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PORT SERVICE QUALITY FROM SHIPPING LINES PERSPECTIVE

Empirical Study on East Mediterranean Region

By

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DECLARATION

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

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

(Signature) .....

(Date) .....

DEDICATION

To Allah, the most merciful, the most Compassionate

To Prophet Muhammad (PBUH)

To my dearest Parents

A Special thanks to my mother, my wife and my beloved kids who gave me all the encouragement and motivation that I needed to complete this work.

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Abstract

Maritime transport services have benefited from the economy of many regions around the world because ships transport more than 90% of world trade. Container terminals play a substantial role in global cargo transportation by serving as an intermodal between the maritime and by a variety of carriers therefore, containerization provides the mechanism that enabled companies to extend to international markets while improving reliability, flexibility, and costs of freight distribution.

Through containerization, all competitors have the potential to gain the same level of access to the global cargo carriage system via port facilities. So seaports are very important to national economies by permitting higher levels of profitability, income, output, and employment in the logistics field.

In the framework of the factors, multi-control determinants of container market and competition between the parties are dealing in that market, a strong competition between shipping companies arises. On the other hand, competition between ports receiving container ships has started to attract more clients such as freight forwarders, importers, exporters, shipping lines, ship owners and logistics service providers. The main purpose is to satisfy clients as one of the quality standards in ports.

This research aims to investigate those criteria that can be applied by port clients (shipping lines only) when they select their calling ports. The research builds a questionnaire to identify those criteria that are currently applied by shipping lines in the container market in East Mediterranean region. Such criteria are the cornerstone of the service quality provided by container terminals.

Data is collected for this questionnaire through investigating previous literature on the same topic in addition to conducting several interviews with the operation managers of different shipping lines working in the east Mediterranean region. Afterwards, the questionnaire is sent to different shipping companies to select the most important criteria from their perspective.

The most important criteria identified by shipping lines are grouped into seven categories. Fuzzy AHP approach is applied in this research to show the weight of each criterion in the port feature category. The results were distributed again in a second questionnaire which is sent to the experts and academics in the field to highlight the basic criteria from their own perspective. Finally, the results of both questionnaires are given weight for each criterion through the AHP method of analysis and the results were applied on the actual data of different services inside each port. Thus, a new rank of ports is established based on the criteria identified by the shipping lines.

It is concluded that the port charges criteria was the highest measure that is currently applied by the shipping lines in container market. In addition, the research comes up with a new index that measures the weight of the shipping lines' criteria and such index can be used for ranking the ports from the shipping lines perspective. Finally the researcher was able to develop a model for determinants of service quality in container terminals (Termiqual), the validity of such model can provide guidance for ports managers, maritime practitioners, decision makers, and quality experts to introduce a high service quality of container terminals, which will be reflected positively on the prosperity of the business, and on the benefit of all the stakeholders.

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List of Abbreviations

Symbols

AGS	Automated Gate System
AHP	Analytical Hierarchy Process
AIDC	Alternative Information and Development centre
DGPS	Digital global positioning system
DWT	Dead weight tonnage
EDI	Electronic data interchange
EU	European Union
FAK	Freight All Kinds
GPS	Global positioning system
GRT	Gross Register Tonnage
ICTs	Information and communication technologies
IMO	International maritime organization
ISO	International Standard Organization
ITOS	International Terminal Operators
K-CR	K-Firm Concentration Ratio
KPIs	Key performance indicators
LSCT	Linear Shipping Connectivity Index
OCR	Optical Character Recognition
RF	radio frequency
RFID	Radio frequency identification technology
RMGs	Rail Mounted Gantry Cranes
RTGs	Rubber Tired Gantry Cranes
RTLS	Real-time locating systems
S C	Selection Criteria
SMR	southern basin of the Mediterranean region
STS	Ship – to – shore
SWL	Safety Working Load
TEUs	Twenty-foot Equivalent unit
UNCTAD	United Nations Conference on Trade and Development
US	United State
WTO’s	World Trade Organization

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 Introduction

Today's dynamic businesses use a container to transfer goods by sea. The container has become the most important node in physical flows between container depots, clients, ports, and vessels. Therefore, the growing demand for empty containers is driven by manufacturing firms distributing their products to users.

Ports and Container terminals became essential components of the modern economy. Containerization plays an indispensable role in reducing transport cost of international trade. Hence, shipyards have started to produce new designs, which are technically better in terms of their adaptability to the new market conditions, more economical and above all highly competitive compared to the existing ships. On the other hand, ports play important role in accommodating new designed ships with larger volumes of cargo. The quality of facilities inside the port can achieve faster ship turn-around time, less unit cost, and provide added value activities. This helps in enhancing port competitiveness. Ports have previously evaluated their performance through comparing their actual and optimum throughputs (measured in tonnage or number of containers handled). If a port's actual throughput approximately reaches its optimum throughput over time, the result is that its performance has improved over time, and vice versa.

The aim of this research is to investigate those elements that can be used by port clients in selecting a calling port. These elements also identify the different levels of services that the shipping lines need. And by taking such elements into consideration, ports can improve the quality of service provided, customer satisfaction and hence, their competitive status.

The layout of this chapter is as follows section 1.2 the nature of the containers' market in maritime transport, Section 1.3 Quality Concept, Section 1.4 Research Problem, Section 1.5 Research Questions, Section 1.6 Research objectives, Section 1.7, Section Research significant, Section 1.8 Research Methodology and Section 1.9 Research Structure.

1.2 The nature of the containers' market in maritime transport

Port services are the main aspect to compete with other port to attract more customers and build great relationship with the port. Quality of facilities can achieve the fastest Turn- Around time of ships in ports, it might reduce the unit cost which provides consequently an added value in port operations and maintains or even enhances the competitiveness level of a port at the lowest costs, a matter that explains why shipping line are more interested in these ports.

Container ports and terminals form an essential component of the modern economy.

Containerization since the middle of the 20th century has extensively reduced the transport cost of international trade: before the container, the transport of goods was extremely expensive that few items were shipped halfway across the country, much less halfway around the world, but in the present day, an American brand car might be designed in Germany, the components are produced in Japan, Taiwan and Singapore, it is compiled in Korea, and the advertising campaign is delivered by a British company (Elsayeh, M, 2011).

The choice of port, landside transportation mode and transportation channel by importers should be understood in the context of efforts to optimize supply chains. Clearly, transportation charges for the different modes and routes are important. But other factors play an important role as well. Differences in the mean and variance of container movement lead times may result in extensive differences in inventory costs. (Tongzon, J. 2007).

1.2.1 The development of the container market

Since the 1970s, many factors have combined to transform the international maritime transportation structure. Key developments include (i) political and geopolitical transformations, (ii) trade liberalization, (iii) deregulation and greater private sector involvement in the provision of transport infrastructure and services, (iv) shocks in energy markets and prices, (v) containerization, (vi) the use of information and communication technologies (ICTs), (vii) the intensification of world trade and international division of labor, (viii) the globalization of manufacturing and distribution processes, (ix) greater economic integration and interdependence, (x) the emergence of sophisticated logistics

services and providers and (xi) falling transport costs. At the time of writing, the effects of the 2009 economic crisis continue to affect maritime transport while the growing shift in global economic influence from advanced economies towards developing regions and heightened environmental and sustainability imperatives are rising as potentially game changing trends. Climate change, in particular, and the underlying energy nexus are emerging as key considerations that are now shaping maritime transport of the future (Talley, 1996).

The market of maritime container transport is quite oligopolistic. Substantial volume is being carried by a small number of "Mega Carriers-Top ten" such as Maersk Line, MSC, and CMA - CGM. The increase of their market share has been impressive from 50% to 60% over the period 1999-2009 (ME Elsayeh, NJ Hubbard, NS Tipi - 2011).

Demand As seaborne trade is heavily dependent on prevailing socio-economic trends; many of the related developments observed over the past four decades have deeply influenced the performance of international seaborne trade (Francesetti, 2004).

According to (Dellinger, R. P. 2013) since 2000, globalization in manufacturing activities heightened, supply chains Extended while intra-company trade and trade in intermediate goods expanded together with intra-regional flows. The 2008/2009 economic downturn marked a turning point in the history of the world economy, merchandise trade and seaborne shipments and underscored the growing importance of developing economies.

In 2011, global container trade was estimated at 151 million (TEUs) (twenty-foot Equivalent unit), a 7.1% increase over 2010. With globalization, amplified trade in intermediate goods, growth in consumption and production levels and mounting ‘containerizable’ cargo base (e.g. agricultural cargoes), containerized cargo is posed to grow significantly. To capitalize on economies of scale associated with larger volumes and to reduce costs, the container shipping sector has increasingly invested in larger containerships while ports worldwide have invested in container terminals and cargo handling equipment. As a container trade movement involves more than two port moves and with growth in the share of trans-shipments in total container port throughput (from 10% in 1980 to 27% in 2007) (Dreary Shipping Consultants, 2007), the volume of global container port throughput is about four times the volume of containerized trade.

1.2.2 The types of clients in container market

Port economics is the study of the economic decisions (and their results) of the port users and providers of port services. Port users include shippers who are the owner of the goods and carriers one, such as person, business, or shipping lines companies', are considered the main player in the business, and they will be discussed later in this dissertation, Port (or terminal) operators are other clients in addition to include, ship agents, customs brokers, ship pilots, towage, stevedores and freight forwarders.

1.3 Quality Concept

Quality is perceived differently by different people. In a manufactured product, the customer as a user distinguishes the quality of goods based on different aspects as for example, features conformance, durability and performance. The quality of service may be valued based on the degree of satisfaction by the customer who receives the service. The equivalent dictionary meaning of quality is "the degree of excellence". However, this definition is relative in nature. The final test in this evaluation process lies with the consumer. The customer's needs must be translated into measurable characteristics in a product or service. Once the specifications are developed, ways to measure and trace the characteristics need to be found. This provides the basis for continuous improvement in the product or service. The ultimate aim is to ensure that the customer will be satisfied to pay for the product or service. This should result in a realistic profit for the producer or the service provider. The relationship with a customer is a continuous one. The reliability of a product plays an important role in developing this relationship (Tirupathi R .Chandrupatla; 2009).

1.3.1. Defining quality

Quality is given several definitions by many scholars. Crosby (1984) defined quality as "conformance to specifications". (Juran, 2000) defined it either as "fitness for purpose or use", or "freedom from deficiencies". (Jones and Lockwood, 2004) presented their concept about quality through the following statement "service providers do not provide the best of what they have, but rather they provide the best customers can consume". So we can conclude from there definition for quality that the function of quality depends on the financial abilities of the customers, or let us put it that way, customers including consumers

are looking forward to posses the product whether a good or a service that meets their needs and wants at a fair price that the buyer can offer.

(Oakland; 2003) and (Rawlings; 2008) also used the customer in their extended definition of quality as they defined quality as "meeting customer requirements".

Here they highlight the fact that the element of the customer's financial ability is not as important as satisfying the needs of the customer. In the same way, the definition of quality of the British standards was "the totality of features and characteristics of a product or service that bear on its ability to satisfy state or implied needs of customers" (Oakland; 2003). These needs then become a series of expectations in the customer's mind. If these expectations are met or exceeded then the customer will be satisfied and will have had a quality experience. The international definition of quality is "the degree to which a set of inherent characteristics fulfils requirements" (BS EN ISO9000, 2000, cited in Dale, 2003:4).

Those definitions highlight three elements of quality. First, quality is concerned with satisfying customer’s needs. Second, quality is concerned with fulfilling the requirements of organizational standards. Third, quality is concerned with freedom from flaws. The majority of authors involved in the quality literature have focused on the element of meeting or exceeding customer needs in their quality definitions. This reflects how important the customer is to the quality organization.

1.3.2. The Importance of Quality in Container Market

In any service market, the price/quality relationship is of extensive importance. In the container market, quality is important in attracting and keeping customers. In Europe, container carriers have choices between different containers ports that can meet their demand. For the terminal operator, this results in the growing importance of quality and the need to know the needs of (potential) customers. A favorable network position and well-organized processes are no longer sufficient to attract container volumes. Meeting customer needs and delivering high quality for low costs are critical factors. In their supply chain, container carriers are interested in speed and reliability. The time a ship stays in a port must be minimized, and, therefore, the handling of containers must be executed in a fast and reliable way. Minimizing the number of damaged or lost containers forms another part of the quality picture. The operations at the terminal, after the handling of the

containers on and off the ship, must be reliable as well. Currently, the adoption of innovative handling systems to improve operations has not been signaled in the European container terminal market (Bontekoning, 2002).

1.4 Research Problem

In spite of the strategic location of the ports resided in the East Mediterranean, however they possess a small portion of the international sea-borne trade, maritime experts and practitioners identified a number of reasons which led to this dramatic situation, one of the main priestly identified reasons is the quality of service introduced by the container terminals, investigation conducted by the researcher showed that there is a lack in criteria models that defies the expectations of the shipping companies concerning quality of service which in turn significantly affect the selection of the port, the aim of this research is to try to introduce a criteria model that determine the level of service quality in container terminal based upon the clients point of view. The research assumes that the adoption of the criteria model will channel the competitive advantage of the East Mediterranean ports in rapid changing competitive market.

1.5 Research Questions

Based on the research objectives, extensive literature review, informal talks with quality practitioners, and maritime transportation experts, three research questions have been proposed, are listed as follows:

Question 1: What are the key determinants of ports service quality?

Question 2: What are the services quality factors selected by the port users that meet their expectations and requirements according to their importance?

Question 3: Is the rank of the ports will change according to the new selected services quality criteria model using service quality model for container terminals (Termiqual Model)?

1.6 Research objectives

The objectives of this study as flows:

1. To identify and assess the key determinants of port service quality

2. To determine what main service attributes are more important to the port users in these ports
3. To rank the ports according to the new selected quality criteria model based upon shipping lines perspective, using (Termiqual Model).

1.7 Research significance

On the practical level the study seeks to develop a model that combines the main criteria/metrics that evaluates the qualitative needs of the shipping lines and the relationship between the shipping line and the port terminal container. This will provide an indication to the port managers that will assist them in their decision-making process to identify the weaknesses and/or strengths of the relationship that may lead to develop the port facilities and the quality of service provided.

On the other hand, the academic aspect of the study will fill an important gap in the literature by using the selection criteria and linking it with the different elements of competition. And this paves the way for further researchers to create similar models that will rank ports all over the world by using port selection criteria from the shipping lines' perspective and demonstrating the needed service quality.

1.8 Research Methodology

This research is an empirical enquiry that investigates a contemporary phenomenon within its real-life context. The dissertation will make use of multiple methods of collecting data, which will be both qualitative and quantitative in nature. The research methods used in this dissertation mainly include literature review, structured interviews, and administered questionnaire. Also the Analytic Hierarchy Process (AHP), and the K-Firm Concentration (KCR) tools will be used for data analysis and both will be discussed in details later in this dissertation.

1.9 Research Structure

This research is divided into seven chapters.

Chapter One: Introduction and Background

Is an introductory chapter, it contains an introduction of the dissertation regarding the nature of the Container market, quality concept in container market, research questions, research objectives, research significance, research methodology and research structure.

Chapter Two: The Development of Container Terminals and Liner Shipping Companies in East Mediterranean Region.

This chapter will be divided into two sub-sections. The first one will be discussing the container ports in east Mediterranean region, while the second will investigate the configuration of liner shipping services and networks.

Chapter Three: Research Methodology

This chapter identifies the research scope, philosophy, approach and strategy, on which the theoretical framework is formulated and the methods, models and techniques used in creating it are discussed.

Chapter four: Literature Review

This chapter critically reviews the literature in the areas of the service concept, services of quality and the model of service quality determinants in container terminals.

Chapter five: Selection of Service Quality Determinants of Container Terminal (Termiqual Model)

This chapter is Research framework, because it is the specific identification of the quality of services provided inside the container terminals elements, through analysis and results the seven basic categories and it's their derivatives.

Chapter Six: Confirming the Validity of Termiqual Model Using Fuzzy AHP Solutions

Chapter six presents the case study of the validity of the Termiqual Model by using (FAHP) technique, implementation phase and data analysis phase**,** through data analysis from experts and academics perspective, rating scale for selected ports.

Chapter seven: Conclusions and Recommendations

Chapter seven presents the research conclusions, limitations and recommendations for further research.

CHAPTER TWO

THE DEVELOPMENT OF CONTAINER TERMINALS AND LINER SHIPPING COMPANIES IN EAST MEDITERRANEAN REGION

2.1 Introduction

worldwide container transport has been developing over the past decades, with annual average growth rates of about 8.3% outgrowing total maritime trade volumes (which grew on average by 3.3% per annum) by 5% per annum over the period from 2000 to 2012 as can be seen in (Figure 2.1).

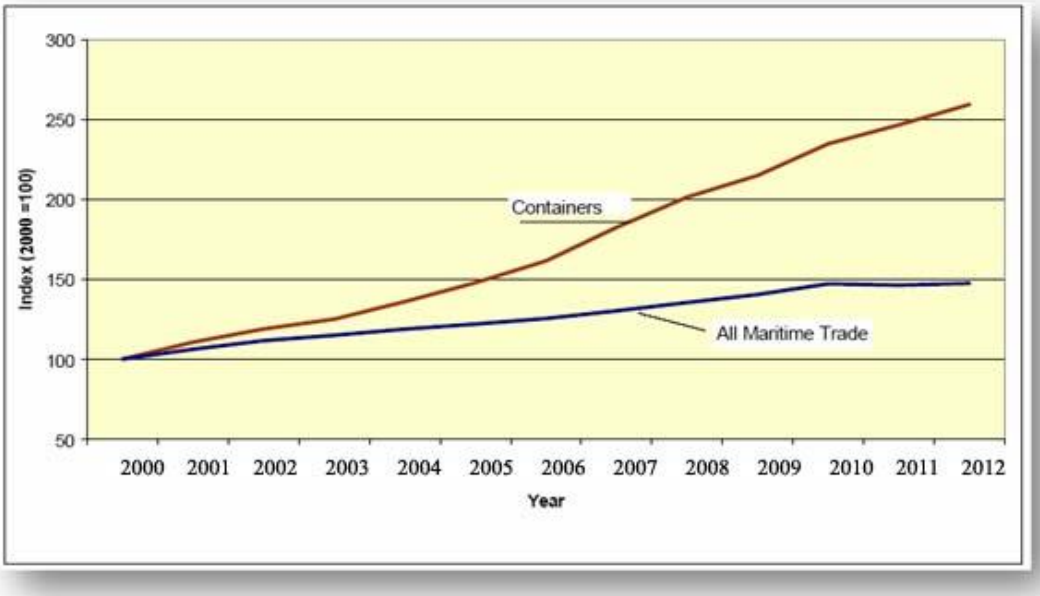

Figure (2.1) Growth of world maritime trade (2000–2012)

Source: PJ Rimmer - Journal of International Logistics and Trade, (2012)

Figure (2.1) shows the former direction of the container trade in the period (2000 - 2012) and comparison with the classification of the global trade of the basic qualities which transfer by sea, we find the following figure (2.2) lower proportion of general cargo transportation continuing demand for container transport and the increase during the period of expectations for the market navigation World trade by loading category of (1998 – 2024)

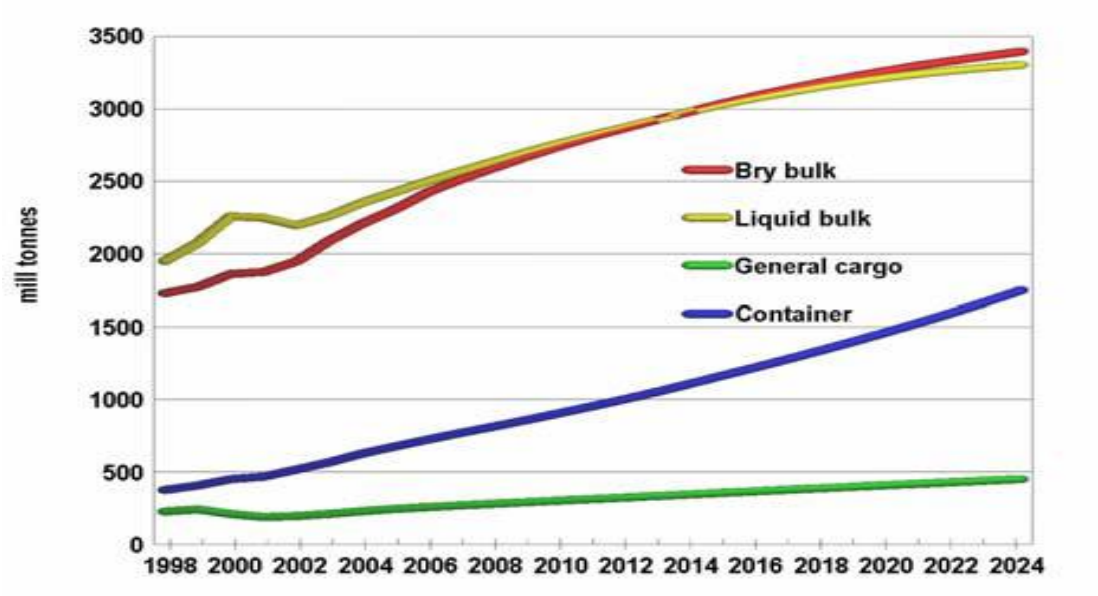

Figure (2.2) World trade by loading category1998 – 2024

Source: DUCRUET, C., NOTTEBOOM, T., 2012

The Mediterranean Sea is from the world's busiest waterways that is responsible for 15 per cent of global shipping action by number of calls and 10 per cent by vessel deadweight tons (DWT). In 2006, 13,000 merchant ships made 252,000 port calls (DWT) at Mediterranean ports. Around 20 per cent of Mediterranean ports are located in the East Mediterranean region.

Littoral States with coastlines bordering the Mediterranean account for around 19 per cent of world seaborne trade in terms of volume. However, seaborne trade between Mediterranean littoral States is relatively underdeveloped and shows only 18 per cent of the total Mediterranean littoral States' trade. Trade carried in tankers represents the largest portion of Mediterranean littoral States' trade and dominates intra Mediterranean trade. Tanker trades represent just fewer than 60 per cent of all seaborne trade between littoral Mediterranean States.

The Mediterranean is an extremely important transit route. In 2006 around 10,000, mainly large, vessels transited the area en-route between non Mediterranean ports. Merchant vessels operating in and through the Mediterranean are getting larger and carrying more trade in larger parcels. Vessels transiting the Mediterranean average 50,000 DWT and are, on average, over three times larger than other vessels operating within the Mediterranean.

Overall vessel activity in the Mediterranean has been rising steadily over the past

10 years and is projected to expand by a further 18 per cent over the next 10 years.

Transits through the Mediterranean are expected to soar by 23 per cent. Increases in vessel activity will be coupled with the deployment of ever larger vessels. Chemical tanker and container vessels will demonstrate the highest rates of growth in respect of port callings within the Mediterranean over the next ten years whilst increases in transits will be most pronounced in the product and crude tanker sector.

Furthermore, competition between East-Mediterranean ports is very difficult. The predictable increase of container traffic, and the constant drive for specialization and capacity increase of maritime vessels have resulted in shipping companies directed as much as possible on a limited number of East-Mediterranean ports of call.

All the time, the connection services are left to feeders. In this method, shipping companies are able to increase benefit from the economies of scale that their larger vessels offer, while they are also able to provide more flexible and faster transport services and sailing schedules.

Emerging strategic alliances between shipping companies, for the moment, have led to a further concentration of demand for port services. In other words, there is clearly a declining trend in the number of players requiring services from ports or container terminals.

2.2 Container Ports in East Mediterranean Region

East Mediterranean ports are important from the point of view of the global carriers.

It is necessary to set up hub and spokes systems that can collect goods from a great variety of ports taking into consideration that there is also a number of fairly small specialized operators in the East Mediterranean region in addition to the large companies. These smaller operators can offer feeder services to the large companies, but they may also operate independently with direct calls. In a complex and rich area such as the East Mediterranean they have little difficulty in finding scope for their operations.

More specifically, ships passing through the Suez Canal have to cover a greater distance to reach northern European ports as compared to the southern ports. Furthermore, the efficiency of East Mediterranean ports has increased and the (EU) countries bordering on the Mediterranean have now become wealthy trading countries.

In general, East Mediterranean ports are experiencing a period of revival and now offer the same number of departures both towards the West and the Far East as do northern European ports, passing via transshipment Centre and travel times to destination are almost equal Tiwari, P., Itoh, H., & Doi, M. (2003).

The forecasts concur in predicting that transshipment will continue to grow in the main countries bordering on the Mediterranean.

As defined the east Mediterranean region including (Egypt, Cyprus, Turkey, Syria, Lebanon and Israel) that are competing in Maritime transport market within the region with a total number of 22 commercial ports, 15 of them are including at least one containers terminal, Table (2.1) shows the nominated ports for the analysis.

Table (2.1) shows the Nominated ports for the analysis

Country	Port	Ports which contain container terminals
Egypt	Alexandria	Alexandria
	El-Dekheila	El-Dekheila
	Port Said	Port Said
	East Port Said	East Port Said
	Damietta	Damietta
	Arish	
Cyprus	Old limassol port	New limassol port
	New limassol port	Larnaka
	Larnaka	
	Pafos	
	Latsi	
	Vassiliko	
Turkey	Mersin	Mersin
	Antalya (akdeniz)	Antalya (akdeniz)
	Iskenderun	
Syria	Lattakia	Lattakia
	Tartous	Tartous
Lebanon	Beirut	Beirut
	Tripoli	
Israel	Haifa	Haifa
	Ashdod	Ashdod
Greece	Piraeus	Piraeus
	Thessaloniki	Thessaloniki

2.2.1 East Mediterranean ports Classifications

There are several types of ports in the region, each has its characteristics, and each performs different functions which differ in quantity and quality, the researcher will introduce the different types of East Mediterranean ports as shown below:

- **Transshipment ports**: which can work as the hub center in a hub and spokes system (for example, Damietta, Alexandria, Port Said) or as relay, linking two orthogonal routes (like most of the activity at Algeciras).

- **Gateway ports**: namely ports with a hinterland supporting them that is rich in production and consumption. For example Piraeus, Odessa, Haifa, Izmir, in the east of the Mediterranean.

- **Regional ports**: which can be situated in the vicinity of industrial centers or densely populated areas, but positioned in remote locations with respect to the actual urban area (like most eastern Mediterranean ports)? The traffic in these ports consists of smaller feeder ships, or infra-regional connected directly with gateway ports or to other minor ports.

A recent study that was published in (Maritime Transport in the Eastern Mediterranean Magazine, 2009) shows that the projection of average growth during the period 2004-2020 in the region of east Mediterranean will reach 5%-7%, figure (2.1) symbol map showing the projection on annual growth of container up to 2020.

Figure (2.3) Show the Eastern Mediterranean region

Source: Google Earth

2.2.3 Functions and configuration of the container port/terminal

The container was mainly designed to improve handling efficiency, primarily port handling efficiency, but also for all the handling processes between different transport modes.

Standardization of cargo handling therefore needs highly specialized facilities. The facilities of a container port are the same, unrelated to their size and regulatory policy. The basic function of a sea port is to transfer goods and passengers between ships and shore and/or between ships (Goss, 1991). In order to fulfill this most basic function, a port provides different kinds of facilities and services. The World Bank classifies port assets into four different categories: basic port infrastructure, operational infrastructure, superstructure, and equipment see Table 2.2.

Table (2.2) Categories of port asset

Basic Infrastructure	Access Channel, Breakwater, Locks, Berths, Rail and road connection
Operational Infrastructure	Inner channels and turning, revetments, quay walls, jetties, navigation aids, buoys, beacons, moorings, docks
Superstructure	Paving, surfacing, lighting, offices, repair shops
Equipment	Tugs, line handling vessels, dredging equipment, ship and shore handling equipment, cargo handling equipment

Source: World Bank (2010, p. 95)

Container ports are complicated organizations hosting different simultaneous activities, e.g. tugging, pilotage, mending, etc., but container handling is the principal function of a container port, with handling constituting over 80% of the charges faced by a carrier bringing a container vessel to a port for loading and unloading (Tovar, Trujillo and Jara-Diaz, 2004). Because different activities take place in a container port, agents involved in container ports are diverse: port authorities, terminal operators, tug boats, consignees, etc. The objectives of different agents often differ, even if they carry out the same activities. Container transport in the port can be handled by a port authority, a terminal operator or inland logistics companies. For instance, a port authority's objective could be to create and maintain the labor capacity, whereas the terminal operator's

objective could be to maximize the profit, and the inland logistics company's objective could be to develop service reliability. In this research we focus on container handling activity within the container port. We conduct analyses of data on both port and terminal levels, and take into account the management characteristics of port and terminal level management, in order to evaluate the efficiency of container handling activities, regardless of the primary objectives of the agents (Qianwen Liu; 2010).

Physically, a container port is composed of one or more container terminals. In order to transport containers from ship to shore and within the port, the required facilities include berths for ships to park, area for container stacking and storage, and handling equipment to upload and unload containers. Among those facilities, the container handling equipment differentiates container ports from other ports. There is a huge variety of container handling equipment, but they can be classified into two major groups: quay crane and yard handling system. Figure 8 provides a schematic representation of the typical container terminal system. On the quayside, containers are transported between ship and shore and container quay cranes are the main equipment used for ship loading and unloading. It can be either mounted on the ship (ship-mounted cranes), or located on the quay, ship-to-shore (STS) cranes; the latter is widely used in container ports and terminals. On the yard side, containers are transferred to land transport modes or are arranged to be loaded on to other ships.

Two types of activities appear in the yard area: stacking of container and horizontal transport. Before containers are moved away they are stacked in the yard area (Qianwen Liu, 2010).

Stacking equipment for containers comprises Straddle Carriers, Rubber Tired Gantry Cranes (RTGs), Rail Mounted Gantry Cranes (RMGs), Reach stackers, and Stackers for Empty Containers. Horizontal terminal transport is the movement of containers between the STS, the stacking area, and the landside operation. Equipment for horizontal transport includes trucks, trailers, straddles carriers, automated guided vehicles (AGV), and reaches stackers.

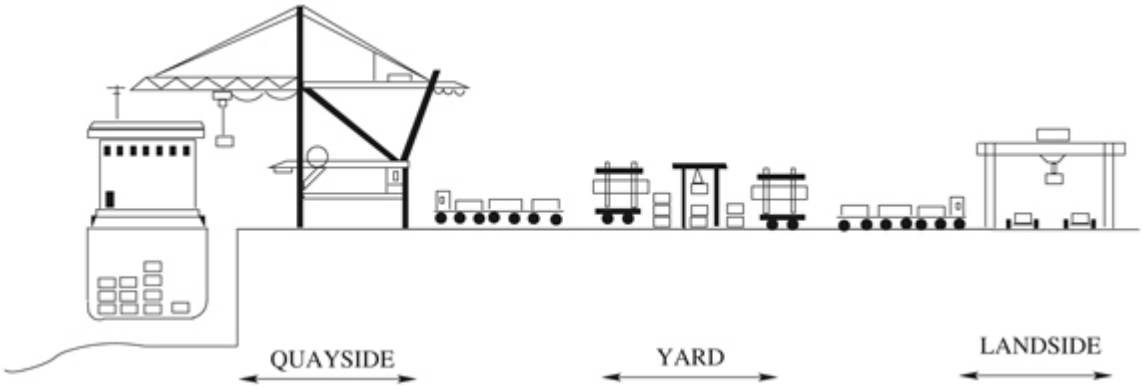

Figure (2.4) A typical container terminal system

Source: Monaco, Moccia and Sammarra (2009)

In addition to the handling facility, terminal size, berth length, storage and trained labor are all important to the operation of container handling. A container port can be seen as the collection of its terminals in terms of physical structure. However, the operation objectives of ports and terminals cannot be compared because the operating agents are different.

2.2.4 Trend of market structure of container terminals

Functional wise, container ports and container terminals can be seen as identical, because they share the same fundamental functional objective: transport containers between ship and shore. Container terminals stood out from container ports as a distinct industry. Ports are usually analyzed by the degree of privatization, but in practice there is rare a 100% private port, so port operating is seen as public sector activity. Terminals operating, on the other hand, can be 100% private, so there are various forms of container terminal operating as shown below.

Global terminal operating and local terminal operating: Horizontal integration has caused a few number of very large international container terminal operators. They operate terminals in different countries and different continents. Hence, the container terminal can be classified into global or local terminal, depending on the operator's geographical coverage *(Qianwen Liu, 2010).*

Dedicated terminal (carrier operated terminal) and independent terminal operator: Vertical integration between ocean carrier and terminal operator results in dedicated

terminals. This is a strategy/practice used by the carrier to ensure the reliability of its service. Hence, the container terminal can be categorized into dedicated or independent terminal, depending on the operator's business coverage (core business).

Multiple purpose terminal and container only terminal: A terminal can handle three types of cargo: bulk, container and general cargo. Bulk cargo is unpacked homogeneous cargo, which is usually dropped or poured. Container cargos are heterogeneous goods which are moved in International Standard Organization (ISO)-specified steel/aluminum boxes that can be lifted or rolled by equipment (Qianwen Liu, 2010).

Within this context, we have surveyed the function and configuration of container ports and terminals basis. Container ports include many different agents with various activities. However, container handling is the most important activity within a container port.

2.2.5 Planned Container Port Developments in Easter Mediterranean

Most of the main container ports in the Mediterranean have development or expansion plans in place to keep pace with containership growth and operator requirements.

Many of the larger container ports in the area are planning to, at a minimum, double their handling capacity in the next ten years. The sections below show some of the plans underway in the eastern Mediterranean. It should be noted that ports will to some degree be competing for the same traffic, particularly in the transshipment sector. Due to competitive pressures, development of port infrastructure. The eastern Mediterranean has been a growing focus for port operators and container lines in the last few years due to its proximity to Adriatic and Black Sea markets, as well as the Suez Canal.

The Suez Canal Container Terminal at Port Said in Egypt plans to be able to handle 5.1 million TEU and accommodate vessels carrying 22 rows across by 2011.

Piraeus plans to triple capacity by 2011. This would mean a handling capacity of around 4.2 million TEU.

Construction of a new container terminal at Yarimca in Turkey began in 2006 for DP World (port operator). The terminal is expected to enter operation in 2008 with a capacity of more than 1 million TEU.

Mersin currently handles 0.64 million TEU and plans are in place to increase this to 1.7 million TEU over the next ten years.

Ravenna has a new container terminal due to be completed in 2011.

2.3 The configuration of liner shipping services and networks

As mentioned Liner shipping companies play a great role in the prosperity of both domestic and international trade, for so, networks are developed to meet the growing demand in global supply chains in terms of frequency, direct accessibility and transit times. Expansion of traffic has to be covered either by increasing the number of strings operated, or by vessel upsizing, or both. As such, increased cargo availability has triggered changes in vessel size, liner service schedules and in the structure of liner shipping

When designing their own networks, shipping lines indirectly have to make a trade-off between the requirements of the customers and operational cost considerations. A higher demand for service segmentation adds to the growing complexity of the Networks. Shippers demand direct services between their favored ports of loading and discharge. The demand side thus exerts a strong pressure on the service schedules, port rotations and feeder linkages. Shipping lines, however, have to design their liner services and networks in order to optimize ship utilization and benefit the most from scale economies in vessel size. Their objective is to optimize their shipping networks by rationalizing coverage of ports, shipping routes and transit time *Rodrigue, J. P., & Notteboom, T. (2010).*

Shipping lines may direct flows along paths that are optimal for the system, with the lowest cost for the whole network being achieved by indirect routing through hubs and the amalgamation of flows. However, the more efficient the network from the carrier’s point of view, the less convenient that network could be for shippers' needs (Notteboom, 2006). Bundling is one of the most important drivers of container service network dynamics. The bundling of container cargo can take place at two levels: (1) bundling within an individual liner service and (2) bundling by combining/linking two or more liner services.

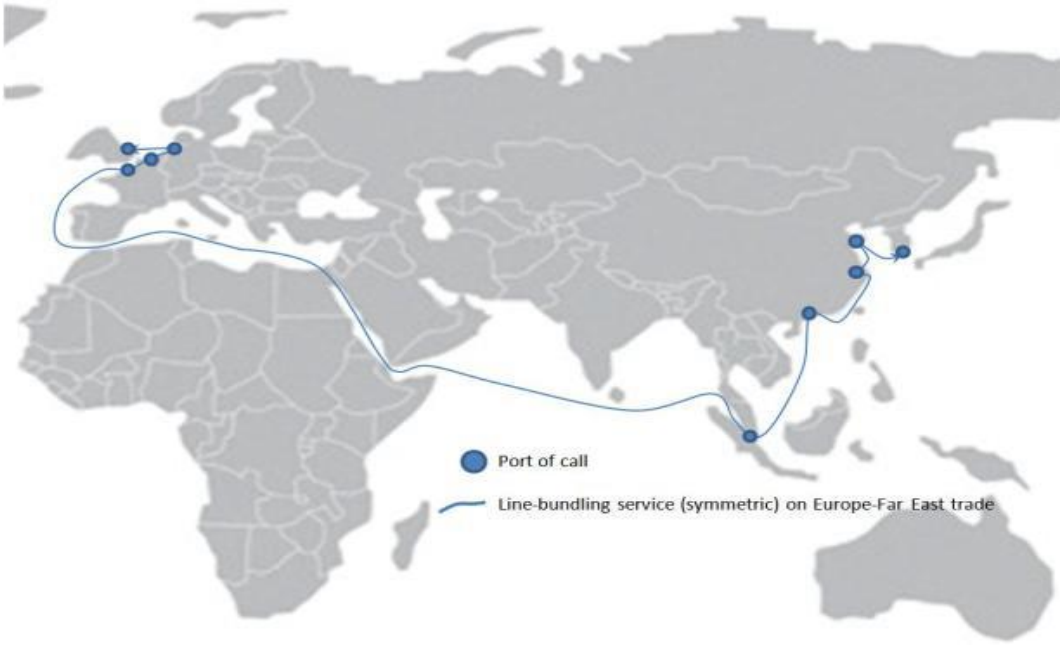

Figure (2.5) Line bundling service (symmetric and asymmetric)

Source: DUCRUET, C., NOTTEBOOM, T., 2012

In channeling gateway and transshipment flows through their shipping networks, container carriers target for control over key terminals in the network. Decisions on the preferred port hierarchy are guided by strategic, commercial and operational considerations. Shipping lines rarely opt for the same port hierarchy in the sense that a terminal can be a regional hub for one shipping line and a secondary feeder port for another operator. For example, Antwerp in Belgium and Valencia in Spain are some of the leading European hubs for Mediterranean Shipping Company (MSC) while they receive only few vessels from Maersk Line. Zeebrugge and Algeciras are among the primary European ports of call in the service network of Maersk Line while these container ports are rather insignificant in the network of MSC. (Song, D.W. and Panayides, P., 2012).

The liner service configurations are often combined to form complex multilayer networks. The advantages of complex bundling are higher load factors and/or the use of larger vessels in terms of TEU capacity and/or higher frequencies and/or more destinations served. Container service operators have to make a trade-off between frequency and volume on the trunk lines: smaller vessels allow meeting the shippers' demand for high frequencies and lower transit times, while larger units will allow operators to benefit from economies of vessel scale. The main drawbacks of complex bundling networks are the need for extra container handling at intermediate terminals and longer transport times and distances. Both elements earn additional costs and as such could counterbalance the cost

advantages linked to higher load factors or the use of larger unit capacities. Some have suggested that the most efficient east/west pattern is the equatorial round-the-world, following the beltway of the world (Ducruet, C., & Notteboom, T. (2012). This service pattern focuses on a hub-and spoke system of ports that allows shipping lines to give a global grid of east/west, north/south and regional services. The large ships on the east/west routes will call mainly at transshipment hubs where containers will be shifted to multi-layered feeder subsystems serving north/south, diagonal and regional routes. Some boxes in such a system would undergo as many as four transshipments before reaching the final port of discharge. The global grid would permit shipping lines to cope with the changes of trade flows as it combines all different routes in a network.

Existing liner shipping networks feature a great diversity in types of liner services and a great complexity in the way end-to-end services, line bundling services and

Transhipment/relay/interlining operations are connected to form extensive shipping networks.

Maersk Line, MSC and CMA-CGM operate truly global liner service networks, with a strong presence also on secondary routes. Especially Maersk Line has created a balanced global coverage of liner services. The networks of CMA-CGM and MSC differ from the general scheme of traffic circulation through a network of specific hubs (many of these hubs are not among the world's biggest container ports) and a more selective serving of secondary markets such as Africa (strong presence by MSC), the Caribbean and the East Mediterranean.

Figure (2.6) Round-the-world service

Source: DUCRUET, C., NOTTEBOOM, T., 2012

Notwithstanding the demand pull for global services, a large number of individual carrier's stays regionally based. Asian carriers such as APL, Hanjin, NYK, China Shipping and HMM mainly focus on intra-Asian trade, transpacific trade and the Europe – Far East route, partly because of their huge reliance on export flows generated by the respective Asian home bases. MOL and Evergreen are among the few exceptions frequenting secondary routes such as Africa and South America. Great differences exist in service network design among shipping lines. Some carriers have clearly opted for a true global coverage, others are somewhat stuck in a triad-based service network forcing them to develop a strong focus on cost bases. Alliance structures (cf. Grand Alliance, New World Alliance, and CYKH) provide its members easy access to more loops or services with relatively low-cost implications and allow them to share terminals.

Figure (2 .7) Pendulum service

Source: DUCRUET, C., NOTTEBOOM, T., 2012

The number and order of port calls, the total two-way sailing distance and the vessel speed are the main determinants of the total vessel roundtrip time. The theoretical/optimal roundtrip time will rarely be achieved in practice due to delays along the route and in ports giving rise to schedule reliability problems. Low schedule integrities can have many reasons ranging from weather conditions, delays in the access to ports (pilotage, towage, locks, tides) to port terminal congestion or even security considerations (Notteboom, 2006). A shipping line can add time buffers in the liner service to cope with the chance of delays. Time buffers reduce schedule unreliability, but increase the vessel roundtrip time.

When it comes to the service frequency, carriers typically aim for a weekly service. The service frequency and the total vessel roundtrip time determine the number of vessels required for the liner service. Carriers have to secure enough vessels to guarantee the desired frequency.

Given the number of vessels needed and the anticipated cargo volume for the liner service, the shipping line can then make a decision on the optimal vessel size and fleet mix. As economies of vessel size are more significant on longer distances, the biggest vessels are typically deployed on long and cargo-rich routes.

2.3.1 Liner Shipping Networks in East Mediterranean

There were numerous differences when the views of purchasing managers were compared to those of worldwide water ports. To conclude, chapter three has covered the previous literature concerning port competition as well as the different criteria for selecting ports from various perspectives. However, it can be said that no previous research was conducted to tackle the point of port selection criteria in the east Mediterranean region and traces their impact on competition. Thus, studying and statistically analyzing this gap present a challenge and a contribution of the present study. In reference to table (2.3) represents those countries and their container ports that are located in East Mediterranean Sea.

Those container terminals were selected from the Group of the eastern Mediterranean and the convergence in size to compete with each other and thus show how difficult the selection process due to the convergence of the distances between those terminal as well as the volume of containers handled per year and an average of 800 000 containers to one million containers annually and more therefore been chosen those terminal were identified five years earlier to follow the changes that occur in ports, which need an average of 5 to 7 years, due to the high capital cost enjoyed by the shipping industry, especially equipment and facilities needed by the customer within the ports.

The table (2.3) Demonstrates volume of throughput during the period (2008-2012), a period chosen for the study period to measure the extent of the changes that occur in ports during the same period of the infrastructure as well as the trade volume traded explains. Annual Growth rate over the past selected so as to clarify the extent of the changes that are related to the size of trade in the region (Eastern Mediterranean) It is noted in the table

(2.3) the extent of absorption of Port Said Port (East - West) (Egypt) for containers and that has helped it in the first place, the port location, which was certain data on the size of trading either port of Damietta (Egypt).

It is noticeable evolution that occurred in the port and considered in the period from 2008 to 2011 is the peak stages Growth of the port, to the attention of the state and the events of the developments, especially infrastructure, as well as many of the technological developments, which in turn helped to increase trading volume and thus the port is number one in the region, especially in transit trade but noticeable decline observed trading volume, particularly in 2012 and its aftermath, which was confirmed by Statistics published for the following years due to the negligence of port management in the development of the depths of your water coral private container terminal in order to anchor harbor at a depth of 14.5 meters, while the size of the depths that you need vessels operating in the region to 16 meters and therefore decreased the number of ships that enter the port which is reflected in the volume of trading in the port.

As shown in figure (2.8), the port of Ashdod (Israel) from the observed reflection of the developments that have occurred in the port which is translated by an increase in trading volume, especially since 2010, as well as the port of Mersin (Turkey), which has been linked renaissance business of the state, which was its system development of the ports of Turkey, especially around the Mediterranean for trade promotion with the countries of the Middle East.

Figure (2.8) Map of Main Shipping Routes in East Mediterranean Sea

Source: *Wiegmans, B ,2008*

Table (2.3) Shows the size of the targeted throughput to the selection port also the Av. Annual Growth rate during the period (2007- 2012)

Port	2007	2008	2009	2010	2011	2012
Port Saied	2.768.825	3.128.776	3. 564.578	3. 838.724	5.366.968	4.831.165
Ashdod	808. 700	827. 900	893.000	1. 018.000	1.038.950	1.181.000
Haifa	1.148.628	1.262.000	1.140.000	1.263.552	1.235.000	1.372.209
Damietta	874.559	1.195.630	1.213.187	1.096.052	1.200.000	760.000
Mersin	782.028	854.500	843. 917	1.024.171	1.126.588	1.263.495
Piraeus	1.373.138	433.582	664.895	513.319	1.680.133	2.745.012
Alexandria	1.170.949	1.264.455	1.460.106	1.495.554	1.490.000	1.500.000

Source: the researcher (Containerisatin International Yearbook 2007-2013)

The qualitative method enabled to explore the richness of knowledge in empty container practices of 30 practitioners, including internal or local carriers, manufacturing firms, trucking companies, intermodal transport operators, freight forwarders, and marine container logistic specialists, involved in the issue. In this study, the semi-structured questionnaires were designed, and the face-to-face interviews were conducted in 2011 to 2012. The average duration of a session with each respondent was 40 minutes to 100 minutes. The interviews were recorded and professionally transcribed verbatim with coded themes and sub-themes through thematic analysis using Muhr, T., & Friese, S. (2004) software.

The purpose of the design of the questionnaire is to determine the most important of these key factors, as well as the most important elements that fall under each such factor.

This questionnaire was sent to most of the shipping companies that serve the container market in the study area (Eastern Mediterranean), and has already were identified more factors and elements (very important) for those companies selected for container terminals located in the study area.

After selecting the most important criteria selected by the shipping companies, a questionnaire was designed and is, therefore, to determine the relative weight of these elements in an attempt to get how important those elements, and the problem that we faced was that of the those elements of what is tangible and can be determined what is intangible and cannot be confined to one or several.

This questionnaire was directed to experts in the field of maritime transport sector as well as academics and so to get over the relative importance of these factors and falls below the elements. After getting the result of the questionnaire and through which to obtain the relative weight of each factor and each element has been determined by the shipping companies and the output from the first questionnaire, and now it turns out it must apply the availability of these elements in a group of selected ports (container terminals).

After assembling the evidence and information available for those stations were selected major factor and falls beneath many of the elements of a Port features.

This is one of the most important key factors identified by the shipping companies in the first questionnaire.

To determine the availability and development of those elements over 5 years since the year (2007-2011) to be the year of measurement is the year 2012, because the Life Cycle Time in the maritime transport sector, particularly in the development of ports ranging from 5-7 years, which *(Nir, A., 2003)* in account by the shipping companies for the attention span of those stations and management development and responding to requests for shipping companies.

After applying those data to a group of container terminals selected show it was arranged that the stations based on those data and that from the viewpoint shipping companies by applying just one factor of a group other key factors as to what is available from the Information and published data from those ports.

This was followed by the application of the main factor your order in the world for a group of container terminals, Throughput which that was specified for a group of ports selected in the study and were accordingly arrange those stations which were taken this factor as a key element in determining these stations to ensure there is full competition among them and thus achieve starters equal opportunities for those stations

2.3.2 The integrated relationship between shipping lines and container terminals

Complementing the above the shipping industry is considered a 'global' industry. Ships carry most worldwide trade, and a large part of it is made up of commodities and products that have to be carried from one part of the world to the other. The global nature and particularly the dynamics of industry concentration receive much attention from academics.

Shipping lines have embraced a wide range of bundling concepts and liner service configurations to drive container service network dynamics. As global trade expands in economical and geographic terms, despite difficult conjunctures such as the global financial crisis, new ports and new shipping networks are regularly created to cope with demand.

The global nature and especially the dynamics of industry concentration get much attention from academics. This is witnessed by a increasing body of very recent work *(Olivier et al., 2007; Bichou and Bell, 2007; Olivier, 2005; Slack and Fre´mont, 2005; Notteboom and Rodrigue, 2005*) on the development of partnerships and alliances in liner shipping, port operations and among liner shipping companies and port operators.

More recently, (Slack and Fremont, 2005) analyze the port terminal operations industry and conclude that this industry is characterized by two major business models, one where the terminal operator is the result of a horizontal integration in the port terminal industry, and the other, where the terminal operator has technologically advanced out of a vertical integration process with a liner shipping company. In practice, a 'hybrid' strategy is becoming common: maritime groups use their terminals to facilitate their own shipping activities

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research can be accomplished in many ways. In this chapter, aspects related to the research process of this dissertation are described and discussed. A general description of available research methods is presented, underpinning a discussion of why some of these have been considered suitable for this specific research project**.**

The layout of this chapter is as follows section 3.2 represents research design, section 3.3 represents research strategies, section 3.4 represents data collection methods, section 3.5 represents 3.5 data validity & reliability, and section 3.6 data analysis.

3.2 Research Design

The research design describes a set of guidelines that connects theoretical paradigm to strategies of inquiry and methods for collecting empirical material *(Denzin and Lincon, 1994).* According to *(Yin,1999)* a research design is an action plan to get from here to there; *(Yin,1999*) describes research design as the logic that connects the data to be collected and the conclusions to be drawn to the initial questions of the study.

The role of research design is to link the questions to data. Design stands between the two, showing how the research questions will be connected to the data, and the tools and procedures to use in answering them. Research design has to follow from the questions and fit them with data. The design is the main plan for a piece of empirical research, and includes main ideas such as strategy, sample, and the tools and procedures to be used for collecting and analyzing data *Punch, S. (2000).*

(Rosenthal and Rosnow, 1991) also defined research design as a "blueprint that provides the scientist with a detailed outline or plan for the collection and analysis of data.

3.3 Research Strategies

For conducting empirical research, there are two main methods of data collection: Qualitative and quantitative. These two methods have their advantages and disadvantages. The qualitative method permits researchers to study selected issues in depth and detail. Approaching fieldwork without being constrained by predetermined categories of analysis adds to the depth, openness, and detail of qualitative inquiry.

The quantitative method, on the other hand, entails the use of standardized instruments so that the changing perspectives and experiences of people can fit a limited number of predetermined response categories, to which numbers are assigned. The advantage of a quantitative method is that it is possible to measure the reactions of a great many people to a limited set of questions, thus facilitating comparison and statistical aggregation of the data. This gives a broad generalizing set of findings presented succinctly and parsimoniously. By contrast, a qualitative method typically produces a wealth of detailed information about a much smaller number of people and cases. This upsurges understanding of the cases and situations studied but reduce generalization Patton, M. Q. (1990).

In order to avoid their disadvantages, one important way to reinforce a research design is to use both qualitative and quantitative methods. A number of research strategies are available for conducting social sciences: Experiments, surveys, histories, case studies, and the analysis of archival information. The kinds of research strategies used in a study 70 should be dependent on three conditions: The type of research questions, the control an investigator has over actual behavioral events and the main focus on contemporary, as opposed to historical, phenomena. However, the first and most important condition for differentiating among the various research strategies is to identify the type of research questions being asked *(Yin, 1989)*.

Based on the three research questions proposed in this study, the research strategies of a literature review, a questionnaire survey, and structured interviews were adopted in this research. The explanations for using such research strategies are presented in the following subsections.

3.3.1 Descriptive and Explanatory Research

- Descriptive Research

According to *(Dane, 1994)* descriptive research encompasses examining a phenomenon to define it more fully or to differentiate it from another phenomenon. He further asserts that descriptive research involves attempts to define or measure a particular phenomenon, usually by attempting to estimate the strength or intensity of the behavior, or the relationship between two behaviors. *Philip, J. A. (2000)* argue that the descriptive research tries to find the limits of previously proposed generalization.

Descriptive research is distinctive in the number of variables employed. Like other types of research, descriptive research can comprise multiple variables for analysis, yet unlike other methods, it requires only one variable. Descriptive studies are aimed at finding out "what is," so observational and survey methods are frequently used to collect descriptive data *(Borg and Gall, 1989).* So it is clear that the first two proposed questions in section 1.7 are descriptive in nature.

- Explanatory Research

(Marshall and Rossman, 1999) state the explanatory studies try to clarify patterns related to the studied phenomenon and to show relationships between events and the meaning of these events. *(Yin, 1999)* notes that in explanatory studies, questions cope with operational links needed to be traced over time. So it is obviously clear that the third question in section 1.7 is explanatory in nature.

3.3.2 Inductive, Deductive Research

In research, it is generally referred to two methods of reasoning as the deductive and inductive approaches. Deductive research based on translating a general theory into specific hypodissertation which is suitable to testing. This kind of research begins from the more general and goes to more specific, usually in order to provide evidence to prove or refute the pre-specified hypodissertation. Deductive research approach can be useful when there is significant amount of literature exist on that field. Working deductively requires a highly structured methodology and quantitative data collection to be able to achieve generalizations and conclude the hypodissertation *(Saunders, 2003).* Statements based on laws, rules and generally accepted principles are used for deductive reasoning which enables researches to measure the facts and related data quantitatively (Inductive and Deductive).

An inductive approach works the other way and begins with specific observations and moving to broader generalizations and theories. In order to develop new conclusions and theories, researchers start the process by following data from the beginning, making observations and measures to define patterns and factuality *(Aillaud & Hähnel, 2006).* This kind of approach is relevant when the context of the research has been wanted to analyze deeply and intimately and the most suitable data to collect would be 'qualitative'.

The possibility to conclude specific and limited statements from this type of research is higher but the researchers may still achieve significant general conclusions *(Saunders, 2003).* According to the nature of the topic of this dissertation, deductive research would be the most appropriate approach to conduct this study.

The previous empirical studies and theories would be highly useful for the authors to create their research design and analyze the data and findings in the most relevant way. In conformity with the structure of deductive research, the authors felt that, it is possible to obtain specific and reliable conclusions from the general and well-known theories.

Furthermore, as *(Alvesson and Sköldberg ,1994)* state, to use conclusions and concepts from previous theories would keep authors away from being unrealistic which an inductive approach may cause *(Aillaud and Hähnel, 2006).*

3.3.3 Qualitative and Quantitative Research

When starting up research it is important to choose an appropriate approach in which to collect data. Two different methods exist, the qualitative method and the quantitative method. It is common to use only one of these methods in a research, however in some cases both can be proper to implement for the same study, as they can be seen as complementary to each other *(Money, Remenyi, Swartz, Williams 1998).*

The main difference between qualitative- and quantitative methodology is that with qualitative there is a focus on the individual to get a deeper understanding of the situation of which you wish to study. A Quantitative method simply means that the researcher collects a large number of facts which are later to be statistically analyzed *(Hussey & Hussey, 1997).*

The latter approach is suitable when there is attentiveness in measuring and comparing the responses from a larger number of people *Patton, M. Q. (1990).*

According to *(Marriam, 1988)* information brought by words is qualitative, while information brought by numbers is considered to be quantitative. Qualitative methods are a set of data collection and analysis techniques that can be used to provide description, build theory, and to test theory *(Van Maanen, 1979).* They stress the fine grained, the process oriented, and the experiential, and offer a means for developing an understanding of complex phenomena from the perspectives of those who are living it *(Miles and*

Huberman, 1994). The primary advantages of qualitative methods are that they allow the researcher to discover new variables and relationships, to uncover and understand complex processes, and to illustrate the influence of the social context *(Barley, 1989).*

Quantitative research helps the researcher to be familiarized with the problem or concept to be studied, and perhaps generate hypotheses to be tested. In this paradigm: (1) the emphasis is on facts and causes of behavior *(Bogdan and Biklen, 1998)*, (2) the information is in the form of numbers that can be quantified and summarized, (3) the mathematical process is the norm for analyzing the numeric data and (4) the final result is expressed in statistical terminologies. Theory building involves trade-offs *(Fine, G. A., & Elsbach, K. D. (2000). (Weick, 1979)* discusses a simple framework for assessing theory along three dimensions: simplicity (i.e. ease of understanding or application), accuracy (i.e. conformity to the truth) and generalization (i.e. extension to other domains). Qualitative research is often accurate and potentially general, but often overly complex. Large-sample quantitative studies often use proxies to measure aspects of the phenomenon of interest and might be categorized as being simple and general, but lacking in accuracy. Any single method of data collection (e.g. cross-sectional survey-based studies, qualitative studies, experiments, large sample quantitative studies) results in tradeoffs in the resulting theory's simplicity, generalization, and accuracy *(Thorngate, 1976).(Weick ,1979)* suggests that the solution is not to search for a method that combines all three elements (accuracy, generalization, and simplicity) but to build theory by alternating among sets of data that provide one or more of these elements or by incorporating complementary research conducted by others. Hence the researcher conducted this research through the collection of both qualitative and quantitative data, to benefit from combining both methods together.

3.4 Data Collection Methods

Data collection methods are an integral part of research design. There are several data collection methods, each has its own advantages and disadvantages. Problems researched with the use of appropriate methods greatly enhance the value of the research.

3.4.1 Primary- and Secondary Data

There are two distinct types of data to be collected, one is in the form of new data for a specific purpose, and this type is called primary data or original data. The second type is

the secondary data, which is data that already exists, that has been written by another author, for a totally different purpose *(Hussey, J., & Hussey, R 1997).*

In this report both primary- and secondary data have been used, to compare new findings with already existing ones.

3.4.2 Structured Interviews

The interview in the form of a guided conversation is an important source of case study information when dealing with the complexity of human interaction and behavior *(Yin, 2009).* Nevertheless, it is important to bear in mind that the interviewees´ answers may be biased, affected by poor recall or misinterpreted due to language barriers. Consequently, the interview shall always be considered a verbal report that needs to be verified against other sources *(Yin, 2009).*

The authors therefore verify and relate the empirical findings against the theoretical framework. An interview can be conducted in several ways depending on the purpose and content of the case study. The authors have chosen structured interviews with closed-ended questions grouped according to theme and asked in a predetermined order *(Yin, 2009).*

The authors found this flexibility suitable in this research since it allowed for a deeper insight in certain issues. It also let the authors follow up new and relevant leads in order to gain as much understanding of the case as possible. It gave the authors an opportunity to get as much information as possible from each interviewee. Each of the interviewees has been chosen due to their specific knowledge on the matter.

3.4.3 Administered Questionnaire

The method chosen for collecting the co-workers opinion was through a standardized self- distributed questionnaire. Although the method is widely used, the composing of it is not an easy task. It is highly important that the questionnaire collects the precise information that the research requires. Thus, composing questions should be done carefully. The reliability and the validity of the data collected, however, depend to a large extent on the technical proficiency of the ones composing the questionnaire *(Robson, 2002).* As the researcher designed the questionnaire, multiple questions and approaches was discussed in order to reach and compile the most appropriate questions for the purpose

and the research questions. The reasoning behind some questions is adapted from other research articles, while other questions have been derived from the structured interview.

3.5 Data Analysis

The analysis of data enabled the researcher to select and develop a model for the determines of service quality in ports in order to analyze the data obtained from the questionnaire through two programs, the first is called the analytic hierarchy process (AHP), and the Second is called K-Firm Concentration (KCR), and both are discussed as follows.

3.5.1 Analytic hierarchy process (AHP)

The analytical hierarchy process (AHP) is a multi-criteria decision-making method developed by *(Saaty, 1987)* it has been applied to solve unstructured problems in a variety of decision-making situations, ranging from the simple personal decisions to the complex capital intensive decisions.

AHP evaluates the consistency of the pair wise comparisons as they are made through hierarchy. In this context, both approaches were considered suitable and reliable tools for identifying the real problems occurring at the depot in Clang Port.

Selective coding was used to provide the overall theoretical picture. The objective of selective coding is to identify a key category or theme that can be used as the core of the study results *(Coleman, G., & O'Connor, R 2007).* Some collected data were analyzed through the analytic hierarchy process (AHP) to determine the priority theme (factor) affecting the bottleneck or congestion. However there are some short comings related to the usage of AHP as will be discussed below in the same section for, so the researcher will use an extension for AHP approach called the Fuzzy AHP.

- **Why Fuzzy AHP instead of AHP**?

In the conventional AHP, the pair wise comparisons for each level with respect to the target of the best alternative selection are conducted using a nine-point scale. So, the application of Saaty's AHP has some shortcomings as follows (Kabir & Hasin, 2011b); (1) The AHP method is mostly used in nearly crisp decision applications, (2) The AHP method makes and deals with a very unbalanced scale of judgment, (3) The AHP method

does not take into account the uncertainty related with the mapping of one's judgment to a number, (4) Ranking of the AHP method is rather imprecise, (5) The subjective judgment, selection and preference of decision-makers have great influence on the AHP results. In addition, a decision-makers requirement on evaluating alternatives always contains ambiguity and multiplicity of meaning. Furthermore, it is also recognized that human assessment on qualitative attributes is always subjective and thus imprecise. Therefore, conventional AHP seems inadequate to capture decision maker's requirements clearly (Kabir & Hasin, 2011b).

In order to model this kind of uncertainty in human preference, fuzzy sets could be incorporated with the pair wise comparison as an extension of AHP model called Fuzzy AHP which comes into implementation in order to overcome the compensatory approach and the inability of the AHP model in handling linguistic variables. The fuzzy AHP model allows a more accurate description of the decision making process.

3.5.2 K-Firm Concentration Ratio (KCR)

The concentration ratio specifies the concentration of production management in particular industry and is an important index to reflect industry and market structures.

"The concentration ratio is the percentage of all sales contributed by the leading three or five, say, firms in a market". *Scherer, F. M. (1999)* So the concentration ratio can be calculated by using the cumulative share of the first three or five firms according to their sales revenue share.

3.6 Data Validity & Reliability

The two most important and fundamental characteristics of any measurement procedure are reliability and validity. These two principles will be discussed in turn.

3.6.1 Validity

Validity is another word for truth *(Silverman, 2000).* The aim is to stay as close to the truth as possible. This might, however, be a complex task since the nature of a qualitative study easy creates subjective biases. All through the process we have tried to view the topic of interest as objectively as possible in order to decrease bias.

Hence, in order to validate the study, several provisions were considered. Firstly, an extensive literature review was conducted in order to learn more about the topic. Also, conversations with competent people have been held in order to improve the understanding of the complexity of the topic. *(Riley, L. P., & Coolican, M. B, 1999)* stated that validity of a research can be tested using at least one out of three methods. Those methods are construct validity, content validity, and criterion-related validity. In this research, the researcher used content validity to ensure the validation of data collection instruments. The researcher was able to match the questions of the designed questionnaire with its objectives.

3.6.2 Reliability

The reliability of a research, on the other hand, is attained if the method used to collect data can produce similar results each time it is used *(Rapoport, M, 2004).* Reliability refers to the dependability, stability, consistency, predictability, and accuracy of a research.. *(*Rapoport, M, *2004)* highlighted two major types of reliability: external and internal. External reliability is concerned with the consistency and stability of the tests involved in a research that is conducted on several occasions (longitudinally). Because of the difficulties that faced the researcher to design the needed questionnaire, the researcher was forced to depend on a pre-designed questionnaires that was developed and used by other researchers in the same field of concern, those researchers measured the internal reliability of their designed questionnaire using the interterm consistency reliability to test the consistency of respondents' answers to all items of the measure. To the degree that the items are independent measures of the same concept, they will be correlated with one another. The most popular test of interterm consistency reliability is Cronbach's coefficient alpha *(Cronbach, L. J, 1946)* which is used for multipoint-scaled items.

CHAPTER FOUR

LITERATURE REVIEW

4.1 Introduction

Port service quality is an important precondition for an efficient development of port industry and traffic system as a whole. It is due to the complexity of any port, as a system consisting of a large number of stakeholders rendering services to customers with various requirements that a unique set of port service quality indices has been still missing. For this reason, this part of the research explains the port service quality concept in compliance with stakeholders and their requirements within the context of port service quality.

The layout of this chapter is as follows section 4.2 the service concept, section 4.2 the service concept, section 4.3 Service of quality and section 4.4 Models of Service Quality Determinants in Container Terminal / Port.

4.2 The service concept

Johnston & Clark, 2008 have discussed the service concept and described it as a shared understanding of an organizations business idea. According to them, the service concept should be constructed based on the organizations visions, service ideas, brand and brand values, in addition to the organizations idea, the service experience, and the service outcome.

A thorough service concept, including all of the above mentioned points, can be used as an alignment tool, making it easier for everyone in the organization to work towards the same goal. By clarifying what the organization is meant to sell, what the customer is supposed to experience and what outcomes this experience should result in, all levels of employees in an organization will have a better understanding of what to deliver and how to deliver it. (Johnston and Clark, 2008) state that the service concept should be a shared understanding, not only within the company, but outside of it. Figure (4.1) shows the two perspectives from which the service concept can be perceived.

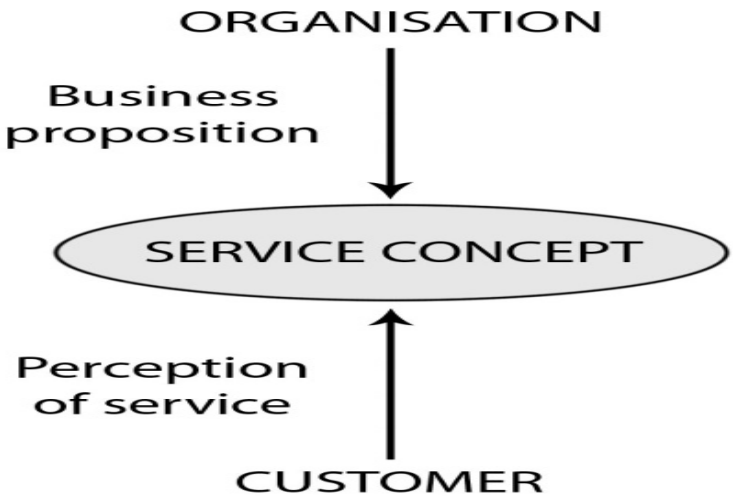

Figure (4.1) The Service Concept

Source: Johnston, D, et al 2008, p. 26

*(Johnston, D, et al 20*08*)* mean that the service concept is an essential part of marketing since a well-articulated service concept will allow customers to know what to expect from the organization. Also *(Grönroos c, 2001)* mentions that it is not the product, but the service concept that is the starting point in marketing. According to *(Johnston and Clark, 2008)* it is not a surprise that customer expectations are difficult to meet in an organization where a detailed service concept is not established.

4.2.1 Definition of service

Many definitions have been proposed to explain service, but all have common features as intangibility and immediate consumption. *(Zethaml & Bitner, 2006)* states that Services are attitudes, processes and functions. While *(Barich, H., & Kotler, P, 1990)* define Service as an act or activity, necessarily immovable and intangible, suggested by one transaction party to another one that would lead to the ownership of no external object, service production may attach to physical goods or not Services include recognizable and necessarily immovable activities which meet a need and Its attachment to goods sale or other services is not of necessity (Stanton, D., & White, D, 1986).

Service is different from physical products. Compared with physical products, Service is thought to be immaterial, heterogeneous, produced and consumed simultaneously, unable to be kept in stock, etc. A widely accepted definition of service is proposed by *(Grönroos ,C. 1990)* "A service is a process consisting of a series of more or less intangible activities that normally, but not necessarily always, take place in

interactions between the customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as keys to customer problems" *(Grönroos, C 2000).* This definition implied that service is a process where interactions between customer and service provider most often exist. Hence, in a service context, there are almost a relationship between customer and service provider; such relationship can be used as a basis for marketing *(Grönroos, C 2000).*

In order to retain loyal customer who will bring long-term profit to the firm, the key issue for service provider is to make use of this relationship in the way it manages customers by offering what the customer's needs and wants.

4.2.2 The nature of service

Morris, B., & Johnston, R. (1987). mentioned four main features to distinguish services from goods as follows:

1. Simultaneity: The fact that the services are consumed at the same time when they are generated and that the services cannot be stored is an important feature in service management. A product can be inspected before delivery, but a service should be evaluated in other ways to be assured of its quality.

2. Perish ability: A service is a perishable object or goods. An airplane seat or unoccupied rooms in hospital or hotel or a leisure hour of a dentist are examples for useless opportunities. Since a service cannot be stored, it would be annihilated forever and could not be used. Fully application of service capacity would change to a management challenge, because customer's demand continuously changes and one cannot respond to these demands through making inventory.

3. Intangibility: Services are beliefs and concepts, and goods are objects. Thus, one cannot maintain moral ownership right for innovations in services and patent and registry rights for innovator. When buying a product, the customer can see it, touch it and test its function before purchasing. But, in case of a service, the customer should rely on and satisfy with service delivering Company's fame and credit.

4. Heterogeneity: Integrating the intangibility nature of services on one hand participates with the customer as a person available in service delivery system and, on the other

hand, makes difference in services from one customer to another. In services, working activity normally focuses on staff rather than objects.

The above cited characteristics of services make it unique and that is why services receive special treatment from marketers. There is general agreement that inherent differences between goods and services exist and that they result in unique, or at least different, management challenges for service businesses and for manufacturers that offer services as a core offering. The difference between goods and services can be best understood from the table (4.1).

Table (4.1) Differences between physical goods and services

Physical Goods	Services
A thing	An activity or process
Tangible	Intangible
Homogeneous	Heterogeneous
Production and distribution are separated from consumption.	Production, distribution and consumption are simultaneous process.
Core value produced in factory	Core value produced in buyer-seller interactions.
Customers do not participate in the production process.	Customer may participate in the production
Can be kept in stock.	Cannot be kept in stock.
Transfer of ownership.	No transfer of ownership.

Source: Christian Gronross, Service management and Marketing, Massachusetts : Lexington Books, 1990, p. 28.

4.2.3 Service Package

Service managers face many problems on recognition of a product. These problems, to some extent, are due to intangibility of services, but this is the customer’s presence in process that causes concern about full experience of services. For instance, when it comes to a restaurant, the space and environment governing thereon is as important as the foods are served therein because going restaurant for most customers is regarded as a way for gathering friends together. Bank client's view is formed quickly and through the attitude of the bank's clerk toward him or her.

Service package is a combination of goods and services, which is presented and delivered in an environment; this collection has the following features:

1. Supporting facility: is a cluster of physical resources that should be present in place before service delivery. For example, we can refer to a golf course, a hospital and an airplane.

2. Facilitating goods: are the materials being bought or used by service receiver, or the items prepared by customer such as a golf club, skiing sticks, food products, auto spare parts and legal documents.

3. Explicit services: are tangible and observable benefits. Of these services, one can refer to termination of a toothache after its being recovered, a good automobile after being tuned up and urgent arrival of fire fighters to accident place.

4. Implicit services: are non-material and moral advantages that customer feels in an indefinite way. Of these kinds of services, one can mention privacy and confidential of a loan granting bureau or repairing a car without any mental disturbance.

Customer experiences all above features and judges them on the ground of his or her perception of services. Therefore, service manager should provide his or her customer with a full experience conforming to desired service package. For instance, in a cheap hotel, a cement block building with plain furniture is regarded as supporting facilitates. Soap and food are also considered as the least facilitating goods. Explicit services include a comfortable bed in a clean room and implicit services include friendly attitude of receptionist and the security of a parking lot with sufficient light.

Any distortion from this service package e.g. employing a porter will increase hotel expenses and will damage its mode of cheapness *(*Taylor, A. L., & Sasser, J. N*, 1978).*

4.3 Quality of Service

The appearance of quality of service as a top priority in many corporate entities is primarily due to the globalization of world trade and the competitive pressure brought about by the escalating demands of consumers, who want better products and services. It ensures that the voice of the customer is always matched by the voice of the processes *(Fotopoulos, C. V & Psomas, E. L, 2010).*

Since the service quality is very significant in surviving and profit making of an organization, it affects in customer's satisfaction and motivation after shopping positively and customer's satisfaction also affects in tendency toward shopping positively *(Ho, S. P., Kuo, Y. H., 2009).*

The perception of service quality has been widely studied during the past three decades. Owing to the intangible, heterogeneous and inseparable nature of services, service quality has been defined by (Parasuraman, Zeithaml and Berry, 1985) as ‘‘a global judgment, or attitude relating to the superiority of a service’’ and noted that the judgment on service quality is a reflection of the degree and direction of discrepancy between consumers’ perceptions and expectations. Service quality can have many different connotations in different contexts. For example, *(Bitner and Hubbert, 1994)* defined service quality as "the consumer's overall impression of the relative inferiority or superiority of the organization and its services.

Rajasekhar, et al., *(2009)* argued that Service quality has been conceptualized as an overall assessment of service by the customers. It is a key decision criterion in service evaluation by the customers. Perceived service quality is thought to be resulting from comparison between customers’ prior expectations about the service and their perceptions after actual experience. Besides service outcomes, service quality perceptions also involve evaluation of the service delivery process. Hence, conceptualization of service quality ought to include both the process as well as the service outcomes.

Ganguli and Roy, *(2010)* stated that the firm's ability to serve the customer needs as well as to maintain its competitive advantage also affects the customer perception of service quality

4.3.1 Services Quality Dimension

In 2013 Walid Montasser conducted a research through which he tried to cover the different efforts of different authors to reach a model of service quality , the first model was introduced by *(A. Parasuraman, Zeithaml and Berry, 1985)* who identified 10 determinants of service quality used by customers to build their own perceptions and expectations, which are: reliability, responsiveness, effectiveness, easiest to get the service, empathy, communication, credibility, assurance, tangibles understanding the customer,

Nine determinants of service quality were identified by *(Reynoso and Moores, 1995)* which are: Tangible, reliability promptness, privately, professionalism, help fullness, communication, consideration, preparedness.

A third model was represented by (Voskoboinik, I., Brooks, H, 1998) who suggested 10 determinants of service quality which are: Reliability, responsiveness, credibility, competence, courtesy, communication, Access, Proactive D/M, attention to detail, understanding the customer,

In 1999 a number of 10 determinants of service quality were introduced by *(Brroks et al, 1999)* which are: Reliability, responsiveness, credibility competence, courtesy, communication, access, leadership attention to detail, understanding the customer, all these findings are listed in table (4.2).

Table (4.2) Service Quality Dimensions as Identified by Various Authors

	Brooks et al. (1999)	**Heings and Brooks (1998)**	**Reynoso and Moores (1995)**	**SERVQUAL (1985)**
Service Quality Dimensions	Reliability Responsiveness Credibility Competence Courtesy Communication Access Leadership Attention to Detail Understanding the Customer	Reliability Responsiveness Credibility Competence Courtesy Communication Access Proactive D/M Attention to Detail Understanding the Customer	Tangible Reliability Promptness Confidentially Professionalism Helpfulness Communication Consideration Preparedness	Tangible Reliability Credibility Security Competence Courtesy Communication Access Understanding the Customer Easiest to get the Service

Source: Abd, W. Y. M. P. D., & Al Manhawy, (2013)

A number of tools where developed over the past two decades as to effectively assess the quality of service offered by organizations, among these effective tools the servqual Model appears**.** This model **w**as developed by *(Parasuraman, Zeithami and Berry, 1985).* In this model service quality is assessed by calculating the difference (gap) between what customers expects and what he/she really perceives.

By the early nineties the authors had refined the model to the useful acronym rater:

- Reliability
- Assurance
- Tangibles
- Empathy, and
- Responsiveness

The simplified (RATER Model) however is a simple and useful model for qualitatively exploring and assessing customers' service experiences and has been used widely by service delivery organizations.

4.3.2 Service Quality in Container Terminal

In any service market, the price/quality relationship is of main significance. In the container terminal, quality is important in attracting and retaining customers. Meeting customer needs and delivering high quality for low costs are critical factors for terminals to be successful. Container transport companies are interested in speed and reliability. The time a ship stays in the port (turn –round time) must be minimized, and, therefore, the handling of containers must be executed in a fast and reliable way. The operations at the terminal, after the handling of the containers on and off the ship, must be reliable as well. Quantitative information on container terminal quality is hard to obtain. Container terminals are monitoring their quality levels, but the results are not publicly available.

Quality levels should meet high standards put by container carriers. Costs, incurred by better quality performance cannot be recovered through higher rates. 'Reliability', in terms of meeting container carriers' demand, is thus a critical performance condition for maritime container terminals. An external performance improvement characteristic might be 'flexibility'. Deep-sea ship arrivals are no easy planning task, as weather influences and other problematic developments make the terminal operator's task more difficult. Through strict contracts, all risks of delays and terminal berth congestion are passed onto the terminal operator.

This makes 'flexibility' a serious performance condition. A critical performance condition for continental terminal operators is a 'total service'.

For so determine the diminution of the quality of services in container terminal is very important to meet the high levels standards of this service

4.4 Models of Service Quality Determinants in Container Terminal / Port

As a matter of fact, a huge amount of research has been conducted to study port selection criteria for quality services from different perspectives. Many of them have focused on the selection criteria for mode and carrier from the shipper's point of view.

These studies are mainly based on cost factors and qualitative evaluation. Other studies have based their methodology on an Analytic Hierarchy Process. Recent literature on port selection includes *(KHOI, T. N.,2007)* who has studied the level of pressure placed on seaports by the creation of global shipping alliances and the trend to post-Panamax container ships focusing on the responsiveness of such terminals due to globalization. *(*Anderssen, T., Kirkbak, S*,2013)*, have focused on the location aspects of ports. They have identified a series of *factors that play significant role in the creation and development of ports.*

(Hayes F 2003) has made a series of similar studies. In one of those he emphasized on certain factors that he considered as important for the development of a load center port. According to his findings these factors are the large-sale local market, high accessibility to inland markets, advantageous site and location, early adoption of the new system and aggressiveness of port management. Similar studies have also been made also by *(*Huybrechts, M., Meermans, H*, 2002),* trying to identify the factors that affect port development and increase its competitiveness.

A number of research papers have focused on port selection criteria for mode and carrier from the shipper's point of view. These studies are mainly based on cost factors and qualitative evaluation *(*Lirn, T. C., Thanopoulou, H. A *et al, 2004)* and studies based on an Analytic Hierarchy Process include *(Bagchi, 1989)* and on "salience selection criteria" by Brooks.

(Chang, Y. T., Lee, S. Y et al. 2008), has researched into the factors that affect port selection. Slack examined the criteria used by shippers when it comes to port selection on the containerized traffic trade between the North American Mid-West and Western Europe. His findings indicated that the most important factors are price and level of service provided by the terminals. Finally *(D'Este et al. 1992)* and *(Chang, Y. T , 2008)* have studied the port/ferry choice. Both studies have been carried out with the use surveys focusing again on factors such as quality service level, frequency of service, price, facilities etc.

However, in a study by *(Lagoudis, N. et al 2006)* the researchers developed a Generic System Model which assisted in the identification of a number of variables that affect the port selection in the total supply chain for international trade. They also adopted

the Soft Systems Methodology as a more holistic approach in order to identify the wider possible variety of factors that determine and affect the port selection in the modern business environment.

In a similar vein, *(Spence, S. A., Farrow, T. F et al 2001)* deal with the structure of the international flow of goods, hence the transport chains, focusing on the automotive industry. As cars are sold and produced across the world, they provide a good example for the global division of labor as well as for the global distribution process using port facilities. Their study reaches the conclusion that integration of a certain port in a transportation chain is very much influenced by the "cost –benefit-ratio" which occurs by the employment of that specific port location. The cost-benefit-ratio varies according to the commodity, the transport organization involved and the cost efficiency of the transport modes chosen. The seaport has generally no direct influence neither on choice of the transport organization nor the land transport mode.

The automotive industry likes to employ rail or barge for its export volumes because of the large quantities heading for a relatively small number of different destinations (ports). In contrast the distribution of smaller volumes from the ports directly to the widespread dealers is very often carried out by (truck.) Quality aspects, requirements on the flow of information and also the demand for frequent shipping services to certain destinations can vary from company to company in the automotive industry and hence the ideal performance profile of a port varies accordingly.

Thus, the results of the study are summarized as follows:

- The port choice in Europe is limited to a relatively small number of port locations competing against each other and partly with other land transportation modes within the same port area.
- For the port choice in Europe the non-specific principal economic parameters such as "costs", "reliability", "quality" and "productivity" are also of high relevance.
- The port choice is influenced by traditionally relevant parameters such as "sea transportation links" on the one hand and recent business developments e.g. "data exchange" on the other hand.
- The port choice is also influenced by social-economic and political constraints such as the risk of strikes or even EU transport policy.

Similarly, *(Lekakou, M. et al 2009)* examined the issue of homeport selection from the cruise companies' point of view and, in the light of the result, examined the potential Piraeus port homeport potential. A two round Delphi method unveiled the critical factors that the cruise companies take into account in homeport selection. Using the notion of "site" and "situation" and a literature review, a list of factors has been developed. The ranking of these factors by a group of experts gave some insightful conclusions on which factors should a cruise port pay attention in order to attract cruises to select it for homeport activities.

The results from data analysis concluded that the "situation" factors are more significant than the "site" factors, an outcome which is in line with the results of previous studies that examined the same subject with a different methodology and from the cruise ports point of view. The Connection with air transport modes, the cost of port services, port infrastructures, political environment and regulatory framework are among the other most important influencing factors. These results provided the opportunity to examine the current situation in the Piraeus cruise terminal and the reasons for not being a major homeport in the Mediterranean Sea. The Cabotage policy, the regulatory framework on port concession and the lack of an appropriate cruise relevant tourism policy seems to be the main reasons for this development.

From a different view point *(Gunasekaran, A., & Kobu, B. 2007)* conduct a research focusing on flexibility. It is an issue widely studied in the manufacturing literature, but only recently has attention been paid to flexibility in logistics and supply chain management. They state that flexibility is taking fame due to the uncertainties and disruptions created in the production and distribution processes of an organization and its respective supply chains. Their paper aims at studying the level of transport flexibility achieved in the ocean transportation industry in order to understand the strategic choices carriers have to make in order to be able to meet market changes and customer demand. Their analysis indicates the different strategic choices ocean transportation companies have to make with regards to transport flexibility.

Thus, this paper has taken the relatively new concept of transport flexibility and tried to characterize shipping companies in terms of both the type of service demanded by the customer, based on the framework of (Bask, A. H, 2001) and the key attributes identified in (Gosling, J, Naim et al. 2010). While certain elements of flexibility have previously

been discussed in the context of shipping before, this paper gives a holistic view of flexibility. This is important as shipping companies have to be responsive to a range of different customer demands.

By understanding the service requirements and their capabilities and competencies, shipping companies are able to provide appropriate transport solutions for different market segments. Through three case studies, it has been identified that important elements in providing this flexibility include the vessels, the chartering terms and, in the case of liner shipping, the size of the transport network, incorporating a range of different transport modes.

On the other hand, (TIWAR, P. et al 2003) assert that the analysis of shippers' behavior with respect to choice of ports and carriers is essential for policy formulation concerning improvement and development of port infrastructure. Their study is one of the few studies on the subject that attempts to model this behavior by using an empirical model, and probably the first attempt to model the joint choice of carrier and port in China. The data used are unique and come from a survey of shippers conducted by The International Centre for the Study of East Asian Development, Japan, for the year 1998. Earlier research on the choice of carrier indicates that service factors and costs are important parameters in determining choice. This paper moved a step further and tried to estimate how the market share of various port-carrier combinations would change in response to changes in their key variables.

The results indicate that Chinese shippers and forwarders are conservative and prefer Chinese shipping lines primarily because they have larger fleets catering to China and longer relations established over a long period of time. Shippers are indifferent to foreign shipping lines and their choice is driven mostly by the port they would like to use to import or export cargo. The number of TEUs handled in a port indicates congestion, and has a negative impact on shippers' decisions.

The numbers of berths and fleet size enhance efficiency in moving cargo and have positive coefficients.

I believe that, the port distance from a shipper's location is an important variable determining port choice. Distance has negative elasticity. The estimated model is used to determine market share elasticity. These are important policy parameters explaining

variations in the market shares of various alternatives in response to 1% change in a policy variable. For example, they estimate what would be the impact on the market share of a port, vis-à-vis other ports, if the shipper's distance from this port increases by 1%. Results are quite illustrative. An increase in the distance of a shipper from Dalian by 1%, assuming the shipper uses a Chinese carrier, reduces the market share of this combination by 7.9%, while the market share of all other port-carrier combinations increases by 0.95% each. If the shipper uses a Southeast Asian carrier instead, the market share of this 'Dalian-Southeast Asian carrier' combination decreases by 8.62%, while the market share of all other port–carrier combinations increases by 0.23%.

The 'fleet size' elasticity shows that shippers are sensitive to changes in the number of vessels of Chinese shipping lines. An increase in the number of vessels of Chinese shipping lines by 1% increases the market shares of those alternatives by around 5.4%–6.1% depending on the port used.

Conversely, according to Chang, *(Chang, Y. T et al, 2008)* although past studies on port choice models have concentrated on port choice made by shippers rather than by other stake-holders, more recent studies have examined port choice from the perspective of the shipping lines. *(Malchow and Kanafani)* identified the factors affecting the port selection for US export cargo liners using a multinomial logic model and found that oceanic and inland distances affect port selection negatively. They later confirmed location as the most important characteristic of a port. Lagos et al. examined the routes of vessels along the US West Coast between 1993 and 1999 and found that carriers tended to choose the number of ports before specifying the ports.

(Tjong Kim Sang, E. F., et al, 2003) Distinguished external factors of using a port from internal factors germane to major port arena and attempted to check if these factors changed over time. They discovered that internal factors were time invariant whereas external factors were time variant. Using container transshipment in Northern Europe as a case study, Ng investigated the importance of different factors in affecting port attractiveness from a port user’s perspective and found that monetary cost is not the only component in explaining port attractiveness.

Other factors, notably, time efficiency, geographical location and service quality, should also be taken into consideration. On the other hand, using a revealed preference

approach, (*Tongzon, J. L., & Sawant, L, 2007)* found port costs and range of port services to be the only significant factors in shipping lines' port choice.

They add that, other studies were concerned with examining if there are differences in valuation of port choice criteria among the major stakeholders. *(González-Benito, J et al, 2006*), attempted to learn if there were differences in port selection factors among the five groups of ports, carriers, freight forwarders, large US shippers and smaller (US) shippers. They found that there were differences across the groups and that water ports tended to view water carriers as their primary customers. *(Zan, Y., Haag, J, 2003)* built a game theoretical model to explain the interaction between port, carriers and shippers.

While it was possible to explain the interaction between shippers and carriers, he was unable to explain the interaction between port and the other parties due to lack of policy data from ports. Lu looked at the logistics services and strategic dimensions in Taiwanese shipping companies, agencies and freight forwarders and found that the most important strategic dimensions of the maritime companies were value-added service, promotion, equipment, facilities, speed and reliability. *(Chang, Y. T., Lee, S. Y et al 2008)* applied an analytic hierarchical process (AHP) method to reveal liners transshipment port selection. Their empirical test showed that both container liners carriers and port service providers have a similar perception about the most important service attributes for port selection; however, the weights among the sub-criteria reveal some differences between the two survey groups.

Through the AHP survey the authors revealed that the five services attributes such as handling cost, proximity to main navigation routes, proximity to import/export areas, infrastructure condition, and feeder network are the most important service attributes of transshipment ports. *(De Langen, P. W,2006)* in his study on Austrian shippers and freight forwarders' port choice factors found that, although they share similar port selection criteria and do not value them differently, they differ in terms of their response to prices. The shippers have less price elastic demand.

Thus, most studies have focused on regional or national cases and have used a narrow range of factors instead of examining the global arena and utilizing a comprehensive list of shipping companies' concerns. Moreover, others seem to be flawed in the experimental design, for instance, in thus, *(Hung, S. Y., Chang, C. et al's, 2006).*

Study contributes to the existing literature by investigating further shipping lines' port choice behavior and by categorizing them into trunk liners and feeder service providers to see if there is any difference in their port choice, which contemporary ports should know.

Furthermore, *(Tongzon, J. & Sawant, L, 2007)* published an article in which the main objective is to assess the various factors of port choice from the shipping lines' perspective and to see if there is a consistency between the stated preference and the revealed preference of the shipping lines for the factors influencing their port choice. However, *(Tongzon, J, 2009)* viewed that it is important to investigate and assess the key factors that major port users consider important in choosing their ports. He stated that an assessment of these factors from the freight forwarders' perspective will be useful in providing an insight into how an effective port strategy should be designed.

In a different approach (*Wiegmans, B. W et al, 2008)* raise the important question: on what ground do deep-sea container operators select container ports and container terminals in the Hamburg-Le Havre range over others?

The emphasis is not on the best location, the most efficient port, or other efficiency issues, but instead they try to understand and analyze the decision-making process of deep-sea container carriers when selecting a container port and when selecting a container terminal in the port in which to invest or from where to buy handling capacity. Their paper adds to the existing literature on the strategic behavior of deep-sea container carriers and the consequences for ports and other strategic actors (e.g. governments). In this paper, three particular aspects were analyzed: buying-decision characteristics (literature review); port choice strategy (interviews) and, terminal selection (interviews). The literature review showed that especially the non-programmed decisions (port selection and to a lesser extent terminal investment) are more difficult than the more programmed decision of buying terminal handling capacity. This is underlined by the buying decision. This shows that the port selection and terminal investment decisions are thus more complicated tasks than the purchase of terminal handling capacity.

For port choice strategy, several conclusions were found. First, before the port choice is made, several strategic considerations at company level have already been taken into account. The interviews indicated that next to service and cost factors, a carrier's port choice behavior might also be affected by the fit of the port in the trade, the requirements

imposed by the alliance structure they operate in, by shippers/customers location and relations, by the strategic attention of shipping lines (e.g. existing contracts, market entry and penetration), and by the arrangements between the shipping line and incumbent terminal operators (e.g. dedicated terminal facilities). These strategic considerations (for port choice) are the most important, as long as cost differences between dedicated versus common terminals are acceptable. Second, after this strategic level, the following three criteria are important for port choice: availability of hinterland connections, reasonable tariffs, and immediacy of consumers (large hinterland).

Third, in addition to these criteria, 'feeders', 'environment', and ‘the total portfolio’ were stated several times as extra (or missing) criteria. Fourth, the decision-making results are different per container carrier, per trade, per port type, etc. It is important to have the best score on criteria and corresponding indicators. But, the importance per criterion may be different per container carrier.

In the end, it is of great importance to offer a good total package to the proposed customers of a container port. Finally, most respondents indicated that port choice is far more important than terminal selection.

For the terminal selection problem, speed, handling costs, reliability and hinterland connections are basic criteria when the capacity and availability of terminal handling capacity is sufficient. With regard to the exploitation and operation of container terminals, the preference of most deep-sea container carriers is to have (partly-) owned dedicated container terminals. If there is a lack of terminal capacity (e.g. to serve ultra-large container vessels), strategic considerations affect the choice between investing in terminal capacity and buying handling capacity.

Another different approach is that of *(Rimmer, P. J., 1998)*. He examined the nature of corporate restructuring among liner shipping companies to meet the needs of producers for logistic services within the Asia-Pacific Economic Region. This task is undertaken by detailing the development of the global alliances forged in 1996. Then their impact on port selection and competition within the Asia-Pacific Economic Region is studied with particular reference to the Trans-Pacific trade. As the composition of these alliances has already changed by mergers their likely effect on port destinies is considered.

Similarly, *(Kent, J. L., & Stephen Parker, R., 1999*) examined the alteration in perceptions of 18 carrier selections factors between import shippers, export shippers, and international containership carriers. (ANOVAs) was used to identify differences between the three groups. Suggests that there are significant differences between import shippers and carriers; export shippers and carriers; and import shippers and export shippers. Significant differences between the import shipper and carrier groups were found on the loss and damage and equipment availability factors. Significant differences between the export shipper and carrier groups were found on the rate changes, service frequency, financial stability, service changes, and equipment availability factors. The only significant difference between the import shipper and export shipper groups was found on the door-to-door transportation rates factor.

According to the above discussion of various dimensions of service quality, it is found that different authors have proposed different dimensions of service quality, the researcher have divided them into seven main categories as shown in the table below.

Table (4.3) possible approach to analyzing quality dimensions in port container terminal

Dimensions	**Specific elements**
Port features	Location, Port Depth, Berth length, Handling Equipment availability, Storage Capacity (TEU), Reputation, Port Dues, Handling Charges, Information technology and Customs Regulations**.**
The port charges	Port Dues, Handling Fees, Operating Cost and Bunkering cost.
The Operation Management	Management, Reliability, Relations with staff, Easiness with Staff and Capacity of Branch/ agents.
The Cargo Handling	Cargo Volumes, Transshipments volume, Cargo Profitability, Efficiency of Handling Facilities, Balance between Ex. And Imp and Clearance Efficiency.
The customer service level	Claim RecordsEffectiveness, Monitoring, Communications Planning, Pilot & Tug, ordering of Resources, Berth allocation, Link to border agencies, Customer Liaison and Liaising with Ship agents.
Information Technology	Aptitude, Service Efficiency, Automated OCR, Real Time location system, Wireless Connectivity, Gate Automation, Motion Equipment & Flexible traffic control and Examination of location info using web.
External Factors	Coordination of shipping alliance, Dedicated terminals investment ability, Frequency of trunk & feeder routes, calling of competitor port, Possibility of Niche Market, Preference of hub port, Political consideration and Hinterland/Foreland connections.

Finally, the researcher will propose the integrated list of determinants of service quality shown in table (4-3) to the shipping lines companies, to investigate their validity and importance for an efficient and effective usage of container terminal in East Mediterranean region.

CHAPTER FIVE

SELECTION OF SERVICE QUALITY DETERMINANTS OF CONTAINER TERMINAL (TERMIQUAL MODEL)

5.1 Introduction

In this chapter identify the key determinants of service quality in container terminal from shipping lines perspectives, for so ,the research will be conducted through a sequence of steps as will be shown in the coming sections.

The layout of this chapter is as follows section 5.2 Case description and section 5.3 Case Analysis and Results

5.2 Case description

To achieve the objective stated previously in the introduction of this chapter, the researcher conducted this part of the research through two steps as follows

A. Step 1

The researcher conducted a set of structured interviews with a group composes of 20 interviewees, 5 of them represents top management level, while the other 5 represents middle line management level, the rest of the 10 interviewees are professional terminal operators with an experience not less than 15 years in the business.

The main purpose of this set of sequential interviews was to confirm the validity and appropriateness of the selected criteria see table (4-3), to demonstrate the model that fit demands of quality of services in container terminals, while the second purpose was to represent this model to shipping lines companies whom are considered as stated in section (1-2-2) to be the most important container terminal clients.

B. Step 2

This step is based on the previous step, where the result of the interviews has been used to investigate the shipping lines operators' point of view about the proposed model for service quality in containers terminal, an administered questionnaire will be disseminated over seven out of the most important 25 operating shipping lines in the world in general and out of 10 particularly in the region (See appendices A&B).

5.3 Case Analysis and Results

The analysis and results of the two steps conducted in the previous section will be discussed in the same sequence as follows

As for step 1

The interviews that were conducted with the previously mentioned groups in section (5.2) revealed the following:

- There was a consensus from all of the interviewees over the constructs of the criteria with all of its elements.
- The interviewees praised the holistic of the model, they believe that this model cover all or at least most of the needs and wants of the users of the container terminals.
- However there were a great controversy between the interviewees about the relative importance of the constructs of the model and even the relative importance of the elements inside each of the model constructs (quality category).

The results of the interviews encouraged the researcher to move on to conduct the second step of this part of the research.

As for step 2

The researcher gathered the questionnaire forms that have been sent to a group of 7 shipping lines with its 7 constructs, where each construct express one category of service quality in container terminal, in the same context each category includes a different number of elements that represents service quality criteria as shown in table 4.3.

The respondents were asked to answer of the questionnaire using 5 points Liker's scale for evaluation of the answers by the points system where (5) represents "very important", (4) represents "important", (3) represent "average", (2) represent "less important" and (1) represents "not important" (See Appendix C).

Finally the answers of the gathered questionnaire forms revealed the following:

5.3.1 The seven basic categories

The analysis of the data provided from the questionnaires shows that the category of "Port Charges" constitute the most important factor with a percentage of 57% from the total sum of the percentages obtained by the rest of the categories Figure (5.1). In addition, the second most important factor is the "Information Technology" with a percentage of 43% the thing that asserts how important the use of modern technology is in ports. Moreover, other categories such as Port features, Cargo handling, Customer service level and External factors obtained a similar percentage of 29% from the total of most important factors for the shipping lines in their selection. However, the thing that isn't expected is that the category of "Operation Management" has obtained a small percentage from the concern of the shipping lines. This confirms that the shipping lines are interested more in the outcome of the management decisions and not the nature of the management itself and the extent of the management response to the needs and requirements of various shipping lines. Each of the seven categories is expressed in percentages in a descending order according to importance as shown in table (5.1).

Table (5.1) The Ranks of the Seven Main quality categories in a descending order

Main Factors	**Proportion**
The port charges	57%
The Information Technology	43%
The Cargo Handling	29%
The customer service level	29%
The port features	29%
The External factors	29%
The Operation Management	14%

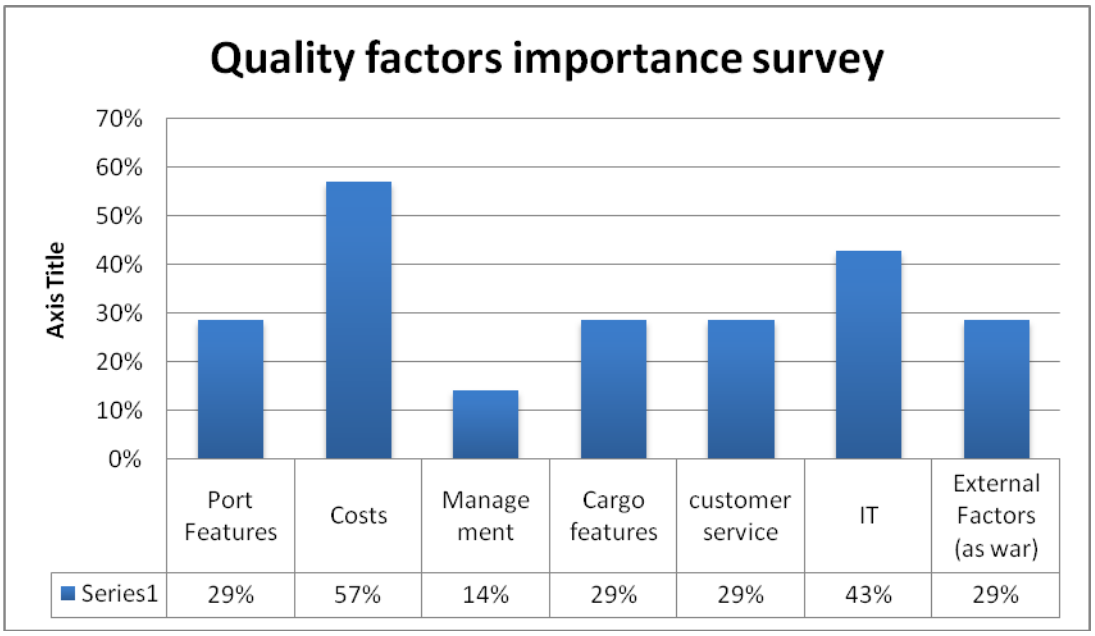

Figure (5.1) Main Factors of Quality service port selection

5.3.2 The Port Features Category

The category of "port features" is divided into 10 sub-categories varied in their level of importance for the shipping lines in a great way. The sub-category of "Port Depth" exceeds all the expectations and achieves the utmost importance to all the shipping lines with the percentage of 100%. This is due to the fact that many elements depend on this factor as the depth of the vessel which the port can receive. As for the container terminals, they are measured depending on the number of containers or the capacity of the vessel which is the potential for the port to receive in addition to the number of cranes and many other facilities for the vessels or container services. Therefore, this sub-category is one of the basic elements which may cause change in the company's navigational path to the nearest port which has the capacity and depth appropriate for the new generation of container ships scheduled for some companies due to the increased demand for the use of containers, resulting in the increased volume of ships. The example on this is very clear in the case of Damietta Port in Egypt.

The depth of the container terminal of this port is up to 14 meters the thing that forced CMA-CGM Company to leave the port despite its important location as the depth of the company's vessels exceeds 16 meters. Despite the fact that the company chose Damietta port as its pivotal port in the east Mediterranean region, today the company

shifted its attention to the East Port Said port as an alternative because it is more suitable for the company's vessels.

As for the second sub-category in the level of importance for the shipping lines comes the "Geographical Location" with the present of 86%. This factor was expected to come as the most important factors in the Port Features category because it is directly connected to the different maritime distances and the amount of deviation from the international navigation tracks, which represent for many companies a great material burden in addition to the amount of time spent and the consumption of fuel and supplies. All these factors force companies to shift the selection process towards the ports on their navigation track to avoid deviation.

Concerning the two sub-categories "Berth Length" and "Handling Equipment Availability" both come in the third level of importance with a percentage of 71% for the shipping lines. They represent important factors for the port facilities because if there is any shortage in any of them, this will result in the occurrence of overcrowded ports.

This might lead to the delay for the container ships which have very strict sailing schedules and result in paying more demurrage for both the shipping lines and for the owners of the goods as a consequence of overcrowding, lack of movement facility inside the port, delay of the ships and delivery.

On the other hand, there are two basic types of handling equipment; container yard and Shore cranes. The Container yard equipment are classified according to the developments of different generations of container ships, which are developed in accordance with the size of the growing demand for transport container vessels and thus requires the entry of certain generations of container ships to container terminals in the East Mediterranean ports to the availability of such equipment as the Gantry Crane which has been developed with the development of different generations of container ships. For example, in the year 1970, the Panamax ships deal with gantry cranes with a quay level of 37 meters and lifting height of 25 meters and need the depth of 10 meters.

While in the year 1995 the S-Class ships require cranes with the quay level of 54 meter and lifting height of 38 meters with the depth of 14 meters. In the year 2002, the E-class ships require cranes with a quay level of 67 meters and lifting height of 41 meter and depth of 17 meters. Finally, in the year 2013, the Triple – E ships which require gantry

crane with a quay level of 72 meters and lifting height of 52 meters and depth of 17 meters. Thus we find the complex relationship between all of the changes in generations; container ships and the subsequent evolution of the volumes in the Cranes of container terminal and also the depth of the harbor as apparent in the previous point.

Moreover, there are different types of container yards. For example, the Fork-Lift Truck, Front Loading Fork Lift, Container Straddle (Transtainer), the Rubber Tire Gantry and The equipment used in the storage yard to arrange the container traffic or the containers that need special treatment, such as refrigerator containers, etc. This equipment is also being developed with the evolution of the size of the container and the ability of lifting and handling like the 20 – 30 – 45 containers… which also requires the development of such equipment, but this type of equipment needs to be frequent in a number significantly associated with the size of the container terminal and the absorptive capacity for a specified number of containers.

Whether each of the two types of different equipment they need regular maintenance and immediate repair for any malfunction or even replacements or update. Due to the special characteristic of the particular system of container transport from high cost, both for obtaining such equipment or operating costs, as well as an interval, which translates into a cost in the form of fines or compensation due to trading operations and the requirements of this process of pre-calculated times and determined on the basis of the world ranking of container terminals in the world and thus link the vessel's stay time within the port which is the most disturbing thing for shipping lines.

As for the "handling charges" sub-category, only got the fourth place with a rate of 57% in terms of the order of the degree of importance for shipping companies, and this component is associated with the cost of the freight as freight includes all inside the expenses of traded goods, which are also associated with many of the technical points which vary from one port to another. Thus, we find that the grace period for the stay of the container inside the station is 3 days and in other ports is up to 10 days and then begin the expense of container flooring. There are also operations of loading and unloading of containers inside the container terminals and thus added to the bill for port services loading and stacking for both incoming and outgoing containers, and which depends on the desire of the shipper. As for administrative expenses, which vary from one port to another the shippers bear its responsibility as container handling depends in some container terminals

on the achievement of a certain number of containers during the year and consequently the company gets discounts on trading with different amounts depending on The extent of which the company exceeds the specified number and thus determine the price for the transfer.

The fifth sub-category in the order of importance for shipping companies is "Information Technology" with the percentage of 43%, which represents a system of communication and exchange of information, both related to ships and to the goods, which helps to reduce the during time of the ship in the port due to the end of most of the paper work before and during the existence of the ship at the port and thus keeps the remaining during time for the ship in the port short due to the availability of specific facilities whether for the vessel or docks for container handling, which represent about 90% of the reasons for the stay of the ships inside the container terminals long periods of time, with increasing costs on the shipping companies.

The last two sub-categories for the lowest proportion of importance for shipping companies are represented in the "Customs Regulations" and "Reputation" with a rate of only 14% of the interest of shipping companies in ports, due to their connection with the shippers in terms of their goods and the speed of their final exit of the port. The shipping companies that are interested in both factors are only the companies that provide transportation service from door to door, where the continued interest in the goods not only when the process of unloading and delivery to the agent or the client directly into the customs of the port, but more than that, until the arrival of the goods to the final destination. This explains the low percentage rate of these two factors for shipping companies in terms of importance in the choice of ports.

Finally the percentages of the elements of the first quality (***Port Features***) category are demonstrated below in figure (5.2), while in table (5.2) they will be presented in a descending order according to their relative importance.

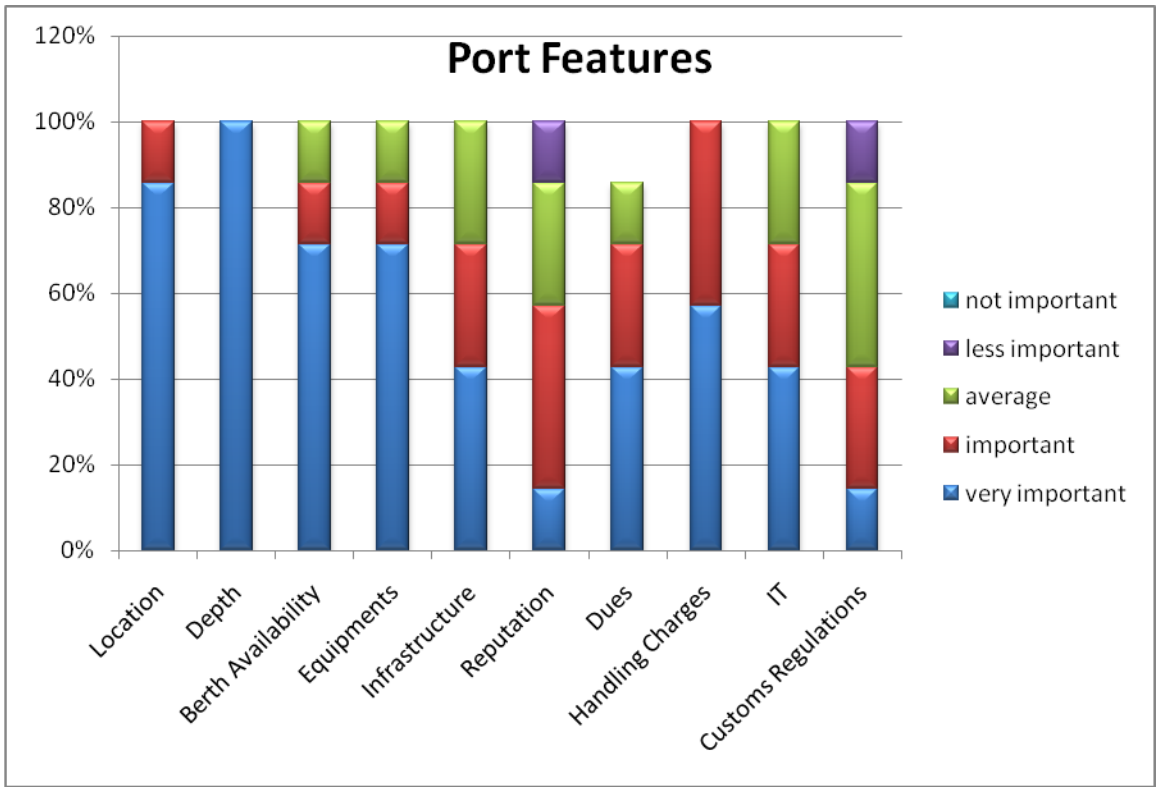

Figure (5.2) The percentage of port Features item

Table (5.2) The Ranks of port Features item in a descending order

Proportion of very important	Port Factors
100%	**Port Depth**
86%	**Location**
71%	**Berth length**
71%	**Handling Equipment availability**
43%	**Storage Capacity (TEU)**
57%	**Handling Charges**
43%	**Dues**
43%	**IT**
14%	**Reputation**
14%	**Customs Regulations**

Note: In spite of obtaining a percentage of 57% Handling Charges will be discussed in details in section (5.3.3).

5.3.3 The cost category

The cost category is considered the most important and the highest ratio in importance compared with all other categories with the percentage of 57% influencing the selection of the various ports in the eastern Mediterranean region. This category is divided into four sub categories, both Handling Fees and Operating Cost obtained a similar percentage of 57% and they are considered among the most important sub-categories especially because contracts of shipping companies with ports or specifically with container terminals at the port depend on the process of trading which includes transportation costs for freight shipper, and therefore influence the profitability of the shipping company. And thus an agreement is undertaken with the administration of the container terminal to identify a specific number of containers that are traded annually and consequently obtaining the discounts agreed upon with the administration of the station or with the company responsible for handling containers inside the port, which was referenced in the previous category of "Port Features".

The third sub-category based on the level of importance for shipping lines is Port Dues with the percentage of 43%, which does not represent the great importance for the shipping companies specializing in container transport. And that if the port committed to the deadline for ships from the moment they arrive on the sidewalk and anchored the station and start their own trading operations have been completed. Therefore, there is no need for wasting more time inside the port in conducting any extra work for the shipping companies and this is directly reflected on the decrease in the fees and therefore not taken into account as an important factor in the selection process.

As for the final sub-category which received a lower percentage is Bunkering Cost which earned 29%. That was expected because the process of bunkering is more connected with the plan of the ship established by the captain of the ship with the help his assistants. This plan depends on the ship's shipping plan and the amount of fuel required and the associated economic speed that determines the course of the ship and therefore the selection of specific ports on the itinerary of the ship to refuel. The selection of such ports depends on many elements such as fuel price and availability of the required quality and quantity, the extent of deviation from the desired route for refueling or the refueling will be in the same ports specified in the ship's tables of sailing. Therefore, this sub-category may

not represent an important point for the shipping companies as the company can't control that element in the accurate and precise navigational calculations.

Finally the percentages of the elements of the second quality (***port charges***) category are demonstrated below in figure (5.3), while in table (5.3) they will be presented in a descending order according to their relative importance.

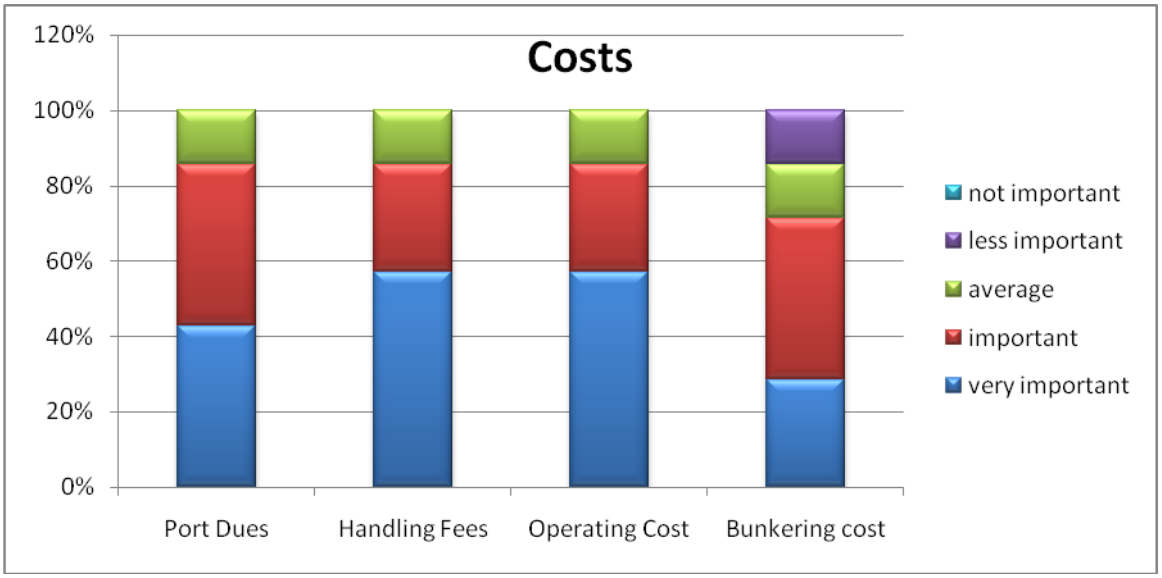

Figure (5.3) The percentage of port charges item

Table (5.3) The Ranks of port charges item in a descending order

Proportion of very important	Port charges
57%	**Terminal Handling Fees**
57%	**Operating Cost**
43%	**Port Dues**
29%	**Bunkering cost**

5.3.4 The Management category

This category is divided into four sub-categories; Management Reliability, Relations with Staff, Easiness with Staff and Capacity of Branch/agents. The sub-category of Relations with staff obtained the percentage of 29% from the level of importance of all the above. However, the most important sub-category for the shipping lines in their selection of specific ports is Management Reliability which obtained a percentage of 43%. This is due to the fact that this element deals with the port administration's response to requests from various companies including all the required facilities in management or speed in the

movement of documents. The thing that represents a great importance for the shipping company as it decreases the time spent inside the port. In addition, the elasticity means a lot for the shipping lines especially when dealing with negotiations or discussions, especially in the various agreements with various engagements of the port where the price offered and agreed upon or what will be agreed upon or in terms of the negotiations in the nature of the services required from the ports.

In this particular context it is worth mentioning as an example what happened between Maersk shipping line and the port of Shanghai in China. Maersk is considered the top shipping line in the world according to Operated fleets as per 04 April 2014, and the port of Shanghai is considered the best port in the world according to (TOP 50 WORLD CONTAINER PORTS) Appendix (B).

The company offered to the administration of the port to allocate berths and port facilities, especially for the company, depending on the size of the deal or the trading of the company with the port. However, this offer was rejected by the Port which stuck to its policy for dealing with all shipping companies alike, regardless of the size of companies and their dealings. This forced the company to leave the port of Shanghai and move to the port of Busan in South Korea. This example shadows the importance of elasticity in the administration of ports when dealing with shipping lines.

As for the second element in this category, Relations with Staff obtained the percentage of 29%. This reflects how the shipping lines take into consideration this factor because it might affect the workers and their frequent strikes. This is directly reflected on causing the delay of many ships whether entering to ports or which might stay inside the port due to the strikes.

Both the Capacity of Branch/ agents and the Easiness with Staff sub-categories both obtained an equal percentage of 41% only. The easiness with the staff inside ports is conducted through the shipping agent or the company's representatives inside the port. Thus, the company doesn’t bother with these things except in case of receiving a clear complaint that there is a clear obstruction which reflects on the delay or stop of some businesses in their due time resulting in the delay of vessels inside the port. Operations such as pre-booking for berths before the arrival of the ship or prior arrangements for various trading operations before the arrival of the ship are examples of the possible

consequences of this delay. This leads in the end to a delay in the part of both the port and the shipping company in providing good services to their clients.

As for the number or size of the shipping agencies in the port or branches of the company inside the port, it depends on the financial ability of these agents and the consequent ability of some agencies to the agency's work for more than a company. Thus we find a process of intense competition between the Shipping Agencies inside the port. On the other hand, allocating the different branches of the shipping companies within the port is a special resolution of the shipping company. Where the company determines in accordance with the volume and frequent dealing with the port to dispense the services of shipping agencies and take the decision to open a branch inside the port to provide all the services of the Agency for the company's vessels. This reflects the fact that both factors get such low percentage.

In spite of the above, but the overall percentage for that category compared to the other 6 categories has got 0%. Which is very surprising because this category shows importance for the people working in the field of business management and particularly in the scope or field of maritime transport, but it is due to the direction of movement of goods which is the most important element, or the so-called direction of movement of world trade, which is forcing many shipping companies to deal with many of the management of the various ports according to their nature, whether the bureaucracy and arbitrary of the government departments or the blooming investment private administration, which values its customers greatly. They are contracted with the state by the (BOT) system and thus reflected on the nature of the services provided within the port and especially in the container terminals.

Finally the percentages of the elements of the Third quality (***port Management***) category are demonstrated below in figure (5.4), while in table (5.4) they will be presented in a descending order according to their relative importance.

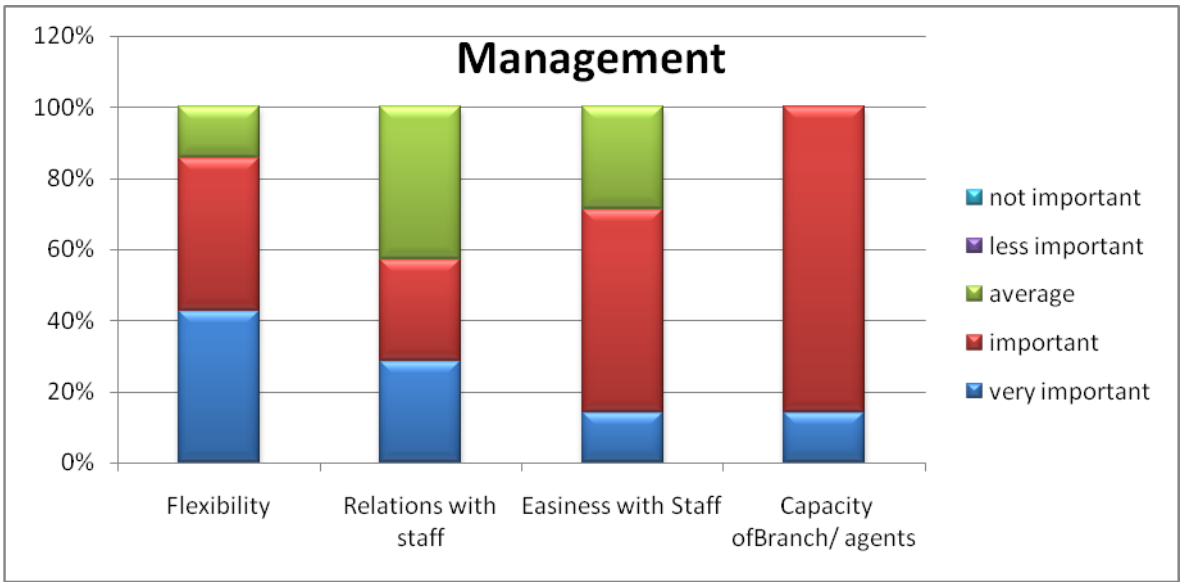

Figure (5.4) The percentage of port Management item

Table (5.4) The Ranks of port Management item in a descending order

Proportion of very important	The Management category
43%	**management Reliability**
29%	**Relations with staff**
14%	**Capacity of Branch/ agents**
14%	**Easiness with Staff**

5.3.5 The Category of Cargo Features

This category is similar to both the categories of Port Features and Port Services with the percentage of 29% from the shipping companies' criteria in selecting ports. This category is divided into 6 sub-categories all dealing with containers and their circulation. The first sub-category which obtained the highest percentage is Cargo Volumes which obtained 71% and this reflects directly on the size of the economic movement in the port and consequently what the shipping companies assess by the number of containers. And thus the allocation of ships with capacity larger payloads to cover the growing demands of the shippers to transport their goods in all its forms and sizes in containers. This calls for each of the shipping companies and various ports to accommodate those demands. As for the shipping companies they have to provide the largest possible number of spaces on the container ships to meet the shippers' needs. On the other hand, the ports have to meet the wishes of the shipping companies to provide container terminals commensurate with container ships of various sizes, as well as more extensive storage areas for a large number of containers, whether incoming or outgoing or even in Transit.

The second sub-category is Cargo Profitability, with the percentage of 75%. This is due to the method of calculation. Freight rates for containers are grounded on the container as a unit of freight irrespective of the commodity or commodities loaded therein, (FAK) Freight All Kinds. The shipping lines quote per box (container) either a six or twelve meter container. From time to time, abnormal or exceptional costs arise in respect of which no provision has been made in the tariffs. For example a shipping line cannot predict the movement of the (US) Dollar or the sudden increase of the international oil price. These increases have to be taken into account by the shipping line in order to ensure that the shipping line continues to operate at a profit. These increases are called surcharges. All shipping lines accordingly retain the right to impose an adjustment factor upon their rates taking into account these fluctuations. All surcharges are expressed as a percentage of the basic freight rate. Surcharges are commonly reviewed in the light of unforeseen circumstances, which may arise and bring cause for a surcharge increase. For example we find a company like Maersk Line container-shipping line, the world's largest, said fourth-quarter profit fell 6.6 percent as spending reductions weren't able to counter a decline in freight rates. Net income at Maersk Line dropped to $313 million from $335 million a year earlier, the Copenhagen-based company said today in a statement. Earnings before interest and taxes at parent company A.P. Moeller-Maersk fell 5.9 percent to 9.46 billion kroner ($1.73 billion), missing the 10.6 billion-krone average of eight analyst estimates compiled by Bloomberg.

Maersk Line, which transports about 15 percent of the world's containers, is battling industry overcapacity after a boom in ship orders bumped with the global financial crisis, triggering the worst slump in prices for carrying cargo since containerization became global in the 1970s. The company said today that overcapacity will depress freight rates in 2014 and that Maersk Line's profit will about match last year's level.

Maersk fell as much as 4.7 percent, the steepest intraday descent since July 23, 2012, and was trading down 2.1 percent at 64,700 kroner at 10:02 a.m. in Copenhagen. That pared the stock's gain this year to 9.9 percent.

Freight volume enlarged 8 percent in the quarter while rates declined 6 percent. Unit costs fell 9 percent in the period, helped by lower fuel consumption and better utilization of the fleet, Maersk Line said.

Full-year group Edit fell 7.5 percent to 41.2 billion kroner. Revenue was less than the 43.1 billion-krone average of 10 analyst estimates. Revenue declined 7.2 percent to 266.2 billion kroner. A.P. Moeller-Maersk's other businesses include oil and gas production and drilling and port operations.

A.P. Moeller-Maersk forecast that 2014 net income plus minority interests will rise "significantly" from the $3.8 billion reported for 2013, helped by the sale of a stake in its supermarket business. Profit this year, excluding impairment losses and divestment gains, will be "in line with the result for 2013", the company said.

This assures the importance of this sub-category, but we shouldn't forget the competitive position of the shipping companies and size of the market to participate in the Eastern Mediterranean region resulting in the search for long-term profits rather than short-term.

As for the two sub-categories of Efficiency of Handling Facilities and Transshipments volume both got an equal percentage of 29%. The sub-category of Transshipments volume is considered an additional service provided by ports and that is because it is a service of a special nature due to the Congestion and delays resulting from the intermingling of transshipments with imports and exports and the consequent competition for stacking space motivated the idea of moving transshipment traffic to offshore terminals or ports that could be dedicated for that purpose, particularly ports with space for Greenfield development. Such ports then evolved into intercontinental hubs for large liners, with spokes of services by smaller liners of different sizes to and from lesser ports. Hub ports were (and now are) chosen by liner companies with regard inter alia to geographic location, depth of water, infrastructure and superstructure, capacity, logistics of services, efficiency and financial arrangements (as the liner companies often participate in financing the investment in hub ports).

As the volumes of containers moving on intercontinental trade routes that cross each other amplified, the economies of redistributing containers at the crossings became evident to liner companies and liner alliances and the concept of relay ports was the outcome. At relay ports, containers are transshipped between large liners rather from large to smaller liners as at hub ports. In the distant future, when the volume of east – west trade in the Southern Hemisphere reaches sufficient proportions and if the north – south trade between Europe and South Africa continues to increase, South African ports will be located at a major crossing point in the physical trade of the world.

Types of transshipment ports as an outcome of the evolution of transshipment in the logistics of liner shipping, several basic types of transshipment terminals and ports now exist, including:

- Gateway ports with stacking space for transshipments;
- Gateway ports with separate terminals for the transshipment of feeder cargo;
- Hub ports usually located away from developed areas (or offshore) with spoke services feeding containers to and from lesser ports;
- Relay ports for the transshipment of containers between large ships, located where major routes for the shipping of containers cross.

Thus this service depends on the availability of the preconditions to be available. And thus represent addition to the services provided by the port to various shipping companies, the most container terminals in the study area (East Mediterranean region) in providing that service is Port Said in Egypt with the depth of around 16 meters and Malta.

As for the sub-category of Efficiency of Handling Facilities its importance is based on the degree of efficiency of the services provided by the port, especially within the container terminals area. Which are arranged globally according to efficiency of handling equipment or in other words the number of containers that have been circulating per hour? Some of the ports in the East Mediterranean region occupy top positions in this aspect according The JOC Top 50 world container ports -Global port throughput 2012-2013. As Port Said port in Egypt came in the position of 37th, and other port in Turkey came as the 43rd. Thus the priority of the shipping companies in choosing different container terminals in their way is according to the extent of the order of those ports in the world ranking, according to the international statistics which are conducted and supervised by neutral organizations, and thus the importance of that element depends on the period of time that it

is possible for the ship to spend inside the container terminal, which represents the biggest problem for shipping companies in the extent of its commitment to the times specified in their sailing tables and the extent of that commitment is reflected in the shipping company's reputation.

As for the two sub-categories of Clearance Efficiency and Balance between Ex and Imp, both obtained the percentage of 14% in their importance for the shipping companies. This is due to their connection with the movement containers and not directly linked to the services provided to the shipping companies within the container terminals. The factor of Balance between Ex. is not taken into account due to it is considered from the calculated risks for the companies. The different trading operations from one port to the other covers a large part of that risk and therefore the shipping company doesn’t depend on the trade of a particular country or special containers' station and thus can skip this factor except in the case of a general recession in the area of study or sailing of the company which can also be overcome in order to change sailing schedules and prices of transportation and thus frequencies of various ports in accordance with the movement of commercial or reduce the number of the company's vessels and therefore not to aggravate the loss that could occur if the company continues to offer its services in the same prices and the same number and types of ships available from the company.

The sub-category of Clearance Efficiency which is the element most closely associated with the exit movement of goods from the customs department, which is due to the nature of the arrangement and customs system used inside the port and follow the goods containerized in particular. The shipping companies as I mentioned previously is linked to the nature of the contract between the shipping company with customers owners of cargos in containers and thus deal agents of the Company or its branch inside the container terminal with the customs administration and the speed of handling and therefore the exit of containers directly at the agreed date and thus achieve customer satisfaction which is favored by many clients of the shipping companies.

Finally a comparison between the percentages of the elements of the Fourth quality (**Cargo Features**) category is demonstrated below in figure (5.5), while in table (5.5) they will be presented in a descending order according to their relative importance.

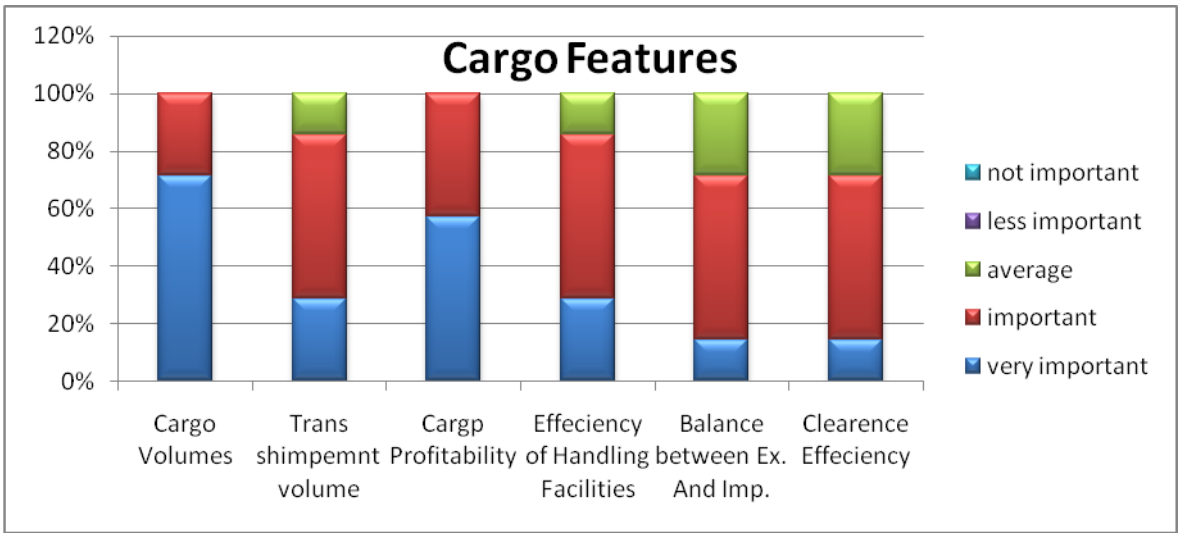

Figure (5.5) The percentage of Cargo Features item

Table (5.5) The Ranks of Cargo Features item in a descending order

Proportion of very important	The Category of Cargo Features
71%	**Cargo Volumes**
57%	**Cargo Profitability**
29%	**Efficiency of Handling Facilities**
29%	Transshipments **volume**
14%	**Balance between Ex. And Imp**
14%	**Clearance Efficiency**

5.3.6 The Category of Customer Service

This category obtained the percentage of 29% from the total of all main categories that the shipping companies consider crucial in selecting ports to deal with. This category is divided to 11 elements. The elements of Planning Shipping Movements, Pilot and Tug Services and Ordering of Resources all obtained the highest percentage of 57% in importance. Planning Shipping Movements is considered a corner stone for any port in the world as the poor planning of shipping movements might lead to lots of disasters inside the port and also results in paying lots of money either due to the accidents that might occur in ports because of the seriousness of the maneuver without prior planning or because of the compensations that the port might pay for shipping companies as a result of delayed deadlines for their ships, either to enter or exit from the port This plan, which will be under the responsibility of the Director of the movement in the port, requires high skills and experience in the field of planning.

As for the element of Pilot and tug services these are basic services needed by the ship in all ports of the world and the efficiency of this service depends on the availability of sufficient numbers of guides in ports, as well as tug boat according to the sizes of different vessels entering the port, and the price of that service as well, which may not differ much between ports in the Eastern Mediterranean region.

The element Ordering of resources, which means the optimal use of resources and avoid wasting time and effort in many futile activities either for the trading cranes or for compact equipment inside the container yard ... etc. which is reflected on the nature of the service provided or received by container ships inside the different stations as well as maintain the equipment in terms of safety working load (SWL). In addition to the repair and maintenance work in a timely manner in accordance with the maintenance schedules that are placed by the maintenance supervisor of Cranes in container terminal so there is no clear deficit in the number of cranes, either to be out of service or through the replacement and renewal processes in accordance with the requirements of the shipping companies and the growing volumes of container vessels.

As for the two Elements Communications and Liaising with Ship Agents have obtained the same degree of attention by the shipping companies and that 43% this is due to their relative importance. We find these elements linked to each other and represent great importance to the shipping companies to coordinate arrangements for the arrival of ships and thus arranging with the agent or company branch inside the port, as well as all the services that the ship needs before it arrives. All this reduces the stay time of the ship inside the port. Moreover, these elements are crucial in the arrangements for receiving the goods and even the delivery processes for recipients of goods, especially in the case of any emergency situation such as a strike at the port and the necessity to move to the closest alternative port. Also cases of calling the ship by the company for maintenance and dropping off all containers in a port on the same shipping rote and this requires speed in calling the agents and management of the port and arranging the logistics of transferring of those containers to their destination, whether by land or sea.

As for the element Berth Allocation, it came third in importance for container ships which operate by time scheduled with the percentage of 29% which depends on the arrival of information book from port operation at the right time and the nature of contract between the shipping company and the administration of the container terminal, which is

also due to prior coordination between the agent of the shipping company or its branch inside the port as it has been referred to in the process of communication and coordination between the administration of the port and the agents which also assure the efficient management of the port authority. This is also assures the importance of the time factor.

Finally, the elements of Claim Records, Monitoring and Customer Liaison came equally in the fourth place in terms of importance with the percentage of 14%. This is due to the fact that these elements are linked more to the shippers or the owners of goods and therefore the part which is dealt with for those elements would be through the shipping agent or branch of the company at the port. Therefore, these elements are considered as administrative problems which can be overcome especially because they don't affect the ship movement, which is the basic concern of the shipping company. As for the owners of the containers, the freight forwarders as well as the shipping agent deal with all the problems and complain with the management of customer services at the port. Thus, the attention of the shipping lines is not attributed to these elements except in the case of companies that complement the service provided to the transport and make transport service (door to door) they are the only companies that are exposed to such elements and try to solve problems encountered in their containers for a quick exit and security of the port to reach the final destination for the arrival of the container.

Finally a comparison between the percentages of the elements of the fifth quality (***customer services level***) category is demonstrated below in figure (5.6), while in table (5.6) they will be presented in a descending order according to their relative importance.

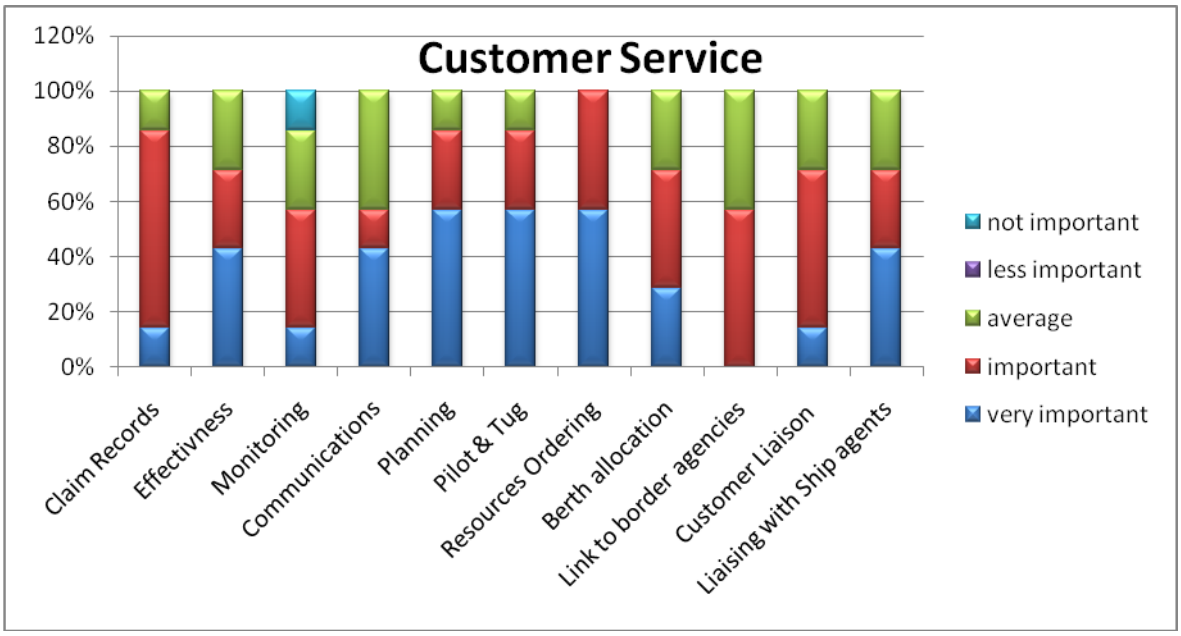

Figure (5.6) The percentage of customer services level item

Table (5.6) The Ranks of customer services item in a descending order

Proportion of very important	The Category of customer services
57%	**Planning**
57%	**Pilot & Tug**
57%	**Ordering of Resources**
29%	**Berth allocation**
43%	**Liaising with Ship agents**
43%	**Communications**
43%	**Effectiveness**
14%	**Customer Liaison**
14%	**Claim Records**
14%	**Monitoring**
0%	**Link to border agencies**

5.3.7 The Information Technology

The category of Information Technology obtained the second highest proportion in the total general categories that represent crucial importance for the shipping companies after Cost category with the percentage of43%. This reflects the importance of the availability of information technology within the container terminals and the quest to provide the best and most reliable service within the container terminals and thus prevent

the waste of time with the traditional methods of business that are based on lots of papers and documents, and so on ....

This category is divided into eight elements, and this category has a special characteristic of a technological integration so that we will find the involvement of more than one element with the same degree or percentage of importance and this integration is to provide the maximum benefit from the information systems and the latest findings by the Computer Science to make service delivery smooth within the container terminals, With the flow of hundreds of thousands of containers inside the terminal without a single occurrence of delay due to congestion in the movement of containers inside the station, whether incoming or outgoing containers which need special treatment, such as refrigerator containers, hazardous materials, etc.

Each of these elements, Aptitude, Service Efficiency and Gate Automation came in the first position in terms of the importance of their presence inside the container terminals for the shipping lines with the percentage of 43% of the total elements for that category. For the availability or Aptitude to use information systems and technology it from the most important elements for shipping companies due to the quality of service that the company expects to be provided in the port in general and within the container terminals in particular. Shipping companies which own container ships have a high level of technology in their operation and thus container terminals must be on the same level of technology of the container ships or close enough. Therefore avoid the waste of any time in search for information which translates ultimately into a waste of time and cost to the shipping company and a bad influence on the reputation of the port. As for element Service Efficiency which is reflected on the lack of proportion of errors that occur from use unequal technology which reflects the inefficiency and thus lack the feasibility of the technology used, which comes in the priority attention of the shipping companies for the response of the container terminal of the level of technology to ensure that they receive satisfactory service that cannot be obtained except by ensuring the efficiency required from the administrative workers of information systems within the container terminal and the high level of technical training which they receive to ensure efficient use and responsiveness of all that is new in the world of technology used to ensure efficient service provided to companies within the container terminals.

The element of *"Gate Automation"* is reflected on the internal movement of containers whether entering or exiting of containers. This affects positively or negatively the movement of containers inside the container terminal and therefore reflects on the overcrowding of containers beside the ships and thus the delay in the time for ending the trading operations scheduled in the port, and thus the use of the mechanical doors for the speed and efficiency of the movement of containers inside the port, which eventually leads to the smooth movement of containers.

The elements which obtained the second position for the shipping companies are the Automated (OCR), Real Time location system, and Motion Equipment & Flexible traffic control. Automated (OCR) is one of many (AIDC) technologies now existing for asset identification and process automation in ports and terminals. Other technologies such as (RFID) radio frequency identification technology), (DGPS) (digital global positioning system) and optics (laser scanners for barcode reading) are also proven and provide similar identification and tracking functions (OCR) is unique in that it enables not only the automated 'hands free' identification and locating of assets, but also the recording of an object's visual condition at that time. Another important benefit is that (OCR) provides a device-less method of identification, without requiring the application of any tag or device to the asset.

In short, (OCR) solutions offer visibility not only to equipment presence at key points of work, but also the condition of that equipment at the time of handling. And, should the automatic recognition of the object fail - which occurs in 3-5% of all attempts due to damaged numbering - a visual record (digital image) of the equipment ID is available for exception management and data correction. The mission critical nature of robotic, unmanned container yards demands 100% accuracy of container identification before entry into an unmanned area of the facility. In addition, these same automated facilities require additional features from (OCR) solution providers such as container door direction, security seal detection, and (IMO)/hazardous placard identification.

And therefore the importance of this element to the shipping companies springs from the speed entry of containers and the similarity between the data and the documents and therefore the lack of obstruction in the entry to the station and therefore avoid the delay in the process of shipping as well as for container exit from the port, especially for shipping companies that provide additional transportation service and thus to maintain the

efficiency of the service and that the advantages to reach on the specified time, which is normal because of being influenced by more than routine administrative work in the case of stations where there is no Automated (OCR).

As for the element of Real Time location system, shipping companies are interested in it in terms of information about the timings of processes that take place within the container terminal and entering in the accounts of the shipping companies that organize trips for container liner shipping, and therefore the ability to determine the turn round time inside the port and fixing it in the sailing schedules and therefore prevent the addition of extra cost on the shipping company as a result of increase the speed of its ships to compensate for the extra stay time in ports. And thus escape from the compensations that can be paid to the owners of the containers, especially if this delay is not due to Force Majeure.

The element of Motion Equipment & Flexible Traffic Control is one of the elements that are due importance to the potential of the container terminal in terms of the number and the efficiency and the extent of flexibility in the use of these cranes and equipment that comes their role in facilitating all the processes that take place for the containers inside the container terminal which is reflected on the speed of finishing trading inside the container terminal and thus exit the ships on time without any delay, because in the case of lack of control and flexibility in changing traffic regulations for equipment and cranes, this would impede the movement of containers and therefore the delay in all the operations which is reflected on a delay of the ships from their specified timing and thus adding extra costs on the shipping company which will result in heavy losses for the company.

The elements that got the third place are Wireless Connectivity and Examination of location info. Using web Both got to the rate of only 14% of the importance of shipping companies because the nature of such techniques are originally available on ships' board, as well as many of the various means of communication and thus the attention to the existence of these elements or not springs from the presence of many alternative means of communication as well as GPS for containers or operations tracing, especially inside the station and in the presence of good planning for port operations, whether for trading or storage or direct exit and therefore the need for tests specifically for sites to be more widely used outside of the container terminal and that was one of the processes that are

used in controlling and insuring the implementation of the plans in advance for container operations within the container terminal.

Finally a comparison between the percentages of the elements of the six qualities (***Information technology***) category is demonstrated below in figure (5.7), while in table (5.7) they will be presented in a descending order according to their relative importance.

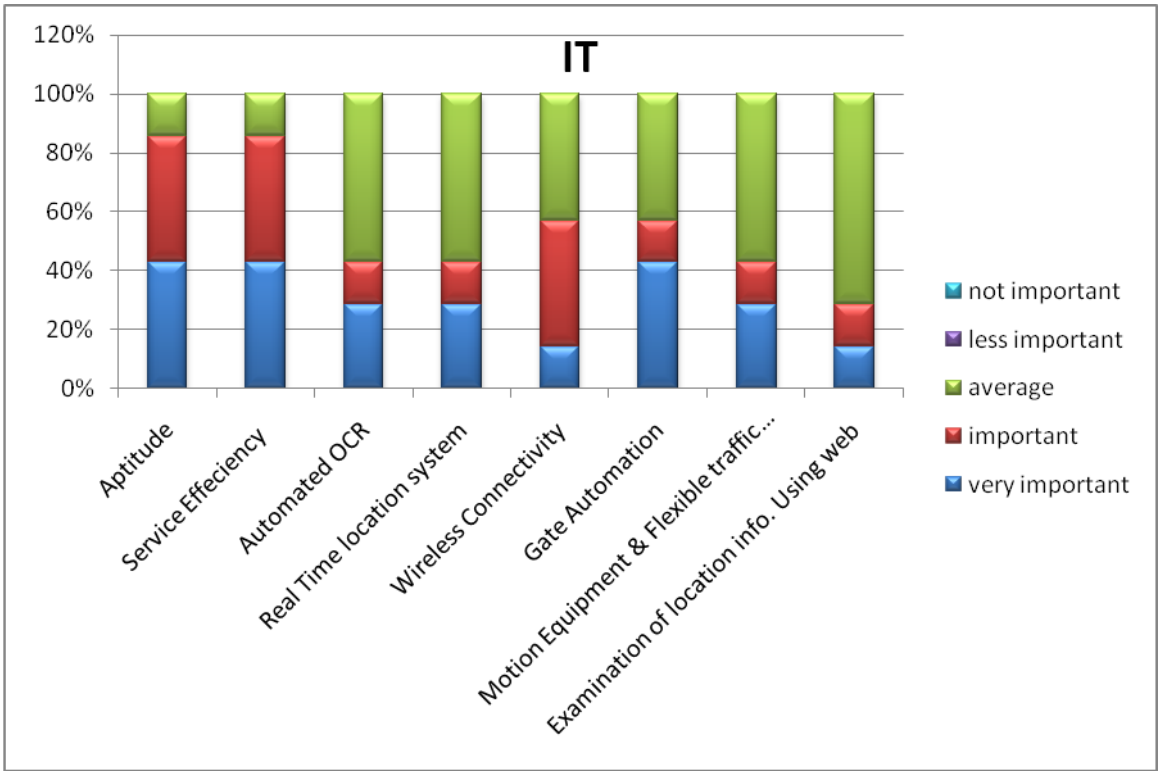

Figure (5.7) The percentage of Information technology in port

Table (5.7) The Ranks of information technology in port item in a descending order

Proportion of very important	The Category of Information technology in port
43%	**Information Technology Aptitude**
43%	**Service Efficiency**
43%	**Gate Automation**
29%	**Automated OCR**
29%	**Real Time location system**
29%	**Motion Equipment & Flexible traffic control**
14%	**Wireless Connectivity**
14%	**Examination of location info. Using web**

5.3.8 The category of External Factors

As for that category which External Factors it has got 29% of the total of the different categories, which fall within the primary determinants in the selection of the stations in the eastern Mediterranean and strange it is equally divided in the same proportion with a group of other categories such as Port Features, Cargo features, as well as customer service.

The split that category to the many items up to a total of eight elements and strange that the survey results were reflective of the reality of the usefulness or importance of those elements to the attention of shipping companies out have been excluded from the arrangement used for the items, which takes into account whether that element is very important, or at least in importance, and these elements coordination of shipping alliance, where the process of coordination were not so important, but I got on the level of important by 43%, which reflects the importance of that element for companies navigational members of the maritime alliances in such case the shipping companies operating system liner they are a member of the Conference navigational and therefore the importance of that element back to the navigation Conference coordination with the administration of the port in the inclusion of the port within the ports of the shipping line, as well as coordination with agents or representative of the company.

As for the element Dedicated terminals investment ability he has got a proportion of 14% of the very important while the 43% of the important and explains that the level of interest in investing in container terminals, which reflects the investment capacity of the port and knowledge of the needs or requirements of the development, which is reflected either positively increase in the number of clients and trading volume or negatively is the additions of others useless or that can positively on clients, which explains megaprojects and costly inside the ports and private container terminals, however, we find that the ROI and Statistics has been no increase in both trading volume or the number of shipping companies. Dealing with the port which is what happens in many sectors of the countries of the world, especially those administered under the administration of government bureaucracy does not represent the true reality of the needs and investments.

As for the element Frequency of trunk & feeder routes, he also got an estimate 43% of the very important, because this element is linked to the nature of the service provided

by the company navigational services, extra transportation within the state and thus Fajita shipping companies for ports that have service distribution, whether by land or on the distribution of the service feeder routes and thus the focus of this element for large companies provided these services only.

For component Calling of competitor port, a component which is agreed upon by all shipping companies in terms of the importance it has got 29% of the very important, which represents the importance of competition between the various ports and this element offers the availability of different choices in front of the shipping companies in terms of the ports, converging and competing in the same region and thus allow great opportunities in front of the shipping companies and thus here show the importance of flexibility in choices, especially when the convergence of the different possibilities and facilities provided by a group of competing ports and the availability of that element helps to allow many companies to select in front of navigational choices.

As for the element Possibility of niche market, this element is designed to deal with niche markets and therefore we find that trade using container transport has Tussah too, especially with the availability in terms of the different designs and therefore the diversity of cargo that can be carried using the containers, but in the end we are addressing a niche market, a market containers have therefore obtained the proportion of estimated 43% of the important and is what you're looking for shipping companies operating in the field of container transport and, although he became a trend great way to use containers to transport most of the types of goods and therefore search for clients shipping companies from the owners of trades various movement inside containers it is what you're looking for shipping companies and ports thus that meet the desires of its customers and shipping companies that provide private container terminals of different possibilities, according to the size of the market that specialized in different countries.

For the element Preference of hub port this element did not have a large share is not of great significance and that because that kind of ports has a market various types of shipping companies different is characterized by its use of giant container vessels need to container terminals high potential and great facilities and great depths and thus has happened to the rate of 43 % of the estimate average because in the case of market eastern Mediterranean.

Political consideration this element of the important elements of the highly but with the results of the questionnaire, the results were the opposite of what is expected has happened to the rate of only 14% of the very important while got to the rate of 43% of the important and so, like many of the elements of Foreign Affairs earlier got the same percentage as estimates which explains the correlation of Commerce and all circumstances, whether in the case of political stability or political tensions which may amount to war, whether civil or with neighboring countries and the only case that is affected by the liner is the state of total ban from entering the ports of those countries, though this problem can be overcome the existence of ports and alternative near the port ultimate example of this continuation of the shipping companies to enter the Syrian ports so far, unstable and in case of default login Hall Beirut port as one of the ports of alternative containers Syrian and therefore this component can be damaged with him, according to what is available and the size of the demand for such ports

Finally element Hinterland / Foreland connections, he also got the same degree of interest rate 14% important, 43% of the very important this element bother him most of the shipping companies large and seeking to spread and takeover the largest share of the market and are therefore considered to this racial considering that the site this port and its potential different and diversity in the size of the customers as they are here do not look to the clients of the port State only, but beyond that to another state can use this port for trading goods from which such port of Alexandria was still decades close to serve many of the African countries, but not the State of the Republic of Egypt alone, which is one of its ports, but arrived to the states in the heart of the African continent was promising to transport goods and many examples in the world, we find the port of Rotterdam in the Netherlands is found enjoying the same that property, which provide commercial services to several European countries and therefore this element serves the shipping companies large and expanding the provision of services is not a navigational services only, but also services, transportation and logistics (shipping provider).

Therefore the company can get a larger share of the market to provide that service and help to the port chosen or preferred in that region, which can receives ships all sizes as well as the size the biggest and varied from port users, both from the same country or from neighboring countries.

Finally a comparison between the percentages of the elements of the seventh qualities (***External Factor***) category is demonstrated below in figure (5.8), while in table (5.8) they will be presented in a descending order according to their relative importance.

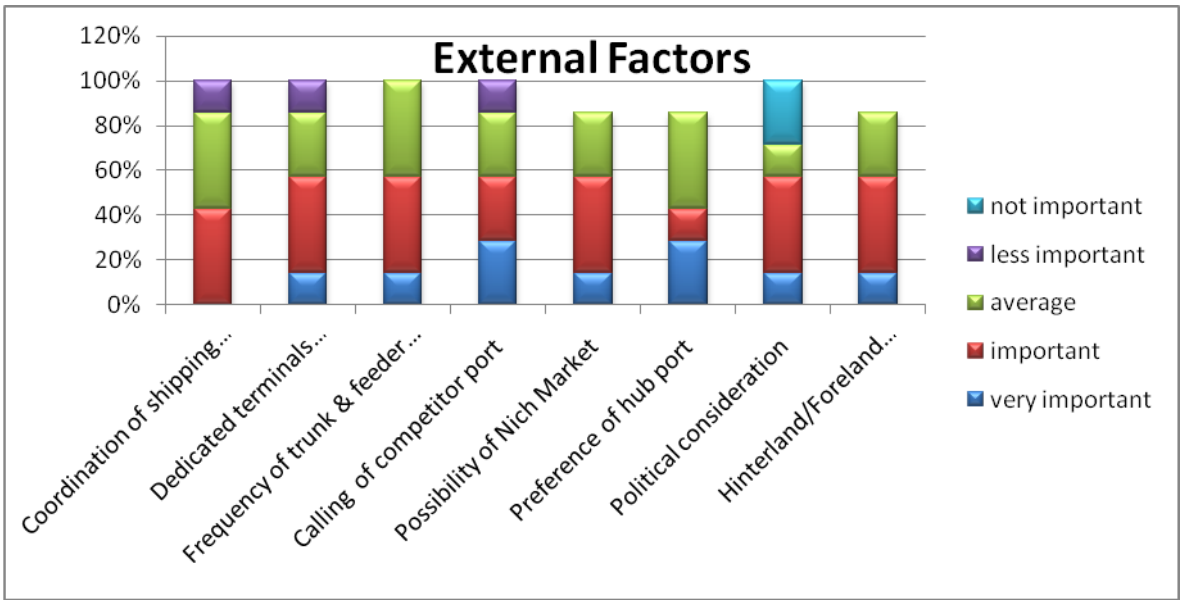

Figure (5.8) The percentage of the External Factor item

Table (5.8) The Ranks of External Factors item in a descending order

The Category of External Factors	Proportion of very important
Calling of competitor port	29%
Preference of hub port	29%
Frequency of trunk & feeder routes	14%
Possibility of Nich Market	14%
Dedicated terminals investment ability	14%
Political consideration	14%
Hinterland/Foreland connections	14%
Coordination of shipping alliance	0%

All of the previous analysis and results can be summarized in table (5.9), where an integrated list of the most important quality determinants of service quality in container terminal from the shipping lines perspective in the east Mediterranean region are displayed. This integrated list is called the Termiqual model, for the following reasons, first, for simplification, second, for clarification, and third, for differentiation from other quality models for example the SERVQUAL Model developed by (Parasuraman, Zeithaml and Berry 1985).

Table (5.9) the list of the Important Quality Determinants of Service Quality (Termiqual Model)

(1) Port Factors	Proportion of very important
Port Depth	100%
Location	86%
Berth length	71%
Handling Equipment availability	71%
Storage Capacity (TEU)	43%
(2) Port charges	Proportion of very important
Terminal Handling Fees	57%
Operating Cost	57%
Port Dues	43%
(3) The Management category	Proportion of very important
management Reliability	43%
Relations with staff	29%
Capacity of Branch/ agents	14%
(4) The Category of Cargo Features	Proportion of very important
Cargo Volumes	71%
Cargo Profitability	57%
Efficiency of Handling Facilities	29%
(5) The Category of customer services	Proportion of very important
Planning	57%
Pilot & Tug	57%
Ordering of Resources	57%
Liaising with Ship agents	43%
Communications	43%
Berth allocation	29%
(6) The Category of Information technology in port	Proportion of very important
Information Technology Aptitude	43%
Service Efficiency	43%
Gate Automation	43%
Automated OCR	29%
Real Time location system	29%
Motion Equipment & Flexible traffic control	29%
(7) The Category of External Factors	Proportion of very important
Calling of competitor port	29%
Preference of hub port	29%
Frequency of trunk & feeder routes	14%
Possibility of Niche Market	14%

The results of this chapter will be introduced to a number of four groups to fulfill the requirements of the rest of the dissertation, as will be shown in the next chapter.

CHAPTER SIX

CONFIRMING THE VALIDITY OF TERMIQUAL MODEL USING FUZZY AHP SOLUTIONS

6.1. Introduction

In this chapter a number of mathematical terms will be processed using (fuzzy AHP) methodology to develop the (Termiqual model), the importance of developing this model comes from its ability in expressing the significant impact of adopting this service quality model on the performance of ports, also this model assumes that will be a significant change in the ports ranks, the methodology behind AHP and the equations used to perform this method will be discussed in details in the rest of the chapter to achieve this objective a second questionnaire will disseminated and analyzed.

The layout of this chapter is as follows section 6.2 Case descriptions; section 6.3 Fuzzy Analytic Hierarchy Process, section 6.4 Data Analysis using AHP methodology from experts and academics perspective

6.2 Case description

This research used these 7 port selection categories to design the research questionnaire. These 7 categories were explained in detail in the first questionnaire, and the researcher has designed the second questionnaire in this chapter (see the appendix) in order to get the importance of the criteria in relative to each other.

Figure (6.1) Questionnaire form to facilitate comparison of the importance of determinants of service quality performance measurement attributes

With respect to (…....)	Importance or preference of one main (sub) attribute over another									
Attribute	Absolutely more important **(9)**	Demonstrably more important **(7)**	strongly more important **(5)**	Slightly more Important **(3)**	Equally important **(1)**	Slightly more Important **(3)**	strongly more important **(5)**	Demonstrably more important **(7)**	Absolutely more important **(9)**	**Attribute**
C1										C2
……..										……..
Cn-1										Cn

This follow-up AHP questionnaire form was posted to four groups each of five respondents with a total of twenty respondents, the first group represents ports

management, the second represents maritime practitioners, and the third represents academic experts, while the fourth group represents the terminal professionals' operators. The researcher seeks to benefit from the diversity in experience, skills and knowledge of the respondents to support the accuracy of the data, and to enhance the credibility of the research, each respondent was asked to answer the questionnaire form, but because of the specific design of it, a set of sessions were conducted to explain to the respondents how to fill the questionnaire form, their responses were analyzed by the AHP approach to obtain the relative degree of importance of each factor and the performance of each port on these 7 categories.

6.3 Fuzzy Analytic Hierarchy Process

Pair-wise comparison techniques the pair-wise technique is developed by Saaty (1977) in the context of developing Analytical Hierarchy Process (AHP). In this method, the pair-wise comparison is used to create a ratio matrix. For comparison, several questions can be asked to the decision maker to compare the importance of two attributes at a time, such as \Which one of these two attributes is more important, and how much more important?" (Meixner, O. 2009) , they are mostly asked in a verbal expressed scale. Verbal expressions range from equal to extreme as equal, moderately more, strongly more, very strongly more, and extremely more (Saaty, T. L. 1990). According to the answers of decision makers the weight ratios are determined by translating verbal expressions corresponding integers from 1 to 9 as 1, 3, 5, 7, and 9. They are shown and explained in Table (6.1).

Pöyhönen, M., & Hämäläinen, R. P. (1997) made an assessment of five attribute weighting techniques; one version of the Analytic Hierarchy Process (AHP), direct weighting, Simple Multi- attribute rating.

Technique (SMART), Swing weighting and Trade-o weighting, According to their results, there are no fundamental deference between the weighting techniques since they have the same theoretical background. They conclude that practitioners can choose whatever method they like for weight development. In this research, we focus on a pair-wise comparison technique since it provides a well structured group discussion and helps the decision makers to focus on areas of agreement and disagreement when setting attribute weights (Drobne, S., & Lisec, A, 2009).

Table (6.1) The scale of linguistic evaluations

Intensity of importance on an absolute scale	**Definition**	**Explanation**
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one over another	Experience and judgment strongly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Very strong importance	An activity is strongly favored, and its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity fover another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals	If activity i has one of the above number assigned to it when compared with activity j, then j has the reciprocal value when compared with i.	
Rationales	Ratios arising from the scale	If consistency were to be forced by obtaining n numerical values to span the matrix

(Source: Saaty; 1977)

This study uses the fuzzy AHP's procedures as mentioned previously to calculate the weight for each factor. For the group discussions, we have constructed some questions based on the fuzzy AHP concept. The goal of questions is to compare pairs of factors in a sequence. Saaty (1990) recommended nine-point scale. However, due to consideration of easy answering, this study only uses five different degrees of evaluation, without considering intermediate values 2, 4, 6, and 8. They are (1) extremely more important, (2)

very strongly more important, (3) strongly more important, (4) moderately more important, and (5) equal.

6.3.1 Calculating the Weights in services Quality Factors

Fuzzy AHP is a widespread multi criteria decision making and has been used widely in the literature (Chang, 1996; Chou et al., 2008; Bashiri and Hosseininezhad, 2009; Cinar and Ahiska, 2010; Balli and Korukoglu, 2009; Kuo, R. J et al., 2002; Tolga et al., 2005). studied the fuzzy AHP, which is an extension of Saaty's theory represented in1977.

Step 1: The first step of fuzzy AHP, also for the classical AHP is to prepare pair-wise questions and ask them to the related persons in order to rank the location quality factors hierarchically as we did group discussions in the first phase of this study. The questions are given in Appendix (C). The top management in shipping line only selected the related linguistic variable by comparing every possible pairing.

Then the ratings are entered into a pair-wise comparison matrix or ratio matrix. Since the matrix is symmetrical, one triangle needs to be filled in, and then the other triangle is filled with inverse proportion of the values as in the Appendix (D).

The AHP of *(Saaty, 1977)* only makes use of the pair-wise comparison matrix to evaluate the ambiguity in multi-criteria decision marking problems as in formula (1). Let C1, C2, Cn denote the set of elements, while (aij) represents a quantified judgment on a pair of elements Ci, Cj. The relative importance of two elements is rated using a scale with the values 1, 3, 5, 7, and 9, where 1 denotes equally important, 3 for slightly more important, 5 for strongly more important, for demonstrably more important, and 9 for absolutely more important. An n-by-n matrix A can be expressed as follows:

$$A = [aij] = \begin{array}{c} \\ C1 \\ C2 \\ \vdots \\ Cn \end{array} \begin{array}{c} \begin{array}{cccc} C1 & C2 & \dots & Cn \end{array} \\ \begin{bmatrix} 1 & a12 & \dots & a1n \\ \frac{1}{a12} & 1 & \dots & a2n \\ \vdots & \vdots & \vdots & \vdots \\ \frac{1}{a1n} & \frac{1}{a2n} & \dots & 1 \end{bmatrix} \end{array} \quad (1)$$

Where $C_1, C_2, \dots, C_n$ denote the set of elements, aij = 1 and aij $= \frac{1}{aij}$ i, j= 1, 2,…,n

Step 2: The second level includes the structuring the pair-wise ratio matrix with the triangular fuzzy numbers. The ratings are converted into the following scale including triangular fuzzy numbers developed by (Bozbura, F. T., & Beskese, A, 2007), Kang & Lee, 2007; Chang, Wu, & Chen, 2008; Chang, Wu, & Lin, 2008; Orlando & José, 2008). In (Yang, J. D. 2002), different a-cuts are then converted, Relative weights of the elements of each level.

(Saaty, 1977) contended that the geometric mean accurately highlights the consensus of experts, and is the most widely used in practical applications *(Bellmann & Zadeh, 1970).* Here, geometric mean (which represents the consensus of experts) is used as the model for triangular fuzzy numbers that is the mean of membership = 1. A fuzzy pair-wise comparison matrix based on triangular fuzzy numbers is used in expressing. The triangular fuzzy numbers are established as follows: (L, M, U) using the formulas from (2) to (4). Where L denotes the minimum numerical value, U denotes the maximum numerical value and M is the geometric mean which represents the consensus of most experts as shown in appendix (F). The triangular fuzzy numbers ~uij are established as follows:

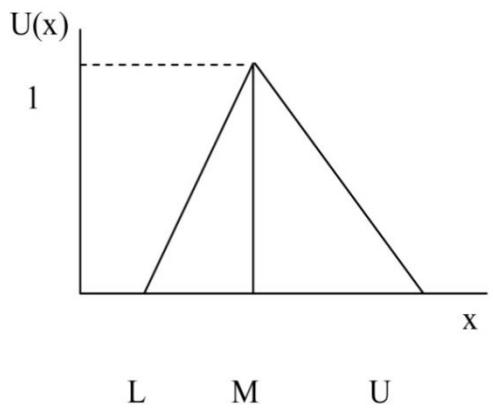

Figure (6.2) Triangular fuzzy numbers

$\tilde{u}ij = (Lij, Mij, Uij), Lij \leq Mij \text{ and } Lij, Mij \epsilon [\,1/9, 1] \cup [1,9]$ (2)

$Lij = \min(Bijk),$ (3)

$Uij = \max(Bijk).$ (4)

Where Bijk represents a judegment of expert k for the relative importance of two criteria i-j.

$$\tilde{A} = [aij] = \begin{array}{c} \\ C1 \\ C2 \\ \vdots \\ Cn \end{array} \begin{array}{c} \begin{array}{cccc} C1 & C2 & \dots & Cn \end{array} \\ \begin{bmatrix} 1 & a12 & \dots & \tilde{a}1n \\ \frac{1}{\tilde{a}12} & 1 & \dots & \tilde{a}2n \\ \vdots & \vdots & \vdots & \vdots \\ \frac{1}{\tilde{a}1n} & \frac{1}{\tilde{a}2n} & \dots & 1 \end{bmatrix} \end{array} \quad (5)$$

Where $\tilde{a}ij$ denotes a triangular fuzzy matrix for the relative importance of two criteria C_1 and C_2. Meanwhile, $[\tilde{a}ij]$ represents the triangular fuzzy numbers by the formulas (2)-(4).

Step 3: In the third phase, we calculate the value of synthetic extent with the Equations (6), As the preferences of experts are relatively subjective opinions, their responses could differ Depending on the degree of environmental uncertainty and depending on whether the experts adopt a conservative or optimistic attitude when determining their preferences. Therefore, the degree of environmental uncertainty and the degree of experts' confidence in their preference should be taken into consideration.

For the questionnaire responses:

$$(a_{ij}^{a})^{\lambda} = \left[\lambda . L_{ij}^{a} + (1-\lambda).U_{ij}^{a}\right], 0 \leq \lambda \leq 1, 0 \leq a \leq 1 \quad (6)$$

Where $L_{ij}^{a} = (Mij - Kij).a + Lij$, represents the left-end value of a-cupaij, $U_{ij}^{a} = Uij - (Uij - Mij).a$, represents the right-end value of a-cup for a-cup for aij.

(1) is used to express the environmental uncertainty

Consequently the aggregate pair-wise comparison matrix is established as follows:

$$[(A^{a})^{\lambda} = \left[(aij)^{\lambda}\right] = \begin{array}{c} \\ C1 \\ C2 \\ \vdots \\ Cn \end{array} \begin{array}{c} \begin{array}{cccc} C1 & C2 & \dots & Cn \end{array} \\ \begin{bmatrix} 1 & (a^{a}12)^{\lambda} & \dots & (a^{a}1n)^{\lambda} \\ (a^{a}21)^{\lambda} & 1 & \dots & (a^{a}2n)^{\lambda} \\ \vdots & \vdots & \vdots & \vdots \\ (a^{a}1n)^{\lambda} & (a^{a}2n)^{\lambda} & \dots & 1 \end{bmatrix} \end{array} \quad (7)$$

Then the Eigenvector method is used for weight calculation. Eigenvalue (8) and Eigenvector (9) are calculated for each aggregate pair-wise comparison matrix at each level as follows:

$$(A^{a})^{\lambda}.W = \bar{\lambda}max.W, \quad (8)$$

$$[(\boldsymbol{A^{a}})^{\boldsymbol{\lambda}} - \bar{\lambda}max].W. \quad (9)$$

Where W denotes the Eigenvector of $(A^{a})^{\lambda}$, $0 \leq \lambda \leq 1, 0 \leq a \leq 1$.

The traditional AHP only uses a specific figure (geometric mean) to represent the expert opinions for the pair-ware comparison matrix. However, the triangular fuzzy numbers are used to present the fuzzy opinions and expert consensus.

The application of AHP methodology to give Eigen values for each criterion in each category is shown in Appendices (E).

In this research, actual data were collected only for port features criteria. Then, a rate-weight score was developed by the researcher for criteria in port features only.

6.3.2 Consistency Test

(Saaty, 1990) proposed utilizing consistency index (C.I.) and consistency ratio (C.R.) to verify the consistency of the comparison matrix. C.I. and R.I. are defined as follows:

$$CI = \frac{\tilde{\lambda}max-n}{n-1} \quad (10)$$

$$CR = \frac{CI}{RI} \quad (11)$$

Where R.I. represents the average consistency index over numerous random entries of same order reciprocal matrices. If C.R 6 0.1, the estimate is accepted; otherwise, a new comparison matrix is solicited until C.R 6 0.1.

Table (6.2) Table of consistency

Test the consistency					
Table name	**EIGENVALUE**	**N**	**CI**	**RI**	**CR**
The Main Factors	7.444745	7	0.07412417	1.32	0.05615467
The Port features	5.204506644	5	0.05112666	1.12	0.0456488
The port Charges	3.08969393	3	0.04484697	0.58	0.07732235
The Operation Management	3.1	3	0.05	0.58	0.0862069
The Cargo Handling	3.037285906	3	0.01864295	0.58	0.03214302
Customer Service level	6.303668115	6	0.06073362	1.24	0.04897873
Information Technology	6.353508	6	0.0707016	1.24	0.05701742
External Factors	4.148487771	4	0.04949592	0.9	0.05499547

Table (6. 2), shows that the consistency is perfect, Since the CR in all tables is less than 0.1 it means that the results are consistent and the test is valid.

The acceptable CR range varies according to the size of matrix i.e. 0.05 for a 3 by 3 matrix, 0.08 for a 4 by 4 matrix and 0.1 for all larger matrices, n>= 5. If the value of CR is equal to, or less than that value, it implies that the evaluation within the matrix is acceptable or indicates a good level of consistency in the comparative judgments represented in that matrix. In contrast, if CR is more than the acceptable value, inconsistency of judgments within that matrix has occurred and the evaluation process should therefore be reviewed, reconsidered and improved. An acceptable consistency ratio helps to ensure decision-maker reliability in determining the priorities of a set of criteria (Saaty, 2000; Kabir, G., & Sumi, R. S, 2010).

Table (6.3) Randomly Generated Consistency Index for different size of matrix

N	1	2	3	4	5	6	7	8	9	10
R. I.	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

(Source: Al-Harbi, K. M. A. S. (2001).

6.4 Data Analysis using AHP methodology from experts and academics perspective

The results of the second questionnaire came out, after the use of AHP Tools for the different criteria that have been settled by most shipping companies that were asked in the first questionnaire. The first questionnaire focused on the importance of those criteria for these companies, which contribute to the transfer of trade in the East Mediterranean region (study location) with the average of more than 90% of the volume of trade in the region (Figure 6.3).

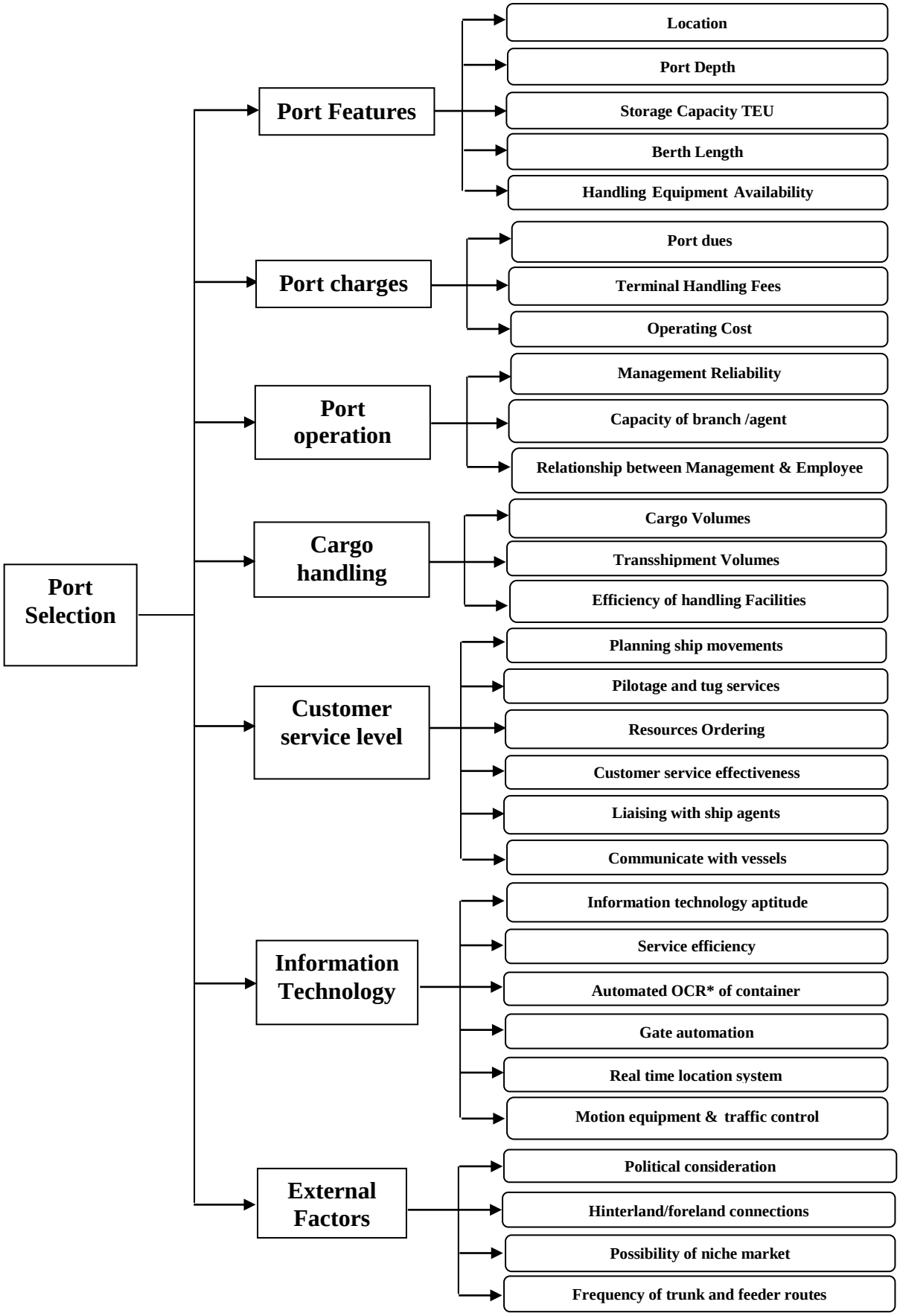

Figure (6.3) Hierarchal representation of port selection factors

6.4.1 The Main Factors category

Based on preliminary results for a group of various factors which the selection of ports has been determined on its basis or more precisely different container terminals in the world have been identified, the most important factors have been selected which have been divided into a set of key factors.

From the analysis of the previous table, we find that the key elements that have been selected with high percentage of importance in the first questionnaire are different from the elements that appeared in the results of the second questionnaire, for several reasons:

The first questionnaire adopted the opinion of the customers that have been pre-selected, which are the different shipping companies that work with these container terminals located in the research area without taking the opinion of other parties concerning the importance of these elements for them.

The second questionnaire relies on fewer elements after being filtrated by selecting the most important elements that were agreed upon and selected by the shipping companies or in other words the elements that obtained most of the votes.

Table (6.4) Key factors in the selection of container terminals

The Main Factors	**Eigenvector (Weight)**
Attribute Name	
The port features	23.5%
The port charges	11.6%
The Operation Management	12.2%
The Cargo Handling	4.2%
The customer service level	8.8%
The Information Technology	14.5%
The External factors	25.1%

Table (6.4) shows the most important key factors in various fields, which is one of the key factors in the selection of container terminals, based on the opinions of customers and the relative importance of those elements in accordance with the opinions of experts and academics.

The second questionnaire depended on the viewpoints of both academics and experts in the maritime transport sector, either previous managers of different ports or port authorities. And therefore represents different view point, the aim behind this is to

calculate the importance of each of these elements to each other using a different form of questionnaire which helps to clarify such importance (Attachment 2) and thus get all of the elements on the different weights to illustrate how important they are.

We find that what we have agreed upon previously appears clearly from the comparison of results. For example, the *"Port Features category"* obtained the percentage of 23.5% which is lower that the percentage obtained in the first questionnaire which was 29%. And this confirms the reasons mentioned before that the different results for each of the factors is due to the fact that the views are varied. In addition, The *"Port Charges category"* achieved 11.6 % from the rate of importance despite having the percentage of 57% from the level of importance for the shipping lines.

Moreover, the various and different results for The *"Operation Management category"*, which got the value of 0% of the importance of the shipping companies as it was explained before that the administrative side is interested in results, not the nature of the administration because it is ultimately required to provide acceptable service from the customer's perspective in order to keep them while from the view point of the academics who are working in the administration, we find that the same category obtained the percentage of 12.2% of importance.

This is due to the connection of the notion of success with good management, which represents good reputation for various institutions on different activities and areas. Similarly, the category of *"Cargo Handling"* obtained the lowest percentage from the view point of academics which is 4.2% while achieving the percentage of 29% for the shipping companies.

This is the result of the deep belief of the academics that the factors of this category are closely connected to the shape of the goods and their movement and the direction of trade in the port in general. Thus, this category is considered by the academics as one of the *"external factors"* that are out of the control of the shipping lines. This assures the discrepancy in the view point in analyzing the same category. As for the category of the *"Customer Service Level"*, it obtained a percentage of importance of 8.8% for the academics in spite of achieving the percentage of 29% for the shipping companies. This is due to the connection of the customer service with the final customers which are on our case the owners of the goods, while the shipping companies from the view point of the

academics are partners in providing the service to the common customer, which are the owners of the goods.

Therefore, the complains of the different shipping companies are related to the operation department in the port which is connected to the port authority and consequently, the academics believe that the department of customer service is working very hard to provide for the demands of its customers (the owners of the goods) more than any other customers of the port like the shipping companies, the freight forwarders and other jobs that provide services for the owners of the goods.

As for the *"Information Technology"* factor, it obtained the percentage of importance 14.5% from the point of view of the academics while from the perspective of the shipping companies it achieved the percentage of 43%. This is directly related to the shipping companies' awareness of the facilitation of procedures using high levels of information technology, in addition many other tasks and services that are of great importance for the shipping companies and the speed of delivery for such tasks and services using information technology as compared to the old ways of paper works which lack accuracy, precision and speed. According to the academics, without underestimating for information technology, they view it just as a tool that facilitates other factors such as good management and customer service… and many other services that are provided by ports while using information technology.

The final category of *"External Factors"* achieved the highest percentage for the academics of 25.1% because they value the diversity of the external factors and their impact on choosing some terminals rather than others. All such factors are out of the control of the shipping lines which gave external factors an equivalent percentage as the customer service equals to 29%. These factors affect controlling the direction of the shipping line and entering ports or container terminals or not, for example, entering lots of shipping lines in the region of the study to the Syrian ports despite the state of war and tension on its lands.

6.4.2 The Port features category

Table (6.5) Show the important factors of the category Port Features according to the view point of the experts and academics.

The Port features	**Eigenvector (Weight)**
Attribute Name	
Location	37.1%
Port depth	10.9%
Storage Capacity (TEU)	12.3%
Berth length	15.3%
Handling Equipment availability	24.5%

When analyzing the basic components of *"The Port Features category"* tables (6.5) we find that from the 10 basic factors of the first questionnaire, only 5 was chosen with great diversity in the level of importance. For example, the element of "*Location*" achieved a percentage of 37.1% for the academics, which is a relatively high percent when compared to other elements. As for the *"Port Depth*", it obtained the highest rate of 100% for the shipping companies because there is no other alternative factor for this element, especially for the modern vessels which require depth in the port. The "daily cost" for such vessels inside any port is very high; consequently this cost is calculated according to the number of days that are expected for the ship to stay in the port and thus, there is no additional time to find alternative solutions to overcome the problem of low depth which resulted for instance, in losing the port of Damietta its relative importance especially in the field of transit trade. In spite of its prominent position, the low depth was the main reason to decrease the demand for entering to this port.

As for the category of *"Storage Capacity (TEU)",* it is one of the most important elements from the technical perspective especially with the different categorization of containers. For instance, we find that both the Dry container and the Reefer container have special characteristics for storage, especially the Reefer which depends mainly on the number of electricity sources and generators available inside the container "storage area". Thus this category is directly connected to the infrastructure of the port, which achieved a percentage of 43% of importance from the customers' point of view. On the other hand, it achieved the percentage of 12.3% from the academics point of view. The reason behind this is the consideration of other factors with this one. For example, the direct exit of containers without the need for storage or shortening the period of storage to the least

possible which is the new trend for directing the goods including the containers to the dry ports which are close to the original port. All these are solutions to overcome the problem of congestion of goods inside the ports or the storage areas.

For the element *"Berth length"*, it is one of the important elements that are also within the infrastructure of the port. It has got 71% of importance percentage in order to overcome the congestion inside the port, which the shipping companies are trying so hard to overcome. Therefore achieving this high rate is due to the long sidewalks which mean the availability of different facilities for trading to escape from the port Congestion. On the other hand the same category achieved the percentage of 15.3% from the academics perspective. This is a similar percentage like other categories. Theoretically, port Congestion is a problem of management because the bad "management" that causes it because each port authority should know the facilities of the port and its capacity for ships and organize bookings for berths and special timings and thus can overcome the problem of non-availability of sidewalks with lengths.

The final element which is "*Handling Equipment availability*" achieved the percentage of 71% of importance for the shipping lines. However, it obtained 24.5% for the academics. This is a relatively high rate when compared with other factors. As it is one of the important processes for trading with its different rates, this factor represents the basic productivity of container terminals, which all the container terminals around the world are being classified on its basis and it represents the biggest drawback for vessels to terminate their job within the ports in general.

6.4.3 The Port Charges category

The *Port "Charges category* "was shortened to three factors only, (table 6-6) which is the opinion of the different shipping companies as a result of the first questionnaire. We also find a discrepancy in the percentage of importance for all factors from the different point of views. For example, *"Port Dues"* obtained the percentage of 43% for the shipping companies and 35.8% for the experts and academics. This clarifies the agreement of both points of view for the importance of this element for the shipping companies. This is because of its connection with the variable costs which are linked to the cost of the trip and which directly affect the company's profitability from the different trips. This include fees associated with using the ship to port facilities such as mooring fees – sidewalk fees - supplies from the port ..... The value of these fees is detected in four ways according to:

cargo volume - cargo weight - Gross Register Tonnage (GRT) – Net Register Tonnage (NET).

There is also another factor which is *"Service Charges"* which covers the services provided to the ship in the port like the costs of counseling, communication and Towage Cost *which* differs from one port to another.

As for the second factor "*Terminal Handling*", it achieved different percentages. From the shipping companies' point of view it has got 57% due to its connection to the Transportation tariff announced to all the shippers and paid by the shipping companies as part of the transportation fees of the containers.

Table (6.6) shows the different factors of The Port Charges category based on the opinion of the customers and the percentage of importance of these factors to the academics and experts.

Table (6.6) The Port Charges category

The port Charges	**Eigenvector (Weight)**
Attribute Name	
Port dues	35.8%
Terminal handling fees	24.9%
Operating cost	39.2%

The increase in the cost of handling will directly affect the transportation tariff and consequently the competition between the shipping companies especially those outside the navigation conference that arranges the competition in the area of the study. Theoretically, it achieved a lower percentage of 24.5% because the different shipping line that passes through a specific port can get different contracts for the trading costs depending on the achievement of the shipping company to the target identified in a sub-contract upon which the company gets a discount in a previously agreed upon percentage. Therefore, from the theoretical perspective we find that this factor is connected with the marketing sector of the shipping company and the number of customers who like the trading of their goods through the port in addition to other advantages enjoyed by the port, for example, proximity to local markets or industrial zones linked to the type of the goods transported.

The third and final factor in this table is the "*Operating Cost*" which represents the cost of operating the ship in terms of labor costs, repairs and maintenance, and insurance

costs. These are the important points which make the ship always in the state of operation. As for the labor costs, which refer to the crew of the ship, sometimes the ship needs a change and getting a crew from the country of the port. Therefore the level of wages should be known in this company and whether it agrees with the company's policy of wages or not. In addition, the cost of repair and maintenance is one of the important costs for the shipping companies as it costs lots of money either for the routine maintenance or the sudden ones which the company is obliged to fix in the port. This justifies the quest for the availability of these facilities in the port and the availability of Shipyard for repairing or towing to another port to perform the maintenance processes. In addition to the insurance costs as sometimes the company does the insurance in the port in case of the termination of contract. It obtained the percentage of 57% for the shipping companies because it represents an important factor in the selection of ports and the direct impact on profitability and the compaction of the company. Similarly the academics and the experts gave it a percentage of 39.3% for the importance of this factor and its connection to lots of other points that affects the decision taker either to enter the port or to search for an alternative port.

6.4.4 The Operation Management category

The "operation management" is considered among the important criteria for the shipping lines to choose ports. It includes many factors but all the opinions have agreed on only three, which are found to be the most affective. The most important factor for the shipping companies is "Management Reliability" which obtained 43% for most of the shipping companies. It is important to note that the administrative team that manages the port facilities in general and the container terminals in particular, should enjoy great deal of reliability, credibility and neutrality and the availability of the principle of equal opportunities for shipping companies operating in the port and thus ensure reaching to the quality of service agreed or represent satisfaction rate acceptable to customers which is the most important thing for the shipping companies.

Table (6.7) shows the different factors of the Operation Management category based on the Opinion of the customers and the percentage of importance of these factors to the academics and experts.

The Operation Management	**Eigenvector (Weight)**
Attribute Name	
management Reliability	17.6%
Capacity of branch/ agent	39.8%
Relationship between management and employee	42.6%

The second factor of" *Capacity of branch / agent*" obtained a high percentage of 86% for the shipping companies. While the experts and academics assured the importance of this factor by giving it a percentage of 39.8%. This is due to the general policy of the port authority and the possibility of obtaining special permits for companies operating in the field of shipping agency and the complexity or easiness of procedures, Laws and regulations governing it and the extent of the opportunity of private sector participation in the provision of that service, as many shipping companies and liner shipping ones, which operates in the field of container transport, began to dispense agents and open headquarters in the port or port state to serve more than one port for all the company's ships that enter those ports of a specific chosen port.

As for the "*Relationship between management and employee*", it is considered as a very important factor either from the practical perspective of the shipping lines which gave it a percentage of 29%, or from the theoretical view of the academics and experts which gave it a percentage of 42.7%. Despite being one of the internal affairs of the port, its impact reflects on the performance of the workers inside the port. It can reach to the maximum in case of strikes and consequently closing the port and stop receiving ships or goods. This represents a huge loss for the port and also for the shipping lines working with the port. Therefore, the shipping companies is keen about obtaining such information as it affects the decision of the company whether to continue working with this port or to search for an alternative port. It is also important to note that the good relationship between the two parties reflects on the performance and the quality of service provided.

6.4.5 The Cargo Handling category

"Cargo Handling" is one of the most important elements that are put into consideration especially with the liner shipping and container ships. This is due to the fact that handling is an important task for the shipping line inside the container terminal. Consequently the cost of trade is included in the transport tariff. Thus, the shipping company is extremely interested in identifying the total cost for trade according to the agreement between the shipping line and the port authority.

Table (6.8) shows the different factors of the Cargo Handling category based on the opinion of the customers and the percentage of importance of these factors to the academics and experts.

The Cargo Handling	**Eigenvector (Weight)**
Attribute Name	
Cargo volumes	26.2%
Transshipment volumes	38.7%
Efficiency of handling facilities	35.1%

As it was referred to earlier in handling charges, practically the shipping lines are interested in the port facilities especially those of the container terminals in handling to secure providing the service in a high quality and appropriate cost in a suitable time. Thus, only three factors were selected to identify the importance of this category. We find that *"Cargo Volumes"* achieved the highest percentage prom the perspective of the shipping lines which is 71%. This reflects the importance of this factor for the shipping lines as identifying the volume of the cargo or the volume of the trade going through the port and consequently identifying the number and volume of the ships especially the containers that we are inquiring about.

This factor achieved the percentage of 26.2% of importance from the point of view of the academics because from the marketing perspective. It is the result that the company gets for its marketing sector. From the theoretical aspect, there are other factors that affect the company in dealing with the cargo to facilitate the movement of the goods and finish the process of trade quickly.

As for the *"Transshipment volumes"* factor, it achieved the percentage of 29% of importance from the practical view. However, it obtained such a high percentage from the

academic aspect by 38.7 %. His is because the presence of such service from the practical point of view isn't available in lots of ports and consequently not many shipping companies depend on it in performing the processes of trade quickly inside the port. On the other hand, the academics find this factor as one of the best practical solutions to facilitate the processes of trade inside the port especially in the cases of congestion for what will be needed from sidewalks or equipment to conduct multiple trading by floating winches.

The factor of *"Efficiency of handling facilities"* achieved the percentage of 29% which is a high percentage as compared with other factors. It is one of the most important factors that many shipping companies are interested in because many problems can appear as a consequence of any lack in this factor. For example, the delay in trading operations and consequently, the delay in delivery of containers to their owners as well as the delay in the completion of the ships' mission within the port and the delay in the sailing dates and arrival especially as it operates under the system of linear movement between ports. This was assured by the other view point of the academics and experts giving this factor the highest percentage of importance which is 35.1%.

6.4.6 Customer Service level category

Only four factors have been identified for the *"Customer Service* category". This category is very important and it reflects on the level of service and the degree of customers' acceptance to such service. The services or facilities provided for the ships inside ports are divided into two basic types on which the level of service is identified.

1. Main Facilities

a. Pilotage - b. Towage - c. Navigation Aid - d. Cargo handling gangs (stevedores)

e. Storage (1. Open-shed warehouses 2. Main warehouses)

f. Transportation - g. Shore cargo handling equipment - h. Documentation

2. Sub Facilities

a. Ship repairs & ship building - b. Shipping intermediates - c. Bunkering

D. Banking & Commercial services - e. Insurance

Table (6.9) shows the different factors of the Customer Service category based on the opinion of the customers and the percentage of importance of these factors to the academics and experts.

Table (6.9) Customer Service category

Customer Service level	**Eigenvector (Weight)**
Attribute Name	
Planning ship movements	18.7%
Pilot age and tug services	11.6%
Resources Ordering	27.6%
customer service effectiveness	6.2%
Liaising with ship agents	8.3%
Communicate with vessels	27.6%

These are the most important services provided to the ships from the moment of entry into the port until the end of its work. And these are most of the services, which the port should provide in addition to some of the services required by the ship from the shipping agent which is for goods and supplies and everything the ship needs to become ready to complete its journey.

As for the importance of these factors from the perspectives of the shipping lines and the academics, we find an agreement in some of them. For instance**,** *"planning ship movements"* factor achieved a percentage of 57% for the shipping lines for its great importance based on which the flow in the movement of ships in the process of entry and exit and transition between different sides can occur, or the port authority can fail in crafting an accurate plan for this and consequently the presence of congestion in the port especially when talking about container ships and container terminals which are known to be working with the system of liner shipping which abide by identifying the exact timings for every movement of the ship and thus, paying more delay penalties and compensations for the owners of the goods as a result of the delay of the shipping or the delivery of their goods. This was further assured by the shipping experts as well. As they gave this factor a percentage of 18.7% of importance. This is considered a high rate as compared to other factors because they find this factor combines between the theoretical aspect represented in the management and its ability to take decisions that avoids such crisis which is one of the frequent problems in the developing countries, and also the practical aspect represented in the extent of real facilities available the practical alternatives for solving any of these problems.

The factor "*Pilot age and tug services*" is one of the basic services provided for the ships when entering or exiting from the port. It achieved the percentage of 57% for the

shipping companies, and it depends on the availability of enough qualified pilots and also the availability of enough number of tug pots and their efficiency and availability all day long. This factor also achieved a percentage of 11.6% from the view point of the academics and this is due to the administrative organization of the work of those launches and the different abilities required by the port which depends on the nature and number of ships passing through the port. This assures from the theoretical perspective that the importance of that element and how to take advantage of it and avoid problems, primarily due to the administrative process for that service.

The "*Resources ordering*" factor is one of the factors that achieved high percentage both from the practical and the theoretical perspectives. The shipping companies gave it 57% and the academics gave it 27.6% of importance. This assures its importance as the resources available at any port are the base for the level of services that can be provided by the port and thus the availability of resources or the lack of availability is fundamental problem especially financial because of the cost to manage the port in providing those resources. The other problem is how to manage those resources optimally through high level of service productivity and efficiency and thus reach to the level of customer satisfaction from the port with all their categories. Therefore the shipping companies are interested in knowing the possibilities and resources available at the port and the degree of efficiency of the use of those resources.

As for "*customer service effectiveness*" factor, it obtained the percentage of 43% from the practical perspective. This factor positively affects the customers' feelings and their appreciation to the level of service provided and the port's desire to provide the best service ever to achieve customer satisfaction and consequently we find that the shipping lines always hope to receive the best service inside the port and depending on this is the assessment of the customers to the port and consequently its ranking from their perspective. This is the important issue for the customers as they evaluate the performance from their view point not from the view point of the port. Therefore, we find that the experts' evaluation for this factor is 6.2% only, because the burden in customer service from the standpoint of the academics is on the planning and administration which is capable of using its resources effectively and allows customers of the port feel satisfied. Therefore, we find that this element is the outcome or result of the elements associated with good management and optimal use of resources and other factors that will make the customer feel the efficiency of Customer Service.

"Liaising with ship agent's" factor is very important for the shipping companies as it achieved the percentage of 43%. It clarifies the extent of the port administration's response to requests from agents, which are also the needs of their shipping companies. Performing this factor in a good way inside the port depends on the ability of agents and their good reputations as well as the strength or the number of companies represented by the shipping agents. From the academics perspective, we find that the experts didn't give this factor a relatively high level of importance only 8.3%, because from the theoretical perspective port authority meets the needs of agents and their representatives from shipping companies equally as there are priorities for the port authority that must be respected and taken into account. In addition, recently some companies especially the large ones started to provide the service of agency for their own ships by opening branches in the ports especially in the companies that are frequently visited. Thus, the interest in the profession of agency decreases demand for it though the element coordination with the administration of the port is still existing but today the coordination is with employees of the company and not agents.

The final factor in this category is *"Communicate with vessels"* it is one of the important factors that both the shipping lines and the academics agreed on its importance. The shipping lines gave it a percentage of 43% while the academics gave it 27.7%. This is considered such a high value compared to other factors in the same category. This factor has a great importance in communication between the port and the shipping lines working in the port especially in case of emergency and thus, making many aspects under the command of port authority and also the state of security of the ships in the port as well as instructions for movement and emergency inside the port.

6.4.7 Information Technology category

Information Technology is from all the basic seven categories that achieved a relatively high degree of importance reached 43%. The ports seek to apply this category for its importance for the international shipping lines. This category is sub divided into six basic factors that were assessed differently in terms of their importance for the shipping lines and the academics. We find that the *"Information technology aptitude"* factor obtained the percentage of 43% for the shipping lines and 25.9% for the academics and experts. This is due to the importance of benefiting from the information technology to the highest extent and consequently we find that the customers are always waiting for more applications that reflect on methods of facilitating their job inside ports. Especially that the

operating costs are extremely high and thus, the ports try to provide for the needs and demands of the shipping companies in decreasing the time inside the container terminals and benefit from using modern technology in facilitating this aspect.

Table (6.10) shows the different factors of the Information Technology category based on the opinion of the customers and the percentage of importance of these factors to the academics and experts.

Table (6.10) Different factors of the Information Technology category

Information Technology	**Eigenvector (Weight)**
Attribute Name	
Information technology aptitude	25.9%
Service efficiency	4.2%
Automated OCR* of container	11.9%
Gate automation	12.3%
Real time location system (RTLS)	23.6%
motion equipment processing and flexible traffic control	22.1%

As for the "*Service efficiency*" factor, it achieved such a high percentage from the shipping lines perspective 43% while achieving only 4.2% from the academics and experts perspective. Which illustrates the interest of experts on the applied domain of using information technology while the focus of the shipping companies on the most efficient use of technology, this shows the percentage difference from the viewpoints of the two parties.

The factor *"Automated OCR* of container*" obtained a high percentage from the shipping lines perspective reaches 29% while obtaining the percentage of 11.9 from the academics and experts' perspective.

The implementation of OCR systems for feasible identification and tracking of containers offers important benefits. Container terminals utilizing this technology will enjoy more efficient use of labor, yard space, and handling equipment while realizing improved productivity and profitability. In order to meet fast turn times for containers at all shipping ports worldwide, tighter control over the movement of terminal assets is becoming increasingly vital. An OCR system will significantly advance the automation cycle for these container terminals that are presently using manual entry methods for container, chassis, and truck numbers.

The growing security needs of container-handling terminals worldwide also necessitate automated identification and tracking of containers at various points of the supply chain. Today, more than ever, the need to overhaul terminal security systems and procedures is immediate and often government-mandated. OCR will well serve as one of the integral technologies providing real-time identification and tracking of containers as they pass through the terminal borders.

The "*Gate automation"* is an important factor for technology. It is one of the different fields of the practical application of technology inside the container terminals to facilitate this process and avoid congestion on the terminal doors whether for entering or exiting.

Automated Gate System (AGS) provides a flexible, IP-based solution to fully automate the processing of entry and exit traffic at your container facility. As an integrated suite of modular hardware and software components, the system can easily be configured by terminal personnel to control all types of operations simultaneously operations as your volumes grow (AGS) benefits to the terminal.

- Up to 500% increase in gate throughput (moves/hour) without expansion or more personnel
- Lower gate operating costs up to 75%
- Reduced congestion improves traffic flow and reduces emissions from extended engine idling
- No personnel in the lanes means no accidents
- Adapts to any facility
- Integrated security and access control

Based on the previous advantages of this category, it is justified the percentage of importance obtained both by the shipping lines 32% and the academics 11.9%. It has been found that the shipping lines gave it this percentage for the previously mentioned advantages of the practical application of it. On the other hand, the academics view it as an administrative problem that can be overcome even with the absence of this category. Thus the presence of these doors is a catalyst for the administration to avoid the increase of the problem and not to prevent it in from happening. This justifies why the experts gave this category such a low percentage.

"*Real-time locating systems*" (RTLS) are used to automatically recognize and track the location of objects or people in real time, usually within a building or other contained area. Wireless RTLS tags are attached to objects or worn by people, and in most RTLS, fixed reference points receive wireless signals from tags to determine their location .Examples of real-time locating systems include tracking automobiles through an assembly line, locating pallets of merchandise in a warehouse, or finding medical equipment in a hospital.

The physical layer of (RTLS) technology is frequently some form of radio frequency (RF) communication, but some systems use optical (usually infrared) or acoustic (usually ultrasound) technology instead of or in addition to RF. Tags and fixed reference points can be transmitters, receivers, or both, resulting in numerous possible technology combinations.

RTLS are a form of local positioning system, and do not usually refer to (GPS), mobile phone tracking. Location information usually does not include speed, direction, or spatial orientation .

This system is used in determining the locations of ships and is also used in communications with ships and thus facilitates access to ships, especially in emergency situations. Therefore it achieved the importance of the shipping lines with the percentage of 29% and the importance of the academics and experts with the percentage of 23.6% and this assures the importance of this factor both from the theoretical and practical perspectives.

As for "*motion equipment processing and flexible traffic control*," it is one of the important factors which achieved the percentage of 29% from the view point of the shipping lines while achieving the percentage of 22.1% from the view point of the academics and experts. This is due to the unproductive time spent inside the container terminals. It is also due to the preparation for the operations whether in terms of equipment or internal transportation or workers. This makes loading and unloading operations represent the longest period of time inside the port compared to any other process for the same ship. Therefore processes of urbanization and movement of equipment and monitoring of the important elements for the success of container terminals because it ultimately reflects the length of time that can be spent by the ship inside the container terminal beside other businesses.

6.4.8 External Factors category

Based on the results of the first questionnaire directed towards the customers which are the shipping companies working on the area of research, it is clear that the customers agreed on only four factors inside the *External Factors* category. These four factors achieved the highest levels of importance and were further assured by the second questionnaire which was directed towards the academics and experts as represented in table (6.11).

Table (6.11) shows the different External Factors category based on the opinion of the customers and the percentage of importance of these factors to the academics and experts.

External Factors	**Eigenvector (Weight)**
Attribute Name	
Political consideration	37.3%
Hinterland/foreland connections	19.8%
Possibility of niche market	20.3%
Frequency of trunk and feeder routes	22.6%

The "*Political Consideration*" factor obtained such a low percentage for the shipping companies reached 14% of importance, because all these aspects and what results from these situations like cases of damages and wars never stop the demand for the maritime transport, but the types of goods coming to the country are different. For example, it changes to the military missions and the basic supplies. Thus, the shipping companies never view such circumstances as a threat or fear because the insurance companies participate in handling the different damages on the ships. An example of this is very clear in case of CMA-CGM Company which is the biggest shipping company working in the area of the study. The ships of the company still go to the Syrian ports and container terminals despite the state of war occurring there. This clarifies the view point of the company concerning this factor.

The other point of view of the academics and experts gave this factor the percentage of 37%, which is the total opposite from the other view point. The reason behind this is the tendency of the experts and academics to work in a stable atmosphere from their perspective and we find that the political stability represents the element of security and flow of trade and also encouraging different investments in different fields inside the country. This is reflected on the economic status and dedication for developing projects

that the customers never stop demanding for. Therefore we find that the lack of political stability is reflected on lack of economic stability and consequently many customers stop dealing with such ports and look for alternatives.

"Hinterland/foreland connection" factor is one of the most important factors in identifying the size and type of different goods that are being traded and transported from different ports. The Hinterland to the port depends on the extent of availability of different means of transport and their connection to the areas of production and consumption and consequently the extensions for the areas used by the ports to move the goods. Thus it has been found that some of the shipping companies are extremely interested in this factor and gave it a percentage of 43%, while others gave it the percentage of 14% at the same time.

The academics and experts gave this factor 19.8% and this assures its importance as it represents the extent of the market and the increase in the types and numbers of customers and consequently the development in ports and adding more roads to connect with this in order to insure the flow of goods from and to the port without any obstacle. It depends also on the trade agreements, whether bilateral or in the form of alliances and joint free zones and all of the different forms of investments.

"*The Possibility of niche market*" factor is also considered among the external factors which don't control the port. Thus we find its impact on the shipping companies is different. Only 14% of the shipping companies gave this factor very important rating, while 43% gave it important rating. Thus, we find that it is like the previous factor. This is because dealing with this factor from the practical view point of the company depends on the impacts, which means, the shipping companies respond to market changes and quality in order to maintain its share of marketing And thus determine the quality of the goods and determine the quality of specialized ships appropriate for those goods traded in such markets and thus maintain their clients to meet the different needs of their applications or in the process of transport and thus provide a response in the port facilities and appropriate for those ships and specialized goods.

It has been found that the academics and experts responded to this factor and gave it a percentage of 20.6% of importance as a result of an integrated system that should be available for dealing with such markets and from their components the specialized ship and specialized station inside the port and equipped with equipment and Cranes suitable for trading and suitable for the quality of those goods and provide what is available and

appropriate means of internal transport to transport goods. In addition to the laws and regulations, and procedures that facilitate the flow of goods smoothly without causing administrative obstructions that renders the process or the speed of entry or exit of goods to and from the port and thus the availability or lack within the markets.

Therefore the experts are interested in such markets and the quality of the goods in reviewing the availability of all these elements to complete the transport system appropriate for such markets.

As for the "*Frequency of trunk and feeder*" routes, it is one of the important external factors which the shipping companies cares for as they gave it the percentage of 14% only, but at the same time 43% of the companies assured that it might be important or relatively important. This factor identifies in the first place the problem of congestion of goods and their movement from and to the ports by using the ground transportation, as well as the Feeder service for container ships which facilitates the movement and thus the arrival of the container to the customer without delay. As for the shipping companies, this is represented in the speed of the movement of goods within the port and thus the lack of congestion inside the port on the sidewalks of the container terminal and hence the delay in appointment schedules for ships sailing.

From the theoretical view point of the academics and experts, they gave this factor 22.6% of importance for what it represents as an application to the different logistic activities and facilitation to the movement of goods and consequently the presence of transportation alternatives for the movement of containers using different means of transport. Consequently as it was mentioned before a solution to the problem of congestion, which could affect the movement of ships inside the port and therefore they look at it as a preventive measure to avoid the occurrence of the problem.

It has been used the Real time location system (RTLS) are used to automatically identify and track the location of objects or people in real time, usually within a building or other contained area. Wireless RTLS tags are attached to objects or worn by people, and in most (RTLS), fixed reference points receive wireless signals from tags to determine their location .Examples of real-time locating systems include tracking automobiles through an assembly line, locating pallets of merchandise in a warehouse, or finding medical equipment in a hospital.

The physical layer of (RTLS) technology is usually some form of radio frequency (RF) communication, but some systems use optical (usually infrared) or acoustic (usually ultrasound) technology instead of or in addition to (RF). Tags and fixed reference points can be transmitters, receivers, or both, resulting in numerous possible technology combinations.

(RTLS) are a form of local positioning system, and do not usually refer to (GPS), mobile phone tracking. Location information usually does not include speed, direction, or spatial orientation .

6.5 Rating Scale for selected ports (Termiqual model)

6.5.1 Rating of each quality factor using performance rating scale

A three point performance rating scale (poor, good, and excellent) is established to evaluate SC operations' performance. SC performance measurement attributes are benchmarked to this performance rating scale. A performance rate (0.3, 0.7or 1) is assigned for each attribute throughout the quality model, where:

0.3 denotes poor performance,

0.7 denotes good performance, and

1 denotes excellent performance with respect to the performance rating scale.

6.5.2 Aggregating and calculating of quality categories indexes

Decision makers associate different importance weights with different criteria at different levels. Then, the weights of criteria of different levels are aggregated to obtain final weights of the decision alternatives. Many approaches have been developed to aggregate the performance from multi-criteria expressions; such as: the weighted mean aggregation operator, to handle hierarchical links, the port terminal operator, for taking interactions into account, and the AHP technique, to quantify the weights and the performance elementary expression (Berrah, L., & Clivillé, V, 2007).

In the proposed FAHP technique, the weighted average aggregation method is used to aggregate the performance of all S C performance measurement attributes. After determining the performance rate (R) and the relative weight (W) of each attribute, the weighted rate (WR) of each attribute is calculated by multiplying the relative weight of each attribute by its performance rate.

$WR = W * R$

Where W = the weight of the attribute and

R = the assigned performance rate for the attribute

Then, the weighted rates of all performance measurement attributes are aggregated in order to obtain the overall SC operations' performance in terms of SC index (SCI). This index reveals the overall SC performance according to an interval based performance scale:

[0.0<R<=0.3], [0.3<R<=0.7], [0.7<R<=1]; where R denotes value of the SCI,

[0.0<R<=0.3] denotes poor performance,

[0.3<R<=0.7] denotes good performance,

[0.7<R<=1] denotes excellent performance.

Table (6.12) (The Termiqual Model)

Measure --Attribute Name	**Min**	**Max**	**Current**	**Scale**	**R**	**W**	**WR**
Location (Dev. Distains)(N.M)				Poor	0.3		
Port depth (M)				Poor	0.3		
Storage Capacity (TEU)(No.)				Poor	0.3		
Berth length (M)				Poor	0.3		
Handling Equipment availability (No. of gantry crane)				Poor	0.3		
Terminal handling fees				Poor	0.3		
Capacity of branch/ agent				Poor	0.3		
Cargo volumes (storage capacity)				Poor	0.3		

The weights assigned to the elements of the first quality category (Port Features) see table (6.5) will be used as indicators to evaluate the performance of each of the seven East Mediterranean ports as shown in tables (6.13-6.19) below.

Table (6.13) Alexandria port index

Measure --Attribute Name	**Min (2007 -2011)**	**Max (2007 -2011)**	**Current (2012)**	**Scale**	**Rate R**	**weight W**	**WR**
Location (Dev. Distains)(N.M)	32	32	32	Poor	0.3	0.371	0.1113
Port depth (M)	14	14	14	Poor	0.3	0.109	0.0327
Storage Capacity (TEU)(No.)	31	39	54	Excellent	1	0.123	0.123
Berth length (M)	15.6	19.4	24.63	Excellent	1	0.153	0.153
Handling Equipment availability (No. of gantry crane)	11	15	21	Excellent	1	0.245	0.245
						index	0.665

Table (6.14) Ashdod Port index

Measure --Attribute Name	**Min (2007 -2011)**	**Max (2007 -2011)**	**Current (2012)**	**Scale**	**Rate R**	**Weight W**	**WR**
Location (Dev. Distains)(N.M)	168	168	168	Poor	0.3	0.371	0.1113
Port depth (M)	15.5	15.5	15.5	Poor	0.3	0.109	0.0327
Storage Capacity (TEU)(No.)	30.288	30.288	30.288	Poor	0.3	0.123	0.0369
Berth length (M)	600	600	600	Poor	0.3	0.153	0.0459
Handling Equipment availability (No. of gantry crane)	10	10	10	Poor	0.3	0.245	0.0735
						index	0.3003

Table (6.15) Damietta Port index

Measure --Attribute Name	Min (2007 -2011)	Max (2007 -2011)	Current (2012)	Scale	Rate R	Weight W	WR
Location (Dev. Distains)(N.M)	46	46	46	Poor	0.3	0.371	0.1113
Port depth (M)	14.5	14.5	14.5	Poor	0.3	0.109	0.0327
Storage Capacity (TEU)(No.)	30	30	30	Poor	0.3	0.123	0.0369
Berth length (M)	1.05	1.05	1.04	Poor	0.3	0.153	0.0459
Handling Equipment availability (No. of gantry crane)	12	20	18	Good	0.7	0.245	0.1715
						index	0.3983

Table (6.16) Haifa Port index

Measure --Attribute Name	Min (2007 -2011)	Max (2007 -2011)	Current (2012)	Scale	Rate R	Weight W	WR
Location (Dev. Distains)(N.M)	168	168	168	Poor	0.3	0.371	0.1113
Port depth (M)	14	14	14	Poor	0.3	0.109	0.0327
Storage Capacity (TEU)(No.)	16.8	16.8	16.8	Poor	0.3	0.123	0.0369
Berth length (M)	13.6	13.6	13.6	Poor	0.3	0.153	0.0459
Handling Equipment availability (No. of gantry crane)	14	23	17	Good	0.7	0.245	0.1715
						index	0.3983

Table (6.17) Mersin Port index

Measure --Attribute Name	Min (2007 -2011)	Max (2007 -2011)	Current (2012)	Scale	Rate R	Weight W	WR
Location (Dev. Distains)(N.M)	357	357	357	Poor	0.3	0.371	0.1113
Port depth (M)	12	12	12	Poor	0.3	0.109	0.0327
Storage Capacity (TEU)(No.)	10	10	10	Poor	0.3	0.123	0.0369
Berth length (M)	710	710	24025	Excellent	1	0.153	0.153
Handling Equipment availability (No. of gantry crane)	3	6	6	Good	0.7	0.245	0.1715
						index	0.5054

Table (6.18) Piraeus Port index

Measure --Attribute Name	Min (2007 -2011)	Max (2007 -2011)	Current (2012)	Scale	Rate R	Weight W	WR
Location (Dev. Distains)(N.M)	107	107	107	Poor	0.3	0.371	0.1113
Port depth (M)	16.5	16.5	16.5	Poor	0.3	0.109	0.0327
Storage Capacity (TEU)(No.)	30500	30500	30500	Poor	0.3	0.123	0.0369
Berth length (M)	3100	3100	3100	Poor	0.3	0.153	0.0459
Handling Equipment availability (No. of gantry crane)	14	15	11	Poor	0.3	0.245	0.0735
						index	0.3003

Table (6.19) Port Saied index

Measure --Attribute Name	Min (2007 -2011)	Max (2007 -2011)	Current (2012)	Scale	Rate R	Weight W	WR
Location (Dev. Distains)(N.M)	0	0	0	Poor	0.3	0.371	0.1113
Port depth (M)	16.5	16.5	16.5	Poor	0.3	0.109	0.0327
Storage Capacity (TEU)(No.)	48	65.6	48	Poor	0.3	0.123	0.0369
Berth length (M)	21.7	25.2	25.5	Excellent	1	0.153	0.153
Handling Equipment availability (No. of gantry crane)	17	22	21	Good	0.7	0.245	0.1715
						index	0.5054

The seven indexes demonstrated above will be represented in table (6.20) in a descending order according to importance, thus a new ranking for East Mediterranean container terminals in ports is established, one of the main advantages for using Fuzzy AHP approach is of its ability of ranking the container terminal ports according to quality criteria, which from the researcher point of view is more accurate and credible than the old method for ranking container terminal ports, which relies on the market share of trade volume in the region (throughput). This old method will be discussed in the next section.

Table (6.20) the result of the index model

The port	W.R
Alexandria port	0.665
Port said port	0.5054
Mersin port	0.5054
Haifa port	0.3983
Damietta port	0.3983
Piraeus port	0.3003
Ashdod port	0.3003

6.6 K-Firm Concentration Ratio

This ratio is considered the oldest method and most commonly used of all indexes; the k-firm concentration ratio describes the market share (as a percentage) of the four largest firms in any given industry. It helps determine the relative size of companies in relation to their entire industry, and therefore their competitiveness in that industry. The Concentration Ratio indicates the relative size of k-large firms in relation to their industry

as a whole. It shows whether an industry is dominated by a few large firms or many small firms. Therefore, (K-CR) was used as an indicator of the relative size of firms in relation to the industry as a whole. Normally 4-firm and 8- firm concentration ratios are used conventionally. This assists in determining the market form of the industry (Pulaj, E., & Kume, V. 2013).

(Chen, J., Wang, Z., Song, Y., & Sun, Y, 2004) introduced K-firm concentration ratio indicator .The equation for determining the K-firm concentration ratio in a percentage of market share held by the largest firms (m) in an industry is.

$CR_m = \Sigma^m_{i=1} s_i$

Therefore it can be expressed as:

$CR_m = s_1 + s_2 + ... + s_m$ where s_i is the market share and m defines the ith firm

The previous equation was used to rank East Mediterranean container terminals in a port which relies on the market share of trade volume in the region (throughput).

Table (6.21) K-CR and market share in the Period from (2007-2012)

Port	2007	Share	Port	2008	Share
Port Saied	**2,768,825**	31.02%	**Port Saied**	**3,128,776**	34.89%
Piraeus	**1,373,138**	15.38%	**Alexandria**	**1,264,455**	14.10%
CR2		**46.40%**	**CR2**		**48.99%**
Alexandria	**1,170,949**	13.12%	**Haifa**	**1,262,000**	14.07%
Haifa	**1,148,628**	12.87%	**Damietta**	**1,195,630**	13.33%
Damietta	**874,559**	9.80%	**Mersin**	**854,500**	9.53%
CR5		**82.18%**	**CR5**		**85.93%**
Ashdod	**08,700**	9.06%	**Ashdod**	**827,900**	9.23%
Mersin	**782,028**	8.76%	**Piraeus**	**433,582**	4.84%
Total	8,926,827	**100%**	**Total**	8,966,843	**100%**

Port	2009	Share	Port	2010	Share
Port Saied	**3,564,578**	36.45%	**Port Saied**	**3,838,724**	37.45%
Alexandria	**1,460,106**	14.93%	**Alexandria**	**1,495,554**	14.59%
CR2		**51.38%**	**CR2**		**52.04%**
Damietta	**,213,187**	12.41%	**Haifa**	**1,263,552**	12.33%
Haifa	**,140,000**	11.66%	**Damietta**	**1,096,052**	10.69%
Ashdod	**893,000**	9.13%	**Mersin**	**1,024,171**	9.99%
CR5		**84.57%**	**CR5**		**85.06%**
Mersin	**843,917**	8.63%	**Ashdod**	**1,018,000**	9.93%
Piraeus	**664,895**	6.80%	**Piraeus**	**513,319**	5.01%
Total	9,779,683	**100%**	**Total**	10,249,372	**100%**

Port	2011	Share	Port	2012	Share
Port Saied	**,366,968**	40.85%	**Port Saied**	**4,831,165**	35.39%
Piraeus	**,680,133**	12.79%	**Piraeus**	**2,745,012**	20.11%
CR2		**53.64%**	**CR2**		**55.49%**
Alexandria	**1,490,000**	11.34%	**Alexandria**	**1,500,000**	10.99%
Haifa	**1,235,000**	9.40%	**Haifa**	**1,372,209**	10.05%
Damietta	**1,200,000**	9.13%	**Mersin**	**1,263,495**	9.25%
CR5		**83.52%**	**CR5**		**85.78%**
Mersin	**1,126,588**	8.58%	**Ashdod**	**1,181,000**	8.65%
Ashdod	**1,038,950**	7.91%	**Damietta**	**760,000**	5.57%
Total	13,137,639	**100%**	**Total**	13,652,881	**100%**

The researcher used the k-firm concentration in order to conduct an objective comparison between the old method and the proposed new one as shown in table (6.22) below.

Table (6.22) comparison between the old method and the proposed new one

Rank	**Ranking for East Mediterranean container terminals using old method (K-Firm Concentration Ratio)**	**Ranking for East Mediterranean container terminals using the new method (Fuzzy AHP)**
1	Port Saied	Alexandria port
2	Piraeus	Port said port
3	Alexandria	Mersin port
4	Haifa	Haifa port
5	Mersin	Damietta port
6	Ashdod	Piraeus port
7	Damietta	Ashdod port

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter presents the overall conclusions derived from this research, followed by recommendations for future work. It starts by discussing the realization of the research aim and objectives through reviewing the research processes which have been undertaken to address these objectives. Then, it illustrates the research contribution to theory and practice. Finally, the limitations of the study are identified, upon which areas for further research are suggested.

The remainder of this chapter is organized as follows. Section 7.2 Recognition of the research questions, Section 7.3 provides an original contribution to Knowledge; section 7.4 explain the Research limitations, finally, section 7.5 suggests recommendations for future work through which this research could be further developed.

7.2 Recognition of the research questions

The researcher tried to achieve the research objectives through answering the three research questions introduced in section (1.5), and for remembrance the three questions will be demonstrated once again as follows

Q1: What are the key determinants of ports service quality?

Q2: What are the services quality factors selected by the port users that meet their expectations and requirements according to their importance?

Q3: How the rank of the ports could change according to the new selected services quality criteria model for container terminals (Termiqual Model)?

The answer to the first question it was through an extensive literature review to a huge amount of researches that has been conducted to study port selection criteria for quality services from different perspectives. Many of them have focused on the selection criteria for mode and carrier from the shipper's point of view, the quality literature covered extended discussions about various dimensions of service quality in container terminals, it is found that different authors have proposed different dimensions of service quality, Was collected on their valuable works and was able to propose his own service quality model for container terminals, this model was divided into seven main categories, where each category is composed of a varying number of quality elements, a total of 50 quality

elements were considered as shown in the table (4.3) . Then the researcher answered the second question which was.

While to answer the second question, the researcher conducted a set of structured interviews with a group composes of twenty interviewees, ten of those interviewees represent port management officials, five of those ten belong to the top management level, while the other five belong to the middle line level, the rest of the ten interviewees are professional terminal operators with an experience not less than 15 years in the business. It's done through conducting this set of sequential interviews to confirm the validity and appropriateness of the selected criteria see table (4-3), finally this model was represented through the dissemination of an administered questionnaire over seven of the biggest shipping lines companies operating in the region the analysis of the questionnaire limited the number of quality elements to **30** whom are considered to have a significant positive impact on quality performance in container terminals see table (5-9).

At last to answer the third question, the researcher collected the weights and rates of all elements of the first category exclusively and through using the Termiqual Model see table (6.12), the indexes which is a value represents the result of multiplying the weights an rates for each port are calculated as shown in tables (6.13-6.19), these calculated indexes are used to re-arrange the ranks of the selected ports as shown in table (6.20).

The results shown in table (6.21) represents the arrange of ports ranking using the traditional way which is based on the number of throughput of each port calculated by using the (KCR) method,

The comparison between the results of using the traditional model and the proposed new model is shown in table (6.22), which clearly shows a significant change in the ranks of the selected ports.

7.3 Contributions to Knowledge

This research provides an original contribution to knowledge by:

A. The comprehensiveness of the model is one of the main contribution in this research, the researcher tried to overcome what he considered a major shortage in similar models, these models were concerned with one or two categories of service quality with a limited numbers of quality elements, but in this research the scope was extended to cover nearly all known categories of service quality in container terminal with all of its quality elements.

B. There was a keen through all stages of the research to strictly commit to the point of views of as much as possible of ports management officials, maritime practitioners, quality personals, and academic experts, to guarantee the accuracy of data, the validity of the model, and the credibility of the research.

C. Has been used instead of the well known statistical packages (SPSS Model) the well-known mathematical model (Fuzzy AHP) which in addition to its simplicity in usage, enabled the researcher to analyze the gathered data with a great deal of accuracy and clearness.

D. Using this mathematical model from identifying a new model for quality of service in container terminal that can be used as a new mean for ranking ports instead of the old mean that was based on the ports throughput. **(Termiqual Model)**

E. Used a new ranking technique for measuring ports competence which enhances the outcome of the research.

7.4 Research limitations

While this research has provided a valuable contribution to knowledge as illustrated in the previous section, there are some limitations regarding the application of the research This research includes a number of limitations that the researcher will try to discuss as follows, the first considered limitation is the limited number of only seven ship liners companies that was contacted, but in this issue there is an important point to be considered, which is that the total number of shipping lines companies operating in the region are only twelve, the second limitation is the limited number of experts that there point of views were investigated through the different parts of the research whether by interviews or by using questionnaires, due to the political turmoil's that overwhelmed Egypt over the last four years, which in return effected the ability to contact a larger number of experts, the third limitation is that there no evidence that the mathematical model used in this research can substitute the usage of other statistical models to confirm the realized results, more investigations must be conducted along with statisticians and mathematicians to reach a verdict concerning this issue.

Also the research procedure was applied to the case study for East Mediterranean container terminals the period of 2007 until 2012 according to the availability of data.

The research framework did not consider measures for the Differing views of the port clients and beneficiaries from the quality of services provided in the port.

In the next section, recommendations for future research are suggested to address the limitations discussed in this section.

7.5 Recommendations and future work

At the short run, attempt to benefit from the stability of the situations across the country after four years of chaos, through increasing the sample size of experts to ensure the accuracy of data, as to confirm the validity of the proposed model, also the researcher will go along the lines of the renowned (SERVQUAL Model), to introduce the Termiqual Model as an easy tool to evaluate the quality of service in container terminals, and to help container terminals quality experts in determining the weaknesses (gaps) in different aspects in quality dimensions. While at the long run, the researcher will seek to extend the scope of the research to include the container terminals across the Mediterranean Sea, the

researcher wishes to generalize the proposed model throughout the business. Finally the researchers recommend the following:

1. Port managers can make use of the shipping lines' port selection criteria in their plans for developing ports.

2. Researchers can make use of the data collected in this research and try to apply the selection criteria on different ports to measure their efficiency.

3. It is highly recommended for scholars to proceed in developing a different model based on the same methodology of the present study to measure the quality of service provided from the ports.

4. Ports are suffering from some problems. For treatment, care must ports to the requirements of port users because of its impact on the competitive position of the port as well as regard to the requirements of different services to achieve the expected level of quality.

5. More attention is needed from researchers to fill the gap in Egyptian ports since this current study is not definitely enough to generalize the results and find all solutions to improve service quality and performance through Collected of all aspects of quality of service provided and the elements of a realistic and research in how development and improvement and thus its impact on the competitive situation in Egyptian ports.

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Appendix A

Total top 25 shipping com (2014)

NO	Company Name	Contact
1	MSC	http://www.mscegypt.com
2	Maersk Line	http://www.maersk.com/Aboutus/Pages/Contactus.aspx
3	China Shipping	http://www.cscl.com.cn/english/address.asp?id=31
4	Hamburg Sud	http://www.hamburgsud-#line.com/hsdg/en/hsdg/linershipping_1/offices/officesdetails_2_2064.jsp
5	K Line	http://www.kline.co.jp/en/index.html
6	ZIM	http://www.zim.com/pages/default.aspx
7	NYK	http://www2.nykline.com/help/overview.html
8	CMA-CGM	http://www.cma-cgm.com/
9	COSCON	http://www.coscon.com/contact/getOffice.do?area=Asia%20%20%20%20%20%20&selectI=1&locale=en&country=Egypt
10	evergreen	/http://www.evergreen-marine.com
11	Hyundai MM	http://www.hmm.co.kr/cms/company/engn/index.jsp
12	APL	http://www.apl.com/wps/
13	Yangming	http://www.yangming.com/english/ASP/index.asp
14	UASC	http://www.uasc.net/
15	PIL	https://www.pilship.com/ecms-server/Public/HomePage.jsp
16	Lloyd Triestino	http://www.italiamarittima.it/
17	Wan Hai	http://web.wanhai.com/index_global.html
18	CSAV-Norasia	http://www.csav.com/en/CustomerServices/Help/Pages/ContactUs.aspx
19	Hatsu	http://www.marinetraffic.com/en/ais/details/ships/218075000/vessel:HATSU_CRYSTAL
20	Hanjin	http://www.hanjin.com/hanjin/CUP_HOM_1001.do
21	OOCL	http://www.joc.com/maritime-news/container-lines/orient-overseas-container-line
22	MOL	http://www.hausmannshipping.com/index.php?id=mol
23	Delmas	http://www.delmas.com/
24	Hapag-Lloyd	http://www.hapag-lloyd.com/en/home.html
25	CSAV	http://www.csav.com/en/Pages/Home.aspx

Appendix B

Top 50 World Container Ports

Rank	Port, Country	Volume 2012 (Million TEUs)	Volume 2011 (Million TEUS)	Website
1	Shanghai, China	32.53	31.74	www.portshanghai.com.cn
2	Singapore ,Singapore	31.65	29.94	www.singaporepsa.com
3	Hong Kong, China	23.10	24.38	www.mardep.gov.hk
4	Shenzhen, China	22.94	22.57	www.szport.net
5	Busan, South Korea	17.04	16.18	www.busanpa.com
6	Ningbo-Zhoushan, China	16.83	14.72	www.zhoushan.cn/english
7	Guangzhou Harbor, China	14.74	14.42	www.gzport.com
8	Qingdao, China	14.50	13.02	www.qdport.com
9	Jebel Ali, Dubai, United Arab Emirates	13.30	13.00	www.dpworld.ae
10	Tianjin, China	12.30	11.59	www.ptacn.com
11	Rotterdam, Netherlands	11.87	11.88	www.portofrotterdam.com
12	Port Kelang, Malaysia	10.00	9.60	www.pka.gov.my
13	Kaohsiung, Taiwan, China	9.78	9.64	www.khb.gov.tw
14	Hamburg, Germany	8.86	9.01	www.hafen-hamburg.de
15	Antwerp, Belguim	8.64	8.66	www.portofantwerp.com
16	Los Angeles, U.S.A.	8.08	7.94	www.portoflosangeles.org
17	Dalian, China	8.06	6.40	www.dlport.cn
18	Keihin ports*, Japan	7.85	7.64	www.city.yokohama.lg.jp/en/
19	Tanjung Pelepas, Malaysia	7.70	7.50	www.ptp.com.my
20	Xiamen, China	7.20	6.47	www.portxiamen.gov.cn
21	Bremen/Bremerhaven, Germany	6.12	5.92	www.bremen-ports.de
22	Tanjung Priok, Jakarta, Indonesia	6.10	5.62	www.priokport.co.id
23	Long Beach, U.S.A.	6.05	6.06	www.polb.com
24	Laem Chabang, Thailand	5.93	5.73	www.laemchabangport.com
25	New York-New Jersey, U.S.A.	5.53	5.50	www.panynj.gov
26	Ho Chi Minh, Vietnam	5.19	4.53	www.vpa.org.vn
27	Lianyungung, China	5.02	4.85	www.lyg.gov.cn
28	Hanshin* ports, Japan	5.00	4.80	www.pa.kkr.mlit.go.jp/kobeport/index.html
29	Yingkou, China	4.85	4.03	www.ykport.com.cn
30	Jeddah, Saudi Arabia	4.74	4.01	www.ports.gov.sa
31	Valencia, Spain	4.47	4.33	www.valenciaport.com

Rank	Port, Country	Volume 2012 (Million TEUs)	Volume 2011 (Million TEUS)	Website
32	Columbo, Sri Lanka	4.26	4.26	**www.slpa.lk**
33	Jawaharlal Nehru, India	4.26	4.32	**www.jnport.com**
34	Algerciras Bay, Spain	4.07	3.60	**www.apba.es**
35	Sharjah, United Arab Emirates	4.00	3.23	**www.sharjahports.ae**
36	Felixstowe, U.K.	3.95	3.74	**www.portoffelixstowe.co.uk/**
37	Port Said, Egypt	3.91	3.91	**www.scctportsaid.com**
38	Manila, Philippines	3.71	3.46	**www.ppa.com.ph**
39	Salalah, Oman	3.63	3.20	**www.salalahport.com**
40	Colon, Panama	3.52	3.37	**www.cct-pa.com**
41	Balboa, Panama	3.30	3.23	**www.ppc.com.pa/balboa.php**
42	Santos, Brazil	3.17	2.99	**www.portodesantos.com**
43	Ambarli, Turkey	3.10	2.69	**www.altasliman.com/en**
44	Georgia Ports, U.S.A.	2.97	2.94	**www.gaports.com**
45	Nagoya, Japan	2.87	2.62	**www.port-of-nagoya.jp/**
46	Tanjung Perak, Surabaya, Indonesia	2.85	2.64	**www.perakport.co.id**
47	Gioia Tauro, Italy	2.72	2.30	**www.portodigioiatauro.it**
48	Metro Vancouver, Canada	2.71	2.51	**www.portmetrovancouver.com**
49	Melbourne, Australia	2.60	2.51	**www.portofmelbourne.com**
50	Durban, South Africa	2.59	2.71	**www.transnetnationalportsauthority.net**

Appendix C

Questionnaire Form (1)

This questionnaire is intended to identify the determinants of service quality of container terminals in the East Mediterranean region. Such region has a decent number of competing terminals and consequently the impact of port selection criteria on the degree of competition among ports' container terminals will reflect on the level of service provided to your company. The thing that might be achieved and improved after knowing your company's real needs from the different container terminals.

This questionnaire is divided into 9 categories. Some of the questions require open-ended answers while the others require the interviewee to choose the grade of importance for each criterion in selecting the best port in the East Mediterranean region for your liner container carriers.

The score of each factor is measured by scale 5 to 1, in such scale 5 represents "very important", and 1 represents "not important".

Category 1: General Information

- Name of the enterprise:_____
- Name of holding company (if applicable):_____
- Name of the Interviewee:(optional):_____
- Position of the Interviewee in the enterprise:_____
- Phone number of the interviewee:_____

Category 2: Company Information

- Which port in the East Mediterranean region does your company prefer?

  ……..

  Has your port of call changed during the last three years?

  - Increased
  - Decreased
  - Remained the same
  - **……**
- **What do you think are the main factors behind the change, if any?**
  - The Port features
  - The port Charges

- The Operation Management
- The Cargo Handling
- The Customer service level
- The Information Technology
- The External factors
- Or other ……

- **What is your annual tonnage capacity?**

  ……..

- **How many branches does your company have?**

  ……..

- **Has your profit changed during the last 3 years?**
- Increased
- Decreased
- Remained the same

  ……..

  What do you think are the main reasons of increase/decrease?

  ……..

No.	Criterion	Very important (5)	Important (4)	Average (3)	Less important (2)	Not important (1)
Category 3: Port features:						
1	location					
2	Port Depth					
3	Berth length					
4	Handling Equipment availability					
5	Storage Capacity (TEU)					
6	Port Reputation					
7	Port Dues					
8	Handling Charges					
9	**IT**					
10	**Customs Regulation**					
Category 4: The port Charges:						
No.	**Criterion**	**Very important (5)**	**Important (4)**	**Average (3)**	**Less important (2)**	**Not important (1)**
11	Port Dues					
12	Terminal Handling fees					
13	operating cost					
Category 5: The Operation Management:						
No.	**Criterion**	**Very important (5)**	**Important (4)**	**Average (3)**	**Less important (2)**	**Not important (1)**
14	management Reliability					
15	Relationship between management and employee					
16	Easiness of Communication With Staff					
17	Capacity of branch / agent					
Category 6: The Cargo Handling:						
No.	**Criterion**	**Very important (5)**	**Important (4)**	**Average (3)**	**Less important (2)**	**Not important (1)**
18	Cargo volumes					
19	Transshipment Cargo Volumes					
20	Port Profitability from Cargo					
21	Efficiency of handling facilities					
22	Import and Export Cargo Balance					
23	Cargo clearance efficiency					
Category 7: The Customer service level:						
No.	**Criterion**	**Very important (5)**	**Important (4)**	**Average (3)**	**Less important (2)**	**Not important (1)**
24	Cargo claims records					
25	customer service effectiveness					
26	Monitoring of harbor traffic					
27	Communicating with vessels					
28	Planning shipping movements					
29	Pilot and tug services					
30	Ordering of resources such as cranes					
31	Berth allocation and planning					
32	Link to border agencies					
33	Customer liaison day to day					
34	Liaising with ship agents					

Category 8 :The Information Technology:						
No.	**Criterion**	**Very important (5)**	**Important (4)**	**Average (3)**	**Less important (2)**	**Not important (1)**
35	Information Technology Aptitude					
36	Service efficiency					
37	Automated **OCR** of container					
38	Real time location system					
39	Wireless connectivity					
40	Gate automation					
41	In motion equipment processing and flexible traffic control					
42	Examination of location information using a web browser					
Category 9: The External factors:						
No.	**Criterion**	**Very important (5)**	**Important (4)**	**Average (3)**	**Less important (2)**	**Not important (1)**
43	Coordination of shipping alliance					
44	dedicated terminals investment ability					
45	Frequency of trunk and feeder routes					
46	Calling of Competitor port					
47	Possibility of Niche Market					
48	Preference of hub port					
49	Political considerations					
50	Hinterland/foreland connections					

OCR: Optical Character Recognition

Appendix D

Questionnaire for AHP Analysis

Dear Respondent,

The following questionnaire will be used to identify the carriers' criteria in selecting ports of call and selection of container terminals in the East Mediterranean region. Such region has a decent number of competing terminals. Thus, such selections may have their impact on your company's criteria in selecting ports of call especially with the presence of the high competition among ports and container terminal, even in the same port. Of course in setting such criteria your company is considering the level of service render to your customers as well as building company's goodwill.

determine the priorities of, selection of container terminals based on a scale with the values 1, 3, 5, 7, and 9, where 1 denotes equally important, 3 for slightly more important, 5 for strongly more important, 7 for demonstrably more important, and 9 for absolutely more important.

With respect to (criteria in selecting ports)	**Importance or preference of one indicator over another**											
Indicator	**Absolutely more important (9)**	**Demonstrably more important (7**	**Strongly more important (5)**	**Slightly more Important (3)**		**Equally important (1)**		**Slightly more Important (3)**	**Strongly more important (5)**	**Demonstrably more important (7)**	**Absolutely more important (9)**	**Indicator**
The Port features	9	7	5	3		1		3	5	7	9	The Costs
The Port features	9	7	5	3		1		3	5	7	9	The Management
The Port features	9	7	5	3		1		3	5	7	9	The Cargo features
The Port features	9	7	5	3		1		3	5	7	9	The Customer service
The Port features	9	7	5	3		1		3	5	7	9	The Information Technology
The Port features	9	7	5	3		1		3	5	7	9	The External factors
The Costs	9	7	5	3		1		3	5	7	9	The Management
The Costs	9	7	5	3		1		3	5	7	9	The Cargo features
The Costs	9	7	5	3		1		3	5	7	9	The Customer service
The Costs	9	7	5	3		1		3	5	7	9	The Information Technology
The Costs	9	7	5	3		1		3	5	7	9	The External factors

Indicator	Absolutely more important (9)	Demonstrably more important (7	Strongly more important (5)	Slightly more Important (3)		Equally important (1)		Slightly more Important (3)	Strongly more important (5)	Demonstrably more important (7)	Absolutely more important (9)	Indicator
The Management	9	7	5	3		1		3	5	7	9	The Cargo features
The Management	9	7	5	3		1		3	5	7	9	The Customer service
The Management	9	7	5	3		1		3	5	7	9	The Information Technology
The Management	9	7	5	3		1		3	5	7	9	The External factors
The Cargo features	9	7	5	3		1		3	5	7	9	The Customer service
The Cargo features	9	7	5	3		1		3	5	7	9	The Information Technology
The Cargo features	9	7	5	3		1		3	5	7	9	The External factors
The Customer service	9	7	5	3		1		3	5	7	9	The Information Technology
The Customer service	9	7	5	3		1		3	5	7	9	The External factors
The Information Technology	9	7	5	3		1		3	5	7	9	The External factors
The Port features												
Location	9	7	5	3		1		3	5	7	9	Port depth
Location	9	7	5	3		1		3	5	7	9	Storage area (TEU)
Location	9	7	5	3		1		3	5	7	9	Berth availability
Location	9	7	5	3		1		3	5	7	9	Equipment availability
The Port features												
Port depth	9	7	5	3		1		3	5	7	9	Storage area (TEU)
Port depth	9	7	5	3		1		3	5	7	9	Berth availability
Port depth	9	7	5	3		1		3	5	7	9	Equipment availability
The Port features												
Storage area (TEU)	9	7	5	3		1		3	5	7	9	Berth availability
Storage area (TEU)	9	7	5	3		1		3	5	7	9	Equipment availability
Berth availability	9	7	5	3		1		3	5	7	9	Equipment availability

Indicator	Absolutely more important (9)	Demonstrably more important (7	Strongly more important (5)	Slightly more Important (3)		Equally important (1)		Slightly more Important (3)	Strongly more important (5)	Demonstrably more important (7)	Absolutely more important (9)	Indicator
The Costs												
Port dues	9	7	5	3		1		3	5	7	9	Terminal handling fees
Port dues	9	7	5	3		1		3	5	7	9	Operating cost
Terminal handling fees	9	7	5	3		1		3	5	7	9	Operating cost
Management												
Management flexibility	9	7	5	3		1		3	5	7	9	Capacity of branch/ agent
Management flexibility	9	7	5	3		1		3	5	7	9	Relationship between management and employee
Capacity of branch/ agent	9	7	5	3		1		3	5	7	9	Relationship between management and employee
Cargo Features												
Cargo volumes	9	7	5	3		1		3	5	7	9	Transshipment volumes
Cargo volumes	9	7	5	3		1		3	5	7	9	Efficiency of handling facilities
Transshipment volumes	9	7	5	3		1		3	5	7	9	Efficiency of handling facilities
Customer Service												
Planning shipping movements	9	7	5	3		1		3	5	7	9	Pilot and tug services
Planning shipping movements	9	7	5	3		1		3	5	7	9	Resources Ordering
Planning shipping movements	9	7	5	3		1		3	5	7	9	customer service effectiveness
Planning shipping movements	9	7	5	3		1		3	5	7	9	Liaising with ship agents
Planning shipping movements	9	7	5	3		1		3	5	7	9	Communicate with vessels
Pilot and tug services	9	7	5	3		1		3	5	7	9	Resources Ordering
Pilot and tug services	9	7	5	3		1		3	5	7	9	customer service effectiveness
Pilot and tug services	9	7	5	3		1		3	5	7	9	Liaising with ship agents
Pilot and tug services	9	7	5	3		1		3	5	7	9	Communicate with vessels
Resources Ordering	9	7	5	3		1		3	5	7	9	Customer service effectiveness
Resources Ordering	9	7	5	3		1		3	5	7	9	Liaising with ship agents
Resources Ordering	9	7	5	3		1		3	5	7	9	Communicate with vessels

Indicator	Absolutely more important (9)	Demonstrably more important (7	Strongly more important (5)	Slightly more Important (3)		Equally important (1)		Slightly more Important (3)	Strongly more important (5)	Demonstrably more important (7)	Absolutely more important (9)	Indicator
Customer Service												
customer service effectiveness	9	7	5	3		1		3	5	7	9	Liaising with ship agents
customer service effectiveness	9	7	5	3		1		3	5	7	9	Communicate with vessels
Liaising with ship agents	9	7	5	3		1		3	5	7	9	Communicate with vessels
Information Technology												
Information technology aptitude	9	7	5	3		1		3	5	7	9	Service efficiency
Information technology aptitude	9	7	5	3		1		3	5	7	9	Automated OCR* of container
Information technology aptitude	9	7	5	3		1		3	5	7	9	Gate automation
Information technology aptitude	9	7	5	3		1		3	5	7	9	Real time location system
Information technology aptitude	9	7	5	3		1		3	5	7	9	motion equipment processing and flexible traffic control
Information Technology												
Service efficiency	9	7	5	3		1		3	5	7	9	Automated OCR* of container
Service efficiency	9	7	5	3		1		3	5	7	9	Gate automation
Service efficiency	9	7	5	3		1		3	5	7	9	Real time location system
Service efficiency	9	7	5	3		1		3	5	7	9	motion equipment processing and flexible traffic control
Automated OCR* of container	9	7	5	3		1		3	5	7	9	Gate automation
Automated OCR* of container	9	7	5	3		1		3	5	7	9	Real time location system
Automated OCR* of container	9	7	5	3		1		3	5	7	9	Motion equipment processing and flexible traffic control
Information Technology												
Gate automation	9	7	5	3		1		3	5	7	9	Real time location system
Gate automation	9	7	5	3		1		3	5	7	9	Motion equipment processing and flexible traffic control
Real time location system	9	7	5	3		1		3	5	7	9	motion equipment processing and flexible traffic control

Indicator	Absolutely more important (9)	Demonstrably more important (7	Strongly more important (5)	Slightly more Important (3)		Equally important (1)		Slightly more Important (3)	Strongly more important (5)	Demonstrably more important (7)	Absolutely more important (9)	Indicator
External Factors												
Political consideration	9	7	5	3		1		3	5	7	9	Hinterland/foreland connections
Political consideration	9	7	5	3		1		3	5	7	9	Possibility of niche market
Political consideration	9	7	5	3		1		3	5	7	9	Frequency of trunk and feeder routes
Hinterland/foreland connections	9	7	5	3		1		3	5	7	9	Possibility of niche market
Hinterland/foreland connections	9	7	5	3		1		3	5	7	9	Frequency of trunk and feeder routes
Possibility of niche market	9	7	5	3		1		3	5	7	9	Frequency of trunk and feeder routes

Appendices E

Stages for the application of AHP Analysis

Main factors

The Main Factors							
	The port features	**The port charges**	**The Operation Management**	**The Cargo Handling**	**The customer service level**	**The Information Technology**	**The External factors**
The port features	1	0.275169683	0.746116285	0.173470053	0.516070141	0.637165735	0.865318094
The port charges	3.634121274	1	1.491596308	0.202153421	0.779154643	0.867305102	2.251988825
The Operation Management	1.340273655	0.670422684	1	0.330068049	0.516718883	1.729475453	4.212865931
The Cargo Handling	5.764683768	4.946737951	3.029678285	1	2.840281222	4.305689696	2.452727949
The customer service level	1.937721099	1.283442264	1.935288284	0.352077813	1	1.984518645	2.6144508
The Information Technology	1.569450372	1.152996791	0.578209999	0.232250829	0.503900532	1	2.11536969
.The External factors	1.155644389	0.444051937	0.237368104	0.407709302	0.382489508	0.472730608	1

Eigenvalues		Eigenvectors (R&L)				
Real	Imaginary	Age/stage struct	Reprod val			
7.44474526	0	6.1%	23.5%			
0.029413315	-1.50738831	12.9%	11.6%			
0.029413315	1.507388314	12.5%	12.2%			
-0.11075121	-0.10121326	36.9%	4.2%			
-0.11075121	0.10121326	15.7%	8.8%			
-0.14103473	0.981159574	9.6%	14.5%			
-0.14103473	-0.98115957	6.4%	25.1%			
r	2.007508449	(rate of increase)				
Ro	0	(expected number of replacements)				
T	#NUM!	(generation time - time for increase of Ro)				
mu1	#NUM!	(mean age of parents of offspring of a cohort)				
N (fundamental matrix)						
1	0	0	0	0	0	0
0.568589696	0.498640029	0.086321	-0.08007	-0.13166	-0.4472	0.05132
-1.13943874	-0.36083299	0.388957	0.024112	-0.26817	-0.08701	0.145166
-1.17367227	0.100034873	0.028144	0.308263	-0.21426	-0.25516	-2.19474
-1.93710558	-0.55900695	-0.05936	-0.15328	0.698568	0.027659	-0.29378
0.172991406	0.078812995	-0.25264	-0.07875	-0.1221	0.661444	-0.1059
-0.15009325	-0.0509804	-0.14232	0.039716	0.002182	-0.18377	0.243294
R (expected lifetime production)						
-0.9166287	-0.39704381	0.00409	-0.04547	0.01112	0.044462	-0.26685

Port Features

The Port features					
	Location	**Port depth**	**Storage Capacity (TEU)**	**Berth length**	**Handling Equipment availability**
Location	1	0.396416742	0.371423822	0.408972798	0.422024323
Port depth	2.522597794	1	1.539177901	1.231265909	2.281843827
Storage Capacity (TEU)	2.692342118	0.649697478	1	1.05790437	3.75320746
Berth length	2.445150399	0.812172247	0.945265024	1	1.076239836
Handling Equipment availability	2.369531675	0.438242086	0.266438776	0.929160923	1

Eigenvalues		Eigenvectors (R&L)		
Real	Imaginary	Age/stage struct	Reprod val	
5.204506644	0	8.6%	37.1%	
-0.040616004	-1.021239143	29.0%	10.9%	
-0.040616004	1.021239143	27.8%	12.3%	
-0.061637318	-0.077227819	20.5%	15.3%	
-0.061637318	0.077227819	14.2%	24.5%	
r	1.649524913	(rate of increase)		
Ro	0	(expected number of replacements)		
T	#NUM!	(generation time - time for increase of Ro)		
mu1	#NUM!	(mean age of parents of offspring of a cohort)		
N (fundamental matrix)				
1	0	0	0	0
-2.281066689	0.590555522	-0.1342	-0.78409175	-0.62977134
-0.671061884	-0.439918508	0.377762	-0.38466659	0.152848314
-1.281882733	-0.15239011	-0.04503	0.480123612	-0.82303549
0.038838914	-0.059274173	-0.23052	0.000399009	0.341002649
R (expected lifetime production)				
-0.661365597	-0.01662867	-0.02859	-0.25717554	-0.38556811

Port Charges

The port Charges			
	Port dues	**Terminal handling fees**	**Operating cost**
Port dues	1	0.516070141	1.475460983
Terminal handling fees	1.937721099	1	1.168053957
Operating cost	0.677754282	0.856124834	1

Eigenvalues		Eigenvectors (R&L)	
Real	Imaginary	Age/stage struct	Reprod val
3.08969393	0	29.8%	35.8%
-0.044846965	-0.524514576	42.9%	24.9%
-0.044846965	0.524514576	27.3%	39.2%
r	1.128072034	(rate of increase)	
Ro	0	(expected number of replacements)	
T	#NUM!	(generation time - time for increase of Ro)	
mu1	#NUM!	(mean age of parents of offspring of a cohort)	
N (fundamental matrix)			
1	0	0	
-0.791653571	0	-1.168053957	
-1.658931155	-0.856124834	0	
R (expected lifetime production)			
-1.856236962	-1.26317879	-0.60279777	

The Operation Management

The Operation Management			
	management Reliability	**Capacity of branch/ agent**	**Relationship between management and employee**
Management Reliability	1	2.270348027	2.423680084
Capacity of branch/ agent	0.440461105	1	1.070817801
Relationship between management and employee	0.412595708	0.933865686	1

Eigenvalues		Eigenvectors (R&L)	
Real	Imaginary	Age/stage struct	Reprod val
3.000001046	0	54.0%	17.6%
-5.23166E-07	-0.001771721	23.8%	39.8%
-5.23166E-07	0.001771721	22.2%	42.6%
r	1.098612637	(rate of increase)	
Ro	0	(expected number of replacements)	
T	#NUM!	(generation time - time for increase of Ro)	
mu1	#NUM!	(mean age of parents of offspring of a cohort)	
N (fundamental matrix)			
1	0	0	
-0.441814828	0	-1.070817801	
-0.411331512	-0.933865686	0	
R (expected lifetime production)			
-1.000009417	-2.263391664	-2.431129081	

The Cargo Handling

The Cargo Handling			
	Cargo volumes	**Transshipment volumes**	**Efficiency of handling facilities**
Cargo volumes	1	1.219775902	1.622870751
Transshipment volumes	0.819822722	1	0.746125801
Efficiency of handling facilities	0.616192016	1.340256561	1

Eigenvalues		Eigenvectors (R&L)	
Real	Imaginary	Age/stage struct	Reprod val
3.037285906	0	41.3%	26.2%
-0.018642953	-0.336006545	27.9%	38.7%
-0.018642953	0.336006545	30.8%	35.1%
r	1.110964323	(rate of increase)	
Ro	0	(expected number of replacements)	
T	#NUM!	(generation time - time for increase of Ro)	
mu1	#NUM!	(mean age of parents of offspring of a cohort)	
N (fundamental matrix)			
1	0	0	
-0.459756762	0	-0.746125801	
-1.098772782	-1.340256561	0	
R (expected lifetime production)			
-1.343966428	-2.175063171	-0.910106272	

Customer Service Level

Customer Service level						
	Planning ship movements	**Pilotage and tug services**	**Resources Ordering**	**customer service effectiveness**	**Liaising with ship agents**	**Communicate with vessels**
Planning ship movements	1	0.618252716	1.108934505	0.246011168	0.631866867	1.609353928
Pilotage and tug services	1.617461555	1	4.69071353	0.319864444	0.631073556	2.354664174
Resources Ordering	0.901766512	0.213187182	1	0.39591904	0.230793583	1.442155614
customer service effectiveness	4.064856108	3.126324353	2.525768905	1	1.039019416	4.879729685
Liaising with ship agents	1.582611863	1.584601335	4.332876098	0.962445922	1	2.279507057
Communicate with vessels	0.621367359	0.424689011	0.693406447	0.204929384	0.438691338	1

Eigenvalues		Eigenvectors (R&L)			
Real	Imaginary	Age/stage struct	Reprod val		
6.303668115	0	10.2%	18.7%		
0.008058316	-0.72454	18.0%	11.6%		
0.008058316	0.724543	7.9%	27.6%		
-0.007756907	0	33.2%	6.2%		
-0.15601392	-1.16944	23.8%	8.3%		
-0.15601392	1.169439	6.9%	27.6%		
r	1.841132	(rate of increase)			
Ro	0	(expected number of replacements)			
T	#NUM!	(generation time - time for increase of Ro)			
mu1	#NUM!	(mean age of parents of offspring of a cohort)			
N (fundamental matrix)					
1	0	0	0	0	0
-0.35873805	0.361335	0.425484404	-0.19117498	-0.23319	-0.29085
-0.009966774	-0.15037	0.31108874	0.018042772	-0.08011	0.009919
-0.100119952	0.315202	-1.23806555	0.428846144	-0.46035	-0.81779
-1.006600012	-0.25936	-0.32527079	-0.0437762	0.567413	-1.6316
-0.383683934	-0.09844	-0.36435991	-0.08246616	0.070046	0.528616
R (expected lifetime production)					
-0.510994341	-0.18812	-0.48845591	-0.15306322	0.125003	-0.55023

Information Technology

Information Technology						
	Information technology aptitude	**Service efficiency**	**Automated OCR* of container**	**Gate automation**	**Real time location system**	**motion equipment processing and flexible traffic control**
Information technology aptitude	1	0.199255478	0.42149447	0.667900699	0.506857625	0.907988289
Service efficiency	5.018682607	1	3.558724948	3.707792751	3.473222399	5.544443371
Automated OCR* of container	2.37251037	0.280999519	1	1.609353928	2.485275882	1.064597625
Gate automation	1.497228556	0.269702237	0.621367359	1	3.445136136	3.136869197
Real time location system	1.972940628	0.287917065	0.402369816	0.290264292	1	0.841734383
motion equipment processing and flexible traffic control	1.101335791	0.180360756	0.939322028	0.318789193	1.188023229	1

Eigenvalues		Eigenvectors (R&L)			
Real	Imaginary	Age/stage struct	Reprod val		
6.353508	0	7.2%	25.9%		
-0.02207	-0.87046263	43.2%	4.2%		
-0.02207	0.870462632	16.0%	11.9%		
-0.02839	0	16.5%	12.3%		
-0.1405	1.202685967	8.4%	23.6%		
-0.1405	-1.20268597	8.6%	22.1%		
r	1.849007055	(rate of increase)			
Ro	0	(expected number of replacements)			
T	#NUM!	(generation time - time for increase of Ro)			
mu1	#NUM!	(mean age of parents of offspring of a cohort)			
N (fundamental matrix)					
1	0	0	0	0	0
-4.69234	0.458215933	-0.4427834	0.070321	-2.72028	-0.61725
-0.30696	-0.10986124	0.391309712	0.064917	-0.01319	-0.68567
-0.85731	-0.1056754	-0.40986493	0.335413	-0.03551	0.193698
0.258085	0.045654902	-0.13218982	-0.15201	0.432943	-0.25787
-0.29651	-0.06777619	0.105737435	-0.17075	-0.23899	0.472104
R (expected lifetime production)					
-0.77537	-0.06398399	-0.16803428	0.033312	-0.56887	0.015336

External Factors

External Factors				
	Political consideration	**Hinterland/foreland connections**	**Possibility of niche market**	**Frequency of trunk and feeder routes**
Political consideration	1	0.454770353	0.770735978	0.475504783
Hinterland/foreland connections	2.198912028	1	0.639439807	1.676378059
Possibility of niche market	1.297461165	1.563868857	1	0.99749057
Frequency of trunk and feeder routes	2.103028266	0.596524152	1.002515743	1

Eigenvalues		Eigenvectors (R&L)	
Real	Imaginary	Age/stage struct	Reprod val
4.148487771	0	15.3%	37.3%
-0.027812227	-0.781063832	30.1%	19.8%
-0.027812227	0.781063832	29.3%	20.3%
-0.092863316	0	25.3%	22.6%
r	1.422743875	(rate of increase)	
Ro	0	(expected number of replacements)	
T	#NUM!	(generation time - time for increase of Ro)	
mu1	#NUM!	(mean age of parents of offspring of a cohort)	
N (fundamental matrix)			
1	0	0	0
-0.439716187	0.332367817	-0.558575823	-0.212
-1.836107764	-0.197767897	0.332367817	-0.87135
-0.611336821	-0.52108731	-0.126778808	0.332368
R (expected lifetime production)			
-0.905817782	-0.249055313	-0.05813982	-0.60995

Appendix F

Column1	EXPERT 1	EXPERT 2	EXPERT 3	EXPERT 4	EXPERT 5	EXPERT 6	EXPERT 7	MIN (L)	GEOMEAN (M)	MAX (U)	α	λ	A	B	AGGREGATE
The Port features								0	#NUM!	0			#NUM!	#NUM!	#NUM!
The port features Vs. The port charges	1	0.11	0.11	0.14	0.33	3	0.14	0.11	0.275169683	3	1	1	0.27516968	0.275169683	0.275169683
The port features Vs. The operation Management	7	5	0.14	0.14	1	1	1	0.14	0.746116285	7	1	1	0.74611628	0.746116285	0.746116285
The port features Vs. The Cargo Handling	0.14	0.14	0.14	0.14	0.33	0.14	0.33	0.14	0.173470053	0.33	1	1	0.17347005	0.173470053	0.173470053
The port features Vs the customer service level	3	1	0.11	0.11	3	3	0.14	0.11	0.516070141	3	1	1	0.51607014	0.516070141	0.516070141
The port features Vs. The Information Technology	9	5	0.2	0.14	0.2	7	0.11	0.11	0.637165735	9	1	1	0.63716574	0.637165735	0.637165735
The port features Vs. The External factors	9	3	0.33	0.14	3	3	0.2	0.14	0.865318094	9	1	1	0.86531809	0.865318094	0.865318094
The port Charges								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
The port Charges Vs. The Operation Management	5	9	0.11	3	0.33	5	0.2	0.11	1.491596308	9	1	1	1.49159631	1.491596308	1.491596308
The port Charges Vs. The Cargo Handling	0.11	1	0.14	0.14	0.33	0.14	0.2	0.11	0.202153421	1	1	1	0.20215342	0.202153421	0.202153421
The port Charges Vs. The Customer service level	3	7	0.11	0.14	3	1	0.14	0.11	0.779154643	7	1	1	0.77915464	0.779154643	0.779154643
The port Charges Vs. The information technology	7	5	0.2	0.11	3	3	0.14	0.11	0.867305102	7	1	1	0.8673051	0.867305102	0.867305102
The port Charges Vs. The External factors	9	7	3	0.2	5	5	0.14	0.14	2.251988825	9	1	1	2.25198882	2.251988825	2.251988825
The Operation Management								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
The Operation Management Vs. The Cargo Handling	0.14	0.14	0.2	0.33	0.33	1	1	0.14	0.330068049	1	1	1	0.33006805	0.330068049	0.330068049
The Operation Management Vs. The Customer service level	0.11	0.2	0.14	1	5	0.33	1	0.11	0.516718883	5	1	1	0.51671888	0.516718883	0.516718883
The Operation Management Vs. The information technology	3	1	7	0.33	5	1	0.33	0.33	1.729475453	7	1	1	1.72947545	1.729475453	1.729475453
The Operation Management Vs. The External factors	7	3	5	3	5	7	3	3	4.212865931	7	1	1	4.21286593	4.212865931	4.212865931
The Cargo Handling								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
The Cargo Handling Vs. The Customer service level	9	7	0.14	0.2	7	7	7	0.14	2.840281222	9	1	1	2.84028122	2.840281222	2.840281222
The Cargo Handling Vs. The information technology	9	5	5	1	7	3	5	1	4.305689696	9	1	1	4.3056897	4.305689696	4.305689696
The Cargo Handling Vs. The External factors	9	7	1	0.33	7	9	1	0.33	2.452727949	9	1	1	2.45272795	2.452727949	2.452727949

Column1	EXPERT 1	EXPERT 2	EXPERT 3	EXPERT 4	EXPERT 5	EXPERT 6	EXPERT 7	MIN (L)	GEOMEAN (M)	MAX (U)	α	λ	A	B	AGGREGATE
The Customer service level								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
The Customer service level Vs. The information technology	3	3	3	3	0.33	1	3	0.33	1.984518645	3	1	1	1.98451864	1.984518645	1.984518645
The Customer service level Vs. The External factors	5	3	7	1	0.33	7	3	0.33	2.6144508	7	1	1	2.6144508	2.6144508	2.6144508
The Information Technology								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
The Information Technology Vs. The External factors	3	5	3	1	0.33	3	3	0.33	2.11536969	5	1	1	2.11536969	2.11536969	2.11536969
The Port features								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
Location Vs. Port depth	1	0.14	1	0.11	0.2	9	0.11	0.11	0.396416742	9	1	1	0.39641674	0.396416742	0.396416742
Location Vs. Storage Capacity (TEU)	0.2	0.2	7	0.14	1	0.33	0.2	0.14	0.371423822	7	1	1	0.37142382	0.371423822	0.371423822
Location Vs. Berth length	0.11	0.11	3	0.14	1	7	0.11	0.11	0.408972798	7	1	1	0.4089728	0.408972798	0.408972798
Location Vs. Handling Equipment availability	3	1	3	0.11	0.33	0.2	0.11	0.11	0.422024323	3	1	1	0.42202432	0.422024323	0.422024323
Port depth Vs. Storage Capacity (TEU)	0.14	1	5	1	5	3	1	0.14	1.539177901	5	1	1	1.5391779	1.539177901	1.539177901
Port depth Vs. Berth length	0.11	0.14	1	1	7	1	7	0.11	1.231265909	7	1	1	1.23126591	1.231265909	1.231265909
Port depth Vs. Handling Equipment availability	3	1	1	1	5	7	1	1	2.281843827	7	1	1	2.28184383	2.281843827	2.281843827
Storage Capacity (TEU) Vs. Berth length	0.14	0.14	0.33	0.33	5	7	3	0.14	1.05790437	7	1	1	1.05790437	1.05790437	1.05790437
Storage Capacity (TEU) Vs. Handling Equipment availability	7	9	1	1	5	5	5	1	3.75320746	9	1	1	3.75320746	3.75320746	3.75320746
Berth length Vs. Handling Equipment availability	1	1	3	1	1	0.2	1	0.2	1.076239836	3	1	1	1.07623984	1.076239836	1.076239836
The port Charges								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
Port dues Vs. Terminal handling fees	1	0.2	5	1	0.33	0.33	0.14	0.14	0.516070141	5	1	1	0.51607014	0.516070141	0.516070141
Port dues Vs. Operating cost	5	1	5	5	0.33	0.33	0.33	0.33	1.475460983	5	1	1	1.47546098	1.475460983	1.475460983
Terminal handling fees Vs. Operating cost	3	0.33	1	1	5	1	0.14	0.14	1.168053957	5	1	1	1.16805396	1.168053957	1.168053957
The Operation Management								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
management Reliability Vs. Capacity of branch/ agent	3	0.14	7	0.14	5	7	7	0.14	2.270348027	7	1	1	2.27034803	2.270348027	2.270348027
management Reliability Vs. Relationship between management and employee	3	3	7	0.14	5	3	3	0.14	2.423680084	7	1	1	2.42368008	2.423680084	2.423680084
Capacity of branch/ agent Vs. Relationship between management and employee	7	9	1	0.14	0.14	7	1	0.14	1.070817801	9	1	1	1.0708178	1.070817801	1.070817801
The Cargo Handling								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!

Column1	EXPERT 1	EXPERT 2	EXPERT 3	EXPERT 4	EXPERT 5	EXPERT 6	EXPERT 7	MIN (L)	GEOMEAN (M)	MAX (U)	α	λ	A	B	AGGREGATE
Cargo volumes Vs. Transshipment volumes	1	9	0.33	0.33	5	1	1	0.33	1.219775902	9	1	1	1.2197759	1.219775902	1.219775902
Cargo volumes Vs. Efficiency of handling facilities	9	9	1	0.2	0.33	3	1	0.2	1.622870751	9	1	1	1.62287075	1.622870751	1.622870751
Transshipment volumes Vs. Efficiency of handling facilities	5	9	0.14	1	0.33	0.14	1	0.14	0.746125801	9	1	1	0.7461258	0.746125801	0.746125801
Customer Service level								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
Planning ship movements Vs.Pilotage and tug services	3	0.33	9	0.11	1	0.33	0.2	0.11	0.618252716	9	1	1	0.61825272	0.618252716	0.618252716
Planning ship movements Vs. Resources Ordering	0.33	0.33	7	1	3	1	1	0.33	1.108934505	7	1	1	1.1089345	1.108934505	1.108934505
Planning ship movements Vs. customer service effectiveness	0.11	0.2	0.14	0.2	1	0.33	0.2	0.11	0.246011168	1	1	1	0.24601117	0.246011168	0.246011168
Planning ship movements Vs .Liaising with ship agents	0.33	0.14	1	1	5	0.11	1	0.11	0.631866867	5	1	1	0.63186687	0.631866867	0.631866867
Planning ship movements Vs. Communicate with vessels	1	3	1	3	5	1	1	1	1.609353928	5	1	1	1.60935393	1.609353928	1.609353928
Pilotage and tug services Vs. Resources Ordering	5	5	5	5	5	3	5	3	4.69071353	5	1	1	4.69071353	4.69071353	4.69071353
Pilotage and tug services Vs. customer service effectiveness	0.33	0.33	0.14	0.2	1	0.33	0.33	0.14	0.319864444	1	1	1	0.31986444	0.319864444	0.319864444
Pilotage and tug services Vs. Liaising with ship agents	0.14	0.2	0.33	0.33	5	1	0.33	0.14	0.631073556	5	1	1	0.63107356	0.631073556	0.631073556
Pilotage and tug services Vs. Communicate with vessels	7	9	1	1	5	3	1	1	2.354664174	9	1	1	2.35466417	2.354664174	2.354664174
Resources Ordering Vs. customer service effectiveness	0.14	0.2	1	0.33	0.33	0.2	3	0.14	0.39591904	3	1	1	0.39591904	0.39591904	0.39591904
Resources Ordering Vs. Liaising with ship agents	0.33	0.14	0.33	0.2	0.33	0.2	0.2	0.14	0.230793583	0.33	1	1	0.23079358	0.230793583	0.230793583
Resources Ordering Vs. Communicate with vessels	3	5	3	3	0.33	1	0.14	0.14	1.442155614	5	1	1	1.44215561	1.442155614	1.442155614
customer service effectiveness Vs. Liaising with ship agents	0.2	1	7	0.33	3	0.14	1	0.14	1.039019416	7	1	1	1.03901942	1.039019416	1.039019416
customer service effectiveness Vs. Communicate with vessels	9	7	7	3	3	9	3	3	4.879729685	9	1	1	4.87972969	4.879729685	4.879729685
Liaising with ship agents Vs. Communicate with vessels	9	9	1	1	1	9	1	1	2.279507057	9	1	1	2.27950706	2.279507057	2.279507057
Information Technology								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
Information technology aptitude Vs. Service efficiency	0.14	0.14	0.14	1	0.33	0.14	0.14	0.14	0.199255478	1	1	1	0.19925548	0.199255478	0.199255478
Information technology aptitude Vs .Automated OCR* of container	0.33	0.2	3	0.14	0.33	1	0.33	0.14	0.42149447	3	1	1	0.42149447	0.42149447	0.42149447
Information technology aptitude Vs. Gate automation	0.33	0.2	0.2	3	1	1	1	0.2	0.667900699	3	1	1	0.6679007	0.667900699	0.667900699
Information technology aptitude Vs. Real time location system	1	1	0.33	0.2	1	0.33	1	0.2	0.506857625	1	1	1	0.50685762	0.506857625	0.506857625
Information technology aptitude Vs. motion equipment processing and flexible traffic control	0.33	1	0.2	1	1	7	1	0.2	0.907988289	7	1	1	0.90798829	0.907988289	0.907988289

Column1	EXPERT 1	EXPERT 2	EXPERT 3	EXPERT 4	EXPERT 5	EXPERT 6	EXPERT 7	MIN (L)	GEOMEAN (M)	MAX (U)	α	λ	A	B	AGGREGATE
Service efficiency Vs. Automated OCR* of container	5	1	7	1	3	5	7	1	3.558724948	7	1	1	3.55872495	3.558724948	3.558724948
Service efficiency Vs. Gate automation	3	3	7	7	3	3	3	3	3.707792751	7	1	1	3.70779275	3.707792751	3.707792751
Service efficiency Vs. Real time location system	0.14	7	7	7	1	9	7	0.14	3.473222399	9	1	1	3.4732224	3.473222399	3.473222399
Service efficiency Vs motion equipment processing and flexible traffic control	7	5	7	5	1	9	9	1	5.544443371	9	1	1	5.54444337	5.544443371	5.544443371
Automated OCR* of container Vs. Gate automation	1	1	1	1	5	1	3	1	1.609353928	5	1	1	1.60935393	1.609353928	1.609353928
Automated OCR* of container Vs. Real time location system	3	3	0.33	3	5	33	3	0.33	2.485275882	33	1	1	2.48527588	2.485275882	2.485275882
Automated OCR* of container Vs. motion equipment processing and flexible traffic control	1	1	1	1	5	0.33	1	0.33	1.064597625	5	1	1	1.06459763	1.064597625	1.064597625
Gate automation Vs. Real time location system	3	5	3	3	1	7	3	1	3.445136136	7	1	1	3.44513614	3.445136136	3.445136136
Gate automation Vs. motion equipment processing and flexible traffic control	1	5	3	5	1	5	5	1	3.136869197	5	1	1	3.1368692	3.136869197	3.136869197
Real time location system Vs. motion equipment processing and flexible traffic control	0.14	1	0.2	3	3	1	1	0.14	0.841734383	3	1	1	0.84173438	0.841734383	0.841734383
External Factors								0	#NUM!	0	1	1	#NUM!	#NUM!	#NUM!
Political consideration Vs. Hinterland/foreland connections	0.14	1	0.2	3	0.33	0.2	1	0.14	0.454770353	3	1	1	0.45477035	0.454770353	0.454770353
Political consideration Vs. Possibility of niche market	0.33	0.33	0.33	5	3	0.14	0.33	0.14	0.770735978	5	1	1	0.77073598	0.770735978	0.770735978
Political consideration Vs. Frequency of trunk and feeder routes	0.2	3	0.2	1	0.33	0.33	1	0.2	0.475504783	3	1	1	0.47550478	0.475504783	0.475504783
Hinterland/foreland connections Vs. Possibility of niche market	1	1	7	1	0.33	0.11	1	0.11	0.639439807	7	1	1	0.63943981	0.639439807	0.639439807
Hinterland/foreland connections Vs. Frequency of trunk and feeder routes	0.33	7	1	1	1	9	3	0.33	1.676378059	9	1	1	1.67637806	1.676378059	1.676378059
Possibility of niche market Vs. Frequency of trunk and feeder routes	0.33	1	0.33	1	1	9	1	0.33	0.99749057	9	1	1	0.99749057	0.99749057	0.99749057