilferage in Nigeria ports will continue even to 2018.

3. That the reason behind the lackadaisical approach to tackling the issue of cargo pilferage in Nigerian ports, was due to the insignificant effect cargo pilferage had on Nigeria ports’ revenue earning.
5.4 RECOMMENDATIONS
1. Strong and encompassing policy backed up with legislative act should be promulgated to truly check mate cargo pilferage/theft just as it is in other developed and developing maritime economy such as USA, Brazil, Canada etc. such policy must have a workable legal framework for ease of implementation.

2. Concessionaries must align with all relevant security agencies such as the Nigeria port police, Nigeria police force, NPA security department etc to ensure total security within the port area especially the security and safety of cargoes.

3. Provision of computer based or electronic devices, used in the security of ports area such as CCTV and other electronic security camera devices. This will help in 24-hours monitory of the activities in the ports.

4. Concessionaries must ensure due diligence in ensuring that cargoes that call at their terminals are safe and well handled.

5. The Nigeria Ports Authority must in their supervisory role ensure that concessionaries comply with all international standards for safety of cargoes at port and ensure that cargo pilfering is eliminated in individual terminals, also adhere to the agreement of providing sophisticated and modern cargo handling equipments.
6. That Port Operators, that are concerned with cargo handling process and port security agents should be trained and re-trained with best global practices on how to avoid cargo pilfering/theft in Nigerian ports.

7. More research work is hereby solicited in the area of maritime logistics viz-a-viz cargo security and safety, including the safe operation of the door to door service in the Nigerian maritime logistic and supply chain sub-sector.

5.5 Suggested Areas for Further Study
The following are areas suggested for further study:

- Impact of cargo pilferage on the GDP of Nigeria
- Cargo handling logistic in the Nigeria maritime industry
- Cost implication of cargo pilferage in a developing economy
- Challenges of global maritime supply chain
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APPENDIX 2

APPENDIX 3
APPENDIX 10
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