UNIVERSITY OF KWAZULU-NATAL

EFFECTS OF INTERMODAL TRANSPORTATION NETWORKS ON THE INBOUND AND OUTBOUND DURBAN CONTAINERISATION

by

Nerissa Govender

208506732

Dissertation submitted in fulfillment of the requirements for the degree of

Master of Commerce

Supply Chain Management

School of Management, Information Technology and Governance

College of Law and Management Studies

Supervisor: Dr T.P.Mbhele

2014

Declaration

I, **Nerissa Govender**, declare that:

(i) The research reported in this dissertation/thesis, except where otherwise indicated is my original research.

(ii) This dissertation/thesis has not been submitted for any degree or examination at any other university.

(iii) This dissertation/thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

(iv) This dissertation/thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:
a) Their words have been re-written but the general information attributed to them has been referenced;
b) Where their exact words have been used, their writing has been placed inside quotation marks, and referenced.

(v) Where I have reproduced a publication of which I am author, co-author or editor, I have indicated in detail which part of the publication was actually written by myself alone and have fully referenced such publications.

(vi) This dissertation/thesis does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the dissertation/thesis and in the References sections.

Signed: …………………..

Date: 30 June 2014

Acknowledgements

This study is dedicated to my parents, Pat and Rodney Govender

My Brother, Sashin Govender

Sylvester Haricharan

And most of all my Grandmother, Mrs Dolly Govender

This research study would not have been successfully completed without the immense support received from my parents Pat and Rodney Govender. They provided me with direction and the strength to never give up even during the most difficult times. I could not have reached this stage without their support and I express my deepest appreciation.

To my brother Sashin, thank you for your patience and overwhelming support throughout the year.

To Sylvester, my most sincere thanks for all that you have done.You never allowed me to give up even during the most difficult times. You gave me the space to dedicate my time to this research and were always patient with me.

To my grandmother Mrs Dolly Govender, this research study is dedicated to you for always being there for me and for encouraging me to meet all my deadlines. I am eternally grateful to you and I wish you were here with me to celebrate this exceptional achievement. I love you lots!

I thank God for always guiding and protecting me during this challenging experience and for his blessings in granting me people to assist me.

I wish to express my utmost appreciation and respect for my supervisor Mr T.P. Mbhele. Thank you for your support, advice and concrete criticism throughout the course of my study. I would never have completed the research without your assistance. Your kindness and sense of humour will always be appreciated and honoured.

To my extended family and friends, I am thoroughly indebted for your continued support and encouragement to pursue my dreams and make this a reality. My dedication to this study was achieved only with the support of my loved ones.

Abstract

The use of containers can be noted to focus entirely on the transportation of shipments with the use of intermodal networks. Those intermodal transportation networks commonly utilise inbound (sea networks) and outbound (road networks) frameworks. The structural design of the Durban Port facilitates movement and creates a transitional configuration of networks to function. The objectives of this study aim to understand the effects of capacity constraints on transitional inbound and outbound containerisation within the Durban harbour intermodal networks. It further attempts to establish the intermodal relationship of containerisation between the transitional shipping and road freight transportation networks. Finally, to examine the role of the Durban Port customs system in cargo clearing and forwarding processes. The nature of this study will be triangulation where both qualitative and quantitative studies are being used. The current logistical system in Durban has negatively impacted the transportation sector. Therefore, there is a need for developmental and strategic approaches to ensure that infrastructure is maintained and improved to accommodate the increase in international trade. The factors contributing to containerisation in relation to transitional transportation networks can create negative elemental designs, especially with the increase in global trade. Overweight containers can lead to mishandling and incorrect stowage capabilities on board shipping vessels. Deficiencies in technological systems such as the newly introduced NAVIS SPARCS increase the chances of longer standing time and cargo dwelling time. These systems were meant to streamline the movement of cargo from inbound to outbound; instead, there have been significant capacity constraints. Such constraints experienced at the Durban Port have led to congestion that has weakened business development. Delivery and cycle time have lengthened, resulting in inefficient service delivery on the part of facilitators and forwarding agents. The outbound transportation networks have struggled to maintain efficient and effective delivery time and service status due to their inability to facilitate the timeous movement of containers through customs for final delivery.

Key words: Intermodal, containerisation, capacity constraints, port transition, inbound and outbound networks.

Table of contents

Chapter Two: Inbound transportation networks

Chapter Three: Outbound transportation networks

Appendices

List of tables

List of figures

Abbreviations

TEU	**Twenty-foot equivalent unit**
RFID	Radio frequency identification
ISO	International standards Organisation
GPS	Global positioning system
DSRC	Dedicated short range communication
SARS	South Africa Revenue Services
SAPS	South Africa Police Service
INCOTERMS	International commercial terms
SANRAL	South African national road agency Ltd
IMO	International Maritime Organisation
DCT	Durban container terminal

Chapter One

Introduction

1.1 Introduction

Containerisation is a common method of intermodal transport, mainly by sea and road. A container requires less physical labour as products are stored in a large, box-like structure and are loaded automatically by a crane (Exporthelp, 2012). The Durban Port in South Africa is filtered as the logistical gateway into Africa and is strategically positioned as the hub ports with linkages for intermodal transportation (EThekwini Municipality, 2011:2). This allows for efficient access to areas surrounding Durban as well as for road freight transportation into Africa.

In the Durban Port, containers are imported from various destinations and cleared for final transportation to customers *via* road transport networks. Containership systems allow for the transitional movement of containers from the sea network to road networks. However, capacity constraints pose a challenge to this process. At the Durban Port, these constraints include overweight containers on sea vessels and road networks, inefficient clearing and forwarding mechanisms and congestion. The constraints inhabited at the Durban Port controls the inefficient logistical procedure of shipments that are entering and departing the African region. This can falter movement and result in late deliveries, lower productivity levels, loss in profitability analysis and discontented clientele. Congestion at the Durban Port is noticeably the reason for delays with intermodal networks as the system procedures in place are not in conjunction with the increased volumes entering the Durban region.

Technological advances and efficient procedures need to be adopted to address the problems faced with the Durban Port in terms of inbound and outbound shipments. Port authorities are working to expand and develop the region at the Durban Port in order to accommodate for the increased volumes of containerships. With the aid of the advancements in technological control, there will be expansion at areas of constraint hence ensuring there is effective and continuous movement of containerised shipments. The Durban Port represents the main trade arena in Africa considering being the ‘Gateway into Africa’ hence processes needs to be in place to enhance and stimulate the logistical process to gain experience with international trade.

1.2 Background

Containerisation can be defined as the ability to transport containerised freight using intermodal networks (Pienaar and Vogt, 2009:277). Containers were introduced in the early century to facilitate the transportation of large products and materials using limited manual labour (see Appendix B (Figure 1)). Shipping networks have designed vessels to carry large, six to twelve meter containers to accommodate increased imports and exports (Rodrique, 2013:45). These containers are accommodated by longer trailers that traverse road transport networks. However, the transition from the shipping network to the road network poses certain challenges in terms of container loads arriving at and departing from a port.

The Durban Port is experiencing difficulty in accommodating the large number of containerised shipments coming into the Port (Calabash case studies, 2004). Other constraints include overweight containers; the mishandling of containerised cargo; inadequate clearing and forwarding mechanisms; congestion at the Durban Port and along the main roads; technological protocols; relationships with freight agents; incorrect documentation for customs clearance; and the actual procedure and demurrage charges for perishable containerised cargo as well as legal and administrative costs due to inefficiency. With the extension of the harbour and Port, Durban is expected to become a gateway for imports. It is therefore essential that such constraints be addressed. This study examines the customs procedures followed at the Port in order to identify issues impacting on intermodal transportation networks.

1.3 Problem statement

The effects of intermodal transportation networks on inbound and outbound containerisation stem to have implications on the international trade surrounding the Durban region. The problem can be ascertained from capacity tribulations at the port; overweight containers; congestion at the port and on roads; inefficient clearing and forwarding mechanisms; long holding times and lead time delays. Other constraints include technological protocols for vessels and trucks; appropriate Incoterms; demurrage charges for late shipment; and incorrect documentation to secure the release of containers. Some information ascertained from respective individuals in the industry provides solutions for congestion and capacity relating to infrastructural development to Port advances. In order to achieve this, tools are in place such as dig out Port facilities and reconstruction of widening and deepening of harbours. To achieve the international trade results of a logistical nation being the ‘Gateway into Africa’, Durban is on the map to being intermodally recognised hence the effects needs to be considered to develop the possible solutions for change.

1.4 Need for the study

The various challenges are experienced in the transition from shipping to road transport, including capacity constraints, overweight containers and customs processing. Therefore the purpose of the study is to identify the effects of using intermodal transportation and areas of improvement with relevant solutions stemming from infrastructural development and technological advancements. International trade in Africa is seen for extension hence factors needs to be generated in order for solutions to be introduced.

1.5 Research objectives

The objectives of this study aim:

- To understand the effects of capacity constraints on transitional inbound and outbound containerisation within the Durban Port intermodal networks.
- To establish the intermodal relationship of containerisation between the transitional shipping and road freight transportation networks.
- To examine the role of the Durban Port customs system in cargo clearing and forwarding processes.

1.6 Research questions

The questions to be answered are as follows:

- What are the effects of the capacity constraints on transitional inbound and outbound containerisation within the Durban Port intermodal networks?
- What is the intermodal relationship of containerisation between the transitional shipping and road freight transportation networks?
- How does the Durban Port customs system influence cargo clearing and forwarding procedures?

1.7 Motivation for the study

Rigorous research is of benefit to the public, general society and communities. The motivation for the study is attributed to various entities involved in intermodal networks of inbound and outbound transportation in relation to containerisation. Sea and road transportation networks contribute to the continuous flow of trade within Durban that benefits businesses and communities. It is hoped that the transportation industry will benefit from the insight into freight management in the Durban Port offered by this study. The logistical network of the Durban Port allows for vigorous research to be conducted so that knowledge is granted to participants in the industry.

1.8 Limitations of the study

The research questions and objectives for the study reveal that it has certain limitations. These include the vast population that forms the logistics industry in South Africa. The industry comprises of small logistic companies that focus on road transportation featuring small to medium sized growth with limited resources hence the time frame is limited to spotlight every company and to canvass the opinions of every individual involved in containerisation and the road transport network. A further limitation lies in the inability to justify the loadings of various variables identified in the study. This provides the statistical basis for the factors analysed in the study; thus only the views of study respondents were taken into consideration and not the entire industry.

1.9 Hypothesis of the study

The table below enhances the relationship between variables in the form of hypotheses.

H_{O1}: There is no relationship between field of employment and capacity constraints. **H_{A1}:** There is a relationship between field of employment and capacity constraints.
H_{O2}: There is no relationship between experience in containership and capacity constraints. **H_{A2}**: There is a relationship between experience in containership and capacity constraints.
H_{O3}: There is no relationship between transport mode and capacity constraints. **H_{A3}:** There is a relationship between transport mode and capacity constraints.
H_{O4}: There is no relationship between work description in containership and capacity constraints. **H_{A4}**: There is a relationship between work description in containership and capacity constraints.
H_{O5}: There is no relationship between experience in containership and intermodal containerisation. **H_{A5}**: There is a relationship between experience in containership and intermodal containerisation.
H_{O6}: There is no relationship between transport mode and intermodal containerisation. **H_{A6}**: There is a relationship between transport mode and intermodal containerisation.
H_{O7}: There is no difference between excessive control and incoterms. **H_{A7}**: There is a difference between excessive control and incoterms.
H_{O8}: There is no difference between excessive control and security protocols. **H_{A8}:** There is a difference between excessive control and security protocols.

Source: Designed by Researcher

1.10 Research methodology of the study

The type of research design used for the study will be exploratory research as it will explore processes of containerisation and events that unfold when containers in transit *via* the intermodal network. Exploratory research is distinguished as being undertaken when not much research is undertaken regarding the subject (Cooper and Schindler, 2010:102). The nature of this study will be triangulation where both qualitative and quantitative studies are being used. Triangulation technique is used in research to ensure both validity and reliability (Gilhooly, 1996:167). The time horizon used is a cross-sectional study where the data is gathered at once over a period of months (Mcburney and White, 2007:341).

The target population used in this research will be those involved in the logistical process for inbound and outbound shipments. More especially, freight forwarders and clearing agents were targeted. The logistical market in Durban is flooded with small to medium enterprises running operations of limited capacity hence three big players in the freight industry has taken part in the study. The type of sample that will be used is non-probability sampling that will allow elements to have no idea or probability of being selected (Beins and Mccarthy, 2012:397). As part of purposive sampling, judgement sampling will be chosen in this research. The sample size will respected to an amount of 206.

The data needed for this research will be collected by means of questionnaires and interviews. The questionnaires will be set out in different ranges to best collect the data required namely using Likert scales and the use of dichotomous questions (Yes/No) as well as the need for ordinal scale. Interviews will also be scheduled with relevant individuals with the use of unstructured questions to follow. Approximately 10 managers will be interviewed of which all information will be strictly private and confidential and will be utilised as part of discussions and recommendations.

1.11 Structure of the dissertation

Chapter One: Introduction

Chapter one presented an introduction to the study and outlined the background to the study, the objectives, the problem statement, research questions and the limitations and delimitations of the study. This chapter sets the background for the rest of the study.

Chapter Two: Inbound transportation networks

Chapter two presents a review of current literature on inbound transportation networks, with a focus on the study area. It outlines current debates on the research topic and the relationship between the literature and the problem statement.

Chapter Three: Outbound transportation networks

Chapter three forms part of the literature review and focuses on outbound transportation networks. This includes an examination of the customs clearance process as well as infrastructural developmentat the Durban Port.

Chapter Four: Research methodology

Chapter four presents the methods selected by the researcher to conduct the study.It highlights the research design and explains the data collection methods used and the qualitative and quantitative data analysis.

Chapter Five: Data analysis

Chapter five depicts the data collected using questionnaires and interprets using it SPSS. Tables, graphs and charts are utilised to depict the data relating to different aspects of the study. The various measuring instruments outlined in chapter four will be used in conjunction with SPSS.

Chapter Six: Discussion of results

Chapter six presents a discussion of the data analysed in chapter five. This enables a concrete presentation based on the data analysis, the literature review, the objectives and the problem statement.

Chapter Seven: Conclusion and recommendations

This chapter provides an overall conclusion and recommendations for future research. The chapter considers the contribution to knowledge made by this study and based on the findings, offers recommendations.

1.12 Conclusion

This chapter provided a brief insight on the forthcoming information featuring the knowledge of containerisation with inbound and outbound transportation networks. The results will be further analysed with the literary factor considered for efficient results. The following chapters will provide an in-depth insight regarding the challenges faced as inbound and outbound networks as well as intermodal transportation. This is interpreted with opinions and advice obtained from key players in the logistical and freight industry.

Chapter Two
Inbound Transportation Networks

2.1 Introduction

Containerisation is a common method of intermodal transport, mainly by road and sea. A container requires less physical labour as products are predominantly stored in large, box-like structures and automatically loaded by a crane (Exporthelp, 2012:1). In the Durban Port, containers are imported from various destinations and cleared for final transportation *via* road transport networks. Containership systems allow for the transitional movement of containers from sea networks to road networks. However, capacity constraints and congestion pose a challenge to this process.The challenges include overweight containers on vessels and road networks, inefficient clearing and forwarding agents, congestion and capacity constraints, insurance effects and port operations. This study aims to highlight the effects of intermodal transportation networks on inbound and outbound containerisation in Durban with a view to facilitating the adoption of appropriate procedures and technology to address these problems.

2.2 Container history

The history of containers dates back to the early 1950s when Malcolm McLean designedeight foot by eight foot corrugated steel boxes to transport goods (Appendix B, Figure 1) in order to reduce the use of manual labour and to speed up the delivery of goods (Murray, 2012). Cargo ships were then able to use automatic unloading procedures. Dockside cranes and hysters provided support to various intermodal networks that moved containers to relevant transportation modes.

According to Pienaar and Vogt (2009:277), "Four international standards organisation (ISO) recommendations were introduced in order to standardise containerisation." These were the identification of the crucial terms, the dimensions, the important identification symbols located on containers and conclusions regarding the corner fittings of general purpose containers. These container standards were institutionalised in the 1960s with the growth of intermodalism in mind in order to facilitate the purposive movement of freight across different modes using equipment (Coyle, Gibson, and Bardi, 2011:87). Containerisation is therefore defined as "the system by which containerised freight is transported intermodally" (Dewitt and Clinger, 1999:2). The movement of freight in a structural box enhances the efficient handling of goods as it reduces labour intensively, thereby limiting the risk of damage to the goods (Pienaar and Vogt, 2009:277).

The manual movement of cargo packages resulted in time delays and pilferage as well as damage to products (Subhash, 2012:6). Containerisation follows specific steps that begin with packing the container and end with their transportation using containerships. The containers are loaded using cranes designed to carry the weight and dimensions of a standard six (6) meter or twelve (12) meter container. The containerships transport the packed containers to the relevant ports for final delivery by road transportation (Subhash, 2012:5).

The globalisation of containers has made transportation modes more efficient and effective. The relationships between intermodal networks have evolved to cater directly for customers' requirements and improve service delivery (Nottleboom and Rodrigue, 2008:157). The volume of containers imported and exported has increased substantially in the past few decades, with a tremendous effect on the world economy. International trade has flourished as a result ofthe improved distribution delivered by containerisation. It has positively impacted freight activities by the modes of transportation as well as supply chain networks that improve transshipment (Nottleboom and Rodrigue, 2008:158). Transshipment is defined as the automatic offloading of a container from one shipping vessel onto another vessel (Manaadiar, 2011:1). Transshipment has evolved in the modern era due to technological advancements. In the early 1900s, it would take days to load and offload ships. With containerisation, this has been reduced to hours (Cudahy, 2006:413).

Containerisation is at a mature stage, especially in the global commercial and retail industries (Rodrigue, 2008:1). The Port of Durban receives large volumes of containers from trading partners like China using reefers (refrigerated container units) (Rodrigue, 2008:2). Containers are also used to export perishable products from South Africa to the rest of the world. Consumers have benefitted from the abundant choices facilitated by the introduction of containers. Increased global trade has also witnessed an increase in competition; this has a positive effect on consumers as products arrived at remarkable speeds and are priced reasonably (Levinson, 2000).

2.2.1 Types of Containers

Containers differ in length and width and by type. A standard container ranges from 20 ft (5.87m) in length, 2.28m in width and 2.26m in height to 40ft (12m) in length, 2.28m in width and 2.26m in height (Asha freight, 2012:1). There are two main types of containers, namely, ISO containers and Smart containers.

ISO containers are an innovative means to transport bulk commodities and the storage of products needed at various locations (Xneting, 2011:5). These technologically improved containers include general purpose containers, dry bulk, flat racks, open top containers, refrigerated and insulated containers, carriage containers for liquid and tank containers.

Smart containers are required for the detection of chemicals, drugs and gases. They use technological innovations such as radio frequency identification (RFID) to detect issues as and when they occur (Pienaar and Vogt, 2009:278). Although this container is relatively more expensive than a general ISO container, it increases efficiency through sensing theft occurrences and maintaining an overall inventory of the load carried in the container. The need for smart containers has evolved in response to the desire to reduce the use of manual labour on ships and at terminals (Department of Transport, 2012). Satellite and RFID systems can detect environments that are hazardous for the container and are more cost-effective than GPS and microchip installations (Pienaar and Vogt, 2009:278). The risk of human error is avoided with an automated system and labour disputes are reduced (Department of Transport, 2012).

2.3 Shipping networks

Shipping networks commonly utilised for the transportation of containers were remodeled to accommodate containerships. The networks developed prior to the design of containers were maintained for the use of break bulk individual items and tankers that were manually loaded and were able to transport a maximum of 1000 TEUs (Rodrigue, 2008:5). In 1956, after the development of corrugated steel containers, the remodeling of existing shipping networks proved risky and costly as a result of onboard crane facilities. Containerships were redesigned to accommodate the variety stacking capability of containers (Talley, 2000:934). This saw the removal of cranes onboard; instead, they were placed at port facilities to accommodate a larger volume of containers.

Shipping networks also developed port handling expertise to facilitate the movement of containers through intermodal transportation or transshipment (Rodrigue, 2008:7). In the early 1980s, larger containerships and shipping networks were constructed to address economies of scale. The more containers carried on a specific shipping network, the lower the costs per TEU (Rodrigue, 2008:7). Thereafter, larger shipping networks were developed to accommodate the ever-growing capacity of containers. This has resulted in TEUs exceeding 8000. With the expanding number of containerships and the TEU cartage increasing, Port and harbour facilities were inadequate to handle the higher capabilities of intermodalism (Talley, 2000:934).

However, this resulted in higher fuel costs that impacted the shipping networks' operational expenses (Rodrigue, 2008:8). Ninety six percent of South Africa's exports are transported using shipping networks (SA info reporter, 2012:3). South African ports facilitate trade across the world. These include Richards Bay, Durban, East London, Port Elizabeth, Port of Ngqura, Mossel Bay, Cape Town and Saldanha Bay. The ports are primarily managed by Transnet National Ports Authority. Transnet Port Terminals is responsible for the operation of shipping networks and cargo operations (SA info reporter, 2012:3). Global shipping networks have made a substantial contribution to the growth of trade within ports located in South Africa. The Port of Durban is seen as the gateway to Africa with a massive number of containers entering and leaving the port on a continuous basis.

2.4 Inbound Durban containerisation

Shipping networks are responsible for the inbound logistics of containers on a global scale. Containers are transported *via* sea networks to various destinations across the world and facilitate economic growth and increased trade. The inbound network is negatively affected by factors such as overweight containers; container stowage; mishandling of containers; cargo insurance; cargo dwelling time; port congestion; capacity constraints; corruption at customs and technological deficiencies. Containers are transported on a daily basis in the Durban region and rely on efficient port operations and adequate road transportation networks.

2.4.1 Overweight containers

Shipping networks are witnessing an increase in overweight cargo. This has significant implications for the continuous flow of shipments between networks and ports. Safety precautions should be strictly adhered to (Port technology, 2011:9). A container is considered to be overweight when its weight exceeds the legal average gross mass (Department of Transport, 2011:66). There are various regulatory measures in place to ensure the safety of shipping vessels using weighbridge facilities before containerised cargo is loaded on deck.

Overweight containers pose risks to workers onboard the shipping vessel, operators in the industry and the environment. Accidents occur as machinery such as cranes is unable to carry cargo that exceeds the average weight (Port technology, 2011:9). In addition to accidents, overweight containers on vessels docking at the Port of Durban pose further risks.

Table 2.1: Risks of overweight containers

Risks	Explanation
Incorrect decisions concerning stowage	A certain weight limit is permitted aboard a vessel. This includes 15 890 kg per 20 foot container and 20 430 per 40 foot container (Alken Murray, 2010). When the container is overweight, incorrect decisions may have been taken with regards to the maximum limit and number of containers (World Shipping Council, 2010:4).
Delays due to re-stowage of containers	When incorrect decisions have been made, containers need to be rearranged as per safety requirements. This can result in delays (World Shipping Council, 2010:4).
Stacking collapse	When incorrectly declared, overweight containers are stacked on top of one another, the chances are great that the entire stack will collapse (Sailors club, 2013:1).
Liability claims	Stacking insecurities give rise to higher insurance claims that pose a risk to liability onboard the shipping vessel. This can arise with stacking and stowage claims (Eikos, 2013:1).
Ship damages	The damage to shipping vessels can be severe when overweight containers collapse, especially chassis damage. The costs can exceed the expectations of shipping lines and can prove detrimental to further trade (World Shipping Council, 2010:4).
Container and revenue loss	When overweight containers are incorrectly declared, the loss of containers is greater than if they were correctly declared and stacked appropriately. The consignee and consigner can suffer a major loss of cargo (World Shipping Council, 2010:5).
Risk of injury and death	The risk to workers onboard shipping vessels can be substantial. Inclement weather can cause overweight containers to damage the ship, with significant consequences (World Shipping Council, 2010:5).
Rearrangement of Schedules	Schedules have to be reorganised if unexpected stowage or stacking collapsing occurs. This results in the ship sitting in the harbor while it waits for other liners to dock and offload cargo. (World Shipping Council, 2010:5).
Increased costs due to accidents	Accidents increase costs for both customers and shipping lines (Christian, 2011:2).

Source: Designed by researcher from the literature review

It has been estimated that incorrectly declared and overweight containers can constitute up to 20% of the cargo on board a shipping vessel (Miller, 2012:2). This has serious implications as container stacking capabilities are on the riseas global trade increases. In most instances, a container's size is standardised at a length of 20 or 40 feet. Therefore, the weight of containers is important to ensure uniformity and risk-free networks (Miller, 2012:2). Shipping networks and road transportation networks are closely aligned to carry weights that comply with the legal limit. A 20 foot container should weigh approximately 19 958 kg and a 40 foot container would weigh about 20185 kg (Miller, 2012:2).

Overweight containers damage infrastructural networks. International authorities such as the International Maritime Organisation (IMO) have urged shipping networks to adopt procedures to package cargo in containers according to the legal limits. The carrying capacity of containers should be established and the shipping networks should ensure that all the documentation relating to specific Incoterms is in order (Port technology, 2011:9). When procedures are adhered to at an early stage of transportation, international trade becomes safer.

South Africa is expected to amendits overweight constraints by December 2014. The weighing of containers on entry to the Port of Durban is both time consuming and detrimental to just-in-time delivery (Venter, 2013:4). This would be prevented if the cargo weight were measured prior to loading onto vessels.Workers employed at port facilities need to be aware of risk of handling and stacking overweight cargo.

2.4.2 Mishandling and incorrect stacking of containers

A standardised and organised approach to correct handling and stacking of containers is required when 20 foot and 40 foot containers are positioned at a nine high level when empty (UK Pandi, 2011:2). Shipping staff and workers need to be continuously updated on new ways of handling and stacking containers. When different situations are experienced, staff should be available to control the situation (UK Pandi, 2011:2). Containers are considered fit and ofinternational standard when they can withstand 192 MT of weight on the corners when gravity is exerted (Sailors club, 2013:3).

Containers should be measured and approved to prevent damage caused by incorrect stowage plans. Port staff attempt to control damage by conducting pre and post inspections at terminals. This ensures that liability claims are kept to a minimum (Sailors club, 2013:3). Inspections are undertaken to ensure that unfit and damaged containers do not damage the stacking capacity. If containers are damaged or mishandled, they could be lost overboard.

When stacks of containers collapse their cargo can be dropped into the sea, in some cases releasing dangerous and hazardous products that harm human and sea life. Precautions therefore need to be taken to avoid such incidents (Sailors club, 2013:3). UK Pandi (2011:2) identifies the following procedures to prevent overweight containers and stacking accidents:

- An institutionalised system that is continuously upgraded. Security and safety should be the main concern. Stacking capacity needs to be foolproofand a range of alternative systems should be available.
- Overweight containers, are the main cause of mishandling and stacks collapsing. Stacking restrictions should be adhered to. If a vessel has more than a four high stack of containers, the containers should weigh less (UK Pandi, 2011). If five or six high stacks are used, those nearer the top should be empty in order to avoid the stack collapsing.
- Stacking plans need to be consulted on a continuous basis to avoid disruption in trade and to prevent liability and lost revenue claims.
- It is difficult to handle two 20 foot containers as opposed to one 40 foot container on a shipping vessel weather deck. This is due to the strength of the wires and cables that hold the containers steady (UK Pandi, 2011).

It is clear from UK Pandi (2011:2) that, mishandling can have extremely detrimental consequences; hence cargo insurance is critical in freight clearing and forwarding.

2.4.3 Cargo insurance

Incorrect cargo stowage plans and the collapse of container stacks have resulted inescalating insurance costs, making transporting by sea expensive. Accidents may also occur due to inclement weather. The wreckage of the MSC Napoli in 2007 during a storm resulted in losses of more than 120 million pounds and 33 containers (Eikos, 2013:1). Insuring cargo is a necessity, especially for larger business networks.

Insurance covers both the cost of the cargo and any damage to the vessel. The International Commercial Terms (Incoterms) stipulate the parties that are involved in the trade and who bear the responsibility of shipping costs. These Incoterms provide an understanding of the risks involved and the security measures that should be adopted in terms of insurance coverage (UNDP, 2008: 18). Good quality marine insurance should ensure that payouts are made timeously. If there is an accident, payment for the lost cargo could take up to ten years; with good quality insurance the waiting period can be much shorter (Eikos, 2013:1).

Insurance can be a costly endeavour, particularly when the cargo is destined for the Port of Durban. Due to the congestion problems at the port, liability costs have exceeded the average and insurance rates will rise substantially (Venter, 2013:22). The Port of Durban is known as the gateway to Africa; however, while trade volumes are increasing annually, there are limited facilities and infrastructure to accommodate global trade (EThekwini Municipality, 2011:2). While the average turnaround time at most ports is 60 hours, at the Port of Durban it is more than double at 141 hours. This exposes containerised cargo to the risk of damage to containers, the loss of cargo and theft (Steyn, 2013:2). The policies adopted in respect of each shipper differ considerably, with lower payout volumes and stricter conditions than other countries.

While Durban is the main corridor for trade to neighbouring African countries, the port lacks resources to accommodate the increase in trade. This increases the likelihood of errors and a lack of control. Increased insurance costs and the inability to attract more trade are the consequences of this situation (Venter, 2013:22). With more development being witnessed with neighboring countries, South Africa especially the Port of Durban, has to find solutions to reduce congestion and increase capacity in order to reduce prices and insurance (Transnet, 2012:4).

2.4.4 Port Congestion and Capacity Constraints

While the Port of Durban is a growing international trading facility, it has been unable to maintain international standards due to a lack of infrastructure (Venter, 2013:5). The congestion and capacity constraints witnessed in Durban have resulted in shipping lines bypassing the port as well as the Port of Cape Town to offload in the Eastern Cape (Venter, 2013:5). Shipping lines have other deadlines to meet. This not only affects South Africa’s trading capabilities, but businesses whose goods are delivered late.

While the containerised cargo facilities often stand idle at the Port of Cape Town awaiting vessels to dock and load, due to the congestion and capacity constraints in Durban, the liners bypass South Africa all together (Shah, 2012:2). This situation also affects exports, many of which are highly perishable. The produce can only stand for a certain period of time before demurrage becomes due. When delays occur, staff at the port is required to work overtime on weekends which can be costly for the public and private sectors (Venter, 2013:5).

The Port of Durban is the busiest container terminal and container port structure in the Southern Hemisphere, handling 120 000 TEUs in 2011/2012 (Peat, 2013:2). With the increase to 1.5m TEUs in 2013, the Port of Durban will be unable to address capacity constraints until further refurbishment and infrastructural developments have been completed. The annual 8% increase in container volumes exacerbates the problems as the recent development of piers and the installments of new craneshas resulted in containers and cargo standing for longer periods of time (Irma, 2010:1).

Customs procedures and protocols have also caused delays in the release of containers and contributed to the congestion at the Port. Incorrect paperwork and documentation hold containers at the Port and limit its capacity to process new exports and imports. Incorrect documentation leads to containers being held at bonded facilities filled to maximum capacity in the vicinity of the Port (Shah, 2012:3). Increased cargo volumes and the limited space available hamper trade; hence the need for development and additional infrastructure (Calabash case studies, 2004:1). Durban is responsible for 70% of South Africa's imports and exports (Etekwini Municipality, 2011:20). In comparison with lower value break bulk materials, containerised shipments are high value products. Even with infrastructural development, the demand for high value products will increase on an on-going basis and the Port of Durban will therefore suffer continuous capacity constraints (Maharaj, 2013:6).

2.4.5 Cargo dwelling time

Containers shipments have increased significantly over the years, feeding expectations that the Port of Durban will deliver positive results. However, dwelling times have negative effects on commercial markets for certain products (Raballand, 2013:1). African Ports have been found to have higher dwelling times for containerised cargo than those in Asia and Europe (Swedish Maritime Administration, 2010:3). This is attributable to overweight containers that require re-stowage as well as changing schedules to accommodate changes in delivery times (World Shipping Council, 2010:7).

Longer dwelling times in Ports impact operational efficiency and the overall economy (Raballand, 2013:3). Freight forwarders and importers control dwelling times as they use Port infrastructure and facilities as storage areas for containers. Containers are held at the Port for various unauthorised reasons (Ensor, 2014:1). Bribery and corruption are rife at Ports and importers use Ports as storage to save costs, resulting in higher dwelling times.

In contrast to the rest of Africa, the Port of Durban has reduced its dwelling time to around four days (Kgare, Raballand and Ittmann, 2011:3). Both the private and public sectors have played a part in this reduction. The private sector has a strong interest in international trade and the government has encouraged the public sector to provide effective support (Ensor, 2014). Penalty fees have discouraged the use of Ports as storage areas.

Refurbishment and new policies at the Durban Port have reformed the customs system and ensured the strict application of port tariffs. Importers are aware that the local authorities are determined to reduce dwelling times (Kgare, Raballand and Ittmann, 2011:3). This has enabled the Port of Durban to attract more international trade than its African counterparts. Transnet has taken into account the customs processes and infrastructural developments that are required to ensure that importers receive cargo timeously (Kgare, Raballand and Ittmann, 2011:3).

2.4.6 Customs and Port corruption- Freight forwarder and Incoterms

The customs processes are strongly linked to the congestion at the Port of Durban. Customs procedures are regarded as relentless and time consuming, especially by customs officials. With the increase in the number of containers expected to arrive at Durban Harbour, the process will become even longer and more tiring with workers having to work overtime (ISS, 2005:73). However, the customs process is necessary to prevent illegal activities.

Corruption is rife in customs in the Durban region; mafia activities have recently been in the public spotlight. The type of products traded determines whether such corruption is collusive or coercive. Corruption can result in decreased demand for Port services (Sequeira and Djankov, 2011:1). In Durban, it is estimated that bribes paid to corrupt officials constitute 32% of the port cost for a standard 20 foot container. On average, bribes are equivalent to 4% of a port operator’s salary. With Durban handling increased volumes of cargo over the years, it is likely that the level of corruption will increase (Sequeira and Djankov, 2011:1). SARS customs officials have been noted to be guilty of accepting bribes. Officials have been involved in racketeering, corruption, extortion and money laundering (Nair, 2012:1). The shipping of drugs in containers encourages bribery and corruption.

When customs procedures take too long, perishable products such as fruit and vegetables for both import and export are damaged. Demurrage charges can be high if the customs process is not efficient and if the documentation is not in order (Wordpress, 2009:1). This is closely related to the relationship with the freight forwarder and the use of correct Incoterms. The freight forwarder is the service provider that takes receipt of containerised cargo and ensures that all information is in order. Freight forwarders are fully liable for the freight in their possession from origin in ports to the final destination, the customer (Pienaar and Vogt, 2009:335).

Clearing and forwarding agents are intrinsically involved in the movement of goods and are responsible for the release of containers. A good relationship between the Port authorities and freight forwarders facilitates the timely release of containers. They are responsible for ensuring that space is available and booked on shipping liners as well as the negotiation of reasonable release costs. Excessive costs and incorrect documentation from the freight forwarder can result in illegal activities such as bribery and corruption (Iqbanugo, 2012:1). Incorrect documentation stems from the type of Incoterms utilised on the shipping invoice. Incoterms are the terms of sale that are accepted worldwide in respect of costs and responsibilities between the buyer and seller (Tradesecrets, 2010:5). According to the international standards, 75% of arbitration is the result of the incorrect use of Incoterms (Duxbury-Holtes, 2013:1).

The Incoterms follow basic terms, be they Exworks, F terms, C terms and D terms. Incoterms are widely recognised and respected across the world and freight and shipmentsoperations are standardised to make it easier to understand trade. Table 2.2 provides an explanation of Incoterms (Sea rates, 2013).

Table 2.2: Incoterms explained

Incoterms	Explanation
Exworks	Exworks responds to the seller that delivers when goods are placed at the disposal of the buyer at named premises (Sea rates, 2013).
F Terms	The F Terms consist of Free Alongside Ship (FAS), Free Carrier (FCA) and Free on Board (FOB). The F Terms mean that the seller fulfils his obligations towards the buyer (Sea rates, 2013).
C Terms	The C Terms consist of Cost and Freight (CFR), Cost, Insurance and Freight (CIF) and Carriage Paid To (CPT). The C Terms mean that the seller is responsible for the freight cost and the risk of loss for damages and insurance is transferred from seller to buyer (Sea rates, 2013).
D Terms	The D terms consist of Delivered at Terminal (DAT), Delivered at Place (DAP) and Delivered Duty Paid (DDP). The D terms mean that the seller fulfils the obligation of delivery to the buyer as well as takes control of the risk associated with duties and taxes. Exworks is the minimum obligation, whereas DDP is the maximum obligation.

Source: Designed by Researcher from the literature review

2.4.7 Technological defects

The modern era has been characterised by technological advancement. These improvements reduce human error and offer more control over basic activities. The Port of Durban has adopted the NAVIS (SPARCS) N4 system to maintain operations at the terminal for both inbound and outbound cargo (Transnet, 2011:11). This system aims to reduce human error and manual operations. However, deficiencies in this system have caused problems in port operations.

These deficiencies have led to delays in ships berthing and other capacity constraints (Peat, 2013:1). The Port of Durban relies heavily on the NAVIS and manual scheduling has been downgraded. Companies have said to lose millions of rand due to vessels being delayed as a resultant of low productivity (Peat, 2013:1). The congestion at the Port of Durban has led to shipping lines by-passing the Port for other Ports as well as high energy costs due to ships docking with an inability to offload (Peat, 2013:1). The NAVIS system has been constantly upgraded since May 2013 but no recent improvements have been announced. The system needs to accommodate rail and road facilities in scheduling and operations. The new tandem lift cranes recently introduced at the Port of Durban will also be included into the NAVIS system (Peat, 2013:6).

Based on the growing volumes of cargo passing through the Port of Durban, it is clear that logistical companies and shipping lines are using the busy Port. This requires that the Port increase its capacity, especially with regard to containers in terms of incorrect documentation that have to be held in bonded facilities (Venter, 2013:27). The bonded warehouses have long lead times and queues for the quayside cranes that move the containers due to inadequacy of the NAVIS system.This congestion has a continuous domino effect that causes various units to suffer a loss of revenue and could be contributing to multiple shipments as opposed to waiting in queues for a single container load (Venter, 2013:27). At the same time, shipping vessels are experience delays in entering and exiting the Port of Durban, representing idle shipments.

2.5 Conclusion

This chapter outlined the background to containerisation, an efficient driver of trade and growth around the world. The examination of shipping networks revealed the development and problems associated with this mode. The discussion on the inbound Durban network outlined the factors that impact negatively on Port operations as well as provided knowledge on factors contributing to delays. A more efficient system would reduce costs and promote savings. A link to sea transportation would be the need for road networks to be involved with the continuous movement of containers to land locked areas.

Chapter Three
Outbound Transportation Networks

3.1 Introduction

The previous chapter dwelt on the inbound transportation networks namely sea transportation with constant recommendations to the Durban port. The inhabitation of the Durban port described the need for infrastructure due to overbearing capacity constraints and constant flow of international trade. This chapter will relay the importance of road networks to the transportation industry in order to release channels for capacity. Road transportation networks are important for final delivery to customers; this is known as the outbound leg of the trading process. The research focuses on the networks through the transitional element in order for effectiveness and efficiency to be achieved. Containers are released at the Durban Port after customs clearance; efficient customs procedures and infrastructural development can alleviate congestion.

3.2 Road transportation networks

Road transport is described as the most effective and flexible mode of transportation in South Africa (Export help, 2010:2). The need for road transportation has increased considerably over the past few years and this mode has replaced rail transportation due to convenience and the services it offers (Pienaar and Vogt, 2009:325). Road transport moves goods from other modes of transport to the final customer, thus providing a unique link in the logistics process (Export help, 2010:2). Eighty seven percent of freight is now transported by road (Department of public works, roads and transport, 2010:9).

While South Africa is attempting to reverse this situation and switch to rail transportation, road transportation still dominates for various reasons. In the first place, it offers greater flexibility, as road networks provide direct routes to clients (Pienaar and Vogt, 2009:325). The public road system in South Africa is well suited to long haulage. In contrast, rail transportation can only deliver to regions that have the proper infrastructural capacity for carriages. Road transport is quicker than rail (Bigham and Roberts, 1952:149). Furthermore, roads run to remote areas that rail in unable to reach.

Although rail transport has the capacity to accommodate larger loads than road transport, road transport uses cheaper packing systems that offer fewer handling and damage risks for various types of goods (Bigham and Roberts, 1952:149). Road haulage also has a reliable, programmed schedule to accommodate various clients, while rail has set times with limited flexibility (Pienaar and Vogt, 2009:326).

Road transport networks are flexible and take factors such as inclement weather conditions, political issues and natural disasters into account in their schedules (OECD, 2007:23). Therefore road transport is the most competitive transport logistics system in South Africa, with various privately owned institutions setting rates and tariffs to suit their clients. It is also a significant link in intermodalism, where more than one mode of transportation is used.

Despite the various advantages related to road haulage, there are limitations that impact the use of road transportation for containers that are explained in the table 3.1. These limitations relate directly to road transportation networks that can impact on the final delivery to achieve customer satisfaction.

Table 3.1: Limitations of road transport networks

Limitation	Explanation
Restricted carrying capacity	Road transport networks generally have restricted carrying capacity compared withother land transport modes. This is due to the size of containers, as the legislation only allows for a certain mass to be carried by road (Pienaar and Vogt, 2009:326).
Bulk goods	The movement of goods that are heavier and more bulky is more expensive than freight that is lighter (National Institute of Open Schooling, 2011).
Environmental issues	Trucks and road transport networks are responsible for excessive noise and air pollution (Pienaar and Vogt, 2009:326).
Weather conditions	Bad weather conditions hamper the transportation of containers by road (National Institute of Open Schooling, 2011).
Energy consumption	Road transport networks' energy consumption is relatively higher than that of rail carriers (Pienaar and Vogt, 2009:326).
Traffic conditions	Traffic conditions on roads surrounding main hubs and ports can affect the intermodal transportation of containers (Hilling, 1996:169).
The cost of Fuel	The increase in the fuel price has negatively affected the profitability of road transportation.At the time of the study, the diesel price stood at a staggering R12.88 per litre.
Contributor to road accidents	Road transportation networks have been identified as major contributors to road accidents due to the massive loading capacity carried that sways trailers off the road (Everitt, 2004)

Source: Designed by the researcher from the literature review

The failure to maintain trucks has resulted in numerous accidents, increasing liability costs (Perdersen, 2001:94). The inadequate road infrastructure in South Africa, especially in areas aroundports and terminals, has contributed to accidents. In Africa, the development of the trucking industry is restrained due to the vast number of private companies that own their own fleets of trucks (Perdersen, 2001:94) to transport goods to their clients (Bierman, 2006:2). Logistical activities and operations have only been outsourced to smaller companies that control habitual pricing mechanism.

3.3 Outbound Durban containerisation

Road transportation networks in Durban are responsible for the final transportation of containers from inbound networks such as containerships. The logistics of containerisation are based on the need to transport cargo to the relevant parties. The outbound transportation network confronts various challenges, including overweight containers, loading delays, traffic congestion, longer delivery times and unprofitable operations.

3.3.1 Overweight containers

Overweight containers are a perennial problem confronting inbound networks. If the weight of a container is not measured correctly when it is loaded onto road transportation vehicles, this can impact both delivery times and safety. Road transportation networks predominantly use trucks with certain chassis limits for standardised container loads (Miller, 2012:1). In the Durban region, weighbridge facilities are located in close proximity to delivery sites (Department of Transport, 2011:66). Metropolitan Police and South Africa Police Service (SARS) officials patrol areas heavily frequented by fully loaded trucks. In Durban, weighbridge facilities are located on the north and south coasts, and at Bayhead and Pinetown (Department of Transport, 2011:66). Legal container weights are enforced to avoid accidents and legal repercussions as well as to uncover bribery and corruption.

Trucks carrying overweight containers also cause infrastructural damage. Damage caused by the road transportation networks has made public transportation more dangerous. Potholes, cracks, rutting, loss of aggregation, poor driving conditions and unpaved shoulders are the result (Kunene and Allopi, 2011:5). The main roads surrounding the Port of Durban that are affected are Quayside, Bayhead, Maydon, Francois, Wisely, South Coast Bluff and Iran Roads (Kunene and Allopi, 2011:5). These are the roads most commonly utilised by road transport networks and have been badly damaged. Public users of intersections and roads have complained on many occasions about the dangers on these roads and unroadworthy conditions. Liability costs such as insurance rates tend to increase under such circumstances (Kunene and Allopi, 2011:5). Time delays also occur.

3.3.2 Loading delays at the port

When goods have passed through customs, they are transported to the final user. They have to be loaded from ships onto trucks. However, the navy automated video information system (Navis) SPARCS S4 has caused delays in loading trucks (Peat, 2013:6). Various operators in the vicinity of the port cited such delays (Mbonambi, 2011:1). This impacts productivity as trucking operators queue on the main roads for more than the normal two-hour waiting period.The problem lies in the scheduling and timeous release of containers on a first in first out basis from the Durban Container Terminal (DCT). The capacity constraints experienced at the Durban Port (Mbonambi, 201:1) have resulted in shipping vessels bypassing the harbour and terminals. The automated system has created bureaucratic headaches; as Port officials are now unable to use manual operations to run the scheduling.

3.3.3 Traffic congestion

With the increase in freight and international trade, the need for road transportation networks will increase substantially. This will result in increased congestion on the roads. The design of road networks and the types of intersections in surrounding major depots and the Port in Durban are major contributors to traffic congestion (Hilling, 1996:169).Such congestion is particularly acute at the container depots and their surroundings.There is a high level of infrastructural damage and an increase in the number of accidents (Everitt, 2004:3). The road transportation networks carrying loads exceeding the weight capacity of trucks and trailers pose risks to public road users.

Due to the major congestion experienced in these areas, the South African Roads Agency Ltd (SANRAL) recently announced that it will upgrade national freeways in Durban. The N2/M41 Mount Edgecombe interchange north of Durban will soon be upgraded to a 4 level unit of configuration (Venter, 2013:15). The cost of the upgrade is estimated at R816 million, but it is expected to ease traffic considerably. There have been manyaccidents in the area due to the limited number of lanes for slow moving trucks and trailers. The national highway along the N2 Wild Coast between East London and Durban will also be upgraded to ease congestion (Venter, 2013:15). While these initiatives will free traffic flow and reduce accidents, measures need to be put in place to control the excessive transportation of containers by road.

3.3.4 Cycle and delivery time

Time is an important consideration when transporting containers from point of origin to destination; the users of freight transport require goods to be delivered on time (Pienaar and Vogt, 2009:336). Dissatisfied customers will take their business elsewhere. Delays in the cycle time and delivery lead time can be attributed to various factors, including overweight containers; inefficient labour; traffic congestion; accidents and weighbridge protocols.

Firstly, overweight containers require a longer transit time due to the greater gross mass carried using road transportation networks (Miller, 2012:1). In South Africa, the typical road transport networks tend to carry containers ranging from a capacity of six to twelve meters, depending on the type of trailer and the size of the truck's axle.

Secondly, the use of inefficient labour and staff who do not process the required documentation timeously can cause delays (Miller, 2012:1). Staff requires training to process documentation and avoid delays. A lack of motivation and/or incentives also affects staff productivity.

Thirdly, infrastructural damage to the roads at the Port of Durban causes traffic congestion and impact many outbound vehicles carrying containerised freight (Kunene and Allopi, 2011). This is the result of overweight containers and leads to further delays in cycle time and delivery lead time.

3.3.5. Unprofitable road transportation networks

With the increase in containerised cargo, the need for road transportation networks has increased. Bigger trucks equipped with cranes as well as truck trailers have been commissioned to meet this demand. However, companies' profitability has been compromised (Venter, 2013:11) by legal and liability costs, among other factors. Economist, Mike Schussler estimates that trucking companies make an average annual turnaround profit of 4% (Venter, 2013:11). Unexpected contingencies that impact profit include strikes, fuel price hikes and a lack of proper infrastructure. In 2012, the fuel price increased by 16.1% and the cost of labour increased by 9% (Venter, 2013:11).

3.4 The transition from inbound to outbound networks in Durban

The presence of both inbound and outbound containerisation with shipping and road transportation networks is immensely important for Durban, the busiest port in the Southern Hemisphere. Shipping networks bring containers in to the port and the road transportation network delivers the goods to customers. The transition of the networks takes place at the point of collection, the Port of Durban.

South Africa has experienced tremendous growth in both imports and exports. Larger shipping networks are delivering an increasing number of containers to the Port of Durban (Carnie, 2011:2). This calls for further infrastructure to accommodate the larger containerships and the enhancement of the container terminal. Road transportation networks carry the goods from the Port to customers (Carnie, 2011:2). The partnership between road and sea networks has contributed to trade and economic growth in Durban and South Africa as a whole. The Port of Durban is the foundation for this relationship.

3.5 Port of Durban

3.5.1 History of the Port

In 1824, Europeans seeking to establish a trading depot landed at what later became known as Port Natal (Ports and ships, 2013:2). Since then, Durban has grown to become the busiest Port facility and container terminal in the Southern Hemisphere (Appendix B, Figure 2). The Port of Durban is strategically situated at Longitude 31^{o}02’E and Latitude 29^{0}52’S with destinations at the Durban Bay of Plenty (Ports and ships, 2013:2). The Bluff and Maydon Wharf are in close proximity to the Port.

The Port of Durban has 59 berths, excluding those set aside for ship repairs and fishing vessels. There are also priority facilities for shipping vessels that are too big to enter the Port to the south of Durban close to Isipingo. Apart from being a major contributor to economic growth, the Port of Durban is also a major source of employment for those residing in the Durban area (Ports and ships, 2013:2). The growth of competitive corporate industries in South Africa has accounted for major Port developments and expansion. The Port operates 24 hours a day, seven days a week to process larger loads (Ports and ships, 2013:2). The entrance channels at the port accommodate ships 243.8m long and 35m wide with a draught of 11.9m at tides of between 0.49m and 1.8m (Ports and ships, 2013:3). For the purposes of safety, after nightfall, only ships 200m in length and 26m wide with a draught of 11.6m may enter the port.

Pilot helicopters and boat services are required for shipping vessels entering the Port of Durban five kilometers from the entrance (Ports and ships, 2013:3). Tugs boats are also used. The tug boats in operation at the Port used by the National Ports Authority (NPA) are named uThukela, Mkhuze, Pholela and Lotheni (Ports and ships, 2013).The Port of Durban's facilities include floating cranes with a carrying capacity of 235 tonnes as well as a passenger boat, Isiponono, that can carry 100 passengers (Ports and ships, 2013:3). The Port of Durban is expanding in order to enable it to service increased loads and to maintain its position as the 'Gateway to Africa'.

3.5.2 Durban Container Terminal

The Durban Container Terminal (DCT) is one of the largest facilities of its kind in the Southern Hemisphere (KZN Department of Transport, 2011:1). It was established in 1977 and moved approximately 78493 containers in its first year of operations (Transnet, 2011:5). Currently, the terminal handles 1 474978 containers every year, from ISO general purpose containers to abnormal containers. The terminal offers six berths of a variety of widths (Transnet, 2011:1). The DCT should be held responsible for controlling the weight of containers that enter and exit South Africa. Overweight containers should not be transported further. Security personnel and protection officers should be able to control the situation at point of entry rather than allowing a situation to develop where costs escalate at the end of the supply chain.

3.5.3 Developments at the Durban Port

Competition from other countries has resulted in the need for infrastructural development at the Port of Durban. This includes an increase in the Port's capacity to handle containers (see Appendix B (Figure 3)) (Gedye, 2012:1). In 2007, the entrance to the Port was widened by 225m and deepened to 19m.The allowed larger vessels such as the MSC SOLA that is 11660 TEU and arrived in Durban on 1 July 2012 to enter the harbour (Mkamba, 2012:1).

A budget of R250 billion was set aside to expand the port and increase its capacity. Currently, the Port can easily accommodate 2.9 million containers but with the proposed expansion, this will increase to 20 million (Gedye, 2012:1). A specific budget has been allocated for the expansion of the DCT (DCT1) as a separate entity, as well as DCT2 to address capacity constraints (Maharaj, 2013).The expansion of the container terminal at Maydon Wharf that is expected to be completed by 2018 will enable the Port of Durban to accommodate vessels with a capacity of 5 million TEU (Maharaj, 2013:1).

Berths 203, 204 and 205 at North Quay are expected to be deepened and widened for containerships carrying larger tonnage. The four phases of the Port development will include the construction of berths for container terminals and automotive facilities (Maharaj, 2013:1).

The dig out port operation at the old Durban Airport will also begin in 2016 and is expected to be completed by 2040. This land is appropriate for container growth (Maharaj, 2013:1). The dug-out plan and the expansion of the Port will provide numerous job opportunities and stimulate economic growth. Crane facilities have also been upgraded to reduce delays at the port (Peat, 2013:4). Seven tandem ship-to-shore cranes were installed. This has improved productivity; a single tandem crane can move 35 loads in an hour. Improved turnaround times have led to cost savings (Bartosek and Marek, 2013:5). These cranes are designed to move 6m and 12m containers with an average tonnage of 80 as well as handle the new containerships carrying more than 25 containers (Peat, 2013:4). The represented a R700 million investment in the Port of Durban.

3.5.4 Effects of new infrastructural developments

While the infrastructural developments at the Durban Port and the dug-out project have been hailed as the best choice for Durban and South Africa as a whole, they can have detrimental effects on surrounding communities and the environment and contribute to climate change (Carnie, 2011:1). Concerns have been raised that they might result in an increase in crime, prostitution; smuggling of illegal substances and pollution in residential areas (Gedye, 2012:1).

Communities directly affected by Transnet’s development plans include Isipingo, Athlone Park, Merewent, Austerville, Merebank, Wentworth, Treasure Beach, Bluff, Jacobs, Clairwood and Umbilo (Gedye, 2012:1). Communities in these areas have stated that they are being bullied into accepting Transnet’s plans. The Clairwood Racecourse is also being sold and will be replaced by a logistics development park to assist port operations. Aside from the sale of this 91-year old monument, roads toward the south coast in the Bluff area will be constantly under construction to accommodate trucks making their way to the service port (Carnie, 2011). More trucks will be on the road, polluting the environment with carbon dioxide emissions. Communities in Clairwood are directly affected by the transformation as the area is home to numerous cultural and historical facilities. Community leaders in the affected areas have launched campaigns to oppose the destruction of their areas in the name of development (Carnie, 2011). This requires that a strong rationale be provided for the Port development and dig out plans as well as prior consultations with affected communities.

3.5.5 Customs procedures at the Durban Port

Customs and excise is coordinated by protection officers from SAPS and the South African Revenue Services (SARS). SARS is responsible for ensuring that duties and any fines on incoming and outgoing container shipments are paid, while SAPS are directly involved in inspecting containerised freight for drugs and illegal goods (ISS, 2005:76).

All goods have to be declared and the correct documentation must be supplied in order for a container to be cleared. Importers and exporters must submit an invoice to theSouth African Reserve Bank. A bill of lading is required for container delivery. Thereafter, the relevant fees become due and a clearing instruction thatrequires the DA 500 form (ISS, 2005:78). The DA 500 form must be stamped to verify that all firearms for export and import have been examined and that the serial numbers have been recorded. Physical inspection of containers takes place at the behest of importers at a specific location that is more secure than the fenced off area in the port (ISS, 2005:78).

Seventy two hours prior to the docking of containership, a schedule of the goods manifest needs to be processed by customs to ensure that the correct containers are offloaded. High risk containers are singled out for inspection and security protocols. In Durban, an approximate 100 to 200 containers are inspected per day (SA Maritime transport sector, 2011:7). Inspections and monitoring identify containers that may have been tampered with for purposes of criminal activities.Technology plays an important part in this process, asthe use of manual, unskilled labourers is prohibited.

A new Customs Bill is expected to be published in 2013 that will tighten import control. Importers will be required to obtain clearance for containerised cargo (Mackenzie, 2013:15). The inspection and unpacking of containers will increase.This is also aimed at curbing bribery and corruption (Mackenzie, 2013:15).

3.5.5.1 Inspection of Containers

The inspection of containers at the Port of Durban takes place at four levels (ISS, 2005):

Level 1

This involves a container being completely unpacked. This is time consuming and requires the services of manual labourers in aprotected location. This kind of search is normally conducted on containers that are considered high risk and those that are suspected to contain contraband items.

Level 2

This is the physical examination of containers imported or exported into Durban. The SAPS is involved at this level to identify illegal items being carried in containers.

Level 3

If the goods consist of material and clothes that are tightly packed into segments, unpacking these items will be difficult as repacking is nearly impossible. Equipment such as x-ray scanners is used to determine if any items other than those stated are contained in the shipment. In 2001, R1.6 million worth of drugs and R22 million worth of counterfeit goods were identified using x-ray scanners (SARS. 2008:2).

Level 4

The last level of inspection relates to tailboard inspection (ISS, 2005:78). The doors of the containers are opened but only 3% of the shipment is inspected, normally made up of the first two rows of packed products.

3.5.5.2 Offloading

Once the inspection process is complete, the customs officials stamp the approval form for labourers to be assigned to offload containers. At the DCT, containers are offloaded by Portnet terminal operators, who stack the containers at a designated terminal with no public access. Due to space constraints at the terminals, after three days, the containers are moved out of the secured area and taken to a container depot or a bonded warehouse that is licensed for storage (ISS, 2005:78). Once customs authorises the clearance of containers, the importer has seven days to remove them. If containers are not cleared by customs in three months, the goods are auctioned off (Goldman, 2000:8).

The many challenges posed by customs clearance procedures include bribes to clear containers without proper documentation (Glaxo, Smith and Kline, 2010:8). There is a high risk that illegal goods will be smuggled into Durban in container shipments. The offloading points are secured and inspections of containers take place in safe surroundings to counteract illegal activities. Any violation by an importer such as afailure to pay fees is loaded on an electronic database linked tothe SARS system. This alerts customs officials to track all container shipments under that importer’s name (SARS, 2008:3).

The final customs clearance seal clears the container for the distribution of goods and items. If this seal is broken, it means that the goods have been tampered with or illegal items may have been added. Since counterfeit versions of the customs seal have been detected, customs and border post security use different seals to clear containers (ISS, 2005:78).

The seals have been tampered by lifting them with a pin or needle, replacing them with a seal of the same nature or number and resealing after the goods have been tampered with or removed. Tampering with containers after the goods have cleared customs is very common at the Durban Port and terminals (ISS, 2005:78). The authorities use information technology to detect whether or not this has occurred and if so, the containers are not permitted to be transported (ISS, 2005:78).

3.6 Conclusion

This chapter discussed outbound transportation networks and their impact on South Africa's roads network.The common link in the relationship between inbound and outbound containerisation is the Port of Durban. The history of the Port was explored and current and future developments, as well as the effects of these developments on some Durban communities, were outlined. Finally, the customs process was examined in order to identify the role of customs authorities and to understand the possibilities that exist for bribery and corruption.

Chapter Four

Research Methodology

4.1 Introduction

Research methodology is a crucial part of any research study. The type of research, methods and design that were chosen determine the reliability and validity of the data collection as well as data analysis. Measuring the data using appropriate instruments mitigates the risk of incorrect analysis.

In this study, the variables that impact intermodal transportation networks for inbound and outbound Durban containerisation need to be precisely measured. The objectives and research questions need to be answered using the correct instruments and analysis. The logistics industry relating to containerisation and intermodal transportation networksis an ever-evolving one that is constantly adopting new approaches; hence, contemporary analysis is necessary in order for the findings to be relevant. The efficient measurement of variables through questionnaires and interviews requires methods that demonstrate commonality.

4.2 Research objectives

The research objectives of this study are:

- To understand the effects of capacity constraints on transitional inbound and outbound containerisation within the Durban Port intermodal networks.
- To establish the intermodal relationship of containerisation between the transitional shipping and road freight transportation networks.
- To examine the role of the Durban Port customs system in cargo clearing and forwarding processes.

4.3 Hypotheses of the study

Table 4.1: Hypotheses explained

H_{O1}: There is no relationship between field of employment and capacity constraints. H_{A1}: There is a relationship between field of employment and capacity constraints.
H_{O2}: There is no relationship between experience in containership and capacity constraints. H_{A2}: There is a relationship between experience in containership and capacity constraints.
H_{O3}: There is no relationship between transport mode and capacity constraints. H_{A3}: There is a relationship between transport mode and capacity constraints.
H_{O4}: There is no relationship between work description in containership and capacity constraints. H_{A4}: There is a relationship between work description in containership and capacity constraints.
$H_{O5:}$ There is no relationship between experience in containership and intermodal containerisation. H_{A5}: There is a relationship between experience in containership and intermodal containerisation.
$H_{O6:}$ There is no relationship between transport mode and intermodal containerisation. H_{A6}: There is a relationship between transport mode and intermodal containerisation.
$H_{O7:}$ There is no difference between excessive control and incoterms. H_{A7}: There is a difference between excessive control and incoterms.
$H_{O8:}$ There is no difference between excessive control and security protocols. H_{A8}: There is a difference between excessive control and security protocols.

Source: Designed by Researcher

4.4 Type of design

This study utilises an exploratory design to explore processes and events that unfold when containers are intransit *via* the intermodal network. Exploratory research is employed when not much is known about a phenomenon (Sekaran and Bougie, 2010:103). In this study, it is used to obtain in-depth information on the research topic in order to understand the phenomenon. The researcher used various sources of data as well as a literature review (Cooper and Schindler, 2010:102).

The researcher aimed to explore the facets of containerisation and intermodal transportation networks in order to gain knowledge on this topic to generate and test a hypothesis. The hypothesis determines whether the information presented is based on an exploratory study of containerisation and intermodal transport networks thus considering knowledge and appropriateness. This will enable the researcher to reach conclusions and make recommendations.

4.5 The nature of the study

The nature of the study determines whether a quantitative, qualitative or triangulation method is the most appropriate research design for this exploratory research. Quantitative research gathers opinions from a large target population in order to generate statistical findings (The marketing donut, 2010). The data are presented in the form of diagrams, statistics and tables (Sekaran and Bougie, 2010:304). Quantitative methods use questionnaires and surveys that are statistically coded. Qualitative research makes use of various sources such as focus groups and individuals (Sekaran and Bougie, 2010: 370). This is an appropriate method for exploratory studies (Cooper and Schindler, 2010:146). New information is solicited by means of individual interviews and unstructured open-ended questions.

Triangulation is used when qualitative and quantitative methods are combined (Gilhooly, 1996:167) and it is further associated with validity and reliability (Sekaran and Bougie, 2010:385). A researcher can be more confident of his/her findings when data are obtained from many sources using various data collections methods. This study will use triangulation as data are sourced from interviews and questionnaires gathered from the target population. This will allow the researcher to reach reliable findings. Triangulation is employed in the study with the use of both interview questions and structured questionnaires to ensure this can be further analysed with literary aspects.

The nature of the study also refers to the time horizon. A cross-sectional study gathers data once over a period of weeks or months (Mcburney and White, 2007:340). Conclusions regarding the larger population can be drawn instantaneously due to the time period being shorter (Shuttleworth, 2010). A longitudinal study is used when the researcher wishes to generate data on more than one occasion (Sekaran and Bougie, 2010:119). Changes can be traced over a period of time (Cooper and Schindler, 2010:144). Longitudinal studies are more time consuming and expensive than cross-sectional studies (Mcburney and White, 2007:340). The current research is a cross-sectional study to gather data on containerisation and the road transport network in order to answer the research questions.

4.6 Sampling Design

Sampling design is the method of choosing the individuals and groups that best represent a population for a study (Yount, 2006:1). This requires that decisions be made regarding the population; the sample size, subjects, elements and sampling units before gathering the relevant data. Using sampling, a researcher is able to make conclusions and recommendations based on the selection of limited elements (Ellis and Levy, 2008:19).

4.7 Target Population

The target population is those individuals who the researcher wishes to investigate as part of the study. This may include groups, events or subjects of interest (Beins and Mccarthy: 2012:390). The population may not necessarily be an individual (Cooper and Schindler, 2010:374). The target population in this research study is container depots in the Durban area that handle, store, maintain and move containers. The freight forwarder network is involved in the movement of containers from point of origin to the point of destination. An examination of the road freight transport network, which includes private and public trucking companies, will provide insight into the daily challenges in transporting freight. The 4th party logistics service providers that coordinate shipment activities as well as the intermodal industry which involves transportation by more than one carrier will be also investigated.

The target population in the study consists majorly of big freight forwarders in the industry. Due to the freight industry being so vastly populated with small to medium sized industries, the study focused on three large providers in the Durban region. The others consisted of small to medium road freight service providers and container depot companies. According to Rainbow Nation (2014), there are 165 small to medium freight forwarding companies in Durban.

4.8 Type of sample

The type of sampling chosen for the study is non-probability sampling. The non-probability sampling method allows for a specific element to be chosen. These elements have no idea or probability of being sampled (Lavrakas, 2008:4). Non-probability sampling is categorised into convenience and purposive sampling. Convenience sampling is considered the cheapest and easiest method of sampling as it collects information from the population that is most convenient (Lavrakas, 2008:5). Purposive sampling involves approaching the population that is required, such as designated groups (Trochim, 2006:1). Judgement and quota sampling are forms of non-probability sampling. Judgement sampling includes those individuals chosen by the researcher due to their experience and knowledge (Herbst and Coldwell, 2004:81), whilst quota sampling means that groups are selected to participate in the research study based on a quota system (Herbst and Coldwell, 2004:82).

In this study, the researcher chose to use judgement sampling. This population includes depots, freight forwarders, road freight networks, 4th party logistics service providers and the intermodal industry. Respondents were chosen based on their knowledge of the subject in order to generate recommendations arising from the findings.

4.9 Sample Size

The sample size should be large enough to generate statistical findings and to achieve specific research objectives (Desu and Raghavarao, 1990:2). The sample size may be limited by time and financial constraints as well as the actual size of the population being inadequate (Desu and Raghavarao, 1990:3). The sample size in this study is 206 out of 300 questionnaires that were distributed to the target population. This is made up of 27 respondents from container depots, 51 freight forwarders, 63 road transport network operators, 34 4th party logistics service providers and 31 from the intermodal industry. The return ratio from the 300 questions distributed was noted to be 68.67%. The sample size was chosen as such due to the overflow of smaller logistical road networks based in Durban region. The businesses chosen were those that are medium sized with experience relating to the Durban port. According to Sekaran (2003) table, the sample size for the amount of logistical companies should equate 167 but the study has exceeded this with 206 questionnaires and the return ratio of 68.67%.

These respondents were chosen due to their experience and extensive knowledge. Ten managers from various companies in Durban were also interviewed; this forms part of the qualitative analysis. The managers were also selected due to their knowledge and decision-making ability. The responses from interviews were utilised as part of the discussion chapter as well as provided insight towards the recommendations for the study.

4.10 Data Collection Methods

Data can be collected from primary and secondary sources. Primary sources include data gathered from targeted individuals using questionnaires and interviews; these are administered by the researcher (Sekaran and Bougie, 2010:181). Secondary sources of data include the literature and other information that is readily available (Cooper and Schindler, 2010:148). The primary data for this study consisted of information gathered using personal administered questionnaires and interviews with the target population. Questionnaires pose specific questions and provided closed alternative answers for respondents to select from (Mcburney and White, 2007:310). The researcher structured the questionnaire into four sections, namely:

- **Section A**– Biographical data which includes a respondent’s life and work experiences in containerisation and the road transport network. These questions, numbered 1-5, required a respondent to choose their answers from a list of alternatives.

- **Section B**–This contained dichotomous questions where the respondent was required to select"Yes" or "No". These questions, numbered 6 – 12, relate to the variables identified in the study. Question 12 allowed a respondent to provide additional information.
- **Section C**–Provided an ordinal scale which ranks each variable according to the respondent's knowledge. This is broken into two parts which require ranking, from least important to most important. These are 1= "Least important", 2= "Less important", 3= "More important" and 4= "Most important".
- **Section D-** Interval scale or rating questions using a 5 point Likert scaling method. Questions 23-33 were answered by selecting 1= "Strongly Disagree", 2= "Disagree", 3= "Neutral", 4= "Agree" and 5= "Strongly Agree".

The questionnaires were distributed to the study population. Each respondent received the same questions and ample time was provided for completion.

Since the research project is an exploratory study, interviews were also necessary. In interviews, the researcher asks questions face to face, telephonically or electronically (Murray, 2003:19). Semi-structured questions were used; this allowed for structured questions to be posed during the course of the interview (Murray, 2003:20). Face to face interviews were scheduled with ten managers and all the interviews were strictly private and confidential. The questions asked in the interviews corresponded with the variables analysed in the questionnaires. The questions portrayed in the interview process consisted of those concerned with the opinions of relevant individuals within the industry. The results of the questions are further analysed and interpreted with recommendations and discussions. During the generating of findings, the researched posed to use questionnaires and structured interviews questions as the form of primary sources and literature techniques as secondary sources. The sources will be analysed in conjunction and discussed in the study.

4.11 Data Analysis

Due to this being both a quantitative and qualitative study, Univariate, Bivariate and Multivariate measuring instruments were selected.

4.11.1 Univariate Analysis

Univariate analysis is used to code and enter data in order to undertake data analysis (Sekaran and Bougie 2010:338). It involves the analysis of one variable at a time. Frequency distribution and descriptive statistics are part of this process.

4.11.1.1 Frequency Distribution

Frequency distribution codes each element in the study in order to determine percentages and statistics (Investopedia, 2012). The frequencies are shown in tables and percentages are represented in bar graphs. This allows for a thorough description of each scenario. An example of listed frequencies using a table is provided below in chapter five as a common indication of biographical questionnaires:

The frequency depicted on the table divides the sample of 206 by gender. The frequency shown in the table is graphically represented using a bar graph. A bar graph presents the data by means of bars of vertical sizing (Mohan, 2012). The patterns of graphs vary according to the system or program used.

4.11.1.2 Descriptive Statistics

Descriptive statistics will be depicted by means of measures for central tendency and dispersion for interval scaled items (Sekaran and Bougie, 2010:322). Central tendency depicts the mean, median and mode. The mean, also known as the average, is the sum of the values divided by the total number of items (QuickMBA, 2010). The median is the middle value of all the values, arranged in either ascending or descending order (Downing and Clark, 2010:9). The mode is the measure that occurs most frequently (Downing and Clark, 2010:9). The central tendency which forms the mean, median and mode can be attributed to the normality of distribution that represents skewness and distribution. Therefore:

- If the mean is more than the median is more than the mode, there is a positive relationship of distribution and it is skewed to the right (Mean > Median > Mode). Positive distribution leads to a long tail skewed to the right (Taylor, 2012).
- If the mean is less than the median is less than the mode, then there is a negative relationship of distribution and it is skewed to the left (Mean < Median < Mode). Negative distribution leads to a long tail skewed to the left (Taylor, 2012).

Dispersion allows for the calculation of the variability gathered from central tendency with the aid of range, variance, standard deviation, minimum and maximum, kurtosis and skewness. Dispersion allows for interval and nominal data to be selected for measurement (Rao, 2008:31). Range is used to calculate the difference between the minimum and maximum values in the data set. Variance is a calculation used in dispersion to determine how isolated the data in a set are. The calculation is the difference of the mean in the observation which is squared and thus divided by the total number of elements in the data set (Downing and Clark, 2010: 9). Standard deviation works with the variance calculated for dispersion. The variance is square rooted to decide on standard deviation.

The mean and standard deviation as part of dispersion and central tendency are the most meaningful for descriptive statistics using ration and interval scales (Sekaran and Bougie, 2010:318). Kurtosis provides information relating to the peak of the distribution, whilst skewness provides symmetry to the distribution (Pallant, 2010:57). Therefore:

- When the skewness and kurtosis figures are zero, the distribution is normal.
- When skewness is positive, the scores are lower and to the left.
- When skewness is negative, the scores are higher and to the right.
- When kurtosis is positive, the peak is centralized with long tails.
- When kurtosis is negative, the distribution is more flat.

4.11.2 Bivariate Analysis

Bivariate analysis ensures that more than one variable is measured using scales of interval and ratio (Cooper and Schindler, 2010:509). In this study, bivariate analysis will examine Pearson correlation, testing of the hypothesis, analysis of variance, chi-square and cross tabulation.

4.11.2.1 Pearson product- movement Correlation Coefficients

Pearson product-movement correlation coefficients depict the relationship of two variables based on the linear association and the strength involved (Laerd statistics, 2012:2). This measure of strength is denoted by *p.* The Pearson correlation coefficient stretches over a range of -1 to +1, where 0 is the middle; it is used to measure if one variable relates to another (Sekaran and Bougie 2010:321). The focus is on the direction of the relationship rather than the correlation size. This measure of bivariate analysis tests the direction, significance and nature of relationships. Direction is determined by whether or not variables of larger capacity are related to other variables of larger capacity; hence, if the variables co-relate, the relationship is positive (Cooper and Schindler, 2010:510).

Significance levels test the relationship between variables with a scale of 0.05; this determines whether the relationship should be rejected or accepted whilst testing a hypothesis (Jackson, 2012:159). In doing so, the researcher needs to keep in mind the nature of relationships, especially between variables of dependency. This represents the positive and negative relationships between two variables. The test for hypothesis rests on two types of hypotheses:

- The alternative hypothesis, signified by H_A is regarded as having samples that is inclined by other cases of different nature.

- The null hypothesis, signified by H_0 is mainly observed and is a result of pure probability.

Hypothesis testing involves various steps in order to prevent different results being obtained at a later stage (Stat trek, 2012). These steps are:

- The hypothesis has to be acknowledged to be either a null or alternate hypothesis. The stated hypothesis needs to be mutually exclusive in terms of rejecting one and accepting the other.
- A significance level of either less than or greater than 0.05 needs to be established in order for the hypothesis to be recommended.
- Thereafter a statistical technique needs to be chosen to test the hypothesis according to the scales used. These techniques include univariate and multivariate tools.
- Finally, the results should be analysed in order to determine where the level of significance lies in the region 0.05. If the level is greater than 0.05 (> 0.05) then the null hypothesis is rejected and the alternate hypothesis is accepted. However, if the value is less than 0.05 (<0.05), the null hypothesis is accepted and the alternative is rejected (Sekaran and Bougie, 2010:336).

The description of relationship based on strength uses a measuring scale according to the coefficients calculated (Cooper and Schindler, 2010:511):

- +1.0 Perfectly positive relationship
- +0.7 Strong positive relationship
- +0.4 Moderate positive relationship
- 0.0 No relationship
- -0.4 Moderate negative relationship
- -0.7 Strong negative relationship
- -1.0 Perfectly negative relationship

Scatterplots is used as an illustrative technique to depict the relationship between two variables. A visual depiction of the correlation amongst variables normally works better than listing data (Jackson, 2012:159). A number of statistics are employed when using a scatterplot to determine the affiliation between variables (Skymark, 2012:1):

- The mean for both horizontal and vertical axis (namely X and Y) which determines the average points on the plot.
- The minimum and maximum values of axis.

- The sample size according to the total sample available to the researcher for the allocated plots.
- The range between the axis being the difference between maximum and minimum.
- The standard deviation.
- The slope of the line according to the closeness of variables.
- The line which crosses the Y axis to best interpret the scatterplot.

4.11.2.2 Analysis of Variance (ANOVA)

Analysis of Variance (ANOVA) considers an independent variable as a factor and is tabulated on a variety of levels. The variance is used as a comparison between the groups and with the variability contained in the other groups (Pallant, 2010:249). These groups are examined on scales of interval and ratio (Turner and Thayer, 2001:3). ANOVA tests the degree of freedom and significance levels. The significance levels have a level of 0.05 which depicts that (Pallant, 2010:253):

- If the significance level is less than or equal to 0.05, then the difference is significant between the variable and the groups.
- If the significance level is greater than 0.05, then there is no significant difference between the dependent variable and the level in groups.

ANOVA tests for homogeneity of variance using the Levene's test. This assesses whether the variance amongst all groups is the same and this is noted with the significance level (Pallant, 2010:253). The testing for homogeneity of variance follows certain significance levels that will determine whether a recall for other tests is needed. The levels are:

- If the significance level is greater than 0.05, there is no violation of the homogeneity of variance.
- If the significance level is below 0.05, there is violation and further analysis of data needs to be conducted using the robust tests of equality of means.

4.11.2.3 Chi-square

Chi-square is a measure between two nominal variables as part of bivariate analysis that shows whether or not the pattern that is created is the result of chance. Chi-square is linked with the degree of freedom which generalises the relationship of significance between variables (Kothari, 2004:233).

4.11.2.4 Cross Tabulation

Cross tabulation establishes the relationship between variables of different scales. The scaling technique ensures that the chi-square is significant and the linear by linear regression should be positive in order for the relationship to be considered significant. Cross tabulation is used to tabularize the data from section A of the researcher's questionnaire which relates to biographical information with the other elements featured in the questionnaire (Mohan, 2012:1). This method of bivariate analysis allows for two variables to be computed at the same time. The combination of the variables in rows and columns forms cells which illustrate the grouping of data in order to identify the relationship amongst variables and whether it is independent or not (Mohan, 2012:1). Table 4.2 below indicates the hypothesis generated in data analysis with the use of cross tabulation techniques.

Table 4.2: Hypothesis and results for bivariate (Cross Tabulation and ANOVA)

Hypothesis	Questions	Results
H_{O1}: There is no relationship between field of employment and capacity constraints. H_{A1}: There is a relationship between field of employment and capacity constraints.	Does the field of employment contribute to capacity constraints?	This is due to the types of employment not having control over the logistics industry.
H_{O2}: There is no relationship between experience in containership and capacity constraints. H_{A2}: There is a relationship between experience in containership and capacity constraints.	Does experience in containership control capacity at the Durban Port?	Experience in containership enables members to be aware of the situation at the Durban Port and make recommendations concerning restructuring.
H_{O3}: There is no relationship between transport mode and capacity constraints. H_{A3}: There is a relationship between transport mode and capacity constraints.	Is the mode of transport used directly related to capacity constraints?	This is based on the intermodal relationship amongst sea and road networks.
H_{O4}: There is no relationship between work description in containership and capacity constraints. H_{A4}: There is a relationship between work description in containership and capacity constraints.	Does the work description in containership contribute to capacity constraints at the Durban Port?	Thisis based on the relationship between the inbound and outbound transportation networks, as intermodalism is synchronised with work description.
$H_{O5:}$ There is no relationship between experience in containership and intermodal containerisation.	Does experience in containership relate positively to transitional	More experience ensures that members in the industry have the knowledge and skills to withstand

H_{A5}: There is a relationship between experience in containership and intermodal containerisation.	shipping and road freight transportation networks?	circumstances that arise in the transitional process.
$H_{O6:}$ There is no relationship between transport mode and intermodal containerisation. H_{A6}: There is a relationship between transport mode and intermodal containerisation.	Does the mode of transportation used influence the intermodal containerisation networks?	Road transport influences the intermodal containerisation process as it is commonly utilised.
$H_{O7:}$ There is no difference between excessive control and incoterms. H_{A7}: There is a difference between excessive control and incoterms.	Does excessive customs control determine theeffective use of Incoterms?	Incoterms assists in merging communication on an international level hence with clearing shipments; the need for correct terms will be enforced.
$H_{O8:}$ There is no difference between excessive control and security protocols. H_{A8}: There is a difference between excessive control and security protocols.	Does the security protocol at the Durban Port contribute to excessive customs control?	Security at the Durban port is well imposed to ensure that restricted areas are cordoned off with limited public access for the customs process to be interfaced.

Source: Designed by the researcher

4.11.3 Multivariate Analysis

Multivariate techniques are used when many variables need to be analysed (Sekaran and Bougie, 2010:338). This study used the multivariate techniques of multiple regression and factor analysis.

4.11.3.1 Multiple Regression

Multiple regressions are a weighting equation used to generate the relationship between a dependent variable and many independent variables in order to distinguish models in the elements (Aiken, West and Reno, 1991:196). This is also known as a dependency technique of Multivariate analysis. The researcher chose to use stepwise multiple regressions which allow the independent variables to be selected based on a statistical criterion (Pallant, 2010:150). The relationship between the dependent variable and independent variables has to be established in order to determine multiple regression in which correlation levels should be lower rather than higher. In order to be retained, the independent variables should show a correlation of less than 0.7 (Pallant, 2010:158).

With regards to interpretation, multicollinearity needs to be ascertained in order for multiple regression to qualify as a multivariate. Multicollinearity occurs when more than two variables that participate in multiple regression are interrelated (Aiken, West and Reno, 1991:196). Therefore, if the correlation between variables is less than or equal to 1, the multicollinearity makes the interpretation of multiple regression impractical. The normal size acceptable for multicollinearity is above 0.70. This can be measured using tolerance value and variance inflation factor. Tolerance describes the display of the variability of an independent variable that is not explained by other variables in the data set (Pallant, 2010:158). Tolerance is calculated using formulas; if the value generated is less than 0.10, the multiple regression with variables is high, depicting multicollinearity (Pallant, 2010:158). Variance inflation factor is the opposite of the tolerance factor. When the value exceeds 10, the requirement for multicollinearity is exceeded (Pallant, 2010:158). However, in order for multiple regression to be properly implemented in data analysis, multicollinearity should not exist on the model.

Another element of multiple regression is the depiction of outliers that may exist when data analysis is conducted. Outliers approach a very sensitive outcome to statistics depending on their high and low values which needs to be detected at the entrance of interpretation (Pallant, 2010:151). The outliers should be removed from the data set in order to confiscate room for error whether it entails the concise inspection of independent and dependent variables. However, in many cases, the outliers can assist with normality with multiple regression (Osbourne and Waters, 2002).

When constructing multiple regression, it is important to analyse outcomes such as the residual scatterplots. This ensures that that the differences are noted and steps are taken to minimise the effects. The residual scatterplot allows the researcher to view various elements of normality, linearity and homoscedasticity (Pallant, 2010:151). These elements are explained below. Normality involves the normal distribution of variables, especially those of a dependent nature. When distribution becomes non-normal, skewness and kurtosis values can create problems for relationships and tests for significance (Osbourne and Waters, 2002).

Linearity states that the residuals should have a straight line methodological relationship (Pallant, 2010:151). The fact that linearity may not exist between independent and dependent variables in many cases, limits multiple regression in fully analysing the variables. This is referred to as the under estimation of variables which runs the risk of higher variability of type I errors for the independent variable (Osbourne and Waters, 2002). The residual scatterplots allowsfor the determination of non-linearity of multiple regression. The difference between a curvilinear relationship and a linear relationship is illustrated:

Homoscedasticity requires that the variance of the residuals should be the same amongst all levels (Aguinis, 2004:44). Therefore, when difference is noted between variables at the various levels, homoscedasticity is present (Osbourne and Waters, 2002). In this element of residual scatterplots, a Type I error can also be seen when heteroscedasticity is introduced. The difference is that homoscedasticity has an evenly distributed scatterplot around the linear regression, whilst heteroscedasticity has an uneven approach to the scatterplot.

4.11.3.2 Factor Analysis

Factor analysis is an interdependency technique that forms part of the multivariate component for analysis. It is used to correlate variables that belong together such as interval or ration scaled variables (Kline, 1994:5). The statistics tests used for factor analysis are:

- The Kaiser-Meyer-Olkin (KMO) measure of sampling which needs to exceed a value of 0.6 to be considered for further investigation (Palland, 2010:192).
- Bartletts test of sphericity which is significant at 0.05.

The relationship of new variables for correlation is initiated with factor analysis and is determined by the use of principles components analysis (Pallant, 2010:185). This analysis transforms variables interchangeably to new sets therefore generating factors of linear combinations with the variables in which variance is taken into account (Mohan, 2012:5). There are various elements to take into consideration when conducting factor analysis, including loading, eigenvalues, communalities and rotation. Loading is observed when the strength of the variable is acknowledged in terms of correlations and relationship (Mohan, 2012:5). The eigenvalue is the variance in a sum total where variance is reliable for a certain factor. When interpreting factor analysis, the eigenvalue forms the second column in the table which shows the factors that have been removed; hence the variance that is removed by the factors is depicted as the eigenvalue (Statsoft, 2012:1). Communalities are the estimate of the particular variable being explained (Mohan, 2012:5). An estimation of communalities needs to be developed for variables so that the proportions of variables that are dependent and independent are common and universal (Statsoft, 2012:1). Rotation provides a simpler and easier method for depicting the relationship between variables and other factors (Mohan, 2012). Factor rotation is an approach that is orthogonal when uncorrelated and oblique when correlated (Pallant, 2010:185). The orthogonal approach produces easier results whilst the oblique approach is more difficult due to the correlation factor. In this study, the researcher used the varimax approach to factor analysis which provides minimal variables that have a greater loading (Pallant, 2010: 185).

There are various techniques involved in the decision of factor analysis that concern the abovementioned elements. These assist the researcher to make a decision with regards to the factors that should be used. These techniques include Kaiser's criterion, the scree test and parallel analysis (Pallant, 2010:184). The factors used in Kaiser's criterion as part of analysis have to have an eigenvalue that is greater than 1.0 so that further analysis may be completed. The scree test indicates the eigenvalues which need to be identified and plotted against factors to investigate the direction and curvature of the plot (Pallant, 2010:184). Catell's scree test is commonly used. Finally, parallel analysis entails the comparison of eigenvalue size so as to obtain factors that have a similar or the same size. Whether or not to retain values is decided by the exceeding capacity of eigenvalues. Parallel analysis is the most definite response to determine which factors to retain as opposed to the Kaiser criterion and the Catell's scree test due to the choice of components that are correct as well as the most accurate values (Pallant, 2010:184).

4.11.4 Reliability and Validity

Reliability and validity is used as a measurement of goodness. There are two main forms of validity: internal and external validity. Internal validity measures exactly what it was designed to measure (Cooper and Schindler, 2010:289), whilst external validity is generalised to various factors which need to be measured. Validity takes various forms, including content validity, criterion-related validity and construct validity. The different types of validity are depicted in table 4.3 below.

Table 4.3: Validity

Type	What is measured	Methods
Content Validity	The content that strongly represents the items considered in the study	• Judgement methods • Evaluation from the panel
Criterion related Validity	Deals with prediction and whether the aspects of the criterion are easily captured by the predictor	• Correlation
Construct Validity	Consideration of theory and the measurement instrument	• Judgement • Correlation • Factor analysis • Multivariate

Source: *Cooper, D. R., and Schindler, P. S. (2010). Business Research Methods.New York, NY: McGraw-Hill: 290.*

Reliability is achieved when the results are continuously consistent. Reliability and validity normally work together. Error needs to be eliminated with reliability as a measure of goodness as it uses various elements and instruments which are tough and can withstand flexibility and change (Cooper and Schindler, 2010:293). Reliability estimates include the Cronbach's alpha, test and retest and parallel forms. Table 4.4 below depicts the reliability instruments.

Table 4.4: Reliability

Type	Coefficient	What is measured	Methods
Cronbach's Alpha	Consistency is internal	The items used in the instrument are homogenous and therefore reflect the same ideas	Correlational formulas that are specialized.
Test Re-test	The coefficient is solid	Reliability of test scores that is administered twice over six months	Correlation to determine the relationship.

Source: *Cooper, D. R., and Schindler, P. S. (2010). Business Research Methods.New York, NY: McGraw-Hill: 290.*

In this study, reliability will be measured using Cronbach's alpha whilst content validity will be used to test validity. In Cronbach's alpha, consistency should follow a range closer to 1 (Hair, Celsi and Money, 2011:237). Content validity is also used as a test to ensure that an adequate set of items is used to measure the concept (Hair, Celsi and Money, 2011:23).

4.12 Conclusion

Selecting the appropriate research methodology is an important part of any research study. Data measuring instruments and analysis are critical aspects of research and it thus is of immense importance that they be conducted in the correct manner. The research methodology plays an important element in analysing the data obtained within the industry. The aim is to ensure all methods analysing is appropriately selected and can be used to justify the outcomes of the study. The data analysis chapter will feature the methods of data analysis to interpret the results.

Chapter Five

Data analysis and interpretation of results

5.1 Introduction

This chapter presents the data analysis and the interpretation of the study's results. The primary data were subject to triangulation to test for validity and reliability. This chapter formulates an analysis using univariate, bivariate, and multivariate methods in bar graphs, diagrams and tables to showcase specific data. The data are distributed across nominal, ordinal, interval and ratio scaling in order to understand the need of objectives in respect to the methods chosen for analysis. The total numbers of questionnaires generated of 206 contain valid cases that were coded for data. There are no missing cases in the study.

5.2 Descriptive Statistics

Univariate and bivariate analysis will feature the aspects of descriptive statistics with focus on frequency distribution, descriptive and cross tabulation.

5.2.1 Frequency Distribution

Figure 5.1: Total respondents by Gender

Figure 5.1 below depicts the bar graph generated from the total respondents of gender that consisted of male and female personnel's.

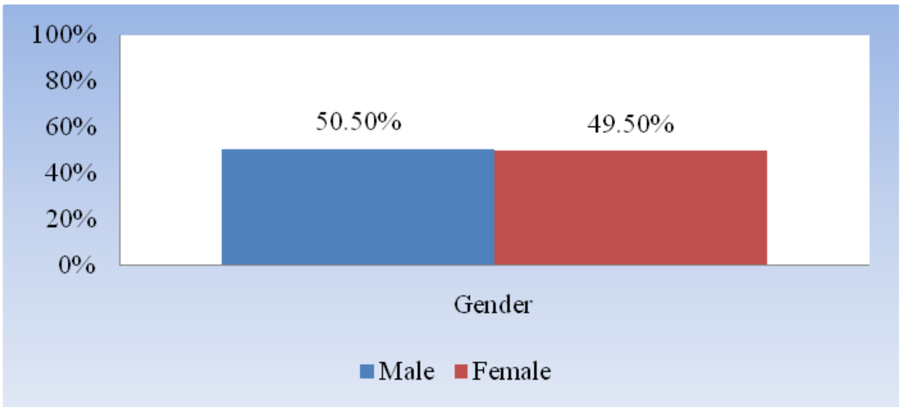


Figure 5.1 illustrates that 50.50% (104 out of 206) of the respondents are male, with an almost equal number of female respondents at 49.50% (102 of 206).

Figure 5.2: Field of Employment

Figure 5.2 shows the bar graph of the field of employment. This is the various sectors participants stemming from container depots, road freight transport, intermodal industry, freight forwarders and 4th party logistics service providers.

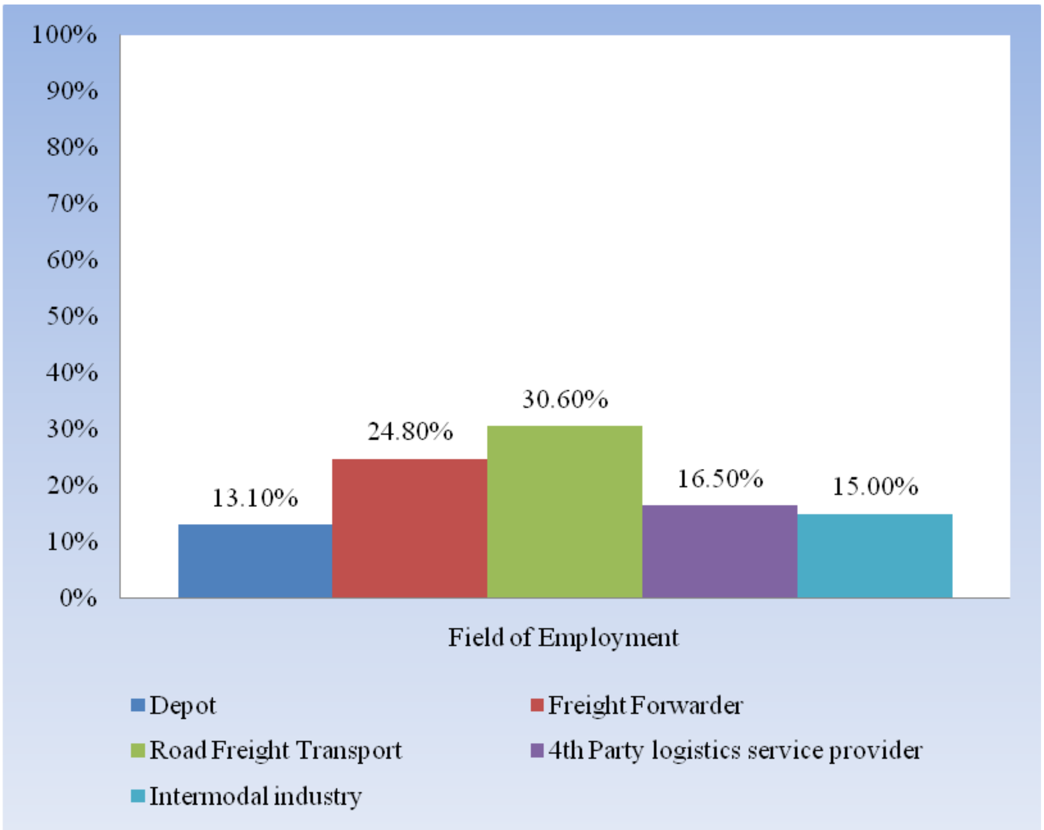


Figure 5.2 shows, that, respondents from container depots comprised 13.10% of the sample, withfreight forwarders, who arrange for the transportation of containerised shipments using both inbound and outbound networks comprising 24.80%, and road freight transport operators 30.60%.Private road freight companies provide cost-effective services to many companies in the Durban region, especially those involved in international trade. Fourth party logistics service providers made up 16.50% of the sample; their services range from transportation for final delivery to tracing shipments in transit. These service providers often partner with freight forwarding and clearing agents to ensure that containerised shipments are delivered using appropriate routes and deliver in good time. Fifteen percent of the respondents are representatives of the intermodal industry that has relationships with inbound transportation networks to the Durban Port as well as final outbound transportation.

Figure 5.3: Work Experience

The bar graph of figure 5.3 illustrates the number of years work experience gained in the logistics industry.

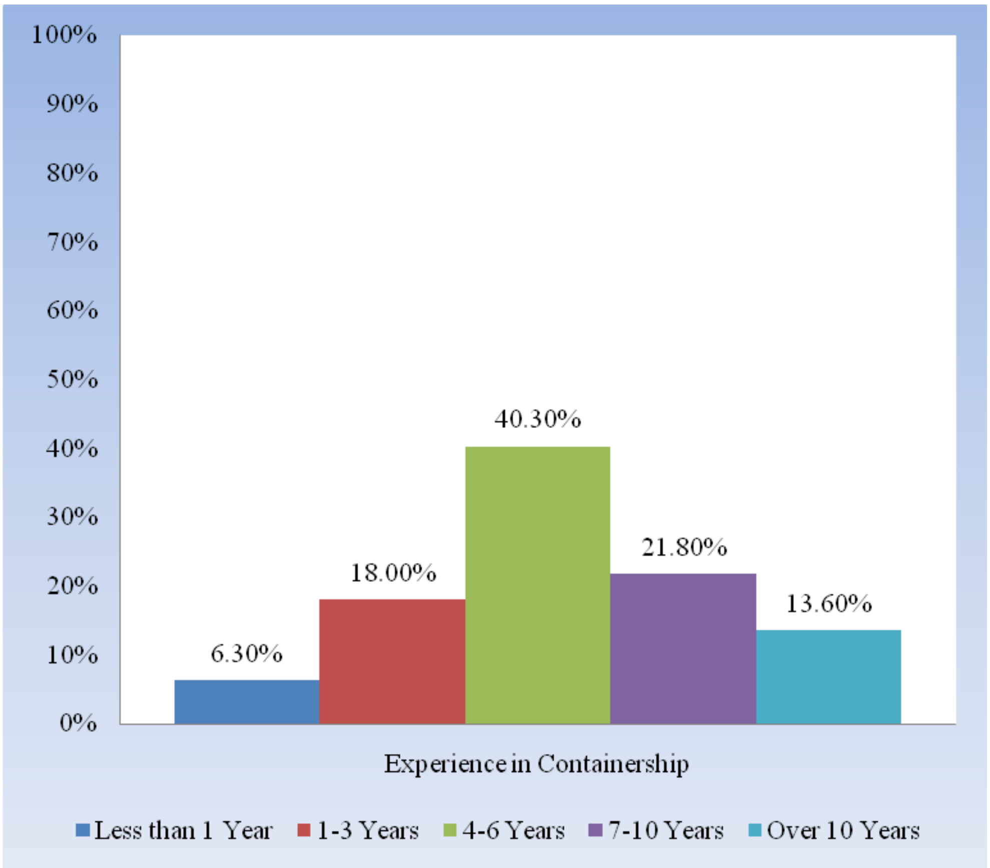
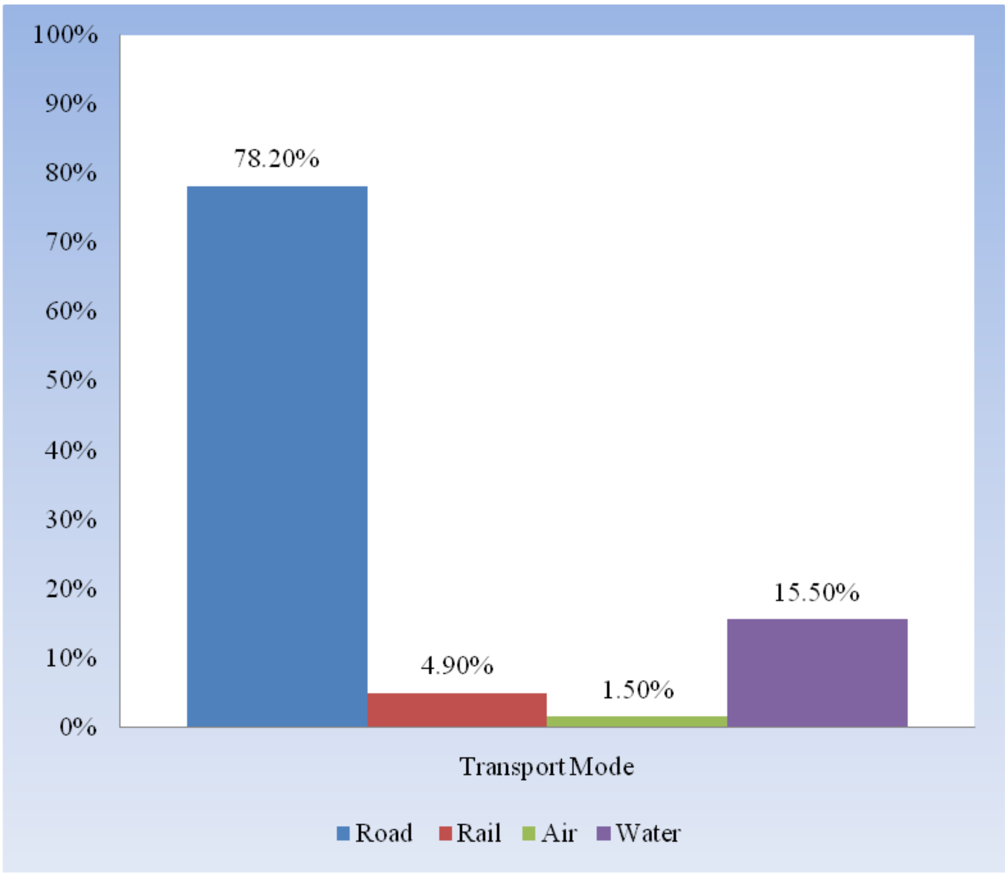


Figure 5.3 shows the number of years work experience that respondents have in the containerisation and road transport network. A total of 6.30% (13 out of 206) respondents had less than a year's experience.This was followed by 18% with one to three years' experience, 40.30% with four to six years' experience and 21.8% (45 out of 206) with seven to ten years' experience. Twenty eight respondents (13.6%) had more than ten years' experience. In the logistics industry, the sample size of 206 ensures that individuals with an adequate work experience are maintained in the sector. The individuals with experience in the intermodal industry of 4-6 years have maintained adequate knowledge and expertise to efficiently conduct smooth movement.

Figure 5.4: Transport Mode

The bar graph below indicates the different modes of transportation and the variety of usage in the industry.



The majority of the respondents (78.20%) used road transportation to carry freight. Road networks are considered less costly as well as the most reliable. Using road networks facilitates timely deliveryand there is less damage to containers. Stiff competition in the road transportation sector allows customers to negotiate favourable terms. Only 4.90% of the respondents indicated that they use rail transport, a figure that is below the average, due to the poor current state of infrastructure, carriages and railway facilities. The system is unable to accommodate growing international trade, especially in the Durban Port. An even smaller number of respondents (1.50%) indicated that they use air transport, which is more suitable for smaller units and not for containerised shipments. Air transport is also a more costly mode of transportation as the cost depends on volumetric weight. Water transportation was cited as the second most used mode of transportation after road transport (15.50%).

Figure 5.5: Work description in Containership

The figure below represents the work description in containership relating to the logistical industry.

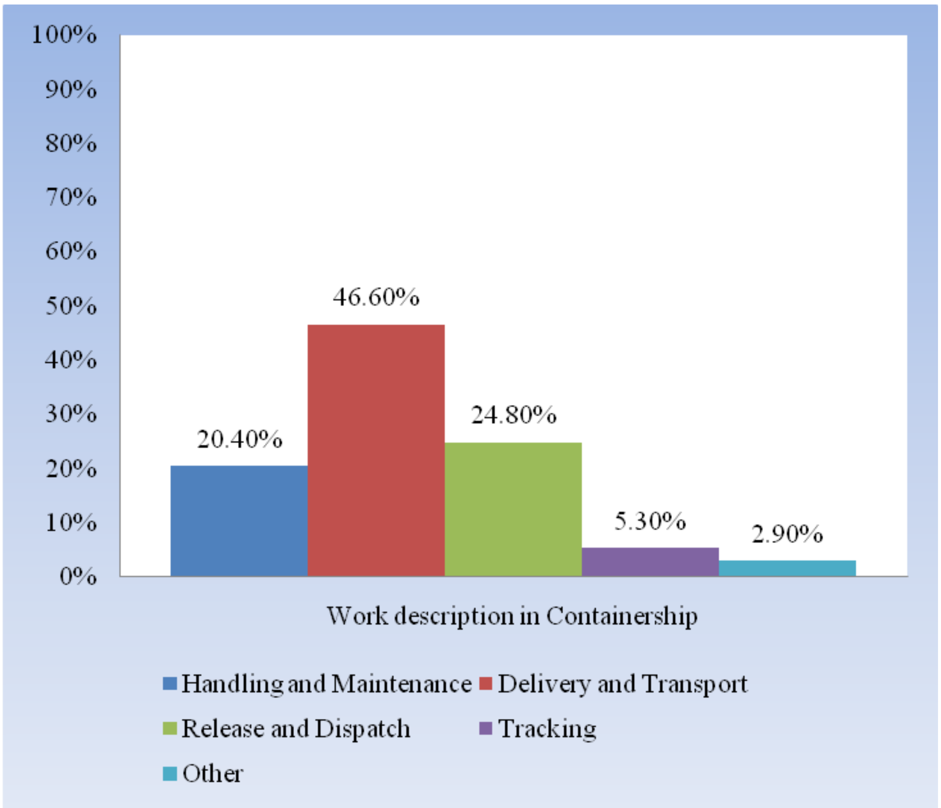
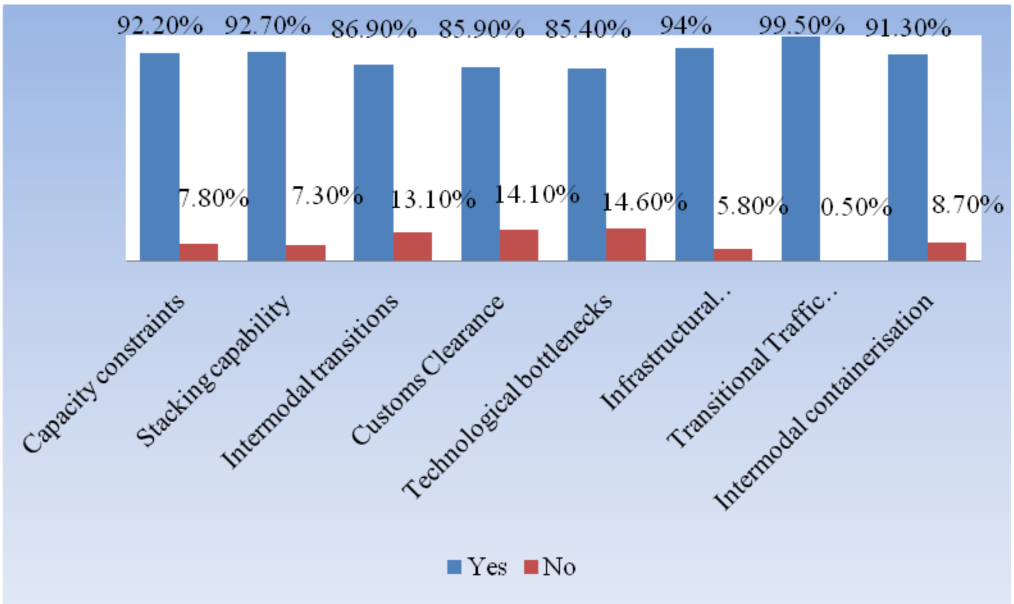


Figure 5.5 shows the variety of job descriptions in the logistical industry. 20.40% of the respondents are involved in handling and maintenance; these employees work at a container depot, maintain the containers and refit them to industry specifications. Delivery and transport represents the highest number of respondents, with 46.60% of the sample involved in road transportation networks that play a pivotal role in ensuring that containers are delivered on time to customers. The continuous movement of containers frees up storage facilities for incoming loads. The second largest group of respondents (24.80%) is employed in release and dispatch activities; this involves taking the goods through customs and discharging containers from container depots. Finally, 5.30% of the respondents are responsible for tracking and tracing; this is the duty of the freight forwarder or the clearing and forwarding agent who ensure that status reports are provided on the progress of deliveries. The duties under the "other" category include constant communication with default importers, packing and loading cargo into containers and the regular maintenance and repair of crane equipment.

Figure 5.6: Combination of Dichotomous Questions (Yes/No)

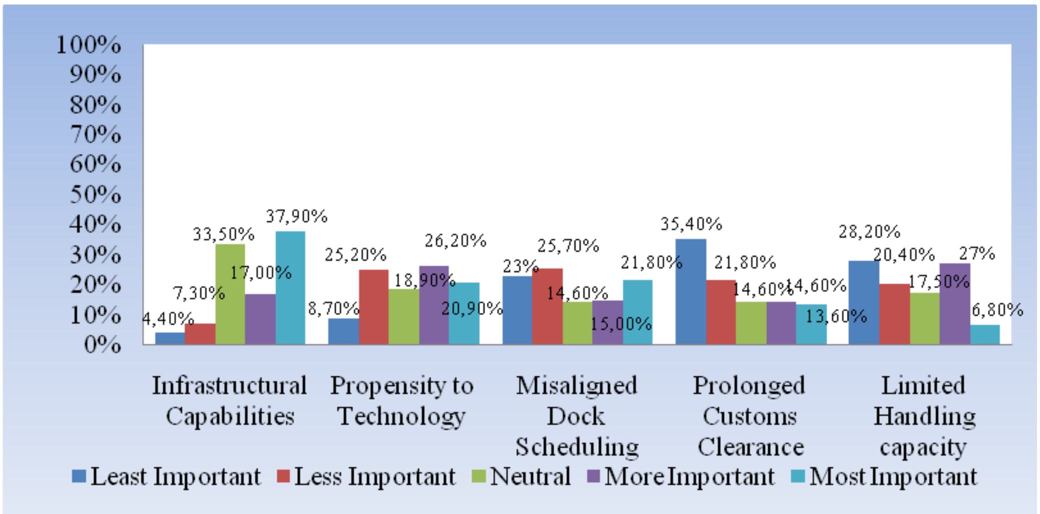
The dichotomous questions featuring of "Yes" and "No" options based on eight questions pertaining to the logistics industry.



Dichotomous questions are based on"yes" or "no" answers. In this study, eight questions were included in a figure to demonstrate the responses. Figure 5.6 shows that, 92.20% of the respondents agree that capacity constraints pose challenges to inbound and outbound networks, while 7.80% disagree. The stacking capability of containers that runs the risk of higher insurance costs as well as a higher risk of damage was identified by 92.70% of the respondents, with 7.30% disagreeing. The intermodal transitional network relates to viable in-transit road networks; 86.90% of the respondents agree that this is a challenge, while 13.10% disagree. Nearly eighty six percent (85.90%) of the respondents agreed that the delayed release of containers at the Durban port is due to the prolonged customs clearance process while 14.10% felt it is due to other factors. Furthermore, 85.40% and 14.60% of the respondents respectively agreed and disagreed that, technological bottlenecks such as the NAVIS SPARCS at the Durban Port have increased the waiting time for intermodal networks.Ninety four percent of the respondents agreed that infrastructural development can alleviate capacity constraints at the port and on the roads while 5.80% disagreed. Almost all (99.50%) respondents agreed that delivery times to customers are affected by traffic congestion and 91.30% agreed that intermodal containerisation on transitional shipping and road networks perform a synonymous function in creating a transitional approach.

Figure 5.7: Factors relating to capacity constraints

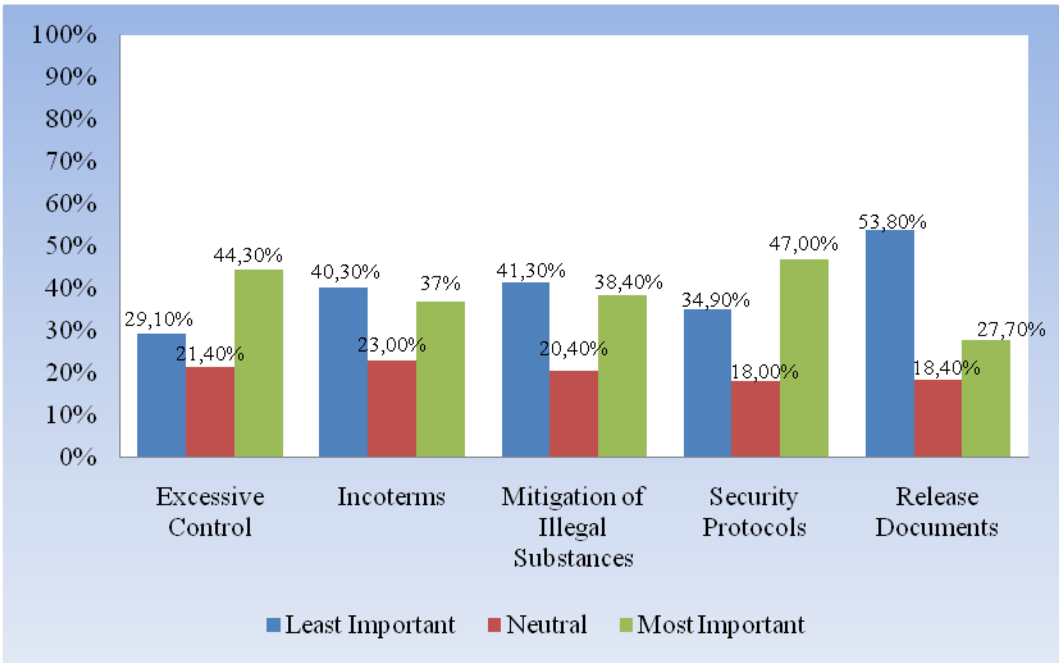
The below bar graph illustrates the ranking questions dealing with capacity constraints from least important to most important.



Nominal scaling questions involve ranking questions from least important to most important. This deals directly with capacity constraints at the Durban Port as well as the factors that contribute to delays and cycle time. The lack of infrastructural capacity to handle containers is ranked least important by 4.40% of the respondents, while 7.30% rated it less important, 33.50% were neutral, 17% rated it more important and 37.90% most important. 8.70% of the respondents rated reliance on technology in the form of the NAVIS SPARCS systems least important, 25.20% less important, 18.90% were neutral, 26.20% rated it more important and 20.90% most important. Twenty three percent of the respondents felt that the scheduling of containers with regards to docking plays was least important with regards to congestion, while 25.70% rated this less important, 14.60% were neutral, 15.% rated it more important with and 21.08% felt that it was the most important factor. Customs clearance procedures that cause delays, were cited by 35.4% of the respondents as least important, 21.8% rated this factor less important, 14.6% were neutral and felt that this factor was more important, respectively and 3.60% felt that this factor was the most important. Finally, 28.20% of the respondents cited the limited handling capacity at the Durban Port as trade continues to grow exponentially as least important, 20.4% felt it was less important, 17.5% were neutral, 27% rated this factor as more important and 6.8% of the respondents rated this as the most important factor.

Figure 5.8: Reasons for the lengthy and challenging customs clearance process

The bar graph below depicts the ranking configuration for questions posed against the challenging customs clearance process.



The nominal scaling provides reasons for the lengthy and challenging customs clearance processes for clearing and forwarding containers at the Durban Port. 29.10% of the respondents rated excessive control during the customs procedure least important, 21.40% were neutral, and 44.30% of the respondents felt that this was most important. 40.30% of the respondents felt that Incoterms for the proper release of containers were least important controls, with 23% being neutral and 37% rating this most important. Customs processes relating to the prevention of illegal substances from entering the country were rated least important by 41.30% of the respondents, 20.4% were neutral and 38.40% rated this most important. Security protocols that trace counterfeit items and eliminate theft were rated least important by 34.90% of the respondents, 18% were neutral and47% felt this was most important. The lengthy customs process and documents required for the clearing and forwarding of containers at the Port were rated least important by 53.80% of the respondents, with 18.4% being neutral and 27.70% stating that this was most important.

5.2.2 Descriptive Statistics

Descriptive statistics are used for measures of central tendency and dispersion. The items measured are contained in the interval scale section of a questionnaire (Sekaran and Bougie, 2010:322).

Table 5.1: Inbound transportation of Durban containerisation

The below descriptive statistics table represents the interval scaling questions for inbound transportation of Durban containerisation.

Variables	N	Range	Min	Max	Mean	Std D	Var	Skew	Kurt
Overweight Containers	206	4.00	1.00	5.00	4.709	0.595	0.354	-2.611	9.222
Stowage	206	2.00	3.00	5.00	4.607	0.589	0.347	-1.218	0.482
Technological Docking Delays	206	4.00	1.00	5.00	4.544	0.688	0.474	-1.564	2.884
Intermodal Port Containerisation	206	4.00	1.00	5.00	4.505	0.737	0.544	-1.564	2.616
Cargo Dwelling Time	206	3.00	2.00	5.00	4.485	0.630	0.397	-0.948	0.422
Cargo Insurance And Liability	206	3.00	2.00	5.00	4.471	0.653	0.426	-1.273	2.217

This section of descriptive statistics uses the data generated from interval scaling as the 5 point Likert scale was used for rating questions from “strongly agree= 5” to “strongly disagree= 1”. A minimum and maximum pointis allocated to each question that form the data set and the means are arranged in descending order from highest to lowest values.

Table 5.1 shows that the factor, overweight containers indicated the highest mean (4.709) with standard deviation (0.595). Overweight containers are therefore deemed relatively important due to exorbitant liability costs and legal issues. To ensure safety and stability on vessels, in the harbour and on road networks, employees should avoid mishandling the containers to enhance proper stowage and stowability (mean= 4.607 with standard deviation= 0.595). The exception of a minimum value= 3 was encountered with stowage.Technological defects with a mean value of 4.544 (standard deviation = 0.688) contribute to the delays in turnaround time in inbound transportation of containersin the Durban Port. The intermodal nature of inbound and outbound transportation of containers is noted as directly link to port congestion and inefficiencies with a mean value of 4.505 (standard deviation = 0.737). Congestion results in higher costs and longer standing times for intermodal networks. Scheduling is an important concept for the free movement of merchandise. The prolonged dwelling time witnessed at the outbound networks yielded a mean value of 4.485 (standard deviation = 0.630) that negatively influences the ability to align outbound transportation networks’ schedules. In this case, the minimum value finds solitude from two as opposed to the remaining factors.

The transition process of inbound and outbound networks is excessive due to increased cargo insurance and liability costs (mean= 4.471 with a standard deviation of 0.653). The disproportionate insurance costs are due to unforeseen circumstances that may arise during the transitional process.

Table 5.1 indicates that the range for all the factors influencing inbound transportation of containers to Durban is five, as responses were generated on the basis of “strongly agree” to “strongly disagree”. The mean for all factors, namely overweight containers, stowage, cargo insurance and liability costs, cargo dwelling time, intermodal port containerisation and technological docking delays is larger than 4.0, a more than adequate average. The standard deviation works in conjunction with the mean whilst the variance is of the variables in the study. The variance of the study is quite low; this shows that the respondents have answered the interval scaling questions quite close to the mean on variables. All the factors generated negative skewness numbers that cause the cluster of scores to exist on the right end of the normal distribution curve. Kurtosis stems positivity; hence, the distribution on the graph will be peaked as opposed to flat.

Table 5.2: Outbound transportation of Durban containerisation

The below table indicates the second set of descriptive statistics data for outbound transportation of Durban containerisation

	N	Range	Min	Max	Mean	Std D	Skew	Kurt
Durban Port Profitability	206	2.00	3.00	5.00	4.646	0.546	-1.236	0.559
Road Design	206	3.00	2.00	5.00	4.612	0.588	-1.387	1.660
Transition Cycle Time	206	3.00	2.00	5.00	4.578	0.633	-1.342	1.180
In-transit Overweight Containers	206	3.00	2.00	5.00	4.500	0.646	-1.042	0.475

The interval interpretation of descriptive statistics makes reference to the effects of road transportation networks as a variable. This indicates that the factors considered depict the possible concerns of the outbound transportation network in relation to Durban containerisation.

The profitability of road networks elicited very negative feedback due to inherent congestion at the port as demonstrated by mean= 4.646 and standard deviation= 0.546.Cycle and delivery times to final customers are of the utmost importance to the logistics industry in order to retain current customers and attract new customers. Unfortunately, the structure and design of the roads surrounding the Durban port do not accommodate the increase in global trade (mean= 4.612 with standard deviation= 0.588).

Capacity constraints relating to the transition from inbound to outbound networks at the Durban Port cause unnecessary delays in delivery (mean= 4.578 with standard deviation= 0.633). The carriage of overweight containers (mean= 4.500 with standard deviation= 0.646) using road networks prevents efficient delivery times; time delays at weighbridge facilities add to this problem.

It is evident from table 5.2 that all the means generated as part of the effects of road transportation networks exhibited levels greater than 4.0. The overall maximum values (5.00) are consistent, with minimum values at 2.00 with the exception of Durban port profitability (3.00). Skewness is negative and the distribution is clustered to the right whilst kurtosis is positive with a peaked curve.

5.2.3 Cross Tabulation

Cross tabulation generates a relationship between two variables to determine the appropriate association, analyse the hypothesis and formulate generalised questions. The different scales are used when measuring for cross tabulation.

Table 5.3: Field of Employment and Capacity Constraints for Cross Tabulation

The below table illustrates the cross tabulation between the field of employment and capacity constraints

Does the field of employment contribute to capacity constraints?		**Capacity Constraints**		**Total**
Field Of Employment		**Yes**	**No**	
Depot	Count	25	2	27
	% of Total	12.1%	1.0%	13.1%
Freight Forwarder	Count	46	5	51
	% of Total	22.3%	2.4%	24.8%
Road Freight Transport	Count	58	5	63
	% of Total	28.2%	2.4%	30.6%
4th Party Transport Service Provider	Count	32	2	34
	% of Total	15.5%	1.0%	16.5%
Intermodal Industry	Count	29	2	31
	% of Total	14.1%	1.0%	15.0%
Total	Count	190	16	206
% of Total		92.2%	7.8%	100.0%

Chi-Square Tests

	Value	**Df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	0.546	4	0.969
Likelihood Ratio	0.544	4	0.969
Linear-by-Linear Association	0.232	1	0.630

H_{01}: There is no relationship between field of employment and capacity constraints.

H_{A1}: There is a relationship between field of employment and capacity constraints.

Table 5.3 demonstrates the relationship between field of employment and capacity constraints. The areas discussed - depot, freight forwarder, road freight transport network, 4th party logistics service provider and intermodal industry - are directly linked to the level of capacity constraints in the Durban Port. These fields of employment are involved in the actual clearing and forwarding of containers; if the correct information and paperwork is not presented by these agents, capacity is exceeded. The containers will be held at the Durban Port pending correct information from the inbound through to outbound levels.

Respondents' majority (92.20%) felt that capacity constraints pose a challenge to the transportation networks. The degree of freedom (4) and level of significance is determined based on the minimum expected count. The *p*-value (0.969) is greater than the level of significance (0.05). The Chi-square test (0.546) is less than the expected count (2.10). The decision is to rejectthe alternate hypothesis (H_{A1}) and accept the null hypothesis (H_{01}) based on the lack of relationship between field of employment and capacity constraints.

This infers that the experience of capacity constraints is not limited to a certain employment category, but cuts across all modes and methods of transportation. The capacity issues stem from the inability to control the growing influx of container loads in the Durban Port due to the lack of infrastructural capabilities and skills. Hence, members of the industry have no influence and control over capacity at the port.

Table 5.4: Experience in Containership and Capacity Constraints

The table below shows the relationship between experience in containerships and capacity constraints.

Does experience in containership control capacity at the Durban Port?		**Capacity Constraints**		**Total**
Experience In Containership		**Yes**	**No**	
Less Than 1 Year	Count	13	0	13
	% of Total	6.3%	0.0%	6.3%
1-3 Years	Count	35	2	37
	% of Total	17.0%	1.0%	18.0%
4-6 Years	Count	77	6	83
	% of Total	37.4%	2.9%	40.3%
7-10 Years	Count	41	4	45
	% of Total	19.9%	1.9%	21.8%
Over 10 Years	Count	24	4	28
	% of Total	11.7%	1.9%	13.6%
Total	Count	190	16	206
	% of Total	92.2%	7.8%	100.0%

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	3.156	4	0.532
Likelihood Ratio	3.889	4	0.421
Linear-by-Linear Association	2.888	1	0.089

H_{02}: There is no relationship between experience in containership and capacity constraints.

H_{A2}: There is a relationship between experience in containership and capacity constraints.

Table 5.4 shows the relationship between experience in containership and capacity constraints. This has a positive relationship as the more years of experience in working with containers the greater the ability to work with these constraints and to make recommendations to improve the system.Respondents with 4-6 years experience (37.4%) agreed that capacity constraints are a problem in the industry. The degree of freedom (4) and level of significance is determined based on the minimum expected count. The *p*-value (0.532) is on par with the level of significance (0.05). The Chi-square test (3.156) is beyond the expected count (1.01).

The decision to reject the alternate hypothesis (H_{A2}) and accept the null hypothesis (H_{02}) is based on the relationship between work experience and capacity constraints.75.70% of the respondents with more than four years experience agreed that experience in containership assists in the alleviation of capacity constraints.

Table 5.5: Transport mode and capacity constraints for cross tabulation

The relationship between transport mode and capacity constraints is shown in the below table.

Is the mode of transport used directly related to capacity constraints?		**Capacity Constraints**		**Total**
Transport Mode		**Yes**	**No**	
Road	Count	151	10	161
	% of Total	73.3%	4.9%	78.2%
Rail	Count	9	1	10
	% of Total	4.4%	0.5%	4.9%
Air	Count	3	0	3
	% of Total	1.5%	0.0%	1.5%
Water	Count	27	5	32
	% of Total	13.1%	2.4%	15.5%
Total	Count	190	16	206
	% of Total	92.2%	7.8%	100.0%

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	3.625	3	0.305
Likelihood Ratio	3.312	3	0.346
Linear-by-Linear Association	2.973	1	0.085

H_{03}: There is no relationship between transport mode and capacity constraints.

H_{A3}: There is a relationship between transport mode and capacity constraints.

Table 5.5 depicts the relationship between the transport mode and capacity constraints. This relates to the selected modes of transport (road, rail, air and water)'s effect on capacity constraints at the Durban Port. The intermodal transportation networks between road and sea are linked to capacity based on the continuous flow of transportation modes.

The degree of freedom (3) and level of significance is determined based on the minimum expected count. The *p*-value (0.305) is greater than the level of significance (0.05). The Chi-square test (3.625) is beyond the expected count (0.23). The decision is to reject the alternate hypothesis (H_{A3}) and accept the null hypothesis (H_{03}) as there is no relationship between transport mode and capacity constraints.

Statistically, there is no relationship between variables but in terms of inbound and outbound networks, 73.30% of the respondents agreed that road freight transport poses a major challenge at the Durban Port.

Table 5.6: Work description in containership and capacity constraints for cross tabulation

Table 5.6 illustrates the relationship between work description in containership and capacity constraints. The various factors relating to the two variables are further analysed.

Does the work description in containership contribute to capacity constraints at the Durban Port?		Capacity Constraints		
Work description in Containership		**Yes**	**No**	**Total**
Handling and Maintenance	Count	40	2	42
	% of Total	19.4%	1.0%	20.4%
Delivery and Transport	Count	88	8	96
	% of Total	42.7%	3.9%	46.6%
Release and Dispatch	Count	47	4	51
	% of Total	22.8%	1.9%	24.8%
Tracking	Count	9	2	11
	% of Total	4.4%	1.0%	5.3%
Other	Count	6	0	6
	% of Total	2.9%	0.0%	2.9%
Total	Count	190	16	206
% of Total		92.2%	7.8%	100.0%

Chi-Square Tests

	Value	**Df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	2.744	4	0.602
Likelihood Ratio	2.866	4	0.580
Linear-by-Linear Association	0.373	1	0.541

H_{04}: There is no relationship between work description in containership and capacity constraints.

H_{A4}: There is a relationship between work description in containership and capacity constraints.

As table 5.6 illustrates, the relationship between work description in containership and capacity constraints is seen as positive. Work description in containership relates to handling and maintenance, delivery and transport, release and dispatch, and tracking as well as other components dealing with the actual movement of containers on a daily basis. Thecontinuous movement of containers to and from the Durban Port depends on efficient transport; hence capacity constraints are clearly understood by members of the industry. Respondents of 42.70% agreed that transport and delivery influence the development of capacity constraints while a total of 92.2% agreed that capacity constraints are a challenge for transportation networks.The degree of freedom (4) and level of significance is determined based on the minimum expected count. The *p*-value (0.602) is greater than the level of significance (0.05). The Chi-square test (2.744) is beyond the expected count (0.4). The decision is to reject the alternate hypothesis (H_{A4}) and accept the null hypothesis (H_{04}).

Table 5.7: Experience in Containership and Intermodal containerisation in Cross Tabulation

The table below shows the information pertaining to the variables of experience in containership and intermodal containerisation.

Does more in containership relate positively to transitional shipping and road freight transport networks?		IntermodalContainerisation		Total
ExperienceInContainership		**Yes**	**No**	
Less Than 1 Year	Count	13	0	13
	% of Total	6.3%	0.0%	6.3%
1-3 Years	Count	33	4	37
	% of Total	16.0%	1.9%	18.0%
4-6 Years	Count	75	8	83
	% of Total	36.4%	3.9%	40.3%
7-10 Years	Count	40	5	45
	% of Total	19.4%	2.4%	21.8%
Over 10 Years	Count	27	1	28
	% of Total	13.1%	0.5%	13.6%
Total	Count	188	18	206
	% of Total	91.3%	8.7%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.784(a)	4	0.595
Likelihood Ratio	4.125	4	0.389
Linear-by-Linear Association	0.005	1	0.942

H_{05}: There is no relationship between experience in containership and intermodal containerisation.

H_{A5}: There is a relationship between experience in containership and intermodal containerisation.

Table 5.7 shows the relationship between experience in containership and intermodal containerisation. Respondents with four to six years' (36.40%) experience agreed that more experience has a positive impact on intermodal containerisation, while 91.30% of all respondents agreed that this was the case. The *p*-value (0.595) is greater than the level of significance (0.05). The Chi-square test (2.784) is beyond the expected count (1.14). The decision is to reject the alternate hypothesis (H_{A5}) and accept the null hypothesis (H_{05}). While there is no statistical relationship between experience in containership and intermodal containerisation, the overwhelming majority of the respondents agreed that more experience in containership would alleviate the challenges confronting transitional shipping and road freight networks.

Table 5.8: Transport mode and Intermodal containerisation in Cross Tabulation

The table below shows the dichotomous question of intermodal containerisation and the relationship with the transport mode.

Does the mode of transportation influence the intermodal containerisation networks?		IntermodalContainerisation		Total
TransportMode		Yes	No	
Road	Count	148	13	161
	% of Total	71.8%	6.3%	78.2%
Rail	Count	10	0	10
	% of Total	4.9%	0.0%	4.9%
Air	Count	2	1	3
	% of Total	1.0%	0.5%	1.5%
Water	Count	28	4	32
	% of Total	13.6%	1.9%	15.5%
Total	Count	188	18	206
	% of Total	91.3%	8.7%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.890	3	0.274
Likelihood Ratio	3.848	3	0.278
Linear-by-Linear Association	0.889	1	0.346

H_{06}: There is no relationship between transport mode and intermodal containerisation.

H_{A6}: There is a relationship between transport mode and intermodal containerisation.

Table 5.8 depicts the relationship between the transport mode and intermodal containerisation. The modes of transport, namely, water and road, are compared with the transitional movement of containers from shipping to road freight transport networks. Traditionally, road transportation forms the primary mode (78.2%) followed by water transportation (15.5%).

The degree of freedom (3) and level of significance is determined based on the minimum expected count. The *p*-value (0.274) is greater than the level of significance (0.05). The Chi-square test (3.890) is beyond the expected count (0.26). The decision is to reject the alternate hypothesis (H_{A6}) and accept the null hypothesis (H_{06}) as there is no relationship between transport mode and intermodal containerisation.Although there is no statistical relationship between the variables, 91.30% of the respondents agreed that the mode of transportation influences the intermodal containerisation network. Road transport accounts for the majority of trade in the Durban region and service delivery is determined by this variable.

Table 5.9: Results of hypothesis for Cross Tabulation

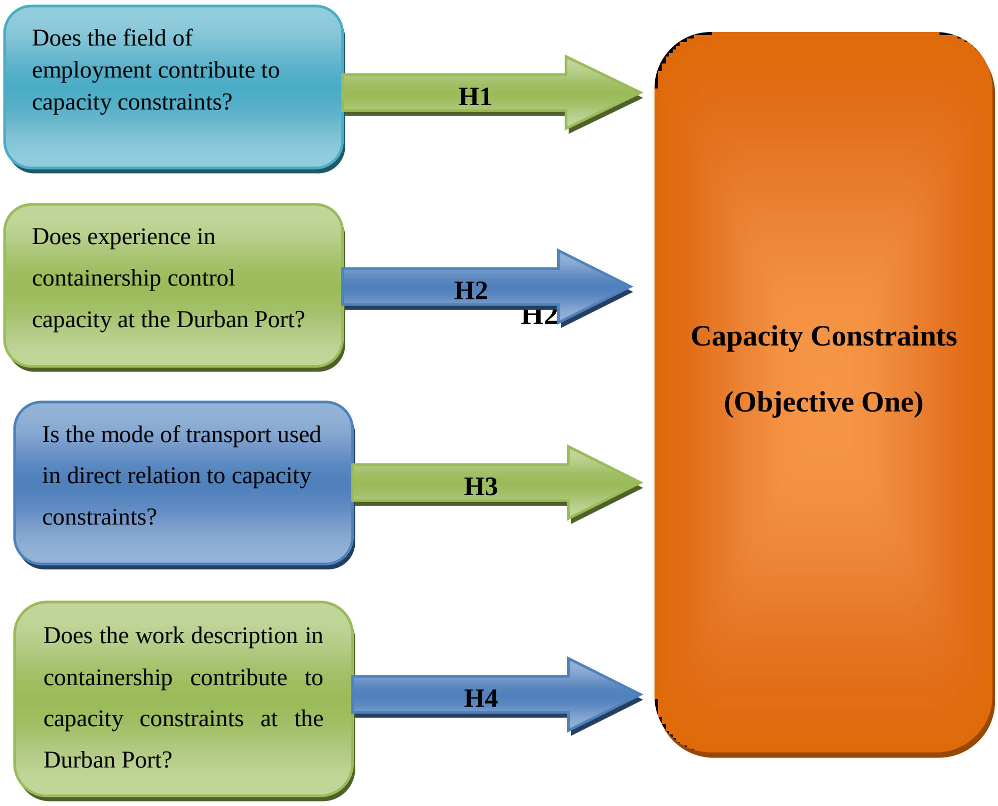
The below results are tabulated from the information analysed in terms of the relationships between variables in the cross tabulation. The table is segregated into hypothesis, the questions asked and the results generated.

Hypothesis	Questions	Results
H_{O1}: There is no relationship between field of employment and capacity constraints. **H_{A1}:** There is a relationship between field of employment and capacity constraints.	Does the field of employment contribute to capacity constraints?	This is due to the types of employment not having control over the logistics industry.
H_{O2}: There is no relationship between experience in containership and capacity constraints. **H_{A2}:** There is a relationship between experience in containership and capacity constraints.	Does experience in containership control capacity at the Durban Port?	Experience in containership allows for members to be aware of the situation at the Durban Port and to make recommendations concerning restructuring, redesign and continuous support.
H_{O3}: There is no relationship between transport mode and capacity constraints. **H_{A3}:** There is a relationship between transport mode and capacity constraints.	Is the mode of transport used in direct relation to capacity constraints?	This is based on the intermodal relationship amongst sea and road networks.
H_{O4}: There is no relationship between work description in containership and capacity constraints. **H_{A4}:** There is a relationship between work description in containership and capacity constraints.	Does the work description in containership contribute to capacity constraints at the Durban Port?	This based on the fact that the relationship between inbound and outbound transportation networks as intermodalism is synchronized with work description.
$H_{O5:}$ There is no relationship between experience in containership and intermodal containerisation. **H_{A5}:** There is a relationship between experience in containership and intermodal containerisation.	Does more experience in containership relate positively to transitional shipping and road freight transportation networks?	More experience ensures that members in the industry have the knowledge and skills to overcome any adverse circumstances in the transitional process.
$H_{O6:}$There is no relationship between transport mode and intermodal containerisation. **H_{A6}:** There is a relationship between transport mode and intermodal containerisation	Does the mode of transportation influence the intermodal containerisation networks?	Road transportation influences the intermodal containerisation process as it is commonly utilised.

Source: Designed by Researcher

Figure 5.9: Hypotheses attached to capacity constraints objective

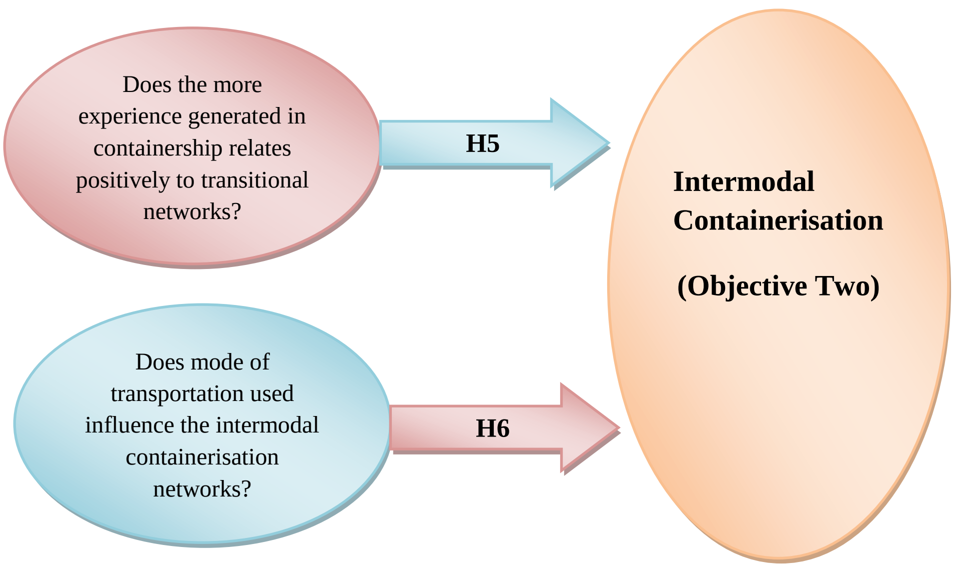
The figure below illustrates the hypothesis generated under the term of objective one namely capacity constraints.



Source: Developed by researcher

Figure 5.10: Hypotheses attached to intermodal containerisation objective

The figure below illustrates the hypothesis generated after analysis with regards to the second objective of intermodal containerisation.



Source: Developed by researcher

5.3 Inferential Statistics

Inferential statistics will cater towards the use of analysis of variance (ANOVA), multiple regression and factor analysis.

5.3.1 Analysis of Variance (ANOVA)

Analysis of variance determines an independent variable and measures the difference amongst other variables. Variance is used as a comparison with other factors as with the level of significance (Pallant, 2010:249).

Table 5.10: One way ANOVA- Excessive control by Incoterms

The table below assists in determining the difference between excessive control with customs processes and incoterms.

Descriptive statistics

Are excessive customs controls a determinant of the effective use of Incoterms?		N	Mean	Std. D	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
Least Important		37	2.946	1.104	0.182	2.578	3.314	2.00	5.00
Less Important		46	3.369	1.339	0.197	2.972	3.767	1.00	5.00
Neutral		47	3.681	1.304	0.190	3.298	4.065	1.00	5.00
More Important		36	3.833	1.276	0.213	3.402	4.265	1.00	5.00
Most Important		40	2.750	1.104	0.175	2.397	3.103	1.00	4.00
Total		206	3.325	1.290	0.089	3.148	3.503	1.00	5.00
Model	Fixed Effects			1.237	0.086	3.155	3.495		
	Random Effects				0.204	2.759	3.892		

Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
1.014	4	201	0.401

ANOVA

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		33.887	4	8.472	5.541	0.000
	Linear Term	Unweighted	0.020	1	0.020	0.013	0.909
		Weighted	0.007	1	0.007	0.005	0.945
		Deviation	33.879	3	11.293	7.386	0.000
Within Groups			307.322	201	1.529		
Total			341.209	205			

Robust Tests of Equality of Means

	Statistic	df1	df2	Sig.
Welch	5.881	4	99.076	.000
Brown-Forsythe	5.619	4	196.975	.000

Multiple Comparisons Post Hoc Tests (TUKEY HSD.)

(I)Incoterms	(J)Incoterms	Mean Difference (I-J)	Std Error	Sig.	95% Confidence Level Lower Bound	Upper Bound
Least Important	Less Important	-0.424	0.276	0.530	-1.175	0.328
	Neutral	-0.735	0.276	0.057	-1.483	0.013
	More Important	-0.887(*)	0.289	0.021	-1.684	-0.090
	Most Important	0.196	0.282	0.957	-0.580	0.972
Less Important	Least Important	0.424	0.273	0.530	-0.328	1.175
	Neutral	-0.311	0.256	0.743	-1.017	0.394
	More Important	-0.464	0.275	0.445	-1.221	0.293
	Most Important	0.619	0.267	0.144	-0.116	1.355
Neutral	Least Important	0.735	0.271	0.057	-0.013	1.483
	Less Important	0.311	0.256	0.743	-0.394	1.017
	More Important	-0.152	0.273	0.981	-0.906	0.601
	Most Important	0.930(*)	0.266	0.005	0.198	1.663
More Important	Least Important	0.887(*)	0.289	0.021	0.090	1.684
	Less Important	0.463	0.275	0.445	-0.293	1.221
	Neutral	0.152	0.273	0.981	-0.601	0.906
	Most Important	10.0833(*)	0.284	0.002	0.301	1.865
Most Important	Least Important	-0.195	0.282	0.957	-0.972	0580
	Less Important	-0.619	0.267	0.144	-1.355	,0116
	Neutral	-0.930(*)	0.266	0.005	-1.663	-0.198
	More Important	-1.083(*)	0.284	0.002	-1.865	-0.301

* The mean difference is significant at the .05 level.

Homogenous Subset- Tukey HSD (a,b)

Incoterms		N	Subset for alpha = .05 1	2	3
Tukey HSD(a,b)	Most Important	40	2.750		
	Least Important	37	2.946	2.945	
	Less Important	46	3.369	3.369	3.369
	Neutral	47		3.681	3.681
	More Important	36			3.833
	Sig.		0.162	0.060	0.441

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 40,710.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

H_{O7}: There is no difference between excessive control and Incoterms.

H_{A7}: There is a difference between excessive control and Incoterms.

One-way ANOVA uses the dependent variable of excessive control against incoterms fencing degrees of least important, less important, neutral, more importantand most important. ANOVA seeks to locate the difference amongst variables.

Table 5.10 shows the descriptive statistics with more important (3.833). The Levene’s test of homogeneity of variance (0.401) is greater than the level of significance (0.05); hence the researcher has not violated the homogeneity of variance assumption.

Therefore, there is no reason to consult the other tests linked with Robust tests of equality of means, although the Robust test of equality of Means (Brown-Forsythe and Welsh test) shows significance values (0.00) less than 0.05.

The ANOVA test was conducted between groups for excessive control and Incoterms that depicted a value of 0.000. This is less than the level of significance (0.05) hence the researcher accepts the alternate hypothesis (H_{A7}), meaning that the difference between the mean scores in the group is significant. The null hypothesis (H_{07}) is rejected. The multiple comparisons based on the variables between groups all show significance levels of greater than 0.05, hence we accept the alternate hypothesis (H_{07}).There is significant difference amongst variables but it is difficult to determine which group attracts the most variation. The post hoc test using Tukey HSD establishes the difference between least important (M = 2.9466, Std = 1.1042) and most important (M = 3.833, Std = 1.276).

The homogenous subset uses the Tukey HSD test to analyse the difference of means. The means for excessive control and Incoterms is produced on three different columns, indicating that there is significant difference between the means of the factors. Hence, the decision to accept the alternate hypothesis is maintained. The difference between excessive control and Incoterms is maintained as the maintenance and security procedures in the customs process ensure that proper protocols especially pertaining to documentation and legality are adhered to.

Table 5.11: One way ANOVA- Excessive control and security protocols

The table below assists in determining the difference between excessive control with customs processes and security protocols.

Descriptive statistics

Do security protocols at the Durban Port contribute to excessive customs control?		N	Mean	Std. D	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
Least Important		40	3.825	0.957	0.151	3.519	4.131	2.00	5.00
Less Important		32	3.625	1.184	0.209	3.198	4.052	1.00	5.00
Neutral		37	3.351	1.437	0.236	2.872	3.830	1.00	5.00
More Important		52	2.981	1.565	0.217	2.544	3.416	1.00	5.00
Most Important		45	3.044	0.952	0.141	2.758	3.330	1.00	4.00
Total		206	3.325	1.290	0.089	3.148	3.502	1.00	5.00
Model	Fixed Effects			1.259	0.087	3.152	3.498		
	Random Effects				0.167	2.859	3.790		

Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
8.70	4	201	0.000

ANOVA

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		22.609	4	5.652	3.566	0.008
	Linear Term	Unweighted	20.318	1	20.318	12.818	0.000
		Weighted	20.504	1	20.504	12.935	0.000
		Deviation	2.106	3	0.702	0.443	0.723
Within Groups			318.599	201	1.585		
Total			341.209	205			

Robust Tests of Equality of Means

	Statistic	df1	df2	Sig.
Welch	4.649	4	95.706	0.002
Brown-Forsythe	3.669	4	175.376	0.007

Multiple Comparisons Post hoc tests (Tukey HSD)

(I)Security Protocol	(J)Security Protocol	Mean Difference (I-J	Std Error	Sig.	95% confidence Interval Lower Bound	Upper Bound
Least Important	Less Important	0.200	0.298	0.963	-0.621	1.021
	Neutral	0.473	0.287	0.468	-0.316	1.264
	More Important	0.843(*)	0.264	0.014	0.115	1.573
	Most Important	0.780(*)	0.273	0.038	0.027	1.533
Less Important	Least Important	-0.200	0.298	0.963	-1.021	0.621
	Neutral	0.273	0.303	0.896	-0.563	1.110
	More Important	0.644	0.282	0.157	-0.134	1.422
	Most Important	0.580	0.291	0.273	-0.220	1.382
Neutral	Least Important	-0.473	0.287	0.468	-1.264	0.316
	Less Important	-0.273	0.303	0.896	-1.110	0.563
	More Important	0.370	0.270	0.648	-0.374	1.116
	Most Important	0.306	0.279	0.807	-0.462	1.076
More Important	Least Important	-0.844(*)	0.264	0.014	-1.573	-0.115
	Less Important	-0.644	0.282	0.157	-1.422	0.134
	Neutral	-0.370	0.270	0.648	-1.116	0.374
	Most Important	-0.063	0.256	0.999	-0.769	0.641
Most Important	Least Important	-0.780(*)	0.273	0.038	-1.533	-0.027
	Less Important	-0.580	0.291	0.273	-1.382	0.220
	Neutral	-0.306	0.279	0.807	-1.076	0.462
	More Important	0.063	0.256	0.999	-0.641	0.769

* The mean difference is significant at the .05 level.

Homogenous Subset- Tukey HSD (a,b)

Security Protocols		N	Subset for alpha = 0.05	
			1	2
Tukey HSD(a,b)	More Important	52	2.9808	
	Most Important	45	3.0444	
	Neutral	37	3.3514	3.3514
	Less Important	32	3.6250	3.6250
	Least Important	40		3.8250
	Sig.		0.152	0.446
	More Important	52	2.9808	

Means for groups in homogeneous subsets are displayed.
a.Uses Harmonic Mean Sample Size = 40,087.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

H_{O8}: There is no difference between excessive control and security protocols.
H_{A8}: There is a difference between excessive control and security protocols.

One-way ANOVA uses the dependent variable of excessive control against security protocols, fencing degrees of least important, less important, neutral, more important and most important. The ANOVA seeks to locate the difference amongst variables. Table 5.11 shows descriptive statistics with least important (3.825). The Levene's test of homogeneity of variance (0.000) is less than the level of significance (0.05), hence the researcher has violated the homogeneity of variance assumption. This requires that the Robust test of equality of means (Brown-Forsythe and Welsh test) be conducted. According to the statistics, the levels of Brown-Forsythe (0.002) and Welsh (0.007) are less than the significant value (0.05).This controls the inherent fact that there is difference between excessive control and security protocols.

The ANOVA test was conducted between groups for excessive control and security protocols that depicted a value of 0.008. This is less than the level of significance (0.05), hence the researcher accepts the alternate hypothesis (H_{A8}) meaning the difference between the mean scores in the group is significant. The null hypothesis (H_{08}) is rejected. The multiple comparisons based on the variables between groups all show significance levels of greater than 0.05, hence we accept the alternate hypothesis (H_{08}).There is significant difference amongst variables but it is difficult to determine which group attracts the most variation. The post hoc test using Tukey HSD ensures the difference between least important (M = 3.825, Std = 0.957) and most important (M = 3.044, Std = 1.952).

The homogenous subset uses the Tukey HSD test to analyse the difference of means. The means for excessive control and security protocols is produced on two different columns, indicating that there is significant difference between means of factors contained. Hence, the decision to accept the alternate hypothesis is maintained.

The difference between excessive customs control systems and securityprotocols, is constantly maintained as without efficient security at the Durban Port, the customs process will not be effective.

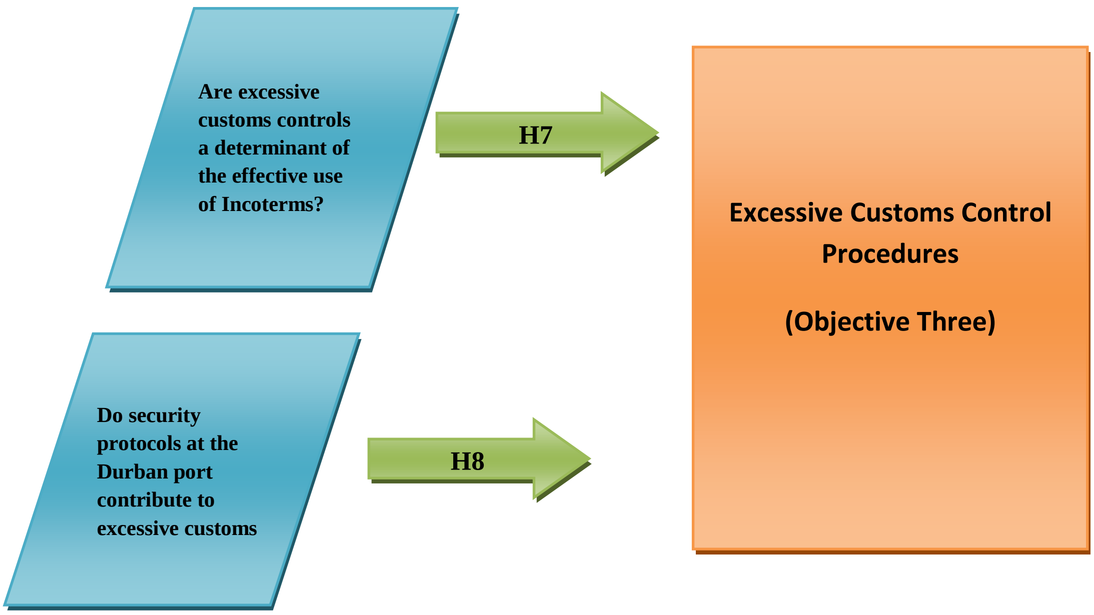
Table 5.12: Hypothesis results for One way ANOVA

The table constructed below indicates the hypothesis generated from the tests of ANOVA. This depicts the hypothesis of positive and negative, the questions asked in the hypothesis and the results generated.

Hypothesis	Questions	Results
H_{O7}: There is no difference between excessive customs control and incoterms. **H_{A7}:** There is a difference between excessive customs control and incoterms.	Are excessive customs controls a determinant of the effective use of Incoterms?	Incoterms assists in merging communication on an international level hence with clearing shipments; the need for correct terms will be enforced.
H_{O8}: There is no difference between excessive customs control and security protocols. **H_{A8}:** There is a difference between excessive customs control and security protocols.	Do security protocols at the Durban Port contribute to excessive customs control?	Security at the Durban port is well imposed to ensure that restricted areas are cordoned off with limited public access for the customs process to be interfaced.

Figure 5.11: Hypotheses attached to excessive customs control objective

The figure below illustrates the hypothesis generated in terms of the third objective that is excessive customs control.



Source: Designed by the researcher

5.3.2 Multivariate Analysis

5.3.2.1 Multiple regression on intermodal port containerisation

Multiple regressionsare a weighting equation used to generate the relationship between a dependent variable and many independent variables in order to distinguish models in the elements (Cooper and Schindler, 2010:546).

Table 5.13: Correlations for Multiple regression

The table below shows the results of questions from the ranking aspects to show the correlation between the variables in multiple regression.

Pearson Correlation	IIPC	2OC	3S	4CIL	5CDT	6TDD	7IOC	8TCT	9DPP	10RD
1IPC	1.000	0.070	0.156	0.477	0.625	0.591	0.533	0.438	0.277	0.184
2OC	0.070	1.000	0.507	0.368	0.106	0.234	0.127	0.358	0.146	0.233
3S	0.156	0.507	1.000	0.547	0.306	0.373	0.340	0.324	0.141	0.191
4CIL	0.477	0.368	0.547	1.000	0.616	0.502	0.388	0.424	0.169	0.237
5CDT	0.625	0.106	0.306	0.616	1.000	0.468	0.371	0.418	0.205	0.235
6TDD	0.591	0.234	0.373	0.502	0.468	1.000	0.637	0.484	0.282	0.307
7IOC	0.533	0.127	0.340	0.388	0.371	0.637	1.000	0.602	0.256	0.244
8TCT	0.438	0.358	0.324	0.424	0.418	0.484	0.602	1.000	0.482	0.487
9DPP	0.277	0.146	0.141	0.169	0.205	0.282	0.256	0.482	1.000	0.724
10RD	0.184	0.233	0.191	0.237	0.235	0.307	0.244	0.487	0.724	1.000
	206	206	206	206	206	206	206	206	206	206

1IPC- Intermodal port containerisation; 2OC- Overweight Containers; 3S- Stowage; 4CIL- Cargo insurance and liability; 5CDT- Cargo dwelling time; 6TDD- Technological docking delays; 7IOC- in-transit overweight containers; 8TCT- Transition cycle time; 9DPP- Durban port profitability; 10RD- Road design

The correlations between variables are viewed as a normal correlation relationship. All statistics tend to range positively for Pearson product movement correlation. The level values follow suit with moderate relationships with the dependent variable (intermodal port containerisation), showing values ranging from 0.070 to 1.625 of highest correlation with cargo dwelling time. The normality of relationships relies on the strength of significance values to control the independent variables. All factors are closely related and correlated with each other. The variables not in close correlation are overweight containers with cargo dwelling time and intermodal port containerisation and in-transit overweight containers. This decides the relationship with inbound and outbound transportation networks and is comprehensively decided by making use of the dependent variable intermodal port containerisation. This dependent variable is conducive to acknowledging information that is loosely correlated.

Table 5.14: Statistics on model summary, coefficients and ANOVA for Multiple regression

The table below assists in generating results for multiple regression with the help from model summary, coefficients and ANOVA.

Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R^2 Change	F Change	df1	df2	Sig. F Change	
1	.625(a)	.390	0.387	0.57740	0.390	130.427	1	204	0.000	
2	.710(b)	.504	0.499	0.52196	0.114	46.634	1	203	0.000	
3	.728(c)	.530	0.523	0.50930	0.026	11.219	1	202	0.001	
4	.745(d)	.555	0.546	0.49709	0.024	11.045	1	201	0.001	1.933

Coefficients

Models		Unstd Coef			Correlation			Collinearity Statistics	
		Beta	T	Sig.	Zeroorder	Partial	Part	Tolerance	VIF
4	(Constant)		1.409	0.160					
	CargoDwellingTime	0.452	8.350	0.000	0.625	0.507	0.393	0.755	1.324
	TechnologicalDockingDelays	0.292	4.472	0.000	0.591	0.301	0.211	0.519	1.928
	In-transitOverweightContainers	0.237	3.828	0.000	0.533	0.261	0.180	0.578	1.729
	Stowage	-0.172	-3.323	0.001	0.156	-0.228	-0.156	0.825	1.213

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	43.483	1	43.483	130.43	0.000(a)
	Residual	68.012	204	0.333		
	Total	111.495	205			
2	Regression	56.189	2	28.094	103.12	0.000(b)
	Residual	55.307	203	0.272		
	Total	111.495	205			
3	Regression	59.099	3	19.700	75.95	0.000(c)
	Residual	52.397	202	0.259		
	Total	111.495	205			
4	Regression	61.828	4	15.457	62.55	0.000(d)
	Residual	49.667	201	0.247		
	Total	111.495	205			

. Predictors: (Constant), Cargo Dwelling Time
b. Predictors: (Constant), Cargo Dwelling Time, Technological Docking Delays
c Predictors: (Constant), Cargo Dwelling Time, Technological Docking Delays, In-transit Overweight Containers
d Predictors: (Constant), Cargo Dwelling Time, Technological Docking Delays, In-transit Overweight Containers, Stowage
e Dependent Variable: Intermodal Port Containerisation

Multiple regression was used to determine the relationship between one dependent variable and various independent variables. The dependent variable (intermodal port containerisation) has isolated four independent variables, namely, cargo dwelling time, technological docking delays, in-transit overweight containers and stowage.

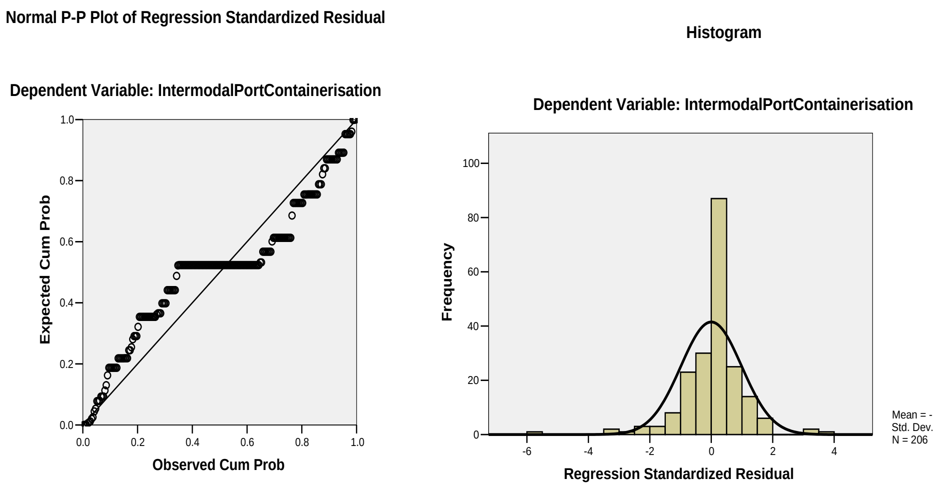
In order to depict whether multicollinearity exists, a test is brought on by collinearity statistics of tolerance and variance inflation factor (VIF). Judging from the two models shown with coefficients, the tolerance level (1.000) is much greater than 0.10 which depicts that the multiple correlations with variables are low; hence the factor of multicollinearity is omitted. The variance inflation factor (1.000) depicts values below 10; hence there is no concern of multicollinearity in the analysis. Using the dependent variable, the four models generated positive coefficients for independent variables in conjunction with intermodal port containerisation.

The model summary explains the variance of the intermodal port containerisation in relation to model one of cargo dwelling time, model two of cargo dwelling time and technological docking delays, model three of cargo dwelling time, technological docking delays and in-transit overweight containers and model four of cargo dwelling time, technological docking delays, in-transit overweight containers and stowage. In model one cargo dwelling time has 39% of the variance in the intermodal port containerisation. In model two, cargo dwelling time and technological docking delays has 49.9% variance in intermodal port containerisation. In model three, cargo dwelling time, technological docking delays and in-transit overweight container has 52.3% of the variance in the intermodal port containerisation. The final model, cargo dwelling time, technological docking delays, in-transit overweight containers and stowage has 54.6% of the variance in the intermodal port containerisation.

Model one (cargo dwelling time) includedthe R square (0.625), adjusted R^2(0.387),*F*= 130.427 with degree of freedom (1; 204) with a significance value (0.000) at $p<0.05$. Model two (Cargo Dwelling Time, Technological Docking Delays) included R square value (0.504), adjusted R^2 (0.499), F = 103.12 with degree of freedom (2; 203) at $p<0.05$ (0.000). Model three (cargo dwelling time, technological docking delays and in transit overweight containers) included the R square (0.530), adjusted R^2 (0.523), *F* = 75.95 with degree of freedom (3; 202) with a significance value (0.000) at $p<0.05$. The final model (cargo dwelling time, technological docking delays, in transit overweight containers and stowage) included the R square (0.555), adjusted R^2 (0.546), *F* = 62.55 with degree of freedom (4; 201) with a significance value (0.000) at $p<0.05$.

In the Durbin-Watson test, the autocorrelation amongst variables as noted to be between zero and four. The Durbin Watson (1.933) is centralised at a value closer to 2; hence there is no serial autocorrelation.

Figure 5.12: Normal P-Plot and Histogram for multiple regression



The assumption can also be analysed with the use of a normal probability plot of regression standardised residual; the points on the plot reasonably lie on the linear graph from the bottom left to the top right and hence a case of normality is in order. The histogram maintains points between the ranges of -3.3 and +3.3; hence the introduction of outliers is abolished. The analysis of data for multiple regression above considers that there was no breach to the assumptions regarding multicollinearity, normality, linearity and homoscedasticity; hence a formation of four models was formed with regards to one dependent variable.

Table 5.15: Residual statistics

Residual statistics seen in the table below shows the existence of outliers between variables.

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.9600	5.1863	4.5049	0.54918	206
Residual	-2.85749	1.92158	0.00000	0.49222	206
Std. Predicted Value	-2.813	1.241	0.000	1,000	206
Stud. Residual	-1.049	8.861	0.003	1.027	206
Residual Deleted	-3.023	2.1628	0.00003	0.65894	206
Stud. Deleted Residual	-3.105	5.685	0.000	1.056	206
Mahal. Distance	0.072	12.523	1.993	2.006	206
Cook's Distance	0.000	2.388	0.020	0.008	206
Centered Leverage Value	0.001	0.149	0.005	0.003	206

Dependent variable: Intermodal port containerisation

The determination of the existence with outliers is established with the residual statistics and mahalanobis distances. The outliers can be further analysed with the identification of the normal probability plot seen in figure 5.11. As examined and interpreted, there are no outliers that exist as part of the diagram.

The study has residual value (min = -2.85749 and max = 1.92158), with all factor values falling between the norm of outliers (-3.00 or +3.00). The mean (0.0000) with standard deviation (1.000) forms a close correspondence to a standardised predicted value. Cooks distance has a measureable category of values (min = 0.000 or max = 2.388) with a mean (0.020) indicating less than one; hence no large effect on outliers is exhibited. Mahalanobis distance ensures that the higher values have higher differentiation from average values. Therefore, the mahalanobis distance in this study shows min = 0.72 and max = 12.523.

Table 5.16: Case-wise diagnostics for residual statistics

Case-wise Diagnostics

Case Number	Std. Residual	Intermodal Port Containerisation	Predicted Value	Residual
76	-5.748	1.00	3.8575	-2.85749
150	-3.333	3.00	4.6570	-1.65704
173	3.126	5.00	3.4463	1.55372
174	3.040	5.00	3.4889	1.51108
176	3.866	5.00	3.0784	1.92158
188	-3.216	2.00	3.5988	-1.59884

a. Dependent Variable: IntermodalPortContainerisation

The cases mentioned are normal based on the residuals being between +3 and -3, namely,-2.85749, -1.65704, 1.55372, 1.51108, 1.92158 and -1.59884. Table 4.16 shows that the predicted value isbelow the intermodal port containerisation scoring; therefore, the prediction of scores was less than actual scoring.

Table 5.17: Multiple regression equation

Intermodal Port Containerisation- Equation
$y=A+Bx_1+Bx_2+Bx_3+Bx_4$
Y= Intermodal port containerisation (1.409)+ Cargo dwelling time (0.452) + Technological docking delays (0.292) + In-transit overweight containers (0.237) + Stowage (0.172)
Y= 1.409+ 0.452+0.292+0.237+-0.172

5.3.3 Factor Analysis

Table 5.18: Factor Analysis for Interval scales

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.717
Bartlett's Test of Sphericity	Approx. Chi-Square	799.382
	Df	45
	Sig.	0.000

Total Variance Explained (Extraction Method: Principal Component Analysis)

Component	Initial Eigenvalues		
	Total	**% of Variance**	**Cumulative %**
1	3.864	38.637	38.637
2	1.394	13.942	52.578
3	1.278	12.779	65.357
4	1.051	10.510	75.868
5	0.675	6.748	82.616
6	0.493	4.934	87.550
7	0.461	4.608	92.158
8	0.332	3.322	95.480
9	0.247	2.466	97.945
10	0.205	2.055	100.000

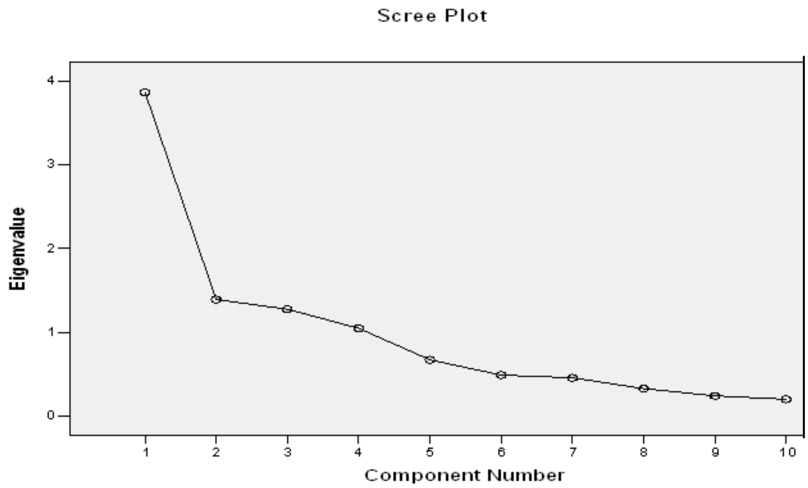
Communalities

	Initial	Extraction
Overweight Containers	1.000	0.794
Stowage	1.000	0.761
Cargo Insurance And Liability	1.000	0.932
Cargo Dwelling Time	1.000	0.634
Intermodal Port Containerisation	1.000	0.765
Technological Docking Delays	1.000	0.688
In-transit Overweight Containers	1.000	0.661
Transition Cycle Time	1.000	0.666
Durban Port Profitability	1.000	0.845
Road Design	1.000	0.840

Table 5.18 indicates the layout for factor analysis using two tests. The first test is the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) which needs a value greater than 0.6. The KMO value (0.717) that is rounded off (0.70) shows that sampling adequacy is implemented. The second test is the Bartlett Test of Sphericity ($0.00<0.05$) and is considered significant at degrees of freedom (45). The factor matrix determines four components with loadings. The *p*-value (0.000) is considered less than the level of significance (0.05). The Cronbach's alpha (0.851) is rounded off (0.80) means that a high level of consistency for reliability is obtained with factors.

In order to determine which values require extraction as part of factor analysis, the value of eigenvalue is generated. The components that exceed 1 are extracted. In this analysis, components 1, 2, 3 and 4 have eigenvalues greater than 1and relate to 3.864, 1.394, 1.278 and 1.051. These four components explain a total variance of 75.868. The components are extracted using the principal component matrix. Eigenvalues greater than or equal to one are retained due to the interpretation of analysing factors.

Figure 5.13: Scree plot for Factor analysis



In the analysis of the screeplot (Figure 5.13), it is evident that after the first component, there is an extreme downward sloping curve that goes further downhill to components 2, 3 and 4. Components 1, 2, 3 and 4 capture the majority of the variance that is obtained on the scree plot.

Table 5.19: Rotated component matrix for Factor Analysis

Factors	**Components**	**% of variance**	**Extraction**
Factor One: Intermodal cargo containerisation		38.637	
Cargo Dwelling Time	0.759		0.634
Intermodal Port Containerisation	0.865		0.765
Technological Docking Delays	0.766		0.688
In-transit Overweight Containers	0.751		0.661
Factor Two: Durban road profitability		13.942	
Transition cycle time			0.666
Durban Port Profitability	0.903		0.845
Road Design	0.898		0.840
Factor Three: Overweight stowage		12.779	
Overweight Containers	0.860		0.794
Stowage	0.820		0.761
Factor Four: Cargo insurance and liability		10.510	
Cargo insurance and liability	0.964		0.932

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.851	0.849	10

Table 5.19 indicates the components that are extracted into four parts as every variable is decided on in terms of values. Component 1 has extracted factors from interval scaling which include cargo dwelling time (0.759), intermodal port containerisation (0.865), technological docking delays (0.766) and in-transit overweight containers (0.751).The second component consists of Durban Port profitability (0.903) and road design (0.898). The third components are overweight containers (0.860) and stowage (0.820).The last factor was cargo insurance and liability (0.964). The extraction is obtained using the principal component matrix and varimax.

The meaning of each factor in the rotated component matrix extracted using the principal matrix analysis and varimax technique should be relational. Each factor loading should be appropriately named.

5.3.3.1 Interpretation of factors

Factor 1: Intermodal cargo containerisation

The most important factors from the component matrix comprise cargo dwelling time, intermodal port containerisation, technological docking delays and in-transit overweight containers. The first factor merely describes the relation between elements such as technological errors that contribute to cargo dwelling time and is a major feature in the automated activities. The in-transit overweight containers promote the delays exhibited in the delivery of cargo and the dwelling time; larger, overweight shipments take longer to be cleared as more documentation is required. Intermodal port containerisation occurs between inbound and outbound containerisation and the transition exhibited and this is mainly attributed to technological delays occurring at the Port premises.

Factor 2: Durban road profitability

The second component is Durban Port profitability and road design. The feature of the elements contributes towards the outbound transportation formas road transportation is a contributor to the design of roads, especially in relation to accidents and conducting business in theareas surrounding the port. Durban Port profitability is the fertility of road transportation networks that operate in the industry but due to the expenses that are largely attained; the linkage towards unprofitable business is strongly viewed.

Factor 3: Overweight stowage

The containers that are placed on shipping lines have to be stacked accordingly. If the containers are overweight and are stacked inappropriately, this will result in stowage overboard and resultant damage.

Factor 4: Cargo insurance and liability

Cargo insurance and liability relate to the inbound and outbound transition process at the Durban Port. Insurance plays an important role in the movement of cargo from point of origin to the point of destination.

5.4 Reliability

Reliability is a measure of goodness to determine consistency using Cronbach'sAlpha.

Table 5.20: Cronbach's Alpha

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.851	0.849	10

Reliability measures the test of goodness with regards to multiple regression. Table 5.20 shows that the Cronbach's Alpha is 0.851 which is less than 1. Therefore the level indicates a moderate to high level of internal consistency for reliability with the use of the independent variables listed as 10 items and the one dependent variable listed as intermodal port containerisation.

Table 5.21: Item-Total Statistics for Reliability

Item-Total Statistics for reliability

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Overweight Containers	40.9466	15.163	0.345	0.377	0.854
Stowage	41.0485	14.603	0.481	0.466	0.843
Cargo Insurance And Liability	41.1845	13.585	0.645	0.567	0.829
Cargo Dwelling Time	41.1699	13.966	0.584	0.550	0.834
Intermodal Port Containerisation	41.1505	13.436	0.580	0.582	0.835
Technological Docking Delays	41.1117	13.241	0.679	0.551	0.825
In-transit Overweight Containers	41.1553	13.781	0.608	0.577	0.832
Transition Cycle Time	41.0777	13.496	0.691	0.577	0.825
Durban Port Profitability	41.0097	14.956	0.441	0.571	0.846
Road Design	41.0437	14.696	0.460	0.577	0.845

The column noting Cronbach's Alpha if the item is deleted represents the value of reliability if the specific item was removed. Therefore, it is evident that the removal of any item would reduce the Cronbach’s Alpha by a significant amount. The corrected item total correlation is lowest at overweight container of 0.345. This may allow a decision as to whether the independent variable should be detached.

5.5 Validity

Construct validity is used in the measure for goodness as the consideration of theory and instruments is taken into account (Cooper and Schindler, 2010:290). The methods used are factor analysis and multivariate analysis. From factor analysis and multiple regression, it is evident that the measures used are valid based on the interpretation of results.

5.6 Conclusion

The use of measuring instruments is important when analysing information. Univariate, bivariate and multivariate analysis was undertaken in order to interpret data and format results. Univariate analysis uses frequency distribution and descriptive statistics. Bivariate analysis uses cross tabulation with Chi-square and analysis of variance (ANOVA). Multivariate analysis is Pearson product-movement correlation, factor analysis and multiple regression based on interval scaled items using reliability. The results analysed in this chapter will be further interpreted with the use of research objectives and hypotheses in order to determine accurate results. The results will be discussed with the use of literature in terms of inbound and outbound transportation networks so that recommendations for future research and to the logistical industry can be determined.

Chapter Six
Discussion of Results

6.1 Introduction

This chapter presents the discussion of results that is conducted in order to determine findings that establish if there was correct implementation of measurement. The results control the standing of variables within the context of the effects of intermodal transportation networks on inbound and outbound Durban containerisation. The objectives of the study and the findings of the literature review were amalgamated with the interpretation of data to discuss the results.

6.2 Discussion relating to research objectives and hypotheses

The following information presented relates to the discussions according to the objectives and the hypotheses maintained throughout the study. This has been taken into consideration when discussing figures pertaining to certain elements in the study.

6.2.1 Effects of capacity constraints on transitional inbound and outbound containerisation within the Durban harbour intermodal networks

This analysis makes use of variables that are analysed with measuring instruments. The objective to identify the effects of capacity constraints was the basis for cross tabulation for data analysis. Therefore keeping in mind cross tabulation and the literature, the factors were discussed as part of the hypothesis generated.

Based on the literature and the analysis provided, capacity constraints are predominantly apparent during the transition from inbound transportation to outbound transportation. Respondents of 92.20% from the industry agreed that capacity constraints pose a threat to the inbound and outbound movement of containers. The respondents consisted of major players in the industry that link directly with both the inbound and outbound networks. The study's results demonstrate that capacity within the port is a major concern among transportation networks.

Respondents with between four and six years' experience (37.40%) expressed concern regarding capacity constraints. This suggests that those who are fairly new to the industry find it more difficult to deal with such constraints than individuals who are more experienced. Respondents with more than ten years experience noted that with knowledge, comes new friends that are able to help address capacity issues. This is particularly helpful when it comes to the customs process.

The two most common modes of transportation are road (73.3%) and water (13.1%). Road transportation contributes to congestion in the terminal bays and the influx of larger 40-foot trailers has exacerbated the situation. Water transportation has also increased substantially.

Individuals working in the industry with specific reference to delivery and transport (42.7%) have been compounded to capacity constraints as a factor. The respondents from both inbound and outbound operations have a close working relationship with transitional port activities.

The study revealed that capacity constraints are a major cause of prolonged cargo dwelling time and cycle time for road transportation networks, technological errors, port congestion, infrastructural capabilities, customs processes and the use of incoterms.

The longer dwelling time results in the irrational movement of containers. Overweight containers clog the port and harbour. Scheduling is affected and containers are placed incorrectly so that clearance becomes more difficult and dwelling time is longer. This was demonstrated by the positive mean above 4 (4.4854) for cargo dwelling time whilst delivery time is commonly applicable to the road transportation networks. The delivery and cycle time is prolonged as containers are held at the Durban Port for various reasons, including incorrect documentation or overweight capacity. The mean (4.5777) is relatively high in this regard, suggesting that the factors are closely aligned and result in unnecessary delays.

The Port of Durban is the common place of entry for both inbound and outbound networks and technological factors play a major role in ensuring that movement is coordinated efficiently. 85.40% of the respondents agreed that technological errors have contributed to capacity constraints. The NAVIS SPARCS system introduced to streamline inbound and outbound networks' activities has unfortunately been a major contributor to the malfunctioning of the transitional process. Constant upgrades have exacerbated capacity constraints and have caused major shipping lines to bypass the Durban port in order to ensure that they remain on schedule. Individuals working at terminals find it difficult to cope with manual methods.

It is acknowledged that congestion is closely aligned with the capacity problems witnessed at the Durban Port. There is also a relationship between such constraints and intermodal containerisation relating to inbound and outbound transportation networks. Increased cargo dwelling time is noted as another side effect of capacity constraints and port congestion. Constant rescheduling is required to allow shipping lines to finally dock at the Durban Port rather than bypassing the terminals to offload at the Port of Cape Town. Overweight containers raise legal and liability issues.

With overweight containers (m = 4.708) having a less than significant level, it is noted that the road transportation networks contribute to accidents, road damage, and legal and liability claims. Overweight containers need to be subjected to legal weighbridge protocols. The Durban Port is the common ground in the transition from inbound to outbound transportation. Overweight containers contribute to capacity constraints that affect shipping lines, the Port and road networks. The shipping lines are affected by stowage (m=4.607) overboard as larger containers are placed at the top with lighter containers acting as the base of the stack. Larger containers require longer procedures and this, results in more containers being held at terminals, bays and the harbour, contributing to capacity constraints and congestion. Finally, road transportation networks bear the brunt of legal issues, stemming from the fact thatthe South African Police Service (SAPS) and Metro Police continuously make examples of logistical companies. Therefore, port congestion has contributed significantly to the capacity constraints faced by both the inbound and outbound transportation networks.

The lack of infrastructural capabilities at the Durban Port and the constant influx of containers mean that capacity is a major concern. 37.90% of the study respondents identified infrastructural capabilities as the most important factor causing capacity constraints. The ongoing development of the Durban Port and the areas surrounding the Bayhead, especially in terms of storage facilities is very important as the industry is currently unable to cope and customers are constantly disappointed with service delivery.

The customs process at the Durban Port determines whether containers are held at bonded facilities in close proximity to the port or are continuously movedin response to capacity constraints. Customs officials flag the system for commodities that are suspicious or if the importer is in default. Many importers are stopped for customs checks, thereby prolonging the process. The documentation needs to be in order, for example, it should have correct incoterms for the calculation of charges. High value commodities or those for final use such as garments are held for long periods of time in order for inspections to be conducted. This exacerbates the long queues of incoming containers as well as transport networks to collect the shipments. This has had negative effects in the Bayhead area. Only 35.40% of the study respondents felt that prolonged customs procedures are the least important reason for the port's capacity constraints.

Therefore, the effects of the capacity constraints on transitional inbound and outbound containerisation within the Durban Port intermodal networks are noted to be cargo dwelling time and cycle time for road transportation networks, technological deficiencies, Port congestion, infrastructural capabilities, customs process and the use of Incoterms.

This can result in service delivery problems, traffic overflow in key areas, liability and legal claims, accidents and infrastructural damage.

6.2.2 Establish the intermodal relationship of containerisation between the transitional shipping and road freight transportation networks

The second objective of this study answers the research questions based on the cross tabulation methods within the data analysis. The intermodal relationship between shipping and road transportation networks can be understood by posing basic biographical questions as well as examining the factors inhibiting perfect correlation with stowage, cargo insurance and liability, cargo dwelling time, technological docking delays, in-transit overweight containers, transitional cycle time, Durban Port profitability and road design.

Respondents of 36.40% with four to six years' experience agreed that there is an intermodal relationship of containerisation between inbound and outbound transportation networks. Freight forwarders in the industry usually establish relationships with shipping and road networks in order to continuously expand service delivery. These transportation partners need to coordinate their operations, from loading onto terminal bays for collection to final delivery to customers. The longer their experience, the more successful such partnerships are, promoting cost effectiveness.

The mode of transportation also forms a consistent relationship, with roads (71.8%) and water (13.6%) used for intermodal containerisation. Industry members tend to favour the road networks due to the fact that they have negotiated good prices with local agents and the level of service delivery. The majority of sea transport networks are large, international operators, with small offices in local regions that negotiate with clearing and forwarding agents. Sea networks have longer transit times and are less able to estimate delivery times than road and air transportation.

Stowage (0.156) at the point of correlation with intermodal containerisation is an on-going problem, with overweight containers onboard shipping vessels. When containers are overweight, stacking and scheduling are not aligned, resulting in stowage overboard, particularly in inclement weather. Stowage increases cargo insurance and liability claims (0.477). All these factors impact the intermodal relationship between inbound and outbound transportation.

Cargo dwelling time (0.625) is an important factor in maintaining the relationship between transportation networks. When clearing and forwarding agents experience delays in the transportation of containerised commodities *via* shipping networks, these delays impact the road transport networks responsible for the final delivery of containers. Therefore, the relationship between the networks needs to be maintained in order to improve service delivery. Difficulties with technological docking procedures (0.591) such as the NAVIS SPARCS system as well as the failure to ensure that a manual backup system is in place prolongs the turnaround time. The outbound networks are affected as long queues form to load the docked containers.

In-transit overweight containers (0.533) and transitional cycle time (0.438) have a direct association with inbound and outbound networks as containers are offloaded at terminals. When overweight containers are transported through the Durban port customs procedures are prolonged. This also impacts road networks and liability costs are incurred. Furthermore, this results in delays in offloading, customs and loading onto networks.

Durban port profitability (0.277) and road design (0.184) relate specifically to road networks as transportation is seen as a major cost for international trade. The design of the roads around the Durban Port is not conducive to efficient transportation, thus impacting profitability.

6.2.3 Examine the role of the Durban Port customs systems in cargo clearing and forwarding processes

The third objective was achieved using analysis of variance (ANOVA). This shows the customs processes and procedures in conjunction with clearing and forwarding agents and their various roles. The literature review and data analysis assisted in answering the research question on how the Durban Port customs system influences the cargo clearing and forwarding procedures. The factors viewed with respect to customs clearance procedures weredependent on the excessive control strategies based on incoterms and security protocols.

Incoterms (levenes: 0.401, sig = 0.000) does not violate the homogeneity test, illustrating the partnership with customs clearance processes. Incoterms are common international commercial terms that facilitate communication among industry players. If incorrect Incoterms are utilized, incorrect shipping and transportation methods will be evident. This iscrucial for most business enterprises in the sector, especially for customs processes when officials issue release documents and determine duties and taxes. Duties and taxes are formulated on the basis of costs; therefore Incoterms need to be stated at the outset. Importers needs to be aware of these terms so as to ensure smooth customs processes and improve their relationship with clearing and forwarding agents as these agents issue estimates for final costs and quotations.

Security protocols (levene's: 0.000, sig = 0.008) also need to be ascertained. These prevent the importation of illegal and hazardous substances into the country. Customs processes aim to curb the infiltration of such substances as well as the importation of counterfeit products. An extensive, four-level searching procedure for containers has been adopted. The customs procedures require all documents and invoices relating to the goods to be produced. Over the past few years, clearing and forwarding agents have been playing the role of customs officials to ensure that all goods that are imported into South Africa comply with the requirements. This reduces the time goods take to pass through customs as less time is spent going to and fro to generate paperwork for the release of shipments. The clearing and forwarding agents act on behalf of customers to ensure that everything is in order so that containers are transported timorously. It should be noted, however, that the increase in bribery and crime at the Durban Port has led to a tightening of security, with access to some areas being restricted to authorised individuals. New technology has also been introduced to enhance security.

Customs processes play an important role in clearing and forwarding processes. All documentation needs to be in order before a container is cleared for release and agents play an important role in this regard. Unfortunately, some customs officials accept bribes to clear commodities more quickly; this is a reflection of the broader problem with corruption in South Africa.

6.3 Conclusion

The objectives set out at the beginning of the study have been achieved through the use of measuring instruments for the analysis of data and the literature review. The data analysis was based on these objectives in order to solve the research problem and answer the research questions. The literature provided a framework for the understanding of each objective that contained variables. This enabled the researcher to justify the results.The recommendations are based on the study's findings and is clearly depicted based on the discussion featuring the literary component and the data analysis. The conclusions justify the research findings and contribute to the logistical industry by ensuring future research is welcomed.

Chapter Seven

Conclusion and Recommendations

7.1 Introduction

This research study contributes positively to the intermodal logistics industry in the Durban region. Although some limitations and delimitations were identified, strong conclusions were drawn regarding inbound and outbound transportation networks and Durban containerisation. Based on the knowledge gained, future research could assist the industry.

7.2 Conclusions on the major findings

7.2.1 Conclusions based on literature review

The effects of intermodal transportation on inbound and outbound Durban containerisation describe the issues associated with the transition of transportation from shipping to road networks. The literary aspect experienced explains the background of containerisation and the impact of containers of various types within the transportation sector.

The Durban inbound network enlightens the aspect of shipping networks in the logistics industry and the support provided to international trade using the network. The effects noticed with the shipping networks include overweight containers, mishandling and incorrect stacking, cargo insurance, port congestion and capacity constraints, cargo dwelling time, customs and port corruption as well as technological defects. The variables incorporated with inbound transportation networks affect the transitional movement of containers from one link to another. The freight forwarder and incoterms follow suit an important aspect of inbound transportation as proper documentation and reliable sources for tracking is required. The solutions recommended for commonality to occur at the Durban port is more affluent to infrastructural development, harbour reconstruction and customs procedure.

The Durban outbound network portrays the role of the road transportation network in the logistical industry. The limitations of the road network are maintained when there is a limited weight restriction on national and public roads. The legislation system effective in South Africa ensures strict rules are applied to small companies with weighbridge facilities. The road networks face constraints of overweight containers, loading delays at the port, traffic congestion on roads, cycle and delivery time delays and unprofitable road transportation networks. This constricts the transitional domino effects of transportation between inbound and outbound networks.

The transportation networks discussed in the literature has commonality to the lack of port facilities and proper technological advancements. The recommendations to the issues pertaining to the Durban port can be well included to deduce solutions for effective alteration from one network to another.

7.3 Recommendations

7.3.1 Recommendations on the study conducted

The recommendations provide suggestions for various improvements that address the issues identified in this study's findings. These include recommendations made by industry players from interview questions in relation to containerisation and intermodal networks. The suggestions for future research show how the study can contribute to further research. Based on the analysis of the data and the discussion of the results, the objectives were achieved and the research questions were answered. The study identified the problems in the Durban port in relation to the inbound and outbound networks for the delivery of containers.

Capacity constraints at the Durban Port have affected the major players in the industry due to holding and storage of containers or prolonged cycle times. The perishable goods sector is most affected as they incur excessive demurrage charges. Clearing and forwarding agents are feeling the pinch. While road transportation networks were previously able to rotate five loads to and from the Durban Port, due to the longer standing time, they are now only able to do one. Infrastructural development is critical in alleviating these capacity constraints. This includes the new dug out port that should have been started 10 years ago when the increase in global trade became apparent. More storage facilities should be provided, especially for containers that are delayed by customs processes and are not given free storage. Specific areas should be set aside for different types of containers such as reefers, 20 foot and 40 foot containers and break bulk commodities. Industry players have called for more storage facilities for containerised shipments in order to ease congestion. The release of containers to the areas surrounding the Durban Port needs to be properly facilitated in order to maintain service levels.

The deficiencies of the technological systems introduced at the Durban Port are said to constrain the inbound and outbound movement of containers. Industry players noted that although it is currently experiencing problems, once the NAVIS SPARCS system is fully installed and correct implemented, it should work well. However, efficient manual systems should be in place in order to cater for power outages and other problems. The NAVIS system needs to be constantly updated with new shipments ready to be loaded and offloaded; if such shipments are not entered on the system, the containers cannot be released.

Clearing and forwarding agents will incur demurrage charges and suffer damage to their reputation. Therefore, the systems need to be fully implemented and on-going training should be provided on the use of both the system and manual operating methods.

Overweight containers cause infrastructural damage and incur legal sanctions. Government has adopted regulations that specify the weight of containers in-transit. The containers imported to South Africa should therefore not exceed the legal capacity. Those that do so should be subject to deportation. This problem should be solved at the first stage of transportation as the cargo arrives at the Port of Durban. Every facility that is used to transport containers should have weighbridge systems. Overweight containers can increase the costs incurred by different organisation's; therefore containers with a full capacity should be weighed before dispatch.

The customs clearance procedure is efficient to a certain extent with limited smuggling activities. The main area of concern is bribery and fraud. Smuggling will not occur if other countries abide by South Africa's policies and laws relating to imports. Harsher sanctions should be imposed on international and local organisation's that engage in smuggling. Clearing and forwarding agents should also play the role of customs officials to facilitate the process as well as to form relationships with importers.

The Port of Durban is the central location that ensures the movement of containers for inbound and outbound transportation networks. To justify the appellation, "Gateway to Africa", it should be fully operational 24 hours a day, seven days a week. The port needs to ensure that staging areas are in place within loading facilities for the proper movement of containers. Power stations needs to be in place to accommodate the higher influx of containers on a daily basis. Finally, rail facilities and carriages should be modernized and increased to prevent congestion.

It is evident from the discussion of the study's findings and its recommendations that there are solutions to the factors that contribute to the problems experienced by the inbound and outbound transportation networks. Stricter laws and regulations regarding logistics and the transportation of containers need to be adopted in response to the increased use of intermodal transport networks in Durban.

7.3.2 Summary of recommendations

Capacity constraints

- There is a need for infrastructural development near the port to accommodate the large influx of containers.
- Dig out port facilities to be available after construction.
- Storage facilities should be in place for goods held over the pre-disclosed time period.
- Separate loading areas should be established for different forms of containerised shipments.
- Demurrage charges for clearing and forwarding agents should be reduced.

Infrastructural developments

- It is noted that new developments have eased congestion such as harbour widening and deepening, dig out facilities and increased storage area stemming over the harbour surrounding.
- The Harbour reconstruction should be ongoing.
- Efficient road design would solve the problems faced by outbound networks.

Technological errors

- The system should be fully implemented before further utilisation.
- All users should be trained to use the system
- Workers need to be taught how to use manual methods in the event of the failure of the system.

Overweight containers

- Government should restrict entry to containers that are overweight.
- Every facility should have a weighbridge system.

Customs clearance

- Harsher and stricter action should be taken against international and local organisation's that engage in smuggling.
- Clearing and forwarding agents should play the role of customs officials to control the customs process.

Movement

- The port facility should be open 24 hours a day, 7 days a week (24/7).
- Newer and an increased number of power stations should be provided.
- Different staging areas need to evolve to curb congestion.
- Rail facilities need to be properly designed to ensure that movement from the port to the main centre's is fully operational.

7.4 Contribution of the study to knowledge

One of the contributions of this research study is to make those involved with inbound and outbound logistical activities around Durban aware of the issues pertaining to containers transported using sea and road networks through the Durban Port. Identifying the effects of intermodal networks will enable improved facilitation of container movement throughout the Port of Durban and streamline activities. Providing insight into problems will enhance the economic viability of the logistics industry. This could take South Africa to the next level and ensure that the country's trading activities is on par with global markets, thereby facilitating international trade links.

7.5 Limitations of the study

The study is based on logistical companies in the Durban region. Due to the variety of medium sized companies with operations relating to the Durban port, the findings for interviews and questionnaires focused on the opinions of individuals in strategic positions. While the sample size was limited to those individuals in management positions, the responses from those interviewed were illuminating. The measurement instruments used were based on responses from the sample size to as to ensure accuracy. Throughout the study, the study's objectives were addressed by combining the discussion of results with the research questions.

7.6 Direction for future research

This study on the effects of intermodal transportation on inbound and outbound networks within Durban containerisation could assist the identification of the positive and negative aspects of choosing a specific mode and carrier. The identification of problems relating to the transportation of containers could assist the industry to control external factors in order to contain costs and increase profitability. Capacity constraints could be addressed by the extension of port operations and storage areas as well as the introduction of advanced technology in conjunction with training. An efficient and honest customs system would speed up inspections, especially if industry agents play a role in this regard. It is recommended that further studies be conducted on other South African ports such as Richards Bay and Cape Town.

7.7 Summary

The objective of this study was to understand the effects of capacity constraints on transitional inbound and outbound containerisation within the Durban Port intermodal networks. The data for the study were collected from a sample size of 206 and focused primarily on the variables identified in the literature review. In terms of inbound transportation, these included overweight containers, mishandling and incorrect stacking capability, cargo insurance, cargo dwelling time, port congestion and capacity constraints, corruption at customs and the port, incoterms and technological errors. The variables in the transportation networks related to overweight containers, loading delays at the port, traffic congestion, cycle and delivery time and unprofitable road transportation networks. The transition of both networks is noted to have a common place of business which is the Durban Port.

The capacity constraints exhibited at the Port of Durban as well as a lack of infrastructural development and technological limitations were found to cause congestion. These constraints can be solved by employing better resources and handling facilities in order to promote the growth of international trade in Durban. The trade in Durban allows for better facilities to be developed and maintained so that international freight is promoted.

It is evident that the factors which contribute towards the relationship between inbound and outbound transportation are found at the Durban Port and on roads. The main concerns regarding this transition relate to cycle and delivery time delays caused by the lack of offloading equipment in order for final delivery to take place. The customs process contributes to a longer release time as documentation needs to be in order and examination of the goods needs to be complete before a container is released for delivery to customers. Industry players therefore need to ensure that their documentation is in good order so as to minimize legal and liability costs.

It was noted that bribery and corruption feature in the relationship between customs officials and clearing and forwarding agents. While agents require that the customs authorities ensure that containerised shipments are released timeously to enhance service delivery, the process can be prolonged when honest officials insist on the correct release documents with sufficient emphasis on the Incoterms utilised.

Based on the literature review and the data analysis, one solution could be that clearing and forwarding agents fulfill the role of the customs authority so as to ensure that containers are of the correct capacity, value and incoterms and that the proper documents are provided for release.

The variables set out in the study were fully explained and the factors were outlined and linked to the research questions. The answers to questions and interpretation were controlled by recommended means in order to assess the future of logistics industry in Durban. The recommendations flow from the interpretation of the effects of intermodal transportation on inbound and outbound networks within Durban containerisation.

Bibliography

Aguinis, H. (2004) *Regression analysis for categorical moderators*. Guilford press.

Aiken, L. West, S and Reno, R. (1991) *Multiple regression: Testing and interpreting interactions*. Sage publications.

Alken Murray. (2010) *Ocean shipping container capacities*. [online], available: http://www.alken-murray.com/OceanContainer.pdf. [16 March 2014].

Asha Freight. (2012) *20ft & 40 ft container shipping to South Africa from uk.* [online], available:www.ashafreight.com/shipping-container-to-south-africa.html.[22 June 2013].

Bartosek, A and Marek, O. (2013) *Quay cranes in container terminals*. Transaction on transport sciences. Volume 6, Number 1 (2013). Department of logistics and transportation processes.

Bierman, N. (2006) *The role and characteristics of private road transport operators in South African freight market.*[online], available:http://www.uj.ac.za/EN/Faculties/management/departments/transport/about/Documents/The%20role%20and%20characteristics%20of%20private%20road%20transport%20operators%20in%20the%20South%20African%20freight%20market%20NL%20BIERMAN.pdf. [22 September 2013].

Bigham, C.T., and Roberts, J.M. (1952) *Transportation principles and problems*. McGraw Hill Book Company.

Calabash case studies. (2004) *Container handling: The port of Durban, South Africa*. [online], available: http://www.saiea.com/calabash/casestudies/html/durban_port.pdf [05 May 2013].

Carnie, T. (2011) *Act now to save Durban*. [online], available: http://www.sdcea.co.za/images/stories/pdfs/trucking_port_expansion_dugout_port_info.pdf. [26 June 2013].

Christian, A. (2011) *Overweight containers, a serious threat to ship safety*. [online], available: http://ideas.repec.org/a/cmc/annals/v16y2011i2p11-16.html. [26 June 2013).

Cooper, D. R., and Schindler, P. S. (2010).*Business Research Methods*. New York, NY: McGraw-Hill.

Coyle, J.J., Novack, A.R., Gibson, J.B., and Bardi, J.E. (2011) *Management of Transportation*. 7th Edition: South-Western Cengage Learning.

Cudahy, B.J. (2006) *Box boats: How container ships changed the world*. Fordham University Press: New York.

Department of public works, roads and transport (2010) *Province freight data bank*. [online], available: http://dpwrt.mpg.gov.za/index-1.html. [16 March 2014].

Department of Transport. (2011) *Road freight strategy for South Africa.* [online], available: www.agbiz.co.za/LinkClick.aspx?fileticket=eEDB8eDPB4Y%3D. [26 June 2013].

Department of Transport. (2012) *Smart containers.* [online], available: www.transport.sa.gov.au/pdfs/freight/lamp_docs/.../scharf.pdf. [22 June 2013].

Desu, M and Raghavarao, R. (1990) *Sample size methodology*. Academic press, Inc.

Dewitt, W and Clinger, J. (1999) *Intermodal freight transportation*. Committee on international freight transportation.

Downing, D and Clark, J. (2010) *Business statistics*. Barrons educational series Inc.

Duxbury-Holtes, L. (2013) *Incoterms*. Platinum mile consultants.

Eikos. (2013) *A cargo risk you should never ignore*. Export and import southern Africa. Vol 11, Number 1.

Ellis, T and Levy, Y. (2008) *Framework of problem based research: A guide for novice researchers on the development of a research worthy problem*. Volume 11: International journal of an emerging transdiscipline.

Ensor, L (2014) *Durban port plan delay means lost business*. [online], available: http://www.bdlive.co.za/business/trade/2014/01/22/durban-port-plan-delay-means-lost-business. [16 March 2014].

Etekwini Municipality (2011*) Port of Durban economic footprint*. Economic development University.

Everitt, D. (2004) *Risks associated with dangerous goods transport in South Africa*. University of KwaZulu-Natal: Masters research.

Export help. (2012) *Containerisation*. [online], available: http://www.exporthelp.co.za/modules/16_logistics/containerisation.html. [25 June 2013].

Exporthelp. (2010) *Step 16: Handling the export logistics.* [online], available:www.exporthelp.co.za/modules/16_logistics/containerisation.html. [19 May 2013].

Gedye, L. (2012) *Durban port expansion: Drastic makeover for shipping*. [online], available: http://mg.co.za/article/2012-09-27-durban-port-expansion-drastic-makeover-for-shipping. [13 July 2013].

Glaxo, Smith and Kline. (2010) *Anti bribery and corruption handbook*. [online], available: http://www.gsk.com/content/dam/gsk/globals/documents/pdf/AntiCorruption-Booklet.pdf. [20 March 2014].

Goldman, T. (2000) *Customs and Excise*. UNPD Publications.

Hair, J. Celsi, M and Money, A. (2011) *Essentials of business research methods*. M E Sharpe Inc.

Herbs, F and Coldwell, D. (2004) *Business research.* Juta academic.

Hilling, D. (1996) *Transport and developing countries*: Routledge Publishers.

Igbanugo, H. (2012) *Assessing and minimising customs related corruption risk in Sub Saharan Africa's Port.* [online], available: http://gcs.dowjones.com/wp-content/uploads/2012/03/Assessing-Minimizing-Customs-Related-Corruption-in-SSA-Ports-2012.pdf [05 May 2013].

Investopedia.(2012) *Frequency Distribution.* [online], available: www.investopedia.com/terms/f/frequencydistribution.asp [23 August 2013].

Irma, V. (2010) *Increased congestion predicted at Durban port as container volumes grow at 8% a year.* [online], available: http://www.engineeringnews.co.za/article/infrastructure-2010-06-25. [26 June 2013].

ISS. (2005) *Chapter 4, security measures at sea ports entry: Durban and Richards Bay* [online], available: www.iss.co.za/pubs/monographs/no84/Chap4.pdf. [17June 2013].

Jackson, S. (2012) Research methods and statistics: A critical thinking approach. Wadsworth cengage learning. (4th Ed).

Kgare, T. Raballand, G and Ittmann, H. (2011) *Cargo dwell time in Durban*. [online], available: http://mpoverello.com/2011/09/28/cargo-dwell-time-in-durban/. [26 June 2013].

Kline, P. (1994) *An easy guide to factor analysis*. Routledge publishers.

Kothari, C. (2004) *Research methodology: Methods and techniques*. New age international (Pty) Ltd publishers.

Kunene, O. and Allopi, D. (2011) *Assessment of road infrastructure within the port of Durban.* [online], available: www.sama.org.za/media//.../c7633207de11ca62ffff81c87f000101.p.[19 June 2013].

Laerd Statistics. (2012) *Pearson product-movement correlation coefficient* [online], Available: https://statistics.laerd.com/statistical-guides/pearson-correlation-coefficient-statistical-guide.php [22 September 2013].

Lavrakas, P. (2008) *Encyclopedia of survey research methods: Probability sampling*. Sage publications, Inc.

Levinson, M. (2000) *Container shipping and the economy*. [online], available: http://onlinepubs.trb.org/onlinepubs/trnews/trnews246.pdf. [26 June 2013].

Mackenzie, A. (2013) *New customs bill expected to generate majorgrowth*. Freight and trading weekly. June 2013.

Maharaj, A. (2013) *Economic development position paper on port expansion*. [online], available: http://www.durban.gov.za/media_publications/edge/Documents/Port%20Expansion%20Research%20Paper%20(Feb%202013).pdf. [26 June 2013].

Manaadiar, H. (2011) *What is Transhipment*. [online], available: http://shippingandfreightresource.com/2011/06/08/what-is-transhipment/. [26 June 2013].

Mbonambi, G. (2011) *Port authorities blamed for delays*. [online], available: http://www.iol.co.za/news/south-africa/kwazulu-natal/port-authorities-blamed-for-delays-1.1144516#.UeL-OpoaLIU. [26 June 2013].

Mcburney, D.H., and White, T.L. (2007) *Research methods*. 7th Edition. Thomson Wadsworth: Belmont.

Miller, T (2012) *Overweight container guide*. [online], available: http://www.ukpandi.com/loss-prevention/article/overweight-container-guide-28/. [26 June 2013].

Mkamba, L. (2012) *Giant MSC SOLA to enter SA port*. [online], available: http://www.iol.co.za/mercury/giant-msc-sola-to-enter-sa-port-1.1334062#.UeWtFJoaLIU. [16 July 2013].

Mohan, R. (2012) *Why study business research*. [online], available: www.scribd.com/doc/82071910/222/scatterplotsforexploring [23 August 2013].

Murray, R. (2003) *Blending qualitative and quantitative research methods in thesis and dissertation*. Corwin press Inc.

Murray, M. (2012) *Containerisation*. [online], available: http://logistics.about.com/od/tacticalsupplychain/a/containerisation.htm. [26 June 2013].

Nair, Y. (2012). *Harbour mafia bust*. [online], available: http://www.iol.co.za/dailynews/news/harbour-mafia-bust-1.1285333#.UeLHmZoaLIU. [26 June 2013].

National institute of open schooling. (2011) *Lesson 10 Transportation.* [online], available: www.nios.ac.in/Secbuscour/cc10.pdf. [19 June 2013].

Northport. *(2009) History of containers.* [online],available*:*www.northport.com.my/docs/thehistoryofcontainer.pdf. [25June 2013].

Nottleboom, T and Rodrigue, J.P. (2008) *Containerisation, box logistics and global supply chains: The integration of ports and linear shipping networks*. [online], available: http://www.palgrave-journals.com/mel/journal/v10/n1/full/9100196a.html [26 June 2013].

OECD. (2007) *Managing urban traffic congestion*. ISBN 978-92-821-0128-5.

Osbourne, J., Waters, E (2002) Four *Assumptions Of Multiple Regression That Researchers Should Always Test* [online], available: www.pareonline.net/getvn.asp?v=8&n=2 [23 August 2013].

Pallant, J. (2010) *SPSS Survival Manual (4th ed).*

Peat, A. (2013) *Durban beats Melbourne to become busiest southern hemisphere port.*Freight and trading weekly. June 2013.

Peat, A. (2013) *Industry suffers a NAVIS breakdown*. Freight and trading weekly. May 2013.

Peat, A. (2013) *New Durban cranes speed up productivity*. Freight and trading weekly. June 2013.

Pedersen, O. (2001) *Freight transport under globalization and its impact on Africa. Journal of transport geography*, 85-99: Pergamon.

Pienaar, W.J., and Vogt, J.J. (2009) *Business Logistics Management- A Supply Chain Perspective*. 3rd Edition. Southern Africa: Oxford University Press.

Port technology.(2011) *Ports and overweight containers*. [online], available: http://www.porttechnology.org/technical_papers/ports_and_overweight_containers_. [26 June 2013].

Ports and ships. (2013) *Transnet Port terminals*. [online], available: http://ports.co.za/durban-harbour.php. [16 July 2013].

Psychwiki. (2008) *Data analysis with SPSS.* [online], available: www.psychwiki.com/images/1/16/Lab3Correlation.doc [23August 2013].

QuickMBA. (2010) *Central tendency*. [online], available: www.quickmba.com [23 August 2013].

Rainbow Nation. (2014) *Directory of South African transport and logistics*. [online], available: http://www.rainbownation.com/directory/index.asp?CatID=1676. [02/04/2014].

Rallaband, G. (2013) *Why high dwell times in African ports*. [online], available: http://www.translogafrica.com/article/why_high_dwell_times_in_african_ports. [26 June 2013].

Rao, A. (2008) *Research methodology for management and social sciences*. Excel books.

Rodrigue, J.P. (2008) *Trade and transportation: Containerisation*. [online], available:http://people.hofstra.edu/jean-paul_rodrigue/downloads/Trade%20and%20Transportation-%20Containerisation_JPR.pdf. [26 June 2013].

Rodrique, J.P. (2013) *The geography of transport systems*. New York: Routledge, 416 Pages.

SA info reporter. (2012) *South Africa's transport network*. [online], available: http://www.southafrica.info/business/economy/infrastructure/transport.htm#.UeAGBJoaLIU. [26 June 2013].

SA maritime transport sector. (2011) *Transhippment*. Part 3.

Sailors club. (2013) *Container stack collapse- overweight and unfit containers*. [online], available: http://www.sailors-club.net/index.php?option=com_myblog&show=container-stack-collapse-overweight-and-unfit-containers.html&Itemid=101. [26 June 2013].

SARS (2008) *Scanner inspection and logistics processes*. Durban container terminal.

Sea rates. (2013) *Incoterms, international chamber of commerce*. [online], available: http://www.searates.com/reference/incoterms/exw/. [26 June 2013].

Sekaran, U., and Bougie, R. (2010) *Research methods for business*(5th ed.).Wiley and sons.

Sequiera, S and Djankov, S. (2011) *Corruption and firm behaviour*. [online], available: http://personal.lse.ac.uk/sequeira/Corruption_Firm_Behaviour_Sequeira_Djankov.pdf. [26 June 2013].

Shah, S (2012) *Documentation and cargo interveners in cargo operations*. [online], available: www.kpa.co.ke/InfoCenter/mediaworkshop/.../SHAH%20final.pptx. [05 May 2013].

Shuttleworth, M. (2010) *Research designs.* [online], available:www.experiment-resources.com[23 August 2013].

Skymark.(2012) *Scatterplots.* [online], available: www.skymark.com/resources/tools/scatter_plots.asp [23August 2013].

Stat Trek. (2012) *Hypothesis Testing.*[online], available: www.stattrek.com[23 August 2013].

StatSoft, Inc. (2012). *Electronic Statistics Textbook- Factor analysis.* [online], available:http://www.statsoft.com/textbook/. [23 August 2013].

Steyn, L (2013) *Pressure on to build new Durban port*. [online], available: http://mg.co.za/article/2013-07-05-00-pressure-on-to-build-new-durban-port. [16 March 2014].

Subhash, S. (2012) *A brief presentation on containers*. [online], available: http://www.slideshare.net/subhash_ae/a-brief-presentation-on-containerisation-presentation. [26 June 2013].

Swedish maritime administration (2010) *Shipping and the port section in Sub Saharan Africa*. Swedish international development cooperation agency.

Talley, W (2000) *Ocean container shipping: Impacts of a technological improvement*. Journal of economic issues.

Taylor, C. (2012) *What is skewness?.* [online], available: www.statistics.about.com[23 August 2013].

The marketing donut. (2010) *Quantitative research.* [online], available:www.marketingdonut.co.uk/...research/what-is-quantitative-research- [23August 2013].

Tradesecrets.(2010) *Incoterms.* [online], available: http://www.tradesecrets.co.za/pdf/sec7-5.pdf [05 May 2013].

Transnet (2011) *Navis (SPARCS N4) A simplified user guide*. [online], available: http://www.transnet.net/Divisions/TPT%20Documents/Navis%20Users%20Guide.pdf [05 May 2013].

Transnet (2012) *Economic impact assessment*. Transnet port authority. Urban- Econ (Pty) Ltd.

Transnet.(2011) *Durban container terminal.* [online], available: www.transnetportterminals.net/PortTerminals.asp?terminal=21. [30 June 2013].

Trochim, W. (2006) *Nonprobability sampling.* [online], available: www.socialresearchmethods.net[23 August 2013].

Trochim, W. (2006) *Probability sampling.* [online], available: www.socialresearchmethods.net[23 August 2013].

Turner, J and Thayer, J. (2001) Introduction to analysis of variance: Design, analysis and interpretation. Sage publications Inc.

UK Pandi.(2011) *Stuffing and stacking containers*. [online], available: http://www.ukpandi.com/fileadmin/uploads/uk-pi/LP%20Documents/Carefully_to_Carry/Stuffing%20and%20stacking%20containers.pdf. [26 June 2013].

UNDP (2008) *United Nations development programme- Shipping guide.* Phoenix design aid.

Venter, L. (2013) *Durban congestion squeezes Cape Town off the schedule*. Freight and trading weekly. April 2013.

Venter, L. (2013) *Durban port needs to get its NAVIS act together-SDV*. Freight and trading weekly. June 2013.

Venter, L. (2013) *Port congestion pushes up insurance rates*. Freight and trading weekly. June 2013.

Venter, L. (2013) *Sanral set for R816-m upgrade in Durban*. Freight and trading weekly. May 2013.

Venter, L. (2013) *Steer clear of trucking-economist*. Freight and trading weekly. June 2013.

Venter, L. (2013) *Weighty container issue moves closer to resolution*. Freight and trading weekly. May 2013.

Vesseltracker. (2013) *Photo of Port.* [online], available: http://www.vesseltracker.com/en/Port/DURBAN/Photo.html [22 June 2013].

Wordpress. (2009) *Demurrage- everything there is to know about demurrage*. [online], available: http://demurrage.wordpress.com/2009/12/18/what-causes-demurrage-charges/ [05 May 2013].

World shipping council. (2010) *Solving the problem of overweight containers*. [online], available: http://www.worldshipping.org/public-statements/Solving_the_Problem_of_Overweight_Containers_For_Release.pdf. [26 June 2013].

Xneting. (2011) *What are ISO containers.* [online], available:www.expertscolumn.com/content/what-are-iso-containers. [22June 2013].

Yount, R. (2006) *Populations and sampling- Rationale of sampling*. (4^{th} Ed). Research fundamentals.

Appendix A- Questionnaire and Interview Questions

UNIVERSITY OF KWAZULU-NATAL

School of Management, I.T and Governance

Master's Research Project

Researcher: Nerissa Govender (0828952077)

Supervisor: Mr T.P Mbhele (031-2607524)

Research Office: Ms P Ximba 031-2603587

Title: Effects of Intermodal transportation networks on the inbound and outbound Durban containerisation

The purpose of this questionnaire is to generate information from employees of the company regarding the effects of intermodal transportation networks on inbound and outbound Durban containerisation. The information that is provided by your company is strictly private and confidential to the researcher. The questionnaire will take approximately 10-15 minutes to complete.

Thank you for participating!!!

CONSENT

I ***(Optional)*** ____ (full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

____________________ ____________________

Signature of Participant Date

<u>Section A:</u> Biographical data and Organisational profile. Please tick the appropriate box:

1. Gender:

Female		Male	

2. Which of the following options is your field of employment?

Depot	Freight forwarder	Road freight transport	4th party logistics service provider	Intermodal

3. Years of experience in working with containers

Less than 1		1-3 Years		4-6 Years		7-10 Years		Over10 Years	

4. Which mode is most efficient to be used for the transport of containers?

Road		Rail		Air		Water	

5. Which of the following options describes your section of work in containerships?

Handling and maintenance		Delivery and transport		Release and dispatch		Tracking	Other

<u>Section B</u>

These dichotomous questions (Yes or No) relate to your experience in the industry relating to the inbound and outbound transportation of containers. Please tick or encircle the correct alternative

6. The capacity constraints in Durban Port pose a challenge for the inbound and outbound movement of containers	YES NO
7. The stacking capability of containers affects the liability costs of transportation (Security, risk and insurance)	YES NO
8. Transition networks has an effect on in-transit road freight transportation networks	YES NO
9. The current customs clearance procedure at the Durban Port delays the release of containers to outbound networks	YES NO
10. Technological faults have increased the waiting time for intermodal transport networks	YES NO
11. Infrastructural developments can alleviate capacity constraints in Ports and on roads	YES NO

12. Traffic congestion on inbound and outbound transportation affects the delivery time to customers **If yes, state how:**	YES NO	

Section C

Select FOUR and Rank them from 1 = "Least important" to 5 = "Most important".

What are the main factors concerning the capacity constraints at the Durban Port?

Items	**Critical (Importance)**	**Rank**
13. Lack of infrastructural capabilities for containers		
14. Tendency to rely heavily on technological advances		
15. Misalign scheduling of inbound docking protocols		
16. Unnecessary customs clearance processes that prolongs activities		
17. Inefficiency at Ports and the handling capacity for increased trade		

What are the reasons for the extensive, lengthy and challenging customs clearance process for clearing and forwarding of containers at the Durban Port?

Items	**Critical (Importance)**	**Rank**
18. Excessive control over daily transported commodities		
19. Lack of understanding the usage of Incoterms on shipping reports		
20. Mitigate the risk of illegal substances entering the country		
21. Facilitate the security protocols to trace counterfeit items and eliminate theft		
22. Unnecessary paper trail of documentation for proper release of shipments		

Section D:

Please encircle the most appropriate number with "1" as strongly disagree, "2" as disagree, "3" as neutral, "4" as agree and "5" as strongly agree, for the following questions.

To what extent do you think the following statements have assisted in influencing the inbound transportation of Durban containerisation?

23. The risk of overweight containers contributes to legal ramifications and financial costs	5	4	3	2	1
24. Mishandling of containers frequently results in stowage	5	4	3	2	1
25. Increased cargo insurance and liability costs expedite the transition process	5	4	3	2	1
26. Longer cargo dwelling times influence the scheduling of outbound road transportation	5	4	3	2	1
27. Port congestion and inefficiencies affects inbound and outbound transportation of containers	5	4	3	2	1
28. Technological faults influences the delays in turnaround time	5	4	3	2	1

To what extent do you think the following statements have contributed to the effects of road transportation networks?

29. Carriage of overweight containers do affect road in-transit lead time	5	4	3	2	1
30. The transition period indicates unnecessary delays at the Durban Port	5	4	3	2	1
31. Inevitable traffic congestion on the road networks around the Durban Port	5	4	3	2	1
32. Infrastructural road designs produces unpredictable delivery and cycle times	5	4	3	2	1
33. The cost on the road freight industry exceeds the profitability margins	5	4	3	2	1

THANK YOU FOR PARTICIPATING IN THIS QUESTIONNAIRE!!

UNIVERSITY OF KWAZULU-NATAL

School of Management, I.T and Governance

Master's Research Project

Researcher: Nerissa Govender (0828952077)

Supervisor: Mr T.P Mbhele (031-2607524)

Research Office: Ms P Ximba 031-2603587

Title: Effects of Intermodal transportation networks on the inbound and outbound Durban containerisation

Unstructured Interview Questions

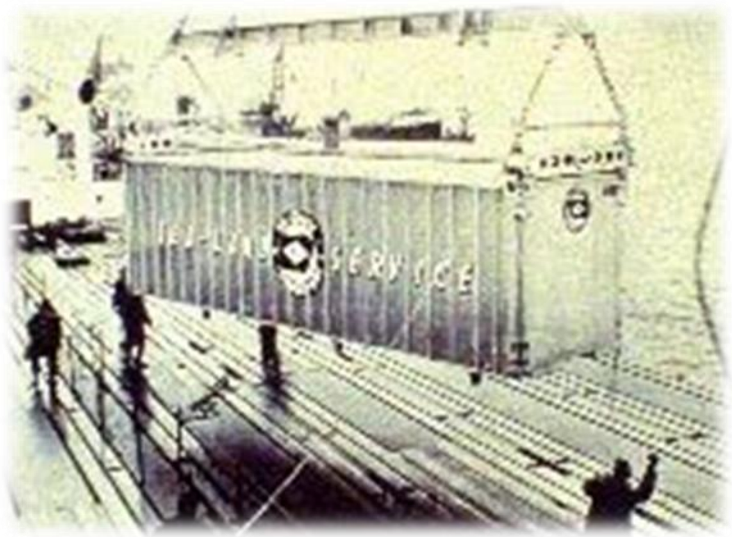
The questions pertaining to unstructured interviews will follow the similar basis of the questions mentioned in this document. Due to the protocols of unstructured interviews, questions will be constructed at the interview process disseminating from a broad problem area.

Questions:

1. What is your opinion regarding the capacity constraints depicted at the Durban Port?
2. Is there a dire need for infrastructural developments at the Ports? As well as the introduction of additional container storage facilities to accommodate the increased trade?
3. Do you think that the constraints faced by inbound and outbound containerisation is widely based on technological faults?
4. Should overweight containers recall issues for the city of Durban such as infrastructural damage or should the legal system be imposed more strictly?
5. Do you think the avenue of customs clearance procedure is efficient with regards to limited smuggling within containers that enter the country?
6. What factors ensure the movements of containers from inbound to outbound networks?

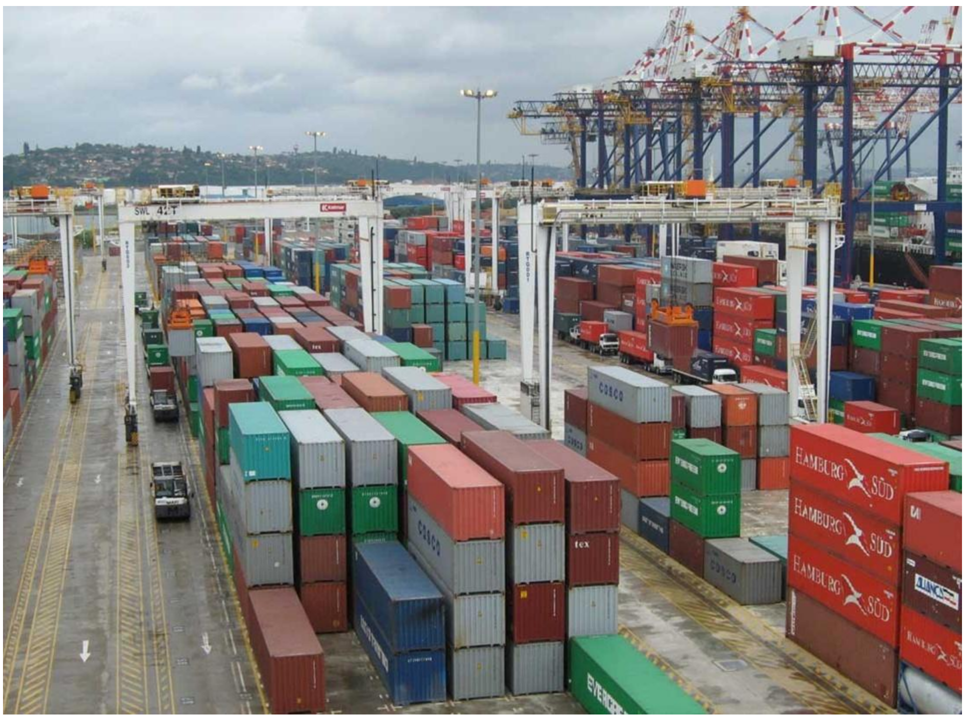
Appendix B- Literature Review

Figure 1: History of Containers



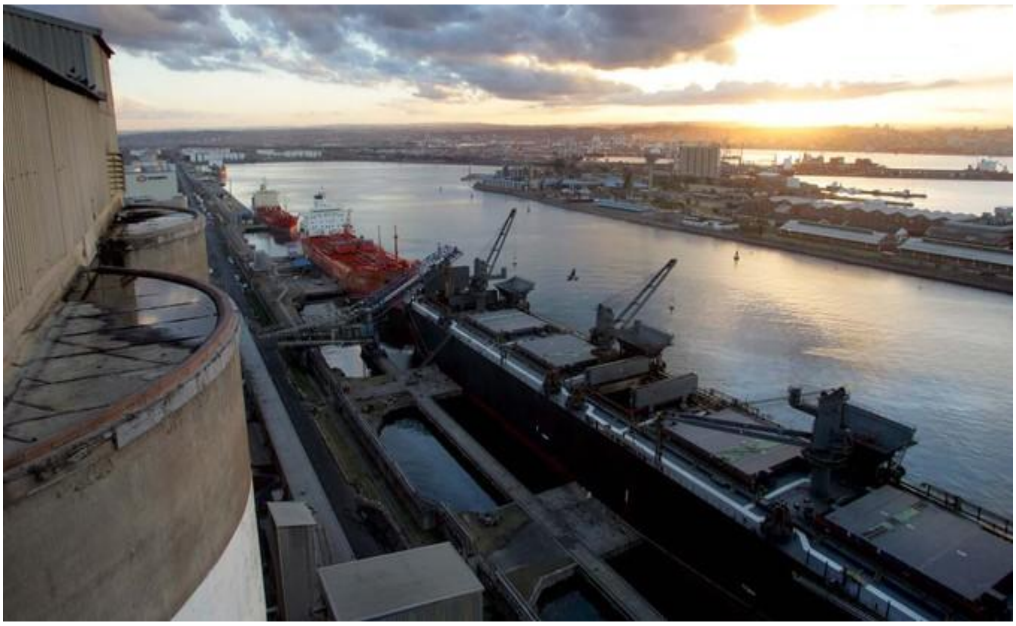
Source: Northport, (2009). History of containers [online], available:
www.northport.com.my/docs/the**historyofcontainer**.pdf

Figure 2: Durban port



Source: vesseltracker, (2013). Photo of Port. [online], available:
http://www.vesseltracker.com/en/Port/DURBAN/Photo.html.

Figure 3: Port expansion



Source: Gedye. (2012) Durban port expansion: Drastic makeover for shipping. [online], available: http://mg.co.za/article/2012-09-27-durban-port-expansion-drastic-makeover-for-shipping.

Appendix C- Frequency Distribution

Figure 1

Gender		Percent
Valid	Male	50,5
	Female	49,5
	Total	100,0

Figure 2

Field Of Employment		Percent
Valid	Depot	13,1
	Freight Forwarder	24,8
	Road Freight Transport	30,6
	4th Party Transport Service Provider	16,5
	Intermodal Industry	15,0
	Total	100,0

Figure 3

Experience In Containership		Percent
Valid	Less Than 1 Year	6,3
	1-3 Years	18,0
	4-6 Years	40,3
	7-10 Years	21,8
	Over 10 Years	13,6
	Total	100,0

Figure 4

Transport Mode		Percent
Valid	Road	78,2
	Rail	4,9
	Air	1,5
	Water	15,5
	Total	100,0

Figure 5

Work Description In Containership		Percent
Valid	Handling and Maintenance	20,4
	Delivery and Transport	46,6
	Release and Dispatch	24,8
	Tracking	5,3
	Other	2,9
	Total	100,0

Figure 6

Capacity Constraints		Percent
Valid	Yes	92,2
	No	7,8
	Total	100,0

Figure 7

Stacking Capability		Percent
Valid	Yes	92,7
	No	7,3
	Total	100,0

Figure 8

Intermodal Transitions		Percent
Valid	Yes	86,9
	No	13,1
	Total	100,0

Figure 9

Customs Clearance		Percent
Valid	Yes	85,9
	No	14,1
	Total	100,0

Figure 10

Technological Bottlenecks		Percent
Valid	Yes	85,4
	No	14,6
	Total	100,0

Figure 11

Infrastructural Developments		Percent
Valid	Yes	94,2
	No	5,8
	Total	100,0

Figure 12

Transitional Traffic Congestion		Percent
Valid	Yes	99,5
	No	,5
	Total	100,0

Figure 13

Intermodal Containerisation		Percent
Valid	Yes	91,3
	No	8,7
	Total	100,0

Figure 14

Infrastructural Capabilities		Percent
Valid	Least Important	4,4
	Less Important	7,3
	Neutral	33,5
	More Important	17,0
	Most Important	37,9
	Total	100,0

Figure 15

Propensity To Technology		Percent
Valid	Least Important	8,7
	Less Important	25,2
	Neutral	18,9
	More Important	26,2
	Most Important	20,9
	Total	100,0

Figure 16

Misaligned Dock Scheduling		Percent
Valid	Least Important	22,8
	Less Important	25,7
	Neutral	14,6
	More Important	15,0
	Most Important	21,8
	Total	100,0

Figure 17

Prolong Customs Clearance		Percent
Valid	Least Important	35,4
	Less Important	21,8
	Neutral	14,6
	More Important	14,6
	Most Important	13,6
	Total	100,0

Figure 18

Limited Handling Capacity		Percent
Valid	Least Important	28,2
	Less Important	20,4
	Neutral	17,5
	More Important	27,2
	Most Important	6,8
	Total	100,0

Figure 19

Excessive Control		Percent
Valid	Least Important	10.2
	Less [Important	18.9
	Neutral	21.4
	More Important	27.2
	Most Important	22.3
	Total	100.0

Figure 20

Incoterms		Percent
Valid	Least Important	18.0
	Less Important	22.3
	Neutral	22.8
	More Important	17.5
	Most Important	19.4
	Total	100.0

Figure 21

Mitigation Of Illegal Substances		Percent
Valid	Least Important	19.9
	Less Important	21.4
	Neutral	20.4
	More Important	13.6
	Most Important	24.8
	Total	100.0

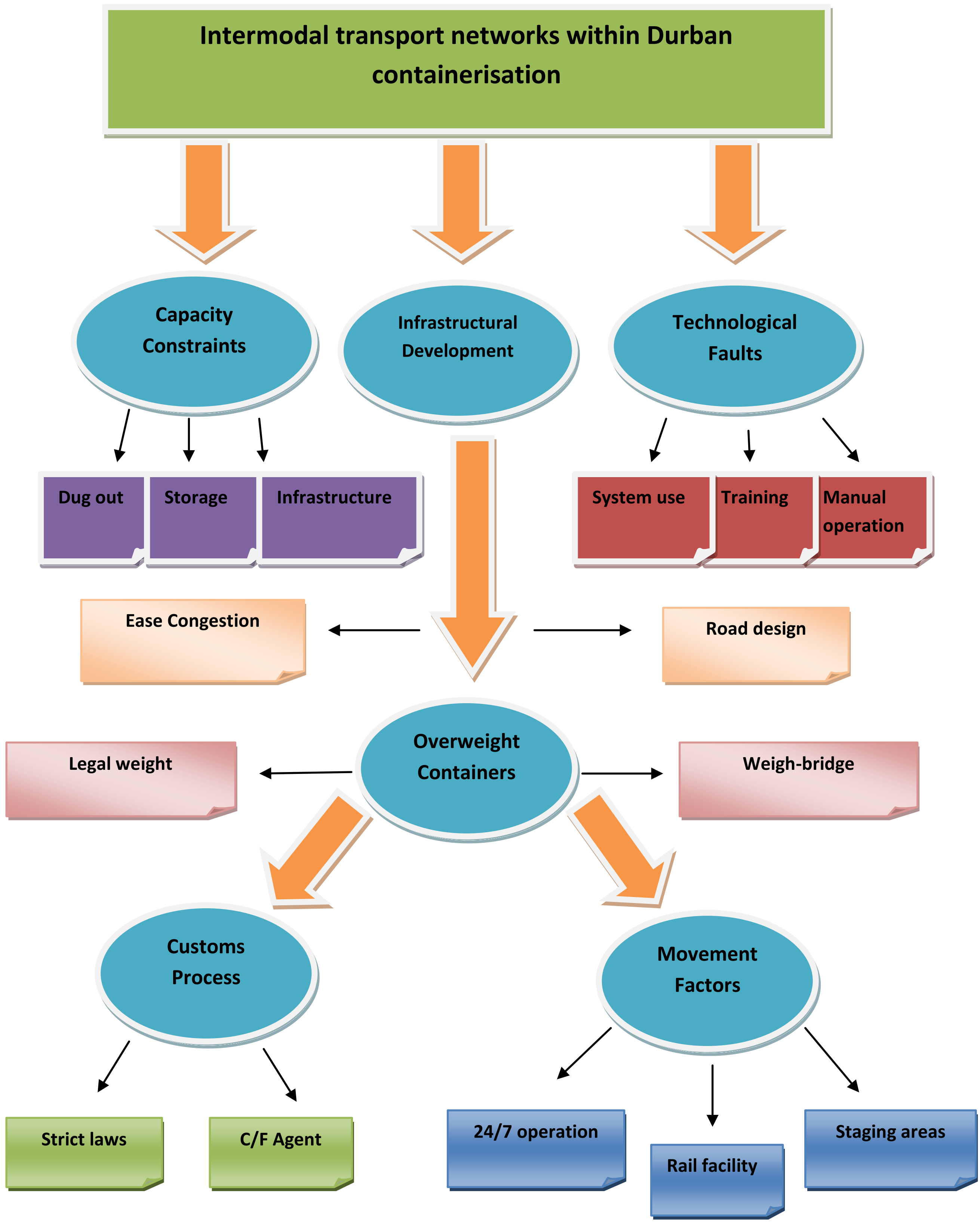
Figure 22

Security Protocols		Percent
Valid	Least Important	19.4
	Less Important	15.5
	Neutral	18.0
	More Important	25.2
	Most Important	21.8
	Total	100.0

Figure 23

Release Documents		Percent
Valid	Least Important	32.0
	Less Important	21.8
	Neutral	18.4
	More Important	16.0
	Most Important	11.7
	Total	100.0

Appendix D: Recommendations Diagram



Source: Designed by researcher

Appendix E: Ethical clearance report

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

27 August 2013

Ms Nerissa Govender 208506732
School of Management, IT and Governance
Westville Campus

Protocol reference number: HSS/0815/013M
Project title: Effects of intermodal transportation networks on the inbound and outbound Durban containerisation

Dear Ms Govender

Expedited Approval

I wish to inform you that your application has been granted Full Approval.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

....

Dr Shenuka Singh (Acting Chair)

/px

cc Supervisor: Mr TP Mbhele
cc Academic Leader Research: Professor B McArthur
cc School Administrator: Ms Hazvinei Muteswa

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Acting Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 3587/8350/4557 Facsimile: +27 (0)31 260 4609 Email: ximbap@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
Website: www.ukzn.ac.za

Founding Campuses: Edgewood, Howard College, Medical School, Pietermaritzburg, Westville

INSPIRING GREATNESS

Appendix F: Turnitin Report

Turnitin Originality Report

Effects of intermodal transportation networks on the inbound and outbound Durban containerisation by Nerissa Govender

From Thesis (Masters FR Thesis)

- Processed on 21-May-2014 18:39 SAST
- ID: 428972902
- Word Count: 30285

Similarity Index: 8%

Similarity by Source

Internet Sources: 2%

Publications: 2%

Student Papers: 8%

Sources:

1. 6% match (student papers from 21-Nov-2013)

Class: Masters FR Thesis
Assignment:
Paper ID: 329577042

2. < 1% match (student papers from 28-Oct-2013)

Submitted to Victoria University on 2013-10-28

3. < 1% match (Internet from 06-Jan-2014)

http://repository.usu.ac.id/bitstream/123456789/4310/1/09E01795.pdf

4. < 1% match (Internet from 18-Apr-2014)

http://omololaadams.blogspot.com/2013/07/factors-influencing-compliance-to.html

5. < 1% match (Internet from 03-Apr-2014)

http://phd.lib.uni-corvinus.hu/321/3/becser_norbert_en.pdf

6. < 1% match (Internet from 18-May-2014)

http://digital.library.okstate.edu/etd/Akour_okstate_0664D_10760.pdf

7.< 1% match (student papers from 13-Mar-2013)

Submitted to Florida Institute of Technology on 2013-03-13

8< 1% match (Internet from 27-Oct-2010)

http://sites.google.com/site/theprofitsoffreebooks/home/5-findings-and-results

9< 1% match (Internet from 25-Oct-2009)

http://etd.ohiolink.edu/send-pdf.cgi?acc_num=osu1117591316

10< 1% match (student papers from 16-Aug-2013)

Submitted to University of Newcastle on 2013-08-16

11< 1% match (Internet from 01-May-2009)

http://dissertations.port.ac.uk/243/01/AlpousV.pdf

12< 1% match (Internet from 30-Aug-2010)

http://www.aph.gov.au/senate/committee/hsaf_ctte/submissions/sub55a.pdf

13< 1% match (Internet from 21-May-2010)

http://www.indiana.edu/~iascp/bali/papers/Straton_Anna_Aligning.pdf

14< 1% match (Internet from 09-Dec-2013)

http://repository.unhas.ac.id/bitstream/handle/123456789/1651/SKRIPSI%20LENGKAP%20-FEB-MANAJEMEN-0612-%20MUH.%20AFIEF%20SALLATU.pdf?sequence=1

15< 1% match (Internet from 03-Mar-2013)

http://idosi.org/wasj/wasj2(3)/4.pdf

16< 1% match (Internet from 02-May-2010)

http://www.nhh.hu/dokumentum.php?cid=10713&letolt

17< 1% match (Internet from 08-Feb-2014)

http://www.nrchmh.org/attachments/LatinoWorkforceNCLR.pdf

18< 1% match (Internet from 19-Jan-2014)

http://pure.au.dk/portal-asb-student/files/55702428/Appendix_7_ANOVAs_and_Kruskal_Wallis_Canada.pdf

19< 1% match (Internet from 21-Oct-2009)

http://courses.agri.huji.ac.il/71965/pit-3.pdf

20< 1% match (Internet from 27-Sep-2012)

http://umaine.edu/business/files/2010/06/DSI-2009.pdf

21< 1% match (Internet from 22-Dec-2009)

http://lmi.ides.state.il.us/download/WBMC_JVS_Full_Report.pdf

22< 1% match (Internet from 25-Jan-2014)

http://www.brentwoodca.gov/citycouncil/epacket/ccap2006/ccep20060725.pdf

Appendix G: Academic editing certificate

62 Ferguson Road
Glenwood
DURBAN 4001
Tel: 072 442 7896
Email: deanne.collins30@gmail.com
Income tax number: 0526066204

30 April 2014

This is to confirm that I have edited the dissertation, "Effects of Intermodal Transportation Networks on the Inbound and Outbound Durban Containerisation", by NerissaGovender, student number 208506732.

Yours sincerely,

(Ms) Deanne Collins (MA)
Professional Editor